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B&W Y-12 technical services LLC

Y-12 NATIONAL SECURITY COMPLEX

CALENDAR YEAR 2010 GROUNDWATER MONITORING REPORT, U.S. DEPARTMENT OF ENERGY Y-12 NATIONAL SECURITY COMPLEX, OAK RIDGE, TENNESSEE

December 2011

Prepared by

Elvado Environmental LLC
Under Subcontract No. 4300073231

for the

Environmental Compliance Department
Environment, Safety, and Health Division
Y-12 National Security Complex
Oak Ridge, Tennessee 37831

Managed by

Babcock & Wilcox Technical Services Y-12, LLC
for the U.S. Department of Energy
Under Contract No. DE-AC05-00OR22800

MANAGED BY
B&W Y-12, LLC
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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DISCLAIMER

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List of Acronyms and Abbreviations

ACO	Analytical Chemistry Organization
BCK	Bear Creek kilometer
BCBG	Bear Creek Burial Grounds
BCV	Bear Creek Valley
Bear Creek Regime	Bear Creek Hydrogeologic Regime
BG	Burial Ground
bgs	below ground surface
BJC	Bechtel Jacobs Company LLC
B&W Y-12	Babcock & Wilcox Technical Services Y-12, LLC
BWXT	BWXT Y-12, L.L.C.
BYBY	Boneyard/Burnyard
CASI	Commodore Advanced Sciences, Inc.
CDL	Construction/Demolition Landfill
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Chestnut Ridge Regime	Chestnut Ridge Hydrogeologic Regime
CRSDB	Chestnut Ridge Sediment Disposal Basin
CRSP	Chestnut Ridge Security Pits
CTET	carbon tetrachloride
CY	calendar year
DNAPL	dense nonaqueous phase liquids
DOE	U.S. Department of Energy
DQO	data quality objective
East Fork Regime	Upper East Fork Poplar Creek Hydrogeologic Regime
ECRWP	East Chestnut Ridge Waste Pile
EMWMF	Environmental Management Waste Management Facility
ETB	ethylbenzene
FCAP	Filled Coal Ash Pond
ft	feet
ft/d	feet per day
GIMS	Groundwater Information Management System
gpm	gallons per minute
GWPP	Groundwater Protection Program
GWQAP	Groundwater Quality Assessment Plan
HCDA	Hazardous Chemical Disposal Area
ILF	Industrial Landfill
KHQ	Kerr Hollow Quarry
MC	methylene chloride
MCL	maximum contaminant level
MDA	minimum detectable activity
mg/d	million gallons per day
µg/L	micrograms per liter
mg/L	milligrams per liter
MMES	Martin Marietta Energy Systems, Inc.
mrem/yr	millirem per year

List of Acronyms and Abbreviations (continued)

msl	mean sea level
NHP	New Hope Pond
NOV	Notice of Violation
NPDES	National Pollution Discharge Elimination System
NT	northern tributary (of Bear Creek)
OF	outfall
OLF	Oil Landfarm
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCE	tetrachloroethene
pCi/L	picoCuries per liter
PDB	passive diffusion bag
POC	point-of-compliance
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
REDOX	oxidation-reduction potential
ROD	record of decision (CERCLA)
SAP	sampling and analysis plan
SCR	south Chestnut Ridge
SDWA	Safe Drinking Water Act
SS	south side (of Bear Creek)
SWDF	Solid Waste Disposal Facility
Tc-99	technetium-99
TCE	trichloroethene
TCFM	trichlorofluoromethane
TDEC	Tennessee Department of Environment and Conservation
TDS	total dissolved solids
TPU	total propagated uncertainty
U-234	uranium-234
U-238	uranium-238
UEFPC	Upper East Fork Poplar Creek
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
WCPA	Waste Coolant Processing Area
WMA	waste management area
WRRP	Water Resources Restoration Program
Y-12	Y-12 National Security Complex
yd^3	cubic yards
111TCA	1,1,1-trichloroethane
11DCA	1,1-dichloroethane
11DCE	1,1-dichloroethene
12DCA	1,2-dichloroethane
12DCE	1,2-dichloroethene
c12DCE	cis-1,2-dichloroethene
t12DCE	trans-1,2-dichloroethene

1.0 INTRODUCTION

This report contains the groundwater and surface water monitoring data that were obtained during calendar year (CY) 2010 at the U.S. Department of Energy (DOE) Y-12 National Security Complex (hereafter referenced as Y-12) on the DOE Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee. The CY 2010 monitoring data were obtained from wells, springs, and surface water sampling locations in three hydrogeologic regimes at Y-12 (Figure A.1). The Bear Creek Hydrogeologic Regime (Bear Creek Regime) encompasses a section of Bear Creek Valley (BCV) between the west end of Y-12 and the west end of the Bear Creek Watershed (directions are in reference to the Y-12 grid system). The Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime) encompasses the Y-12 industrial facilities and support structures in BCV. The Chestnut Ridge Hydrogeologic Regime (Chestnut Ridge Regime) encompasses a section of Chestnut Ridge directly south of Y-12. Section 2 of this report provides background information pertinent to groundwater and surface water quality monitoring in each hydrogeologic regime, including the topography and bedrock geology, surface water drainage, groundwater system, and extent of groundwater contamination.

The CY 2010 groundwater and surface water monitoring data in this report were obtained from sampling and analysis activities implemented under the Y-12 Groundwater Protection Program (GWPP) managed by Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12) and from sampling and analysis activities implemented under several monitoring programs managed by Bechtel Jacobs Company LLC (BJC). Cooperative implementation of the monitoring programs directed by the Y-12 GWPP and BJC (i.e., coordinating sample collection and sharing data) ensures that the CY 2010 monitoring results fulfill requirements of all the applicable monitoring drivers with no duplication of sampling and analysis efforts. Section 3 of this report contains a summary of information regarding the groundwater and surface water sampling and analysis activities implemented under the Y-12 GWPP including sampling locations and frequency; quality assurance (QA)/quality control (QC) sampling; sample collection and handling; field measurements and laboratory analytes; data management and data quality objective (DQO) evaluation; and groundwater elevation monitoring. However, this report does not include equivalent QA/QC or DQO evaluation information regarding the groundwater and surface water sampling and analysis activities associated with the monitoring programs implemented by BJC. Such details are deferred to the respective programmatic plans and reports issued by BJC (see Section 3.0).

Collectively, the groundwater and surface water monitoring data obtained during CY 2010 by the Y-12 GWPP and BJC address DOE Order 450.1A (*Environmental Protection Program*) requirements for monitoring groundwater and surface water quality in areas: (1) which are, or could be, affected by operations at Y-12 (surveillance monitoring); and (2) where contaminants from Y-12 are most likely to migrate beyond the boundaries of the ORR (exit pathway/perimeter monitoring). Section 4 of this report presents a summary evaluation of the monitoring data with regard to the respective objectives of surveillance monitoring and exit pathway/perimeter monitoring, based on the analytical results for the principal groundwater contaminants at Y-12: nitrate, uranium, volatile organic compounds (VOCs), gross alpha activity, and gross beta activity. Section 5 of this report summarizes the most pertinent findings regarding the principal contaminants, along with recommendations proposed for ongoing groundwater and surface water quality monitoring performed under the Y-12 GWPP.

Narrative sections of this report reference several appendices. Figures (maps and diagrams) and tables (excluding data summary tables presented in the narrative sections) are in Appendix A and Appendix B, respectively. Appendix C contains construction details for the wells in each regime that were sampled during CY 2010 by either the Y-12 GWPP or BJC. Field measurements recorded during collection of the groundwater and surface water samples and results of laboratory analyses of the samples are in Appendix D (Bear Creek Regime), Appendix E (East Fork Regime and surrounding areas), and Appendix F (Chestnut Ridge Regime). Appendix G contains data for the QA/QC samples associated with monitoring performed in each regime by the Y-12 GWPP.

2.0 BACKGROUND INFORMATION

The following sections provide information relevant to groundwater and surface water quality monitoring in three hydrogeologic regimes at Y-12 (Figure A.1). These sections include a short description of the topography and geology in each regime; an overview of the hydrogeologic system in each regime; and a discussion of the extent of groundwater contamination in each regime.

2.1 TOPOGRAPHY AND BEDROCK GEOLOGY

The hydrogeologic regimes at Y-12 are located in the Valley and Ridge Physiographic Province, which is characterized by long parallel valleys and ridges formed from folding and thrust faulting that occurred during Paleozoic orogenic events. The geologic strike of the formations generally parallel the axes of the valleys and ridges.

The Bear Creek Regime and the East Fork Regime are each in BCV, which is bound to the north by Pine Ridge and to the south by Chestnut Ridge (Figure A.2). The Bear Creek Regime encompasses several miles of BCV between the western end of the Bear Creek watershed and a low topographic and hydrologic divide near the west end of Y-12. The East Fork Regime encompasses about three miles of BCV east of this topographic/hydrologic divide and west of the ORR property boundary along Scarboro Road. Ground surface elevations along the axis of BCV in each regime range from about 1,000 feet (ft) above mean sea level (msl) near the topographic/hydrologic divide to about 800 ft above msl where Bear Creek cuts through Pine Ridge and about 900 ft above msl where Upper East Fork Poplar Creek (UEFPC) cuts through Pine Ridge.

The Chestnut Ridge Regime is directly south of Y-12 and encompasses a portion of the ridge bordered by BCV to the north, Scarboro Road to the east, Bethel Valley Road to the south, and Dunaway Branch to the west (Figure A.2). The northern flank of the ridge forms a steep slope rising more than 200 ft above the floor of BCV. The crest of the ridge slopes toward the east from an elevation of about 1,200 ft above msl southwest of Y-12 to about 1,060 ft above msl where Scarboro Road crosses the ridge. A series of prominent hills dominate the central part of the broad southern flank of Chestnut Ridge, which gently slopes toward Bethel Valley.

Bedrock geology in the vicinity of Y-12 is characterized by thrust-faulted sequences of southeast-dipping, clastic (primarily shale and siltstone) and carbonate (limestone and dolostone) strata of Lower Cambrian to Upper Ordovician age (Figure A.2). Geologic units in the Bear Creek Regime and the East Fork Regime are the shales and siltstones of the Rome Formation underlying Pine Ridge and the interbedded limestone and shale formations of the Conasauga Group that underlie the southern flank of Pine Ridge and BCV. Carbonates (primarily dolostone) of the Knox Group and the overlying argillaceous limestones and interbedded shales of the Chickamauga Group are the geologic units in the Chestnut Ridge Regime. Strike and dip of bedding in each hydrogeologic regime is generally N55° E and 45° SE, respectively (as referenced to true north).

In BCV, unweathered bedrock is overlain by up to 40 ft of several unconsolidated materials, including alluvium, colluvium, fine-grained residuum, and saprolite (weathered bedrock). Where undisturbed, the saprolite often retains primary textural features of the unweathered bedrock, including fractures (Solomon et al. 1992). However, extensive areas of cut-and-fill within Y-12 have substantially altered the shallow subsurface in BCV throughout much of the East Fork Regime. Most of the fill, which contains many voids and generally consists of 5 to 25 ft of a heterogeneous mixture of building debris and re-compacted soil/residuum (Sutton and Field 1995), was placed in the tributaries and main channel of UEFPC (Figure A.3).

On Chestnut Ridge, bedrock is overlain by as much as 100 ft of red-brown to yellow-orange residuum. The residuum, which is predominantly composed of clay and hematite, contains semicontinuous relict beds of fractured chert and other lithologic heterogeneities (such as silt bodies) that provide a weakly connected network through which saturated flow can occur (Solomon et al. 1992). Also, residuum on Chestnut Ridge is thin or nonexistent near karst features such as dolines (sink holes), swallets (sinking streams), and solution pan features (Ketelle and Huff 1984).

2.2 SURFACE WATER DRAINAGE

The following subsections provide a brief description of surface water drainage systems in the Bear Creek Regime, East Fork Regime, and Chestnut Ridge Regime.

2.2.1 Bear Creek

Surface water in the Bear Creek Regime is drained by Bear Creek and its tributaries (Figure A.2). From its headwaters near the west end of Y-12, Bear Creek flows southwest for approximately 4.5 miles, where it turns northward to flow into East Fork Poplar Creek. Monitoring locations along the main channel of Bear Creek are specified by the Bear Creek kilometer (BCK) value corresponding to the distance upstream from the confluence with East Fork Poplar Creek (e.g., BCK-09.40). Sections of the main channel are referenced as upper Bear Creek (upstream of BCK-11.84), middle Bear Creek (between BCK-11.84 and BCK-09.20), and lower Bear Creek (downstream of BCK-09.20). Tributaries are designated as north tributary (NT) or south tributary along with a value representing the tributary number counted downstream from the headwaters (e.g., NT-1). Major springs along the south side (SS) of Bear Creek are numbered in ascending order downstream from the headwaters (e.g., SS-1).

Approximately half of the annual precipitation in BCV exits via surface water flow in Bear Creek, and possibly higher proportions during winter and early spring, with the remainder of the annual precipitation lost to evapotranspiration and recharge to the groundwater system (DOE 1997a). Flow in the creek increases rapidly during rainfall and afterward reflects the relative contributions of overland flow, stormflow, and groundwater discharge. Flow in the main channel and tributaries generally returns to pre-precipitation levels within one or two days. Major sections of upper and middle Bear Creek are seasonally dry, but flow is perennial in lower Bear Creek.

The main channel of Bear Creek functions as a major conduit of the shallow karst network within the Maynardville Limestone (DOE 1997a). Discharge from springs located along the Maynardville Limestone/Copper Ridge Dolomite boundary on the north slope of Chestnut Ridge dominate the hydrology of the creek, especially during droughts when springs provide most of the flow in the main channel. Additionally, the main channel contains alternating gaining and losing reaches. Each gaining reach generally correlates with a major groundwater discharge area. Losing reaches in upper and middle Bear Creek, particularly a section of the main channel directly south of Sanitary Landfill I, play an important role in transferring contaminants from Bear Creek into the Maynardville Limestone, which directly underlies the creek throughout much of BCV.

2.2.2 Upper East Fork Poplar Creek

Surface water in the East Fork Regime is drained by UEFPC, which was extensively modified during construction of Y-12 (Figure A.3). The East Fork Regime is divided into the three major areas for the purposes of this report: the western Y-12 area between Old Bear Creek Road and grid coordinate easting 55,000; the central Y-12 area between grid coordinate eastings 55,000 and 62,000; and the eastern Y-12 area between grid coordinate easting 62,000 and Scarboro Road. The headwaters and several thousand feet of the main channel in the upper reach of UEFPC, including all its northern tributaries in the western and central Y-12 areas, were filled and replaced with an extensive network of underground storm drains. For reference purposes, each buried tributary of UEFPC is designated with a value (e.g., BT-1) representing the tributary number counted downstream (west to east) from the headwaters. The storm drains direct surface runoff into the exposed portion of the UEFPC channel at several locations. Outfall (OF) 200 is at the beginning of the exposed portion of the UEFPC channel about 6,000 ft upstream of New Hope Pond (NHP)/Lake Reality (Figure A.3). Closed and capped in 1988, NHP was an unlined surface impoundment constructed in 1963 to regulate the quantity and quality of surface water exiting Y-12. Lake Reality is a lined surface impoundment that was built in 1988 to replace NHP.

During normal operations, flow in UEFPC is directed through a concrete-lined distribution channel located around the south and east side of NHP/Lake Reality (Figure A.3). Also, a gravel and perforated pipe underdrain beneath portions of the distribution channel captures shallow groundwater. Until December 1996 when flow was rerouted to bypass Lake Reality, surface flow in the UEFPC distribution channel discharged into Lake Reality (and exited through a weir in the western berm). Beginning in July 1998, flow in the UEFPC distribution channel was diverted through the Lake Reality spillway, which discharges into the mainstream of UEFPC directly north (downstream) of Lake Reality. Bypassing Lake Reality reduces mercury contributions to dry-weather flow in UEFPC.

About 70% of dry-weather flow in UEFPC is attributable to once-through non-contact cooling water, condensate, and cooling tower blowdown, and the remaining 30% is from groundwater discharge (Shevenell 1994). Beginning in July 1996 a flow management program was implemented whereby water from the Clinch River is discharged near OF 200 to augment flow in UEFPC, which decreased from as much as 15 million gallons per day (mg/d) to about 2.5 mg/d because of reduced operations at Y-12 in recent years. Flow management is needed to achieve the National Pollution Discharge Elimination System (NPDES) minimum daily flow requirement of 5 mg/d at Station 17, which is where UEFPC exits the ORR downstream from Lake Reality (Figure A.3). Flow management also allows compliance with NPDES toxicity requirements and helps lower the elevated water temperature in UEFPC.

2.2.3 Chestnut Ridge

The Chestnut Ridge Regime encompasses five primary tributary drainage basins on south Chestnut Ridge (SCR), informally numbered from west to east (SCR1 through SCR5): Dunaway Branch (SCR1) and SCR2 in the western part of the regime, McCoy Branch (SCR3) in the central part of the regime; and SCR4 and SCR5 in the eastern part of the regime (Figure A.2). These tributaries are mainly intermittent at elevations higher than 900 ft above msl. Each receives flow via surface runoff, stormflow discharge, and groundwater baseflow, which increases with distance downstream and includes substantial contributions from springs. All of the tributaries convey surface flow south toward Bethel Valley and discharge into Melton Hill Lake (Clinch River) south of the Chestnut Ridge Regime.

2.3 GROUNDWATER SYSTEM

The following overview of the groundwater system near Y-12 is based on the conceptual hydrogeologic models described in *Report on the Remedial Investigation of Bear Creek Valley at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee* (DOE 1997a) and *Report on the Remedial Investigation of the Upper East Fork Poplar Creek Characterization Area at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee* (DOE 1998), both of which incorporate the hydrogeologic framework and associated nomenclature described in *Status Report —A Hydrologic Framework for the Oak Ridge Reservation* (Solomon et al. 1992).

There are two basic hydrogeologic units in the vicinity of Y-12 that are defined for use in this report: the aquifer and the aquitard (Figure A.2). This nomenclature is intended only to differentiate the more permeable carbonate formations that comprise the aquifer from the less permeable formations that comprise the aquitard; no inference to the conventional connotation of each term is implied or intended. The aquifer includes the uppermost carbonate formation of the Conasauga Group (Maynardville Limestone) and the overlying formations of the Knox Group. The aquitard, which is not a true aquitard but transmits groundwater less effectively than the aquifer, consists of the remaining siliciclastic formations of the Conasauga Group (Nolichucky Shale, Maryville Limestone, Rogersville Shale, Rutledge Limestone, and Pumpkin Valley Shale) and the underlying Rome Formation. The following discussion provides a short description of each hydrogeologic unit.

2.3.1 Aquifer

Components of the aquifer underlie the axis of BCV (Maynardville Limestone) and form Chestnut Ridge (Knox Group). Separate overviews of the hydrologic characteristics of the Maynardville Limestone and the Knox Group are provided below.

2.3.1.1 Maynardville Limestone

Most groundwater flow in the Maynardville Limestone occurs at depths less than 100 ft below ground surface (bgs) in an extensively interconnected network of solution conduits and cavities (karst network). Flow in the shallow karst network is relatively rapid and occurs as "quickflow" discharge to nearby surface drainage features (e.g., Bear Creek). Below the shallow karst network, fractures provide the primary flowpaths. Also, there are seven distinct stratigraphic zones (numbered from bottom to top) in the Maynardville Limestone near Y-12 (Shevenell 1995). Because of vuggy porosity related to dissolution of gypsum nodules, the uppermost stratigraphic zone (Zone 6) is the most permeable and probably transmits the bulk of the groundwater in the Maynardville Limestone (Goldstrand 1995).

Available data indicated fairly homogeneous groundwater geochemistry in the Maynardville Limestone; almost every monitoring well in this formation, regardless of depth, yields calcium-magnesium-bicarbonate groundwater. Some shallow wells monitor sulfate-enriched groundwater, which probably reflects dissolution of locally disseminated secondary minerals, including gypsum, anhydrite, and pyrite. Also, several deep wells monitor calcium-magnesium-sulfate groundwater with very high total dissolved solids (TDS).

Isopleths of groundwater elevations in the Maynardville Limestone show a low hydrologic divide in BCV near the west end of Y-12, with flow along geologic strike to the west-southwest in the Bear Creek Regime (Figure A.4) and along geologic strike to the east-southeast in the East Fork Regime (Figure A.5). In the

Bear Creek Regime, groundwater from the deeper flow system in the Maynardville Limestone discharges along major gaining (influent) reaches of Bear Creek. These discharge areas are possibly related to large-scale structural (e.g., cross-strike faults) or stratigraphic discontinuities in the Maynardville Limestone. Also, in the East Fork Regime, shallow flow in the Maynardville Limestone in the eastern Y-12 area is primarily to the east (along geologic strike) toward Union Valley east of the ORR boundary, but the UEFPC distribution channel underdrain apparently functions as a highly permeable groundwater flow path and a constant head (recharge) boundary that strongly influence local flow directions (BJC 1998).

Results of a long-term pumping test and concurrent dye-trace test performed in July 1998 provide the most recent data regarding the hydrologic characteristics of the intermediate and deep groundwater flowpaths in the Maynardville Limestone in the East Fork Regime, and the degree of hydraulic connection between the shallow and deep flow systems in the eastern Y-12 area (BJC 1998). A stepped pump test was performed using a well (GW-845) installed in the Maynardville Limestone about 250 ft southeast of NHP. Groundwater was pumped continuously from the well (which has an open-hole interval from 157 to 438 ft bgs) at progressively increased discharge rates: 25 gallons per minute (gpm) for 24 hours, 50 gpm for 24 hours, and 100 gpm for seven days (pumping started on July 9, 1998 and stopped on July 18, 1998). Water level drawdown and recovery data obtained from nearby monitoring wells indicated: (1) rapid, large responses in wells located along strike to the east and across strike to the north of the pumping well, (2) more moderate responses in wells located oblique to strike near the contact with the Nolichucky Shale to the east of the pumping well, (3) responses in upgradient wells in the Maynardville Limestone to the west of the pumping well, and (4) little if any response in wells located adjacent to Lake Reality and the UEFPC distribution channel underdrain to the north and northeast of the pumping well. The maximum observed radius of influence from the pumping well encompassed the entire subcrop of the Maynardville Limestone in the eastern Y-12 area, with particularly strong anisotropies to the east (along strike) and north (up-dip) of the well and low-permeability boundary effects along the contact with the Nolichucky Shale (BJC 1998).

In conjunction with the pumping test, eosine dye was injected in a shallow (60 ft bgs) well (GW-153) located about 450 ft southwest (upgradient) of the pumping well (GW-845). Rapid breakthrough of the dye observed in the pumping well clearly demonstrated the hydraulic connection between the shallow and intermediate/deep groundwater flowpaths along strike in the Maynardville Limestone. Additionally, confirmed detection of the dye in two shallow wells (GW-220 and GW-832) located about 600 ft northeast (across geologic strike) of the injection well (and about 300 ft northwest of the pumping well) suggests that the degree of hydrologic connection with the UEFPC distribution channel underdrain and groundwater movement along dip parallel or conjugate fracture flowpaths in the shallow flow system are strong enough to overcome the hydraulic capture zone created at the 100 gpm pumping rate in the intermediate to deep flow systems (BJC 1998).

Based on the information obtained from the long-term pumping test and associated dye trace, well GW-845 was designated as the groundwater extraction point for the contaminant plume capture system required under an interim action Record of Decision (ROD) for Union Valley (DOE 1997b). Full operation of the system began in October 2000 and has involved pumping well GW-845 at a rate of 25 gpm and treating the groundwater to remove particulates, iron, manganese, and VOCs. Monthly water level measurements in selected observation wells show that continuous operation of the system has generally maintained 15 to 17 ft of drawdown in the immediate vicinity of well GW-845 (Figure A.5) and has established an elongated zone of influence that extends parallel with geologic strike for at least 900 ft to the east (downgradient) and 600 ft to the west (upgradient) of the pumping well (DOE 2011).

2.3.1.2 Knox Group

The Knox Group formations underlying Chestnut Ridge comprise three vertically gradational hydrogeologic subsystems: (1) the stormflow zone, (2) the vadose zone, and (3) the groundwater zone. The subsystems are distinguished by groundwater flux, which decreases with depth (Solomon et al. 1992).

Investigations on Chestnut Ridge in a watershed located approximately 4,000 ft west of the Chestnut Ridge Regime show that groundwater occurs intermittently above the water table in a shallow "stormflow zone" that extends to a depth of about 8 ft bgs (Wilson et al. 1990). Macropores and mesopores provide the primary channels for lateral flow in the stormflow zone, which lasts only a few days (5 - 10) after rainfall. Most groundwater within the stormflow zone is either lost to evapotranspiration or recharge to the water table, and the remaining water discharges at nearby seeps, springs, or streams (Moore 1989).

The vadose zone occurs between the stormflow zone and the water table, which typically occurs near the bedrock/residuum interface. Soil moisture content in the vadose zone is below the saturation limit except in the capillary fringe above the water table and within wetting fronts during periods of vertical percolation from the stormflow zone (Moore 1989). Most recharge through the vadose zone is episodic and occurs along discrete permeable fractures that become saturated, although surrounding micropores remain unsaturated (Solomon et al. 1992). The residuum is hydrologically heterogeneous, with quickflow via dolines to conduits in the subsurface; residuum on Chestnut Ridge near the Oak Ridge National Laboratory (ORNL) has a mean hydraulic conductivity of about 0.006 feet per day (ft/d) (Moore 1988).

Groundwater below the vadose zone occurs within orthogonal sets of permeable, planar fractures that form water-producing zones within an essentially impermeable matrix. Dissolution of bedrock carbonates has enlarged fractures and produced an interconnected conduit-flow system characteristic of karst aquifers. Because the occurrence of solution features and the frequency, aperture, and connectivity of permeable fractures decrease with depth, the bulk hydraulic conductivity of the groundwater zone is vertically gradational. Most groundwater flux occurs within the transitional horizon between residuum and unweathered bedrock (water table interval); lower flux (and longer solute residence times) occurs at successively greater depths in the bedrock (Solomon et al. 1992).

Available data show that hydraulic conductivity in the Knox Group varies over multiple orders of magnitude, which is typical of karst aquifers. Results of straddle packer tests in core holes indicate hydraulic conductivity ranging from 0.0002 to 3.1 ft/d at depths generally less than 600 ft bgs in the lower Knox Group (King and Haase 1988). Hydraulic conductivity values calculated from results of falling-head slug tests performed in monitoring wells completed at shallow depths (60 to 195 ft bgs) in the middle Knox Group range from about 0.003 to 14 ft/d (Jones 1998). Also, results of a preliminary dye-tracer test at the Chestnut Ridge Security Pits (CRSP) indicate flow rates of about 100 to 300 ft/d (Martin Marietta Energy Systems, Inc. [MMES] 1990a). Although not confirmed by a second test using different tracers (MMES 1993), these findings are supported by the range of flow rates (490 to 1,250 ft/d) indicated by results of a dye-tracer test performed on Chestnut Ridge near ORNL (Ketelle and Huff 1984).

Groundwater elevations on Chestnut Ridge generally mirror surface topography (Figure A.6). Along the crest of the ridge, which is a recharge area and a flow divide, groundwater generally flows from west to east (parallel to geologic strike), with radial components of flow north into BCV and south toward tributary headwaters on the southern flank of the ridge (across geologic strike). The central part of the regime is characterized by radial flow directions from local groundwater flow divides along hilltops between tributaries. Groundwater flow directions in the southern part of the regime are generally south toward Melton Hill Lake. The overall directions of groundwater flow throughout the Chestnut Ridge Regime do not significantly change during seasonal groundwater flow conditions. Horizontal hydraulic gradients throughout the year are highest along the steep northern flank of Chestnut Ridge (i.e., across geologic strike) and in the upper reaches of tributaries on the southern ridge flank, and are nearly flat along the southern boundary of the regime.

Groundwater in the Knox Group has fairly homogeneous geochemistry. Most wells yield calcium-magnesium-bicarbonate groundwater with pH of 7.5 to 8.0; TDS above 150 milligrams per liter (mg/L); equal or nearly equal molar concentrations of calcium and magnesium; low proportions (<5%) of chloride, sodium, sulfate, and potassium; and very low (i.e., <1 mg/L) carbonate alkalinity and nitrate (as N) concentrations (hereafter synonymous with "nitrate" concentrations). Some wells yield groundwater with enriched chloride and sulfate concentrations that probably reflect the geochemical influence of locally disseminated evaporates (e.g., gypsum) or sulfides (e.g., pyrite). Additionally, groundwater within low permeability (matrix) intervals in the upper Knox Group (e.g., Mascot Dolomite), as indicated by data for several wells at Kerr Hollow Quarry (KHQ), often exhibits greater proportions of sulfate and potassium and higher trace metal concentrations (e.g., strontium) than typical of the groundwater from low yield intervals within the lower Knox Group formations (e.g., Copper Ridge Dolomite). These geochemical differences potentially reflect corresponding differences between carbonate mineralogies in the upper and lower sections of the Knox Group or the proximity to and types of disseminated secondary minerals (Lockheed Martin Energy Systems, Inc. 1996).

2.3.2 Aquitard

The geologic formations that comprise the aquitard directly underlie the primary contaminant source areas in the Bear Creek Regime and the East Fork Regime and are hydraulically upgradient of the Maynardville Limestone throughout much of BCV. Fractures provide the primary groundwater flowpaths in the aquitard; flow through the rock matrix is negligible but nevertheless plays an important role in contaminant migration because of matrix diffusion processes. Flow directions are primarily parallel to bedding (along geologic strike and dip), which may or may not coincide with the direction of maximum horizontal hydraulic gradient inferred from groundwater elevation isopleths. Most flow occurs within the shallow bedrock interval less than 100 ft bgs. Flow across bedding occurs primarily along permeable zones formed by cross-cutting fractures or fracture zones (and possibly small faults). Some of these cross-cutting structures may act as barriers to lateral flow, causing groundwater from deeper intervals to upwell and discharge to the shallower flow system. Others may serve as preferential pathways for migration of contaminants from the aquitard into the Maynardville Limestone.

Most groundwater flow in the aquitard occurs within a highly permeable interval near the bedrock/residuum interface. West of Y-12 in the Bear Creek Regime, flow in the aquitard above the water table occurs in response to precipitation when flowpaths in the residual soils become saturated and rapidly transmit water laterally (stormflow) down slope toward springs, seeps, streams and vertically (recharge) to the water table interval. In the East Fork Regime, however, infiltration into the subsurface and recharge to the water table interval is strongly influenced by the many buildings and other impervious surfaces that cover much of the regime as well as the extensive areas of fill and networks of subsurface storm drains, sewers, and process lines.

Recharge to the water table interval in the aquitard promotes strike-parallel groundwater flow toward nearby discharge areas, which include the subsurface drainage network in the East Fork Regime and the northern tributaries of Bear Creek in the Bear Creek Regime. Although the presence of contaminants in groundwater more than 200 ft bgs in the Nolichucky Shale clearly indicates permeable flowpaths at depth, flow is most active at depths less than 100 ft bgs, and only a small percentage of total flow ultimately recharges the deeper bedrock, where upward hydraulic gradients predominate. In the Bear Creek Regime, about 94% of the available groundwater in the aquitard discharges to Bear Creek tributaries, about 5% flows along cross-cutting fractures into the aquifer, and about 1% flows through strike-parallel pathways in the deeper subsurface (DOE 1997a).

Decreasing groundwater flux with depth in the aquitard in BCV also is reflected by distinct changes in groundwater geochemistry. Most water table interval and shallow (i.e., <100 ft bgs) bedrock wells monitor calcium-magnesium-bicarbonate groundwater. A fairly abrupt change to sodium-bicarbonate groundwater, which is interpreted to be a function of longer groundwater residence time related to reduced fracture aperture or increased fracture spacing (Solomon et al. 1992), occurs at a depth of about 100 ft bgs. Further reduced groundwater flux is indicated by the transition from sodium-bicarbonate groundwater to sodium-chloride groundwater that usually occurs at a depth of about 400 ft bgs. The transition to the sodium-chloride groundwater is accompanied by a general increase in TDS.

Isopleths of seasonal groundwater surface elevations in the aquitard (water table interval) in the Bear Creek Regime (Figure A.4) and East Fork Regime (Figure A.5) indicate flow to the west-southwest and east-southeasterly, respectively, toward the Maynardville Limestone. In the East Fork Regime, however, the operation of basement dewatering sumps and the network of subsurface storm drains and utilities throughout much of the western and central Y-12 areas (Figure A.3) strongly influences the movement and discharge of shallow groundwater. For instance, operation of sumps to suppress the local water table below the basement floor of several buildings (9204-4, 9201-5, and 9201-4, and possibly 9204-2) have influenced local groundwater flow and contaminant transport patterns (DOE 1998). The sumps located in Building 9201-5 were shut down in CY 2005, and water consisting of steam condensate, rainwater, and groundwater has accumulated in the basement since that time.

2.4 GROUNDWATER CONTAMINATION

Groundwater quality monitoring data obtained from the extensive network of monitoring wells associated with Y-12 show that the most widespread groundwater contaminants are nitrate, VOCs, uranium isotopes (primarily uranium-234 [U-234] and uranium-238 [U-238]), and technetium-99 (Tc-99). Maps illustrating the generalized extent of nitrate, VOCs, uranium isotopes (as indicated by gross alpha radioactivity), and Tc-99 (as indicated by gross beta radioactivity) are provided on Figures A.7, A.8, A.9, and A.10, respectively. The following sections provide an overview of groundwater contamination in the Bear Creek Regime, East Fork Regime, and Chestnut Ridge Regime.

2.4.1 Bear Creek Regime

The following sections briefly describe the primary sources of groundwater contamination in the Bear Creek Regime (the S-3 Site, the Oil Landfarm (OLF) waste management area [WMA], and the Bear Creek Burial Grounds [BCBG] WMA) and the principal groundwater transport pathway in the regime (the Maynardville Limestone).

2.4.1.1 S-3 Site

Operation of the former S-3 Ponds emplaced a large reservoir of contamination in the aquitard (Nolichucky Shale) consisting of a heterogeneous mix of inorganic, organic, and radioactive constituents. The principal contaminants are nitrate, Tc-99, uranium isotopes, trace metals (e.g., cadmium), and VOCs. Contaminant concentrations in the aquitard nearest the site have probably reached maximum levels, with the center of mass of the plume slowly moving westward. Westward, strike parallel migration of contaminants in the aquitard occurs until encountering a cross-cutting structure that promotes upward discharge into the shallow flow system or cross-strike flow into the Maynardville Limestone (DOE 1997a). Additionally, matrix diffusion and advective transport processes are slowly releasing contaminants (e.g., nitrate) from the deeper reservoir into the more active (shallow) aquitard flow system.

In the aquitard, nitrate from the former S-3 Ponds extends directly south in the water table interval into the upper reach of Bear Creek and along strike in the water table interval and the deeper bedrock for over 3,000 ft to the west. Because it is highly mobile and chemically stable, nitrate delineates the maximum extent of groundwater transport from the S-3 Site and effectively traces the principal migration pathways in the aquitard. Nitrate concentrations within the plume exceed 10,000 mg/L in the deep bedrock directly below the S-3 Site and exceed 1,000 mg/L in the shallow groundwater near the site (Figure A.7).

Gross alpha activity and gross beta activity within the S-3 Site contaminant plume exceed 1,000 picoCuries per liter (pCi/L). Although a diverse population of radioisotopes is present in the groundwater closest to the site, elevated gross alpha and gross beta activity in the groundwater probably delineate migration of uranium isotopes (U-234 and U-238) and Tc-99, respectively, since these were the dominant radiological constituents in wastes placed into the former S-3 Ponds. Also, sludge produced by denitrification of the waste water in each pond was left in place after closure of the site. Sludge within the saturated zone may release Tc-99 and uranium isotopes to the shallow groundwater flow system in the aquitard (DOE 1997a). These contaminants then may be transported southward towards Bear Creek and westward through the water table interval toward discharge points in NT-1 (DOE 1997a).

Other components of the S-3 Site contaminant plume are trace metals and VOCs. The distribution of trace metals is less extensive than that of nitrate and radioactivity, but the most mobile metals within the plume (e.g., barium) have been transported beyond the acidic groundwater (pH <5) nearest the site. Acetone and tetrachloroethene (PCE) are the principal VOCs within the plume. Concentrations of PCE exceed 5,000 micrograms per liter (µg/L) in wells adjacent to the site, potentially indicating the presence of dense nonaqueous phase liquids (DNAPL) in the subsurface, but decrease to less than 50 µg/L about 500 ft downgradient to the west of the site. This reflects the limited extent of PCE migration and suggests substantial natural attenuation in the subsurface.

2.4.1.2 Oil Landfarm WMA

The primary sources of groundwater contaminants in the OLF WMA are the Boneyard/Burnyard (BYBY), the Hazardous Chemical Disposal Area (HCDA), the OLF disposal plots, and Sanitary Landfill I. Each of these sites except the BYBY is a known or suspected source of VOCs in the shallow groundwater; the BYBY is a major source of elemental uranium and alpha radioactivity in the Bear Creek Regime.

The Boneyard was used for the disposal of magnesium chips and construction debris (e.g., concrete) in unlined shallow trenches. Filled trenches were covered with topsoil and seeded with grass. The Burnyard consisted of two unlined trenches, each about 300 ft long by 40 ft wide, in which various types of refuse (including pesticide containers, metal shavings, solvents, oils, and laboratory chemicals) were burned. Because the BYBY is a primary source of uranium in the groundwater and surface water in BCV (DOE 1997a), this site was prioritized for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action, which was performed in three phases. Remedial designs for the site were prepared during Phase I and remedial action field work began with Phase II. Completed in November 2001, Phase II primarily involved construction of an upgradient subsurface drain to hydraulically isolate the buried wastes at the site in order to reduce the flux of contaminants from the site and to dry the site in preparation of the Phase III field work, which began in May 2002. Phase III focused on the excavation, disposal, and consolidation of wastes from the site and the reconstruction of a section of NT-3 that drains the site. Waste removal actions were completed in October 2002 and involved the excavation of about 64,000 cubic yards (yd^3) of waste materials with the highest concentrations of uranium that were in contact with groundwater. These wastes were disposed in the Environmental Management Waste Management Facility (EMWMF). About 17,000 yd^3 of other waste materials that had lower levels of uranium contamination and were not in contact with groundwater also were excavated, consolidated onsite, and covered with a low-permeability recompacted clay cap. Installation of the cap, including seeding/mulching the topsoil cover, was completed in November 2002. Field work to restore the NT-3 stream channel with natural meanders and gradients in order to reduce erosion of the bank and more efficiently transport water and sediment load through the site was completed in May 2003.

The HCDA was constructed on top of the Burnyard in 1975 and was used as an area for releasing compressed gas from cylinders with leaking or damaged valves and for disposal of reactive or explosive laboratory chemicals. The chemicals were handled to induce the expected reaction or explosion, and remaining liquids were discharged into a small unlined surface impoundment. A low permeability cap was constructed over the HCDA during closure of the OLF. In June 2002, a section of the northwest corner of the cap was excavated and removed during Phase III of the CERCLA remedial action at the BYBY. Excavated wastes were replaced with uncontaminated soil. The filled area was graded to allow for drainage and seeded with grass.

Groundwater contaminants at the OLF are principally VOCs, and a commingled plume containing two distinct suites of VOCs are evident: one to the northeast dominated by 1,1,1-trichloroethane (111TCA), 1,1-dichloroethane (11DCA), and 1,1-dichloroethene (11DCE); and one to the south dominated by PCE, cis-1,2-dichloroethene (c12DCE), trans-1,2-dichloroethene (t12DCE), and trichloroethene (TCE) (MMES 1989). The dissolved VOC plume appears to be restricted to the shallow flow system. Summed VOC concentrations exceed 1,000 µg/L in the northeast part of the plume and 100 µg/L in the southern part of the plume (Figure A.8); maximum concentrations within the plume do not indicate the presence of DNAPL in the subsurface.

Sanitary Landfill I is a probable source of 11DCA, c12DCE, and t12DCE in the shallow groundwater (aquitard and aquifer) downgradient to the south of the site. Maximum VOC concentrations are typically less than 50 µg/L. In the Maynardville Limestone, these constituents have intermingled with the VOC plume (primarily TCE and c12DCE) originating from upgradient sources. Sanitary Landfill I also may be a source of boron in the groundwater at several wells immediately downgradient (west) of the site.

2.4.1.3 Bear Creek Burial Grounds WMA

Groundwater in the aquitard underlying the BCBG WMA is extensively contaminated with VOCs at both shallow (water table) and deep (bedrock) intervals. There are five primary source areas: Burial Ground (BG)-A (North and South), BG-C (East and West), and the Walk-In Pits (Figure A.8). Dissolved VOC plumes in the shallow groundwater at several of these source areas are probably related to widespread occurrence of DNAPL in the subsurface. Contamination in the deeper groundwater flow system reflects density-driven, downward migration of DNAPL.

The disposal trenches comprising BG-A (North and South) received almost two million gallons of waste oils and coolants, and DNAPL has been encountered at 260 ft and 330 ft bgs in monitoring wells downdip of source trenches in BG-A South. Dissolved VOC plumes in the groundwater underlying both areas are dominated by PCE, TCE, and c12DCE. Other common plume constituents are 111TCA, 11DCA, and 1,2-dichloroethane (12DCA). Summed concentrations of these plume constituents exceed 100,000 µg/L. Groundwater in the water table interval transports the plume constituents along strike toward discharge areas in NT-6 and NT-7. Strike-parallel migration also occurs below the water table interval, as reflected by westward (strike-parallel) transport of PCE indicated by data obtained from deeper bedrock wells west of BG-A South.

Separate plumes of dissolved VOCs apparently occur in the shallow groundwater at BG-C East and BG-C West, each plume dominated by c12DCE with lesser amounts of vinyl chloride (VC), both of which are degradation products of PCE. The concentrations of VOCs in each plume are generally less than 500 µg/L. Groundwater containing these VOCs discharges to the NT-8 catchment on the northwest side of the BCBG WMA. Data for both source areas do not clearly indicate the presence of DNAPL in the subsurface (DOE 1997a).

Groundwater near the Walk-In Pits contains a distinct plume of dissolved VOCs dominated by PCE. Concentrations exceed 2,000 µg/L, which is about 1% of the maximum PCE solubility and possibly indicates DNAPL in the subsurface. Contaminants in the shallow groundwater flow system near the Walk-In Pits may not discharge extensively to surface water (DOE 1997a).

Although large quantities of uranium wastes were disposed in the BCBG WMA, few monitoring wells in the area yield radioactive groundwater samples. However, data for soil samples and surface water samples collected from NT-6, NT-7, and NT-8 indicate that uranium isotopes from BG-A South and BG-C East are probable sources of elevated alpha and beta radioactivity (DOE 1997a). Maximum gross alpha and gross beta activities in the samples from these tributaries ranged from about 20 pCi/L to more than 100 pCi/L. The disparity with the groundwater sample data may be an artifact of the monitoring well network (few wells are screened within the shallowest water table interval where radioactive contamination likely occurs), but the relatively low levels of radioactivity in the groundwater also suggest that the bulk of the uranium wastes in BG-A South and BG-C East are not within the saturated zone (DOE 1997a).

Boron is the primary trace metal contaminant in the groundwater at the BCBG WMA. Elevated boron concentrations occur primarily in the shallow groundwater near BG-A South and BG-C (East and West) and probably resulted from disposal of borax wastewater from Y-12. Boron is most likely present in the groundwater as borate [$B(OH)_3$], which is chemically stable and relatively mobile, and is transported toward discharge points in Bear Creek tributaries NT-7 and NT-8.

2.4.1.4 Maynardville Limestone Exit Pathway

Groundwater contaminants in the Maynardville Limestone originate from the S-3 Site (nitrate and Tc-99), the Rust Spoil Area (VOCs) or an unidentified source area in the Bear Creek floodplain adjacent to the Rust Spoil Area, the BYBY (uranium isotopes), Sanitary Landfill I (VOCs), and the BCBG WMA (VOCs and uranium isotopes). These contaminants enter the Maynardville Limestone through direct recharge, hydrologic communication with surface water in Bear Creek, and inflow of shallow groundwater from the aquitard. Relative contributions from the source areas and the geochemical characteristics of the contaminants have produced two primary plumes of contamination in the groundwater: one containing nitrate and radioactivity and another containing VOCs. Both plumes occur in the shallow karst network and the deeper fracture flowpaths and are commingled downgradient of the BYBY.

The nitrate plume (Figure A.7) in the aquifer essentially delineates the maximum extent of contaminant transport from the former S-3 Ponds and effectively traces the principal migration pathways in the Maynardville Limestone. The plume is continuous in the deeper bedrock from south of the S-3 Site for about 10,000 ft along strike to the west, whereas attenuation from more active recharge and groundwater flux has reduced nitrate levels and produced a more discontinuous nitrate plume in the shallow karst network. Nitrate concentrations within the plume exceed 500 mg/L south of the S-3 Site, but rapidly decrease to less than 50 mg/L south of the OLF WMA, and are typically highest in the fracture-dominated groundwater flow system at depths greater than 100 ft bgs.

The distribution of VOCs (Figure A.8) in the Maynardville Limestone reflects the relative contributions of several source areas and commingling during downgradient transport. Plume constituents in the upper part of BCV are TCE, c12DCE, and PCE; probable source areas are Spoil Area I, the S-3 Site, and possibly the Fire Training Facility in the East Fork Regime. The major inputs to the plume occur from: (1) the Rust Spoil Area (TCE) or a nearby source in the Bear Creek floodplain, (2) the HCDA (TCE and c12DCE), Sanitary Landfill I (111TCA and 11DCA), (3) discharge from the Bear Creek tributary (NT-7) that traverses BG-A North and A South (c12DCE and 12DCA), and (4) discharge from the Bear Creek tributary (NT-8) on the west side of the BCBG WMA, including VOCs (PCE, TCE, c12DCE, VC) from BG-C East and BG-C West. The highest concentrations within the plume (i.e., >300 μg/L) occur in the deeper groundwater south (down dip) of the HCDA. These high concentrations coincide with the downward vertical hydraulic gradients in the Maynardville Limestone in this area and the major losing reach of middle Bear Creek south of Sanitary Landfill I.

Radioactivity in the groundwater in the Maynardville Limestone is primarily from uranium isotopes and Tc-99. The extent of these radionuclides is generally delineated by gross alpha activity (Figure A.9) and gross beta activity (Figure A.10), respectively. The distribution of gross beta activity mirrors that of nitrate, indicating both a common source of nitrate and Tc-99 (the S-3 Site) and migration along common flowpaths. Increased gross alpha activity in the groundwater downstream of the NT-3 catchment reflects inputs of uranium isotopes from former sources in the BYBY. Before their excavation and removal in May 2002 (see Secion. 2.4.1.2), waste materials containing high concentrations of uranium were within the saturated zone during seasonally high groundwater levels. Uranium isotopes that were leached from the wastes were transported with the shallow groundwater that discharges into NT-3 and recharges directly into the Maynardville Limestone. Prior to the removal of the wastes, gross alpha and gross beta activity exceeded 1,000 pCi/L in the shallow groundwater along NT-3 from the northwest corner of the site to the confluence of NT-3 and Bear Creek (Figure A.9 and Figure A.10).

Most trace metal contamination in the Maynardville Limestone occurs in the shallow groundwater near the S-3 Site and the BYBY. Near the S-3 Site, the principal trace metal contaminants are barium, boron, cadmium, copper, lead, mercury, strontium, and uranium. Some of these metals (e.g., cadmium) were entrained in the highly acidic wastes disposed at the site, and others (e.g., barium and strontium) were dissolved from the underlying bedrock. Trace metal contamination is sporadic in the groundwater at the BYBY and the principal contaminants are beryllium, manganese, mercury, nickel, and uranium. Boron and uranium are the most common trace metal contaminants in the aquifer downgradient of the S-3 Site and the BYBY, which indicates that relatively mobile ionic species of both metals are present in the groundwater.

2.4.2 East Fork Regime

Sources of groundwater contamination in the East Fork Regime include hazardous and nonhazardous waste treatment, storage, or disposal sites; bulk product transfer, storage, and use areas; former petroleum-fuel underground storage tanks (USTs) and associated dispensing facilities; industrial process buildings; waste and product spill areas; and the many process pipelines, effluent drains, and utilities associated with the industrial operations at Y-12. Also, operation of the former S-3 Ponds emplaced a large reservoir of contamination in the western Y-12 area. Intermingling of contaminants from multiple source areas has produced an extensive, essentially continuous groundwater contaminant plume of varying composition that extends from the western Y-12 area through the southern part of the central and eastern Y-12 areas and into Union Valley east of the ORR (Figure A.8).

A plume of nitrate contamination originating from the former S-3 Ponds extends vertically in the aquitard at least 150 ft bgs and laterally at least 5,000 ft into the western Y-12 area (Figure A.7). Nitrate concentrations within the plume exceed 10,000 mg/L. The geometry of the nitrate plume indicates two principal migration pathways: (1) relatively rapid migration along fairly short, shallow pathways (<30 ft bgs) that typically terminate in storm drains or other utilities, building sumps, and the buried tributaries and original mainstream of UEFPC; and (2) substantially slower migration along much longer strike-parallel pathways at greater depths in the bedrock toward basement sumps in Buildings 9204-4, 9201-4, and 9201-5 (DOE 1998). The S-2 Site also is a minor source of nitrate. However, because the S-2 Site directly overlies the Maynardville Limestone, the plume of nitrate contamination extends much farther from this source (>7,000 ft) than from the S-3 Site in the aquitard (Figure A.7).

The low pH groundwater within the contaminant plume originating from the former S-3 Ponds contains a diverse mix of metal ions and/or ion-complexes (beryllium, cadmium, cobalt, manganese, mercury, and nickel) that are usually not mobile (or are more readily attenuated) in less acidic groundwater, as well as metals that are mobile under a wider range of groundwater pH conditions (barium, boron, strontium, and uranium). Some of these metals were entrained in the acidic wastes disposed at the site (e.g., uranium), and others were dissolved from the underlying saprolite and bedrock (e.g., barium and strontium). Concentrations of several trace metals (e.g., barium) within the plume exceed the applicable Safe Drinking Water Act (SDWA) maximum contaminant level (MCL) for drinking water by an order-of-magnitude or more. Similarly elevated concentrations of several other trace metals (including boron, cadmium, cobalt, copper, mercury, and uranium) occur in the groundwater elsewhere in the East Fork Regime, notably the S-2 Site, but available data do not indicate that extensive plumes of metal ions and/or ion-complexes have developed in the groundwater beyond the immediate vicinity of these sites.

Volatile organic compounds are the most pervasive groundwater contaminants in the East Fork Regime (Figure A.8). The principal components of dissolved VOC plumes in the western Y-12 area and the central Y-12 area are PCE, TCE, c12DCE, 11DCE, and VC. Chloroethanes (primarily 111TCA and 11DCA) are also major components of several plumes in the central Y-12 area. In the eastern Y-12 area, dissolved chloromethanes, primarily carbon tetrachloride (CTET), chloroform, and methylene chloride (MC) are primary components of the VOC plume. Additionally, residual plumes of dissolved petroleum hydrocarbons (benzene, toluene, ethylbenzene (ETB), and total xylenes) occur in shallow groundwater near former petroleum fuel USTs. In the aquitard, concentrations of individual plume constituents exceed 1,000 µg/L in the shallow groundwater near the Waste Coolant Processing Area (WCPA), Building 9201-5, and Tank 0134-U and indicate the presence of DNAPL in the subsurface. At shallow depths (<100 ft bgs) in the Maynardville Limestone, a relatively continuous plume of dissolved VOCs begins near the Fire Training Facility in the western Y-12 area, intermingles with VOC plumes from several sources in the central Y-12 area, and extends underneath NHP in the eastern Y-12 area (Figure A.8). The extent of the plume at intermediate (>200 ft bgs) and deep (>400 ft bgs) intervals in the Maynardville Limestone is not well defined in the western and central Y-12 areas because of very limited well coverage. However, data from the network of wells in the eastern Y-12 area show that a plume of dissolved chloromethanes (primarily CTET), which is believed to originate from several sources, including suspected DNAPL in the Maynardville Limestone west of NHP near Building 9720-6, extends vertically more than 400 ft bgs and laterally (parallel with geologic strike) into Union Valley up to 2,000 ft east of the ORR boundary. Operation of the VOC plume capture system since CY 2000 (see Sect. 2.3.1.1) has effectively reduced VOC concentrations in groundwater downgradient of the pumping well (DOE 2011).

Groundwater with radiological contamination occurs primarily in the aquitard east of the former S-3 Ponds, at the Old Salvage Yard, Buildings 9204-4 and 9201-5, and Tank 0134-U (Figure A.9 and Figure A.10). In the Maynardville Limestone, radiological contamination occurs near the S-2 Site and upgradient of NHP (the Uranium Oxide Vault, wells GW-605 and GW-606, and the former Oil Skimmer Basin). The former S-3 Ponds are the principal source of uranium isotopes (primarily U-234 and U-238) and Tc-99; the migration of Tc-99 generally mirrors that of nitrate from the site. Gross alpha radioactivity levels within the plume exceed the 15 pCi/L MCL and gross beta radioactivity levels within the plume exceed the SDWA screening level (50 pCi/L) for a 4 millirem per year (mrem/yr) dose equivalent (the drinking water MCL for gross beta radioactivity). Relatively limited influx of radiological contamination directly into the aquifer (or extensive dilution) in the East Fork Regime is indicated by the greatly decreased gross alpha, gross beta, and isotopic uranium activity in the groundwater downgradient of known source areas (e.g., S-2 Site and the former Oil Skimmer Basin).

2.4.3 Chestnut Ridge Regime

Groundwater contamination is much less extensive in the Chestnut Ridge Regime and VOCs are the most common groundwater contaminants (Figure A.8). Dissolved VOCs (primarily chloroethanes and chloroethenes) have been detected in the groundwater samples collected from monitoring wells downgradient from the CRSP and Industrial Landfill (ILF) IV. However, a clearly distinct plume of dissolved VOCs is indicated only by the data for wells at the CRSP.

The CRSP are located on the crest of Chestnut Ridge directly south of the central portion of Y-12, and consist of two areas containing a series of east-west oriented trenches that are about 8 to 10 ft wide, 10 to 18 ft deep, and 700 to 800 ft long. Beginning in 1973, the trenches received hazardous wastes until December 1984 and nonhazardous wastes until the site was closed in November 1988. Data obtained from monitoring wells at the site indicate that a narrow, elongated plume of dissolved VOCs extends parallel with geologic strike for at least 700 ft downgradient to the east, and perpendicular to geologic strike for at least 300 ft downgradient to the north and south. The primary components of the plume include 111TCA, 11DCA, and 11DCE near the western trench area, and PCE, TCE, and 1,2-dichloroethene (12DCE) isomers near the eastern trench area. The distribution of the dissolved plume constituents relative to the respective source areas and elongation of the plume along the axis of Chestnut Ridge, despite steeper hydraulic gradients toward the ridge flanks, suggest primarily strike-parallel horizontal transport (west to east) in the groundwater (and possibly vapor phase transport). The maximum depth of vertical migration of the VOCs has not been conclusively determined, but is at least 150 ft bgs in the western trench area, 250 ft bgs near the middle of the site, and 270 ft bgs downgradient of the eastern trench area.

Data obtained since the early 1990s show that low concentrations (many are estimated values below analytical reporting limits) of one or more VOCs are present in the groundwater at two wells hydraulically downgradient of the waste disposal trenches at the CRSP: well GW-796 (<1 µg/L), which is located at ILF V about 400 ft directly south of the site, and well GW-798, which is located at Construction/ Demolition Landfill (CDL) VII about 1,600 ft south-southeast of the site (Figure A.8). Subsequent monitoring results indicate that VOC levels in both wells remain relatively low, with the more recent data showing that PCE concentrations in well GW-798 occasionally exceed the MCL (5 µg/L). The repeated detection of these compounds in the groundwater at both wells probably reflects southward transport from the CRSP because this site is the only known source of VOCs that is hydraulically upgradient of either well.

The ILF IV, which is located on the crest of Chestnut Ridge directly south of the west end of Y-12, has received non-hazardous solid waste since October 1989 and is a suspected source of 111TCA, 11DCA, 11DCE in groundwater downgradient of the site. These VOCs have been repeatedly detected in a well located south of the eastern portion of the site (GW-305). The results potentially indicate groundwater transport along permeable flowpaths from the unlined portion (about 150 ft X 150 ft) at the eastern end of ILF IV. Although the source of these contaminants has not been formally confirmed, no other waste management facility is located upgradient of these wells. In response to sampling results confirming 11DCE concentrations above the MCL, the Tennessee Department of Environment and Conservation (TDEC) issued a Notice of Violation (NOV) in a letter to BJC dated November 2, 2009 (TDEC 2009). The NOV letter requested implementation of Assessment Monitoring Phase 3 at Industrial Landfill IV in accordance with an approved Groundwater Quality Assessment Plan (GWQAP). The TDEC approved the GWQAP (BJC 2009) for Industrial Landfill IV in December 2009 and Assessment Monitoring Phase 3 subsequently began with groundwater sampling of well GW-305 for VOC analysis per the quarterly frequency specified in the plan.

Kerr Hollow Quarry is on the broad southern flank of Chestnut Ridge about 1,000 ft north of Bethel Valley Road and served as a source of stone construction material until it filled with water and was abandoned in the late 1940's. From the early 1950s until November 1988, the quarry was used for the disposal of reactive materials from Y-12 and ORNL. Wastes were removed from the quarry between mid-1990 and late 1993 to obtain certified clean-closure status from the TDEC, but the site was finally closed with some wastes remaining in place. Low levels (<5 µg/L) of several VOCs, primarily CTET, chloroform, and PCE, occur in the groundwater at monitoring wells located to the south (GW-144) and southeast (GW-142) of KHQ. Each of these VOCs may be present at low concentrations in the groundwater downgradient of the site, possibly as a consequence of wastes being disturbed during attempts to obtain clean closure of the site, but none of the compounds have been detected in the Resource Conservation and Recovery Act (RCRA) wells at the site since 1997.

3.0 CY 2010 MONITORING PROGRAMS

The groundwater and surface water monitoring data included in this report were obtained during CY 2010 from implementation of monitoring programs directed by the Y-12 GWPP and BJC. The Y-12 GWPP implemented surveillance and exit-pathway/perimeter monitoring (hereafter referenced collectively as DOE Order monitoring) specifically to meet requirements of DOE Order 450.1A. Associated groundwater and surface water sampling and analysis activities were performed in accordance with the Y-12 GWPP sampling and analysis plan (SAP) for CY 2010 (B&W Y-12 2009a), as modified by applicable addenda (Table B.1). The following subsections provide details regarding these sampling and analysis activities, including: the respective network of sampling locations in each hydrogeologic regime; QA/QC sampling; groundwater and surface water sampling methods; field measurements and laboratory analytes; data management protocols and DQO evaluation; and groundwater elevation monitoring.

The following monitoring programs were implemented by BJC at Y-12 during CY 2010: (1) RCRA post-closure detection monitoring and RCRA post-closure corrective action monitoring (collectively referenced as RCRA monitoring); (2) CERCLA monitoring in accordance with applicable RODs or related decision documents (hereafter referenced as CERCLA ROD monitoring); (3) CERCLA baseline monitoring to evaluate pre-remediation water quality; (4) CERCLA detection monitoring at the EMWMF, an operating facility located in the Bear Creek Regime for CERCLA remediation wastes generated on the ORR; and (5) detection or assessment monitoring for four nonhazardous solid waste disposal facilities (SWDFs) located in the Chestnut Ridge Regime (referenced as SWDF monitoring). Groundwater and surface water sampling and analysis activities associated with these programs were performed in general accordance with the requirements specified in the ORR Water Resources Restoration Program (WRRP) SAP for fiscal year 2010 (BJC 2010a); the WRRP quality assurance project plan (BJC 2010b); the environmental monitoring plan for the EMWMF (BJC 2010c); and a SWDF monitoring SAP issued by the subcontractor responsible for the operations of the landfills on Chestnut Ridge (EnergySolutions 2007). The following subsections provide general information regarding the monitoring programs implemented by BJC (e.g., sampling locations), but specific details, such as QA/QC sampling information, are deferred to the applicable SAPs and related technical reports issued by BJC.

Cooperative implementation of the monitoring programs directed by the Y-12 GWPP and BJC (i.e., preparing SAPs, coordinating sample collection, and sharing data) ensures that the CY 2010 monitoring results fulfill requirements of all the applicable monitoring drivers (DOE Order, RCRA, CERCLA, and SWDF) with no duplication of sampling and analysis efforts.

3.1 SAMPLING LOCATIONS AND FREQUENCY

This report contains groundwater and surface water quality monitoring data obtained during CY 2010 from 231 sampling locations at Y-12, including 187 monitoring wells (complete construction details for each well are provided in Appendix C), 13 springs, and 31 surface water stations. The following subsections provide details regarding the sampling locations in each hydrogeologic regime and the corresponding sampling frequency for each applicable well, spring, and surface water station.

3.1.1 Bear Creek Regime

As shown below in Table 1, a total of 65 monitoring wells, six springs, and 19 surface water stations in the Bear Creek Regime were sampled during CY 2010 for the purposes of DOE Order monitoring, RCRA monitoring, and CERCLA monitoring. Table B.2 identifies the monitoring program applicable to each well, spring, and surface water station; their locations are shown on Figure A.11.

Table 1. CY 2010 sampling locations in the Bear Creek Regime

Monitoring Driver	Monitoring Wells	Springs	Surface Water Stations
DOE Order	37	1	2
RCRA	6	1	0
CERCLA	22	5	17
Totals:	**65**	**6***	**19**
Note: * = Separate samples were collected for DOE Order and CERCLA monitoring purposes at spring SS-4 (see Table B.2).			

Samples were collected either annually or semiannually from most of the monitoring locations during CY 2010. Of the monitoring wells, 31 were sampled annually and 19 were sampled semiannually (Table B.2). Spring and surface water samples were collected annually (two locations), semiannually (three locations), during three quarters (14 locations), or quarterly (six locations).

Thirty-two of the wells that were sampled specifically for DOE Order monitoring during CY 2010 are located near waste management areas in BCV (Table B.2 and Figure A.11), including the primary sources of groundwater contamination in the regime (S-3 Site, OLF WMA, and BCBG WMA. The remaining five wells are components of two Exit Pathway Pickets in the regime: Picket B (GW-703) is located about 2,000 ft west of the Oil Landfarm and Picket C (GW-724, GW-725, GW-738, and GW-740) is located about 3,000 ft west of the S-3 Site (Figure A.12). The wells in each Exit Pathway Picket are completed at various depths along strike-normal transects of the Maynardville Limestone (MMES 1990b), which is the primary contaminant migration pathway in the Bear Creek Regime.

Spring SS-4 was sampled during CY 2010 specifically for DOE Order exit pathway/perimeter monitoring. This spring discharges into Bear Creek (Table B.2 and Figure A.11) and is located southwest (hydraulically downgradient) of the OLF. The surface water stations (BCK-09.40 and BCK.11.97) are located in the main Bear Creek channel (Figure A.11).

Groundwater samples were collected from six monitoring wells and one spring to meet RCRA post-closure corrective action monitoring requirements in the Bear Creek Regime during CY 2010 (Table B.2). These wells include point-of-compliance (POC) wells located downgradient of the S-3 Site (GW-276), the OLF (GW-008), and the BCBG WMA (GW-046); three plume boundary wells (GW-712, GW-713, and GW-714) at Exit Pathway Picket W (Figure A.11 and Figure A.13). Spring SS-6 also serves as a plume boundary monitoring location (Figure A.11).

A total of 44 monitoring locations in the Bear Creek Regime were sampled to meet CERCLA monitoring requirements during CY 2010 (Table B.2 and Figure A.11). Eight wells, five springs, and 13 surface water stations were sampled to support CERCLA ROD monitoring requirements. Fourteen wells and five surface water stations were sampled for CERCLA detection monitoring purposes at the EMWMF.

Two surface water stations located near the BCBG WMA (NT-07 and NT-08) were sampled for CERCLA baseline monitoring purposes (Figure A.11).

3.1.2 East Fork Regime

As shown below in Table 2, a total of 82 monitoring wells, two springs, and five surface water stations in the East Fork Regime (and surrounding areas) were sampled during CY 2010 to meet the requirements of DOE Order monitoring, RCRA monitoring, and CERCLA monitoring. Table B.3 identifies the monitoring program applicable to each well, spring, and surface water station.

Table 2. CY 2010 sampling locations in the East Fork Regime, north of Pine Ridge, and in Union Valley

Monitoring Driver	Monitoring Wells	Springs	Surface Water Stations
DOE Order	60	0	3
RCRA	5	0	0
CERCLA	18	2	2
Totals:	**82 ***	**2**	**5**

Note: * = The total number is less than the sum because separate samples were collected from well GW-722 for DOE Order and CERCLA monitoring purposes (see Table B.3).

Most of the CY 2010 sampling locations lie within the boundaries of the East Fork Regime. However, five wells and two springs are located in Union Valley east the ORR boundary at Scarboro Road (Figure A.13), and three surface water stations are located in drainage features along the ORR boundary on the north side of Pine Ridge (Figure A.14). Samples were collected from the locations either annually (57 wells, both springs, and one surface water station), semiannually (21 wells and four surface water stations), or quarterly (four newly installed wells).

Fifty-four monitoring wells in East Fork Regime, most of which are located within the western and central areas of Y-12 (Figure A.13), were sampled during CY 2010 specifically to meet DOE Order surveillance monitoring requirements (Table B.3). Seven monitoring wells and three surface water locations were sampled to meet DOE Order exit pathway/perimeter monitoring requirements (Table B.3). Most of the exit pathway wells are located between UEFPC and Scarboro Road at the east end of Y-12 (Figure A.13). Two wells are equipped with Westbay^{TM} multi-port sampling equipment (Westbay wells GW-722 and GW-934). Groundwater samples were collected from discrete depth intervals at five sampling ports in well GW-722 (Figure A.15) and at eight sampling ports in well GW-934 (Figure A.16) during July and August 2010 (Table B.3). The surface water stations are located north of Pine Ridge (Figure A.14), and samples were collected in August 2010 (Table B.3).

Groundwater samples were collected from five wells to meet RCRA post-closure corrective action monitoring requirements in the East Fork Regime during CY 2010. These wells include one POC well (GW-108) which is located in the western Y-12 area about 800 ft southeast of the S-3 Site, and four plume delineation wells (GW-193, GW-605, GW-606, and GW-733) which are located several thousand ft east-southeast of the S-3 Site (Figure A.13).

Eighteen monitoring wells, two springs, and two surface water stations were sampled during CY 2010 specifically to meet CERCLA monitoring requirements (Table B.3). Thirteen monitoring wells and two springs were sampled for CERCLA ROD monitoring purposes. Eight of these monitoring wells (GW-151,

GW-154, GW-223, GW-380, GW-382, GW-722 [five discrete sampling depths], GW-762, and GW-832) are located in the eastern Y-12 area. The surface water stations (200A6 and Station 8) are located in the central Y-12 area. The other five monitoring wells and the springs are located in Union Valley east of the ORR boundary along Scarboro Road (Figure A.13).

3.1.3 Chestnut Ridge Regime

As shown below in Table 3, a total of 40 monitoring wells, five springs, and seven surface water stations in the Chestnut Ridge Regime were sampled during CY 2010 to meet the requirements of DOE Order monitoring, SWDF detection monitoring, RCRA monitoring, and CERCLA monitoring. Table B.4 identifies the monitoring program applicable to each well, spring, and surface water station; their locations are shown on Figure A.17.

Table 3. CY 2010 sampling locations in the Chestnut Ridge Regime

Monitoring Driver	Monitoring Wells	Springs	Surface Water Stations
DOE Order	4	2	3
SWDF	18	1	0
RCRA	15	0	0
CERCLA	4	2	4
Totals:	**40***	**5**	**7**

Note: * = The total number is less than the sum because separate samples were collected from well GW-205 for SWDF and CERCLA monitoring purposes (see Table B.4).

Groundwater samples were collected semiannually from most (27) of the monitoring wells, with samples collected annually from 12 wells (Table B.4). Samples from the springs and surface water stations were collected annually (five locations) and semiannually (seven locations).

Four monitoring wells located near the CRSP (GW-514, GW-322, GW-608, and GW-609) were sampled specifically for DOE Order surveillance monitoring purposes during CY 2010 (Figure A.17 and Table B.4). The sampling locations used for DOE Order exit-pathway/perimeter monitoring include springs SCR2.1SP and SCR2.2SP located in the southwestern portion of the regime and surface water stations SCR1.5SW, SCR3.5SW, and S17 located along Bethel Valley Road in main channels of drainage features where surface water exits the Chestnut Ridge Regime (Figure A.17).

Eighteen monitoring wells and one spring were sampled during CY 2010 to meet SWDF monitoring requirements (Table B.4). The monitoring wells are located at four SWDFs: three wells at ILF II; five wells at ILF IV; five wells at ILF V; and four wells at CDL VII (Figure A.17). Well GW-205 at the United Nuclear Corporation Site serves as the plume delineation well for SWDF assessment monitoring at ILF IV. Spring SCR4.3SP, sampled for SWDF detection monitoring at ILF V, is located about 2,400 ft southeast of the site (Figure A.17).

Groundwater samples were collected from 15 monitoring wells to meet RCRA monitoring requirements during CY 2010 in the Chestnut Ridge Regime: three wells for RCRA post-closure corrective action monitoring and 12 wells for RCRA post-closure detection monitoring (Table B.4). RCRA post-closure corrective action monitoring at the CRSP included one POC well (GW-177) located at the west end of the site and two plume delineation wells: GW-301 at the former Chestnut Ridge Borrow Area Waste Pile about

3,000 ft east of the site and GW-831 at the Filled Coal Ash Pond (FCAP) about 2,000 ft southwest of the site (Figure A.17). Note that the SWDF detection monitoring results for five monitoring wells and one spring also serve the purposes of RCRA post-closure corrective action monitoring at the CRSP. The monitoring wells include one background well (GW-521) and four plume delineation wells (GW-557, GW-562, GW-799, and GW-801) (Table B.4 and Figure A.17). The spring sampling location (SCR4.3SP) is located south of CDL VII (Figure A.17). During CY 2010, RCRA post-closure detection monitoring included four wells at the Chestnut Ridge Sediment Disposal Basin (CRSDB), four wells at the East Chestnut Ridge Waste Pile (ECRWP), and four wells at KHQ (Table B.4). The RCRA monitoring well network at the CRSDB includes one well (GW-159) located hydraulically upgradient (northwest) of the site and three POC wells (GW-156, GW-731, and GW-732) to the east-southeast (hydraulically downgradient) of the site (Figure A.17). One upgradient/background well (GW-231) and three downgradient POC wells (GW-143, GW-144, and GW-145) comprise the RCRA monitoring well network at KHQ (Figure A.17). The RCRA monitoring network for CY 2010 at the ECRWP included the upgradient/background well (GW-294) and three POC wells (GW-161, GW-296, and GW-298) located hydraulically downgradient of the site (Figure A.17).

Samples were collected from four monitoring wells, two springs, and four surface water stations to meet CERCLA monitoring requirements in the Chestnut Ridge Regime during CY 2010 (Table B.4). The wells and one surface water station are located at the United Nuclear Corporation Site (Figure A.17). One spring (SCR1.25SP) is located along Dunaway Branch in the southwestern portion of the regime, and a spring (SCR3.5SP) and three surface water stations (MCK 1.4, MCK 2.0, and MCK 2.05) are located along McCoy Branch (Figure A.17).

3.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLING

Quality assurance/quality control sampling activities managed by the Y-12 GWPP during CY 2010 were performed to ensure that the highest level of quality in sampling provided representative groundwater results. Comparable QA/QC sampling protocols also were performed under monitoring programs managed by BJC (BJC 2010b and EnergySolutions 2007).

As shown in Table 4, the QA/QC samples associated with the groundwater and surface water monitoring performed under the Y-12 GWPP during CY 2010 included 65 trip blanks, 47 method (laboratory) blanks, two field blanks, two equipment rinsate samples, and 12 duplicate groundwater and surface water samples.

Table 4. QA/QC samples analyzed in CY 2010 for the Y-12 GWPP

Sample Type	Total Number of Samples per Quarter of CY 2010				Annual Total
	First	Second	Third	Fourth	
Trip Blank Samples	16	9	25	15	**65**
Method Blank Samples	14	7	15	11	**47**
Field Blank Samples	0	1	0	1	**2**
Equipment Rinsate Samples	1	0	1	0	**2**
Duplicate Samples	3	3	4	2	**12**

The blanks and equipment rinsate samples were prepared and analyzed as specified in the *Field Quality Control Samples* operating procedure (B&W Y-12 2009b). Analytical results for the blank samples help assess the environmental conditions in the field and laboratory under which associated groundwater and surface water samples were collected, transported, stored, and analyzed. Trip blanks were samples of analyte-free water prepared in the laboratory and transported to the field and then to the laboratory in coolers containing groundwater and surface water samples. Field blanks were samples of analyte-free water that were transported to the field in a sealed glass container and transferred to sample bottles at monitoring wells GW-322 (second quarter) and GW-332 (fourth quarter) and then transported to the laboratory in a cooler containing the other samples from the well. Method blanks were samples of analyte-free water that were prepared in the laboratory and analyzed along with one or more associated groundwater or surface water samples. The equipment rinsates are samples of the analyte-free water from the final rinse of the decontaminated portable sampling equipment after sampling was completed at newly installed well GW-929 (first quarter) and Westbay well GW-722 (third quarter).

Method blanks, trip blanks, field blanks, and equipment rinsate samples were analyzed for VOCs. Appendix G provides summaries of detected results for the QA/QC blanks and equipment rinsate samples and shows the method blank and trip blank samples associated with each groundwater and surface water sample collected under management of the GWPP during CY 2010.

A total of 12 field duplicate samples were collected during CY 2010 from two wells and one spring in the Bear Creek Regime (Table B.2), seven wells in the East Fork Regime and a surface water station north of Pine Ridge (Table B.3), and one well in the Chestnut Ridge Regime (Table B.4). The duplicate samples were analyzed for the same constituents and parameters specified for the sampling location from which they were collected. Analytical results for the duplicates are presented with the regular sample results in Appendices D, E, and F.

3.3 SAMPLE COLLECTION AND HANDLING

The following discussion pertains to the groundwater and surface water sampling activities managed by the Y-12 GWPP during CY 2010. Personnel with the Environmental Sampling Section of the Y-12 Environmental Compliance Department were responsible for collection, transportation, and chain-of-custody control of the groundwater and surface water samples during CY 2010. Sampling throughout the year was performed in accordance with the most recent version of the technical procedures approved by the Y-12 GWPP Manager (BWXT Y-12, L.L.C. [BWXT] 2002, BWXT 2007a, and BWXT 2008). All samples were collected in appropriate containers, preserved as required, labeled, logged, placed in ice-filled coolers, and transported to the designated laboratory in accordance with chain-of-custody control requirements (B&W Y-12 2009b). Similar protocols were followed under the monitoring programs managed by BJC during CY 2010 (Commodore Advanced Sciences, Inc. [CASI] 2009).

Unfiltered samples were collected from the monitoring wells, springs, and surface water stations in each hydrogeologic regime during CY 2010. Groundwater samples were collected from most monitoring wells using dedicated bladder pumps (Well Wizard™). However, samples were obtained from two wells equipped with a dedicated Westbay ™ multi-port sampling apparatus (wells GW-722 and GW-934).

The low-flow minimal drawdown sampling method (low-flow sampling) was used to obtain groundwater samples from the wells equipped with dedicated bladder pumps. Under this method, a representative sample is obtained without introducing stagnant water from the well casing. To obtain the sample, groundwater is pumped from the well at a flow rate which is low enough (<300 milliliters per minute) to minimize drawdown of the water level in the well (<0.1 ft per quarter-hour). At five-minute intervals after the water-level drawdown has stabilized, field personnel record measurements of the pH, conductivity, water temperature, oxidation-reduction potential (REDOX), and dissolved oxygen. Samples of the groundwater in the well are collected once the field measurements for each parameter show minimal variation over four consecutive readings.

Groundwater samples were collected from Westbay wells GW-722 and GW-934 in accordance with the most recent and approved version of the operating procedures for the multi-port sampling equipment (BWXT 2007a and BWXT 2007b). Four 250-milliliter non-vented stainless steel sample collection bottles are used to obtain groundwater samples from the sampling ports. The sample collection bottles are lowered to the designated sampling port, the sampling port valve is opened remotely, and the bottles are allowed to fill with groundwater. The filled bottles are retrieved to the surface and the contents are poured into the appropriate laboratory sample bottle(s). The sample collection bottles are lowered, filled, and retrieved as many times as needed to completely fill the laboratory sample bottles. Groundwater in the first sample collection bottle retrieved from each sampling port is used as a “formation rinse” to obtain field measurements and to condition the sample collection bottles.

Passive (no purge) sampling methods were used to evaluate groundwater quality at 27 wells during CY 2010. A passive diffusion bag (PDB) was used to evaluate VOC concentrations in groundwater in 24 of these wells, including six wells in the Bear Creek Regime (Appendix D) and 18 wells in the East Fork Regime (Appendix E). The PDB sampling method is suitable only for monitoring for the presence and concentration of selected VOCs in groundwater. This method involves suspending a polyethylene bag (semipermeable membrane) filled with analyte-free water at a selected depth within the monitored interval of the well and leaving the PDB in place for a prescribed period (at least two weeks). The chemical concentration gradient between the uncontaminated analyte-free water in the PDB and the surrounding contaminated groundwater induces VOCs in the groundwater to diffuse through the bag into the analyte-free water until equilibrium conditions are achieved. When retrieved, the water in the PDB is decanted into VOC sample bottles (U.S. Geological Survey 2001).

A “no-purge method” was used for wells that have demonstrated a very low pumping rate (<50 ml/min) to meet the minimal drawdown requirement during purging and sample collection. During CY 2010, the no-purge method was used to collect groundwater samples from two wells (GW-065 and GW-623) in the Bear Creek Regime and one well (56-4A) in the East Fork Regime. For this method, field measurements were obtained and groundwater samples were collected after pumping the stagnant water (calculated volume) from the tubing.

3.4 FIELD MEASUREMENTS AND LABORATORY ANALYTES

The following discussion pertains to the field measurements and laboratory analytes associated with the CY 2010 groundwater and surface water sampling activities directed by the Y-12 GWPP. Identical or functionally equivalent field measurements and laboratory analyses were performed under monitoring programs managed by BJC during CY 2010 (BJC 2007, BJC 2010a, BJC 2010c, and EnergySolutions 2007).

Field personnel measured the depth to the static water surface before sampling groundwater in each monitoring well (except wells GW-722 and GW-934, and the wells sampled using PDBs) and recorded field measurements of pH, temperature, conductivity, dissolved oxygen, and REDOX for each groundwater and surface water sampling location (Table B.5). The depth to the static water level was converted from pressure measurements for each sampling port in wells GW-722 and GW-934. Additionally, REDOX and dissolved oxygen were not recorded for wells GW-722 and GW-934 (not applicable when a well is equipped with a multiport sampling apparatus). Field measurements were obtained in accordance with the most recent and approved technical procedures referenced in the CY 2010 SAP for the Y-12 GWPP (B&W Y-12 2009a). The field measurements recorded for the sampling locations in each regime are presented in Appendix D (Bear Creek Regime), Appendix E (East Fork Regime), and Appendix F (Chestnut Ridge Regime).

Most of the CY 2010 groundwater samples and surface water samples were analyzed for: (1) miscellaneous laboratory analytes (TDS and total suspended solids); (2) major ions and trace metals; (3) VOCs; and (4) gross alpha and gross beta activity (Table B.5). The Y-12 GWPP implemented selective parameter monitoring during CY 2010 on samples from monitoring wells with analytical results for at least eight groundwater samples obtained since January 1991 (B&W Y-12 2009a). Historical data clearly demonstrate that the selected parameters are the contaminants of concern and provide sufficient data for the other parameters. For example, samples from 32 monitoring wells were analyzed only for VOCs, and historical data for these locations show consistently low results for inorganic and radiochemical analytes. The CY 2010 results provide the data necessary to meet requirements of the Y-12 GWPP monitoring program.

Laboratory analyses of the samples were performed by the Y-12 Analytical Chemistry Organization (ACO) laboratories in accordance with the analytical methods and procedures listed in Table B.5. Analytical results are presented in Appendix D (Bear Creek Regime), Appendix E (East Fork Regime), and Appendix F (Chestnut Ridge Regime).

3.5 DATA MANAGEMENT AND DQO EVALUATION

The following discussion pertains to the data management protocols associated with the CY 2010 groundwater and surface water sampling activities directed by the Y-12 GWPP. Field measurements and results of specified laboratory analyses performed for the samples collected from each well, spring, and surface water station during CY 2010 were provided to the GWPP in electronic files and hardcopy printouts provided by the ACO. Electronic files and hardcopy printouts of 10% of the monitoring data obtained under the Y-12 GWPP were verified in accordance with the *Y-12 Groundwater Protection Program Data Management Plan* (BWXT 2003a). Appropriate ACO staff and personnel in the B&W Y-12 Information Technology Department worked to resolve any incomplete data transfers, irregular parameter names or reporting units, and discrepancies between electronic and hardcopy versions of the data. All data management functions were performed using Microsoft Access to maintain the GWPP Analytical Data Management System, a component of the GWPP Groundwater Information Management System (GIMS).

The BJC data management process (BJC 2007) is similar to the process described above for the Y-12 GWPP. Analytical results and field measurements associated with monitoring programs managed by BJC were extracted from the Oak Ridge Environmental Information System and uploaded into the GWPP GIMS by personnel in the B&W Y-12 Information Technology Department. Data were then extracted from GIMS and formatted for presentation in this report.

The CY 2010 groundwater and surface water monitoring data presented in this report have been evaluated with respect to the DQO criteria defined in the *Y-12 Groundwater Protection Program Data Management Plan* (BWXT 2003a). Specific DQO criteria apply to analytical results for field measurements, major ions, trace metals, VOCs, radiological analytes (gross alpha, gross beta, and radionuclides), and miscellaneous laboratory analytes (e.g., total suspended solids). Monitoring results that do not meet applicable DQOs are flagged with an "R" or "Q" qualifier and described in the introductory section of the applicable data appendices (Appendix D, Appendix E, and Appendix F). Functionally equivalent DQO criteria were employed for most of the monitoring programs managed by BJC (BJC 2010a, BJC 2010c, and EnergySolutions 2007). All of the data obtained to meet RCRA and SWDF monitoring requirements have been similarly evaluated; however, portions of the data obtained to meet CERCLA monitoring requirements have not been fully evaluated. Therefore, some results obtained during 2010 from BJC that are presented in this report may not meet the GWPP DQOs.

3.6 GROUNDWATER ELEVATION MONITORING

As shown in Table 5, selected monitoring wells in the Bear Creek, East Fork, and Chestnut Ridge hydrogeologic regimes were used to monitor groundwater elevations during seasonally low flow conditions in CY 2010.

Table 5. Summary of CY 2010 groundwater elevation monitoring in the Bear Creek, East Fork, and Chestnut Ridge regimes

REGIME	DEPTH-TO-WATER MEASUREMENTS		GROUNDWATER ELEVATIONS	
	No. of Wells	Dates	Data	Isopleth Map
Bear Creek	76	Oct. 11-19, 2010	Table B.6	Figure A.4
East Fork	62	Oct. 11-Nov.2, 2010	Table B.7	Figure A.5
Chestnut Ridge	77	Oct. 11-21, 2010	Table B.8	Figure A.6

Field personnel subcontracted by BJC measured the depth to the static water surface in each well in accordance with the operating procedure (BJC 2010b).

4.0 CY 2010 MONITORING DATA

The monitoring data obtained in CY 2010 for compliance with the groundwater monitoring and reporting requirements of DOE Order 450.1A is presented in this section. Separate discussions of the surveillance monitoring and exit pathway/perimeter monitoring data are provided for the Bear Creek, East Fork, and Chestnut Ridge hydrogeologic regimes. Each discussion of data focuses on the analytical results for the principal groundwater contaminants at Y-12, which are nitrate, uranium, VOCs, gross alpha activity, and gross beta activity. Elevated levels of the contaminants are defined as results that exceed the following screening levels: (1) nitrate concentrations above the MCL for drinking water (10 mg/L); (2) total uranium concentrations above the MCL (0.03 mg/L); (3) individual VOC concentrations exceeding applicable MCLs or summed VOC concentrations exceeding 5 µg/L; (4) gross alpha activity above the MCL (15 pCi/L); and (5) gross beta radioactivity above the SDWA screening level of 50 pCi/L for a 4 mrem/yr dose equivalent (the MCL for gross beta activity).

A more detailed analysis and interpretation of the monitoring data for groundwater and surface water sampling locations is contained in the *Y-12 Groundwater Protection Program Groundwater Monitoring Data Compendium* (B&W Y-12 2009d), hereafter referenced as the GWPP Compendium. For each applicable well, spring, and surface water station, the GWPP compendium provides (1) a sampling history, including sampling methods and distinguishing sampling characteristics; (2) an evaluation of hydrologic data (pre-sampling groundwater elevations and available aquifer test data); (3) a discussion of geochemical characteristics of the groundwater or surface water; and (4) a thorough evaluation of the available sampling results for nitrate, uranium, VOCs, gross alpha activity, and gross beta activity, including data summary tables and trend graphs.

In addition to the data evaluation in the GWPP compendium, the following technical reports issued by BJC analyze and interpret the CY 2010 monitoring results for the applicable RCRA, CERCLA, and SWDF sampling locations in the Bear Creek Regime, East Fork Regime, and Chestnut Ridge Regime: the *2011 Remediation Effectiveness Report* (DOE 2011), the *Calendar Year 2010 Resource Conservation and Recovery Act Annual Monitoring Report* (BJC 2011a), the *Annual Report for 2009 - 2010 Detection Monitoring at the Environmental Management Waste Management Facility* (BJC 2011b) and each semiannual *Groundwater Monitoring Report for the Oak Ridge Reservation Landfills* (BJC 2010d and BJC 2010e).

4.1 SURVEILLANCE MONITORING

Groundwater quality monitoring data collected during CY 2010 were evaluated to determine if any changes have occurred in areas that are, or could be, affected by Y-12 operations. Due to inherent differences in their characteristics, these evaluations were done for each hydrogeologic unit (aquitard and aquifer) within each hydrogeologic regime (Bear Creek, East Fork, and Chestnut Ridge).

4.1.1 Bear Creek Regime

In CY 2010, groundwater samples were collected from 62 surveillance monitoring wells in the Bear Creek Regime (Table B.2). Forty-one of these wells are completed in the geologic formations comprising the aquitard in BCV (Nolichucky Shale, Maryville Limestone, Rogersville Shale, Pumpkin Valley Shale, and Rome Formation). Twenty-one wells are completed in the geologic formations that comprise the aquifer in BCV (Copper Ridge Dolomite and Maynardville Limestone).

4.1.1.1 Aquitard Wells

Elevated concentrations of one or more of the principal groundwater contaminants at Y-12 were reported for the groundwater samples collected during CY 2010 from 21 aquitard wells in the Bear Creek Regime (Table B.9). The presence of contaminants in the groundwater at these wells is attributable to the transport/migration of the mobile components of groundwater contaminant plumes emplaced during historical operations of the former S-3 Ponds, the OLF WMA, and the BCBG WMA. These sites are closed former hazardous waste disposal units that are presently regulated under a RCRA post-closure permit. Additionally, the types and concentrations of contaminants detected in the groundwater samples collected from these wells during CY 2010 are generally consistent with the overall extent of nitrate (Figure A.7), total uranium, VOCs (Figure A.8), gross alpha activity (Figure A.9), and gross beta activity (Figure A.10) defined by the available data for the existing network of wells completed in the aquitard formations in BCV west of Y-12.

Nitrate and Uranium

As shown in Table 6, elevated concentrations of nitrate (>10 mg/L) and/or total uranium (>0.03 mg/L) were reported for at least one groundwater sample collected during CY 2010 from seven aquitard wells in the Bear Creek Regime, listed below in sequence from closest to farthest from the S-3 Site (from northeast [hydraulically upgradient] to southwest [hydraulically downgradient]), which is the source of the nitrate and uranium in the groundwater from each well.

Table 6. Bear Creek Regime CY 2010: elevated nitrate and uranium concentrations in surveillance monitoring aquitard wells

Well Number	Direction - Distance from S-3 Site (Figure A.7)		Total Depth (ft bgs)	Nitrate (mg/L)		Uranium (mg/L)	
				Jan-Apr 2010	Jul-Sept 2010	Jan-Feb 2010	Jul-Sept 2010
GW-615	South	50 ft	245	NS	10,999	NS	0.0958 Q
GW-246		50 ft	76	2,879	NS	0.56	NS
GW-276	Southeast	200 ft	18.5	13	10	0.29	0.38
GW-616	Southwest	400 ft	269	246	NS	NA	NS
GW-526	West	1,300 ft	114.6	NS	1,319	NS	NA
GW-537		2,500 ft	23.3	320	NS	NA	NS
GW-085		3,000 ft	58.8	NS	25.8	NS	NA
MCL				10		0.03	
Note: NA = Not analyzed; NS = Not sampled; Q = inconsistent with other measurements from the well.							

These sampling results show that the highest nitrate concentrations occur in the groundwater from wells located directly south (geologically down-dip) of the S-3 Site (GW-246 and GW-615), reflecting the density-driven vertical (dip-parallel) migration of the highly mineralized acidic wastes disposed at the site. The very high nitrate levels in the groundwater samples from well GW-526 confirm the substantial westward transport of nitrate via strike-parallel flowpaths (e.g., bedding plane fractures) at depth (>100 ft bgs) in the Nolichucky Shale. The high nitrate concentration in the shallow groundwater from well GW-537 (Figure A.7) is believed to reflect upwelling of nitrate-contaminated groundwater from deeper flowpaths toward discharge features along NT-2. The elevated nitrate levels in the groundwater from well GW-085 indicate continued westward transport of nitrate in the shallow flow system west of NT-2, at least 3,000 ft from the S-3 Site.

As with nitrate, the CY 2010 groundwater sampling results show that the highest concentrations of total uranium occur geologically down-dip to the south of the S-3 Site. Elevated uranium concentrations in the Nolichucky Shale occur only in the low-pH groundwater within approximately 500 ft of the S-3 Site. The uranium concentration reported for the September 2010 sample from well GW-615 is inconsistent with historical measurements for the well and does not meet DQOs of the Y-12 GWPP (see Section 3.5). This unusually low result is a suspected outlier that is excluded from further evaluation in this report. All of the uranium concentrations reported for the previous six samples from well GW-615 (March 2004 – February 2009) were an order-of-magnitude higher (>1.0 mg/L).

The CY 2010 sampling results for the wells listed in Table 6 support the long-term concentration trends (Table B.9), with time-series plots of the nitrate and uranium data (excluding analytical results that do not meet applicable DQOs) for these wells generally showing:

- Decreasing trends for wells GW-276 (nitrate and uranium) and GW-537 (nitrate), as illustrated by the nitrate data for wells GW-276 and GW-537 (Figure A.18). The decreasing trends reflect substantially reduced flux of nitrate and uranium in the groundwater following closure of the S-3 Ponds and installation of a low-permeability cap in 1988. Additionally, the decreasing concentrations may reflect the long-term cumulative effects of various natural attenuation processes.

- Indeterminate trends for nitrate concentrations at wells GW-085, GW-246, GW-615, and GW-616 and for uranium concentrations at well GW-246, as illustrated by the nitrate data for wells GW-085 and GW-246 (Figure A.18). The data for well GW-085 show long-term fluctuations in nitrate concentrations, suggesting temporal pulses in the level of nitrate in the shallow groundwater. The long-term stable trend for nitrate concentrations at well GW-246 seems unusual in light of the substantially reduced flux after the S-3 Ponds were closed and capped. The trend is probably a function of the extensive mass of nitrate and uranium emplaced in the Nolichucky Shale beneath the site and the relatively low-permeability of the hydrostratigraphic zone intercepted by the monitored interval in the well.

- Increasing trends for nitrate concentrations at well GW-526 and for uranium concentrations at well GW-615 (Figure A.18). The increasing uranium concentrations indicated by the data for well GW-615 (excluding outliers in August 2000 and September 2010) potentially reflect a long-term increase in the relative vertical flux of uranium down-dip of the site. This increase is somewhat conspicuous in light of the indeterminate trend for nitrate at well GW-615, which is far more mobile in groundwater than uranium. These divergent concentration trends at well GW-615 may reflect a stable nitrate plume (following an earlier arrival time) and a slowly expanding uranium plume with breakthrough evident during the gap in sample collection between 1993 and 2000.

Volatile Organic Compounds

Groundwater samples collected during CY 2010 from 17 aquitard wells in the Bear Creek Regime contained one or more dissolved VOCs at individual or summed concentrations of 5 µg/L or more (Table B.9). As shown in Table 7, the maximum concentration of eight VOCs reported for groundwater samples collected from 14 of these wells exceed the respective drinking water MCLs. The presence of dissolved VOCs in the groundwater at these wells reflects their transport/migration from the contaminant source areas emplaced during historical operations of the S-3 Ponds (three wells), OLF (three wells), and various waste disposal areas within the BCBG WMA (11 wells).

Table 7. Bear Creek Regime CY 2010: maximum VOC concentrations in surveillance monitoring aquitard wells

Location/ Well Number (Figure A.8)	Maximum Concentration (µg/L)								
	Chloroethenes					Chloroethanes		Chloro- methane	Petroleum
	PCE	TCE	c12DCE	11DCE	VC	12DCA	11DCA	MC	Benzene
S-3 Site									
GW-246	160	<	<	<	.	.	.	17	.
GW-276	5.5	.	.	.	.	.	.	.	.
GW-615	.	.	.	.	.	.	.	<	.
OLF									
GW-006	.	<	<	.	.	.	7	.	.
GW-008	45	9	<	<	.	.	14	.	<
GW-098	.	6	<	<	.	.	.	.	.
BCBG									
GW-014	10	160	1,100	98	170	<	190	.	<
GW-046	1,500	1,600	5,000	130	660	6.7	510	320	250
GW-068	10	93	2,200	340	410	<	1,200	<	160
GW-071	350	41	<	54	3	.	2,200	.	1,000
GW-082	<	<	850	19	250	.	500	.	21
GW-289	130	16	<	<	.	.	.	.	.
GW-291	240	27	73	.	.	.	.	.	.
GW-623	1,400	3,400	190	110	48	.	1,200	12	<
GW-626	61	33	310	<	<	.	14	.	.
GW-627	1,000	360	<	49	56	.	120	.	.
GW-653	<	5	<	<	.	.	2	.	.
MCL	5	5	70	7	2	5	NA	5	5
Note: "." = Not detected; "<" = Less than MCL.									

As shown in the preceding data summary, extremely high concentrations (>1,000 µg/L) of VOCs (PCE, TCE, c12DCE, and 11DCA) were detected in the groundwater samples collected from several wells located at the BCBG. These results primarily reflect migration/transport of dissolved VOCs at depth (>300 ft bgs) in the Nolichucky Shale directly south (down dip) and/or southwest (along strike) of BG-A South (Figure A.8).

The CY 2010 sampling results for the wells listed in Table 7 support long-term summed VOC (e.g., chloroethenes) concentration trends (Table B.9), with time-series plots of the VOC data for each well generally showing:

- Decreasing trends for wells GW-006, GW-014, GW-071, GW-098, and GW-276, as illustrated by the PCE results for wells GW-014 and GW-276 (Figure A.19). The decreasing concentration trends reflect a combination of several factors, primarily the substantially reduced flux of VOCs following closure of the former S-3 Ponds, OLF WMA, and BCBG WMA, the components of which were closed in 1986-1988 and covered by low-permeability caps in 1989. Along with reduced flux from the respective source areas, the long-term cumulative effects of various natural attenuation processes, including biologically mediated degradation, also explain the decreasing concentrations of VOCs in the groundwater at these wells.

- Indeterminate trends for one well near the S-3 Site (GW-615) and five wells located hydraulically downgradient of the BCBG WMA (GW-046, GW-068, GW-082, GW-289, and GW-623), as illustrated by the PCE results for wells GW-046 and GW-289 (Figure A.19). For example, PCE concentrations at well GW-046 show wide (seasonal, with peak concentrations in July) fluctuations, but similar results were reported for the groundwater samples collected from the well in January 2000 (1300 μg/L), January 2004 (1500 μg/L), and January 2010 (1500 μg/L).

- Increasing trends for well GW-246 at the S-3 Site, well GW-008 at the OLF WMA, and wells GW-068, GW-627, GW-629, and GW-653 at the BCBG WMA. The increasing trend indicated by the PCE data for well GW-246 (Figure A.19) spans a 14-year gap (January 1990 - March 2004) in the sampling history for the well. Increasing concentrations of VOCs indicated by the sampling results for wells GW-627 (Figure A.19) and GW-653 potentially reflect an increase in the relative flux of VOCs via the strike-parallel flowpaths in the Nolichucky Shale west of BG-A South, following down-dip migration of dissolved VOCs in the groundwater and DNAPL in the nearby subsurface.

Divergent concentration trends for individual chloroethenes in groundwater from well GW-068 at the BCBG WMA indicate biodegradation. The CY 2010 results show that c12DCE, 11DCE, and VC are the chloroethenes with the highest concentrations (Table 7). Historic data for the well show clearly decreasing trends for concentrations of PCE and TCE (parent compounds), with clearly increasing trends for concentrations of c12DCE and VC (degradation products), as shown by a time-series plot of the PCE and 12DCE concentrations (Figure A.19).

Gross Alpha and Gross Beta Activity

Groundwater samples collected during CY 2010 from 10 of the aquitard wells used for surveillance monitoring in the Bear Creek Regime contained gross alpha activity and/or gross beta activity above the associated minimum detectable activity (MDA) and the corresponding total propagated uncertainty (TPU). As shown in Table 8, elevated levels of gross alpha activity (>15 pCi/L) and/or gross beta activity (>50 pCi/L) were reported for three of these wells.

Table 8. Bear Creek Regime CY 2010: elevated gross alpha activity and gross beta activity in surveillance monitoring aquitard wells

Well	Date Sampled	Gross Alpha Activity (pCi/L)				Gross Beta Activity (pCi/L)			
		MDA	Activity±TPU			MDA	Activity ± TPU		
GW-246	02/16/10	330	3,500	±	610	670	14,000	±	2,500
GW-246	04/20/10	37	180	±	54	78	12,000	±	270
GW-276	01/04/10	3.1	112	±	19.7	6.04	120	±	20.2
GW-276	07/15/10	2.82	115	±	19.3	4.5	164	±	26.6
GW-537	02/08/10	3.3		<MDA		7	180	±	11
Screening Level		15				50			

The elevated levels of gross alpha activity and gross beta activity reflect transport/migration of uranium isotopes and Tc-99, respectively, from the groundwater contaminants (acidified wastes) emplaced at the source during historical operation of the former S-3 Ponds. As with total uranium, the relatively limited extent of elevated gross alpha activity indicated by the CY 2010 sampling results reflects the limited mobility of uranium isotopes beyond the acidic groundwater in the Nolichucky Shale within approximately 500 ft of the site.

As shown by the CY 2010 sampling results summarized in Table 8 and shown on Figure A.10, gross beta activity remains extremely high (>10,000 pCi/L) in groundwater from the Nolichucky Shale nearest to the S-3 Site (well GW-246), and exceeds 100 pCi/L in the shallow groundwater 2,500 ft west of the site (well GW-537). Historical data show that Tc-99 is the primary beta-emitting radionuclide in the groundwater at each of these wells. Considered a "signature" contaminant from the former S-3 Ponds, Tc-99 is believed to occur as an ion (TcO_4) that, like nitrate, is not readily attenuated in the subsurface and is highly mobile in the groundwater. This largely explains the similar distribution of nitrate and elevated gross beta activity in the aquitard near the site.

The gross alpha and gross beta activity reported for the groundwater samples collected during CY 2010 support the long-term trends indicated by historical data (Table B.9). Time-series plots of the gross alpha and/or gross beta activity reported for each applicable well, excluding results that do not meet applicable DQOs, generally show:

- Decreasing gross alpha and gross beta trends for wells GW-246 and GW-276 (Figure A.20), which are located south and southeast, respectively, of the S-3 Site (Figure A.11). As shown by data for well GW-276, the decreasing trends for gross alpha and gross beta activity mirror the concurrently decreasing trends evident for nitrate and uranium (Figure A.18) and PCE (Figure A.19). As with the other contaminants in the groundwater from this well, the decreasing levels of gross alpha and gross beta activity likewise primarily reflect the substantially reduced flux of uranium isotopes and Tc-99 that occurred after the former S-3 Ponds were closed and capped.

- An indeterminate gross beta activity trend for well GW-537 (Figure A.20). As noted previously, the nitrate concentrations at well GW-537 show a generally decreasing trend (Figure A.18), and the gross beta trend also appears to be decreasing in the groundwater samples collected from the well since August 2003 (659 pCi/L).

4.1.1.2 Aquifer Wells

Elevated concentrations of one or more of the principal groundwater contaminants at Y-12 were reported for the groundwater samples collected during CY 2010 from 16 aquifer wells in the Bear Creek Regime (Table B.9). Seven of these wells are components of two Exit Pathway Pickets in the Bear Creek Regime (Figure A.13): Picket B (GW-703, GW-704, and GW-706) and Picket C (GW-724, GW-725, GW-738, and GW-740). The remaining wells are located near the eastern end of the regime near the S-3 Site (GW-100), and Rust Spoil Area (GW-307, GW-310, and GW-312) and along Bear Creek near the OLF WMA (GW-065, GW-225, GW-229, GW-365, and GW-601).

The presence of contaminants in the groundwater from these aquifer wells is attributable to the migration of groundwater contaminant plumes emanating from historical operations of the former S-3 Ponds, Spoil Area I, Rust Spoil Area, the OLF WMA, and the BCBG WMA and intermixing during transport in the Maynardville Limestone. The types and concentrations of contaminants detected in the groundwater samples collected from these wells during CY 2010 are generally consistent with historical data that define the overall extent of nitrate (Figure A.7), total uranium, VOCs (Figure A.8), gross alpha activity

(Figure A.9), and gross beta activity (Figure A.10) in the Maynardville Limestone (and lower Knox Group) in BCV west of Y-12.

Nitrate and Uranium

Elevated concentrations of nitrate (>10 mg/L) and/or total uranium (>0.03 mg/L) were reported for seven of the aquifer wells used for surveillance monitoring in the Bear Creek Regime, listed below in Table 9 in sequence from closest to farthest from the S-3 Site.

Table 9. Bear Creek Regime CY 2010: elevated nitrate and uranium concentrations in surveillance monitoring aquifer wells

Well Location / Number		Distance and Direction from S-3 Site (Figure A.7)	Nitrate (mg/L)		Uranium(mg/L)	
			Jan 2010	Aug-Sept 2010	Jan 2010	Aug-Sept 2010
S-3 Site	GW-100	1,150 ft Southwest	NS	23.8	NS	<
OLF WMA	GW-601	4,500 ft West	NS	15	NS	NA
	GW-225	4,600 ft West	NS	42.6	NS	NA
	GW-229	5,000 ft West	NS	.	NS	0.104
Exit Pathway Picket B	GW-703	7,000 ft West	NS	16.4	NS	<
	GW-704		13	NS	<	NS
	GW-706		18	13	0.062	0.059
MCL			10		0.03	
Note: “.” = Not detected; “<” = Less than MCL; NS = Not sampled; NA = Not analyzed						

These sampling results show that elevated nitrate concentrations in the aquifer extend to approximately 7,000 ft west of the S-3 Site (e.g., GW-706). Elevated concentrations of total uranium were reported only for groundwater samples from wells GW-229 and GW-706, which are located hydraulically downgradient to the west of the BYBY (Figure A.9). Uranium-bearing wastes were buried at depths below the seasonally high water table at the BYBY. Carbonate dissolved from the limestone bedrock combined with uranyl cations leached from the wastes, which greatly increased the otherwise limited mobility of uranium in the neutral pH groundwater typical of the Maynardville Limestone (DOE 1997a). The bulk of these wastes were excavated and removed during CERCLA remedial actions completed in May 2003.

Elevated concentrations of nitrate and/or uranium in the groundwater samples collected during CY 2010 from the aquifer wells in the Bear Creek Regime support the respective long-term concentration trends indicated by historical data (Table B.9). Time-series plots of the nitrate and uranium data (excluding analytical results that do not meet DQOs) generally show:

- Decreasing trends for nitrate at five wells (GW-100, GW-225, GW-601, GW-704, and GW-706) and for uranium at well GW-706, as illustrated by nitrate and uranium data for well GW-706 (Figure A.21). Decreasing nitrate concentrations reflect a combination of substantially reduced flux of nitrate in the Maynardville Limestone after the former S-3 Ponds were closed and capped, and the cumulative effectiveness of various natural attenuation processes, including the outflow of nitrate-contaminated groundwater into Bear Creek. The sharp decrease in uranium concentrations at well GW-706 between January and July 2003 may be attributable to the CERCLA remedial actions at the BYBY that were completed in May 2003.

- An indeterminate nitrate trend for well GW-703 (Figure A.21) suggesting that the well yields contaminated groundwater from flow/transport pathways that are not well connected to the most permeable karst network in the Maynardville Limestone. The trend suggests minimal overall change in the relative flux of nitrate within the hydrostratigraphic zones intercepted by the monitored interval.

- An increasing uranium trend for well GW-229 (Figure A.21). Available sampling results for well GW-229 show an order-of-magnitude increase in the concentrations of uranium occurred between sampling events performed in September 1995 (0.014 mg/L) and March 2002 (0.238 mg/L). Subsequent sampling results define a generally decreasing trend through September 2010 (0.104 mg/L). The decreasing uranium concentrations indicated by the more recent data suggest reduced flux of uranium in response to the removal of uranium-bearing wastes during CERCLA remedial actions at the BYBY.

Volatile Organic Compounds

Groundwater samples collected during CY 2010 from 15 aquifer wells contained individual or summed VOC concentrations of 5 µg/L or more (Table B.9). As shown in Table 10, the maximum concentrations of TCE, c12DCE, 11DCE, VC, and benzene reported for at least one groundwater sample from one or more wells exceed the respective drinking water MCLs.

Sampling results for these wells also show that TCE is the primary VOC in the intermingled plume of contaminants in groundwater from the Maynardville Limestone west of Y-12, with input to the plume from multiple confirmed sources, including the Rust Spoil Area and the OLF WMA (Figure A.8). The CY 2010 sampling results show the continued persistence of TCE in the groundwater from six of these wells without concurrent detection of TCE degradation products (e.g., c12DCE) suggesting that the geochemical characteristics of the groundwater near these wells are not especially conducive to biologically-mediated degradation processes (reductive dechlorination).

Table 10. Bear Creek Regime CY 2010: maximum VOC concentrations in surveillance monitoring aquifer wells

Well Number	Maximum Concentration (µg/L)				
	Chloroethenes				Petroleum
	TCE	c12DCE	11DCE	VC	Benzene
GW-065	5	.	.	.	.
GW-225	250	<	<	.	.
GW-229	<	160	22	51	9
GW-307	13	<	.	.	.
GW-310	<	.	.	.	.
GW-312	28	.	.	.	.
GW-365	5	<	15	4	.
GW-601	67	.	.	.	.
GW-703	10	<	.	.	.
GW-704	27	<	<	.	.
GW-706	9.8	<	<	.	.
GW-724	88	<	.	.	.
GW-725	9	.	.	.	.
GW-738	13	.	.	.	.
GW-740	42	.	.	.	.
MCL	5	70	7	2	5

Note: "." = Not detected; "<" = Less than MCL

These VOC results support the long-term summed VOC (e.g., chloroethenes) concentration trends (Table B.9), with time-series plots of the VOC data for each well generally showing:

- Variable but generally decreasing trends for eight wells (GW-307, GW-310, GW-365, GW-601, GW-703, GW-704, GW-738, and GW-740), as illustrated by TCE data for wells GW-704 and GW-738 (Figure A.22). The decreasing concentration trends reflect the substantially reduced flux of VOCs following closure of principal source areas (e.g., OLF WMA), and the long-term cumulative effects of various natural attenuation processes.

- Indeterminate trends for 11DCA and benzene at well GW-229 and for summed chlorothenes at wells GW-065, GW-225, GW-706, GW-724, and GW-725, as illustrated by the TCE data for wells GW-225 and GW-706 (Figure A.22). The relatively unchanged levels of VOCs in the groundwater from these wells suggest there is minimal change in the advective flux of VOCs in the hydrostratigraphic zone monitored by each well.

- A generally increasing trend for summed chloroethenes at well GW-229, as illustrated by the 12DCE and 11DCE results for the well (Figure A.22). The data for this well and well GW-365 are clearly distinguishable from the other wells listed in Table 10 by the dominant concentrations of TCE degradation products (c12DCE, 11DCE, and VC). The increasing concentrations do not reflect any clear response to the CERCLA remedial actions at the BYBY. This suggests that the site is not a significant source of the VOCs in the groundwater from the well. However, Sanitary Landfill I is located upgradient and along geologic strike to the east of well GW-229, and may be the source of VOCs in groundwater at the well.

Divergent concentration trends observed for individual chloroethenes indicate ongoing biodegradation near wells GW-229 and GW-365. For example, the low-flow sampling results from March 2001 to September 2010 reported for well GW-365 show that TCE (parent compound) concentrations decreased from 54 µg/L to 5 µg/L while c12DCE (degradation product) concentrations concurrently increased from 17 µg/L to 36 µg/L.

Gross Alpha and Gross Beta Activity

Groundwater samples collected during CY 2010 from 16 aquifer surveillance monitoring wells contained gross alpha and/or gross beta activity above the associated MDA and the corresponding TPU. However, as shown in Table 11, only samples from three of these wells had elevated levels of gross alpha activity (>15 pCi/L) and/or gross beta activity (>50 pCi/L).

Table 11. Bear Creek Regime CY 2010: elevated gross alpha activity and gross beta activity in surveillance monitoring aquifer wells

Well	Date Sampled	Gross Alpha Activity (pCi/L)				Gross Beta Activity (pCi/L)			
		MDA	Activity ± TPU			MDA	Activity ± TPU		
GW-229	09/07/10	7.6	26	±	7.5	8.4		<	
GW-706	01/18/10	1.56	18.6	±	3.72	3.17		<	
GW-706	08/06/10	2.51		<		4.26		<	
GW-738	09/09/10	4.2		<		8.2	120	±	9.9
Screening Level		15				50			

Note: "<" = Less than or equal to screening level.

Elevated gross alpha and gross beta activity in the groundwater at these wells reflects the transport/migration of uranium isotopes (and beta-emitting decay products of uranium) and Tc-99, the principal radiological components of the intermingled contaminant plume in the Maynardville Limestone.

The CY 2010 monitoring results show that the highest level of gross alpha activity occurs in the groundwater from aquifer well GW-229, located downgradient (west-southwest) of the former BYBY (Figure A.9 and Figure A.10, respectively). These results are consistent with historical data for the well, which show that uranium isotopes are the principal source of gross alpha activity and that beta-emitting uranium decay products (e.g., thorium-234) are the principal source of gross beta activity. The primary source of uranium isotopes in the groundwater from this well is considered to be the uranium-bearing wastes that were disposed and subsequently removed from the BYBY. Gross beta activity is higher in the other two wells, which probably reflects a combination of the uranium decay products from the BYBY and Tc-99 from the S-3 Site.

The elevated gross alpha and gross beta activity in samples collected from aquifer wells during CY 2010 supports long-term trends indicated by respective historical data (Table B.9). Time-series plots of the gross alpha and/or gross beta activity reported for each applicable well generally show:

- An overall decreasing gross alpha trend for well GW-706 (Figure A.23), with a similarly decreasing trend for gross beta to below the screening level in CY 2010. The long-term gross alpha trend for conventional sampling was highly variable and indeterminate. However, the trend for low-flow sampling results show a generally decreasing trend with a drop in alpha activity in July 2003 that is a possible response to the CERCLA actions completed in May 2003.

- An indeterminate gross beta trend for well GW-738 (Figure A.23). The result for the sample collected in September 2010 (120 pC/L) is unusually high, with 29 of the previous 35 gross beta results being less than 50 pCi/L and a maximum beta activity of 65 pCi/L (August 2007). The long-term trend suggests minimal change in the relative flux of beta-emitting isotopes within the hydrostratigraphic zones intercepted by the monitored interval.

- An increasing gross alpha trend for well GW-229 (Figure A.23) that is similar to the long-term trend for total uranium (Figure A.21). The results for gross alpha activity show a significant increase between September 1995 and August 2002, followed by a decrease between February 2003 (150 pCi/L) and September 2010 (26 pCi/L). Decreasing levels of gross alpha activity (and gross beta activity) indicated by the recent sampling results suggest a corresponding reduction in the relative flux of uranium isotopes following removal of uranium-bearing wastes from the BYBY during CERCLA remedial actions completed in May 2003.

4.1.2 East Fork Regime

In CY 2010, groundwater samples were collected from 73 surveillance monitoring wells in the East Fork Regime (Table B.3). Forty-five of the wells are completed in geologic formations comprising the aquitard (Nolichucky Shale, Maryville Limestone, Rogersville Shale, Pumpkin Valley Shale, and Rome Formation). The remaining 28 wells are completed in geologic formations comprising the aquifer (Copper Ridge Dolomite and Maynardville Limestone).

4.1.2.1 Aquitard Wells

Elevated concentrations of one or more of the principal groundwater contaminants at Y-12 were reported for groundwater samples collected during CY 2010 from 31 aquitard monitoring wells in the East Fork Regime (Table B.10). The presence of principal contaminants in the groundwater at these wells is attributable to the transport/migration of the mobile components of the groundwater contaminant plumes originating from multiple sources, including the S-3 Site and the WCPA in the western Y-12 area and unidentified sources in the central and eastern Y-12 areas. Additionally, the types and concentrations of detected contaminants are generally consistent with nitrate (Figure A.7), total uranium, VOCs (Figure A.8), gross alpha activity (Figure A.9), and gross beta activity (Figure A.10) results for the existing network of wells completed in the aquitard formations in the western, central, and eastern Y-12 areas.

Nitrate and Uranium

Elevated concentrations of nitrate (>10 mg/L) or uranium (>0.03 mg/L) were detected in groundwater samples collected during CY 2010 from eight aquitard wells in the East Fork Regime. As shown in Table 12, elevated nitrate concentrations were reported for six wells in the western Y-12 area and two wells in the central Y-12 area. The wells listed below are sequenced from closest to farthest from the S-3 Site, the source of nitrate in the aquitard. Elevated levels of nitrate in the groundwater reflect the substantial transport of nitrate (and other similarly mobile contaminants) eastward from the former S-3 Ponds, which created a local mound in the water table that enabled the contaminants to migrate to the east of the hydrologic divide now separating the UEFPC and Bear Creek watersheds. These sampling results show that nitrate concentrations remain highest in the groundwater within approximately 1,500 ft of the S-3 Site (Figure A.7). The results also illustrate the preferred strike- and dip-parallel flow of groundwater in the water table interval (wells 55-2A, 55-2B, GW-274, and GW-633) and the shallow bedrock (<70 ft bgs) interval (wells 55-2C, GW-108, and GW-275) in the Nolichucky Shale east and southeast of the site.

Table 12. East Fork Regime CY 2010: elevated nitrate and uranium concentrations in surveillance monitoring aquitard wells

Well Location/Number/ Approx. Distance (ft) and Direction from S-3 Ponds (Figure A.7)			Nitrate (mg/L)		Uranium (mg/L)	
			Jan-Apr 2010	Aug-Dec 2010	Jan-May 2010	Oct 2010
Western Y-12 Area	GW-106	480 E	NS	634	NS	<
	GW-633	720 SE	NS	760	NS	<
	GW-108	800 SE	6,500	7,600	<	<
	GW-109	800 SE	NS	8,620	NS	<
	GW-274	1300 SE	NS	1,319	NS	<
	GW-275	1300 SE	NS	8,850	NS	.
Central Y-12 Area	55-2B	3000 SE	317	NS	NA	NS
	55-2C		283	NS	NA	NS
		MCL	10		0.03	

Note: "NA" = Not analyzed; "NS" = Not sampled; "<" = Concentration less than MCL; "." = Not detected.

None of the uranium results for samples collected from aquitard wells during CY 2010 exceeded the drinking water MCL. The CY 2010 sampling results are consistent with historical nitrate concentration trends (Table B.10), with time-series plots for each well generally showing:

- Decreasing trends for wells GW-108, GW-274, and GW-633 (Figure A.24). The decreasing concentrations of nitrate in the Nolichucky Shale downgradient of the S-3 Site reflect substantially reduced flux of nitrate (and other mobile contaminants) in groundwater following closure of the site and installation of the low-permeability cap and the cumulative effectiveness of natural attenuation processes.

- Indeterminate trends for wells GW-109 and GW-275 (Figure A.24). The relatively unchanged nitrate levels in the groundwater from these wells seems unusual considering that the S-3 Ponds have been closed for more than 20 years. The persistently high levels of nitrate in the wells probably reflect both the extensive volume (mass) of nitrate emplaced in the Nolichucky Shale beneath the site and the relatively low-permeability of the groundwater flow pathways intercepted by each well. Wells GW-109 and GW-275 are deeper wells that are paired with wells GW-108 and GW-274, respectively.

- Increasing trends for wells 55-2B and 55-2C (Figure A.24). The increasing nitrate concentrations at these wells potentially reflect the continued eastward movement of the center of mass of the S-3 Ponds contaminant plume in the Nolichucky Shale east of the site (DOE 1998).

Volatile Organic Compounds

One or more dissolved VOCs were detected at individual or summed concentrations of 5 µg/L or more in at least one groundwater sample collected during CY 2010 from 28 aquitard wells in the East Fork Regime (Table B.10). Summarized below in Table 13, these sampling results show maximum concentrations of PCE, TCE, c12DCE, 11DCE, VC, CTET, MC, 12DCA, benzene, ETB, and toluene exceeding respective drinking water MCLs. The presence of dissolved VOCs reflects transport/migration from the contaminant plumes from several source areas, including: the former S-3 Ponds, the WCPA, former petroleum fuel dispensing facilities associated with the Rust Garage Area and the East End Fuel Facility, and other sources within the industrial areas of Y-12. Moreover, the extremely high concentrations (>1,000 µg/L) of VOCs in some wells suggest the likely presence of DNAPL in the aquitard underlying several areas within Y-12. For example, the CY 2010 sampling data for wells 55-3A, 55-3B, and 55-3C (located in the central Y-12 area south of Bldg. 9201-5) show the highest dissolved concentrations of chlorinated hydrocarbons in the East Fork Regime. Note that the PCE and CTET detected in the April 2010 sample from well GW-930 are inconsistent with other measurements from the well and do not meet DQOs of the Y-12 GWPP (see Section 3.5). These results, shown with “Q” qualifiers, are suspected outliers (possible artifacts) that are excluded from further evaluation in this report. These VOCs were not detected in previous or subsequent quarterly samples collected from the well (Appendix E).

Table 13. East Fork Regime CY 2010: maximum VOC concentrations in surveillance monitoring aquitard wells

Y-12 Area/ Well	Maximum Concentration (µg/L)									
	Chloroethenes					Chloromethanes		Chloro-ethane	Petroleum	
	PCE	TCE	c12DCE	11DCE	VC	CTET	MC	12DCA	Benzene	Toluene
Western										
GW-108	7.5	<	.	<	.	.	56	.	<	.
GW-109	78	<	.	.	.	.	12	.	.	.
GW-269	8	<	<	96	.	.	.	.	.	.
GW-274	1,300	10	<	<	4	.	23	.	200	.
GW-332	380	140	450	21	9	.	.	.	.	.
GW-337	490	460	1,800	74	22	.	.	.	.	.
GW-633	190	5	<	2	.	.	14	.	2,000	.
Central										
55-2B	380	200	430	13	12	.	.	.	.	.
55-2C	260	180	480	16	12	.	.	.	.	.
55-3A	19,000	1,800	1,500	40	62	.	.	.	.	.
55-3B	60,000	7,400	1,800	200	260	.	.	.	<	<
55-3C	14,000	1,500	1,600	34	120	.	.	.	.	.
56-2A	18	<	<	.	.	.	.	.	.	.
56-2B	630	48	<	1	.	.	.	.	.	.
56-2C	53	87	1,000	13	53	.	.	.	.	.
56-3A	32	<	<	.	.	.	.	.	.	.
56-3B	110	8	<	.	.	.	.	.	.	.
56-3C	460	32	<	1	.	.	.	.	.	.
GW-656	22	1,900	120	150	5	.	.	.	.	.
GW-769	19	5	<	<	.	170	.	.	.	.
GW-770	.	.	.	.	.	35	.	.	.	.
GW-782	34	20	<	<	.	.	.	.	.	.
GW-783	<	<	<	.	.	.	.	.	.	.
GW-791	360	17	<	.	.	.	.	.	.	.
GW-930	< Q	.	.	.	.	8 Q	.	.	.	.
Eastern										
GW-383	220	160	180	<	3	.	.	.	.	.
GW-658	.	.	.	.	.	.	.	480	7,800	2,400
GW-762	2,900	270	85	69	5.7	.	.	.	.	.
MCL	5	5	70	7	2	5	5	5	5	1,000

Note: "." = Not detected; "<" = Less than MCL; "Q" = inconsistent with other measurements for the well.

The CY 2010 sampling results for these wells support the long-term summed VOC (e.g., chloroethenes) concentration trends (Table B.10), with time-series plots of the VOC data for each well generally showing:

- Decreasing trends for 11 wells, including three wells in the western Y-12 area (GW-109, GW-332, and GW-337) and eight wells in the central Y-12 area (55-2B, 55-2C, 56-2A, 56-2C, 56-3A, GW-656, GW-783, and GW-791). These trends are illustrated by the summed chloroethene concentrations detected in the samples from wells GW-337 and GW-656 (Figure A.25). The decreasing concentration trends reflect several factors, such as the cumulative effectiveness of natural attenuation processes, including biologically mediated degradation. Decreasing VOC concentrations in samples from well 55-2B are concurrent with clearly increasing nitrate concentrations (Figure A.24), which suggest separate sources of VOCs and nitrate.

- Indeterminate trends for six wells in the central Y-12 area (55-3A, 55-3B, 55-3C, 56-2B, 56-3B, and 56-3C) and one well (GW-658) in the eastern Y-12 area. These trends are illustrated (Figure A.25) by summed VOCs detected in shallow wells 55-3A (chloroethenes) and GW-658 (petroleum hydrocarbons). Widely variable but essentially unchanged levels of VOCs suggest minimal changes in the advective flux of VOCs in groundwater pathways intercepted by each well.

- Increasing trends for three wells, including wells GW-769 and GW-770 in the central Y-12 area and well GW-383 in the eastern Y-12 area. These trends are illustrated by the concentrations of chloroethenes in well GW-383 and chloromethanes in well GW-769 (Figure A.25). These wells yield VOC-contaminated groundwater from shallow depths (<60 ft bgs) in the Nolichucky Shale. The increasing concentration trends suggest corresponding increases in the relative flux of dissolved VOCs through the hydrostratigraphic zones monitored by each well.

- A mixture of summed VOC concentration trends (Table B.10) for four wells in the western Y-12 area (GW-108, GW-269, GW-274, and GW-633), well GW-782 in the central Y-12 area, and well GW-762 in the eastern Y-12 area. Historical data for each of the wells except for well GW-782 show an increasing trend for summed chloroethenes with a concurrent indeterminate trend for summed chloroethanes or chloromethanes. The long term trends for well GW-782 show decreasing summed chloroethene concentrations with indeterminate summed chloroethane concentrations.

Divergent concentration trends observed for individual chloroethenes in wells 55-3A, 56-2C, and GW-383 are likely attributable to the effects of biotic and/or chemical degradation processes. Historic data for the wells show decreasing and/or indeterminate trends for concentrations of parent compounds (PCE and/or TCE), with increasing trends for concentrations of degradation products (c12DCE, 11DCE, and/or VC). For example, VOC results for well 56-2C from March 1998 to February 2010 show a clear decrease in PCE (1400 µg/L to 220 µg/L) and TCE (380 µg/L to 87 µg/L) concentrations, and a significant increase in c12CDE (184 µg/L to 1009 µg/L) and VC (6 µg/L to 53 µg/L) concentrations.

Gross Alpha and Gross Beta Activity

Groundwater samples collected during CY 2010 from 22 aquitard wells contained gross alpha activity and/or gross beta activity above the associated MDA and the corresponding TPU (Appendix E.3). However, as shown in Table 14, only four of these wells had elevated gross alpha activity (>15 pCi/L) and/or gross beta activity (>50 pCi/L).

Table 14. East Fork Regime CY 2010: elevated gross alpha activity and gross beta activity in surveillance monitoring aquitard wells

Location and Well	Date Sampled	Gross Alpha (pCi/L)				Gross Beta (pCi/L)			
		MDA	Activity	±	TPU	MDA	Activity	±	TPU
Western Y-12 Area									
GW-108	01/06/10	66.5	262	±	69.2	98.7	14,800	±	2,370
GW-108	08/04/10	60.7	89.2	±	42.9	104	6,320	±	1,020
GW-274	12/09/10	33		<MDA		72	1,300	±	95
GW-633	11/22/10	53	64	±	57	90	1,600	±	110
Central Y-12 Area									
GW-204	10/28/10	3.2	26	±	5	7.6		<MDA	
Screening Level		15				50			

Groundwater transport/migration of alpha- and beta-emitting radionuclides from the contaminant plume emplaced during historical operations of the former S-3 Ponds accounts for the elevated levels of gross alpha and gross beta activity in the groundwater from wells GW-108, GW-274, and GW-633. Uranium isotopes are the primary alpha-emitting radionuclides in the contaminant plume originating from this site and uranium decay products probably account for some of the gross beta activity in the groundwater. However, Tc-99 is the "signature" component of the S-3 Ponds contaminant plume in the East Fork Regime and is the principal beta-emitting radionuclide in the Nolichucky Shale east of the site. The elevated gross alpha activity reported for well GW-204 indicates groundwater transport of radiological contaminants (primarily uranium isotopes) from unspecified sources within the central Y-12 area (Figure A.9).

The elevated gross alpha and gross beta activity in groundwater samples collected from aquitard wells during CY 2010 support the long-term trends indicated by historical data (Table B.10). Time-series plots of the gross alpha and/or gross beta activity reported for each well (excluding results that do not meet applicable DQOs) show:

- A decreasing gross beta trend for well GW-633 (Figure A.26). As with the decreasing nitrate concentration trend at the well (Figure A.24), the decreasing gross beta activity reflect reduced flux of mobile contaminants in groundwater following closure of the S-3 Site and installation of the low-permeability cap .

- Indeterminate trends at wells GW-108 (gross alpha), GW-204 (gross alpha), GW-274 (gross beta), and GW-633 (gross alpha), as illustrated by the gross alpha data for wells GW-108 and GW-204 (Figure A.26). Widely variable and not clearly increasing or decreasing levels of gross alpha activity in the groundwater from these wells suggest minimal change in the flux of alpha-emitting radionuclides (primarily uranium isotopes) in the groundwater.

- An increasing gross beta trend for well GW-108 (Figure A.26) that reflects an increase in the flux of Tc-99 (and possibly other beta-emitting radionuclides) in the groundwater pathways intercepted by the well. The increasing gross beta activity trend contrasts with the decreasing nitrate concentration trend for the well. Considering that both contaminants share a common source (the S-3 Site), the increasing levels of gross beta activity suggest that Tc-99 levels remain unaffected by natural attenuation processes that reduce nitrate concentrations. However, the gross beta activity shows a generally decreasing trend since the maximum result in January 2007, suggesting a temporal pulse of Tc-99 activity in groundwater.

4.1.2.2 Aquifer Wells

Elevated concentrations of one or more of the principal groundwater contaminants at Y-12 were reported for groundwater samples collected during CY 2010 from 21 surveillance monitoring aquifer wells in the East Fork Regime (Table B.10), including four wells located in the western Y-12 area; seven wells located in the central Y-12 area; nine wells in the eastern Y-12 area; and one well in Union Valley east of the ORR boundary.

Nitrate and Uranium

As shown in Table 15, elevated concentrations of nitrate (>10 mg/L) or total uranium (>0.03 mg/L) were detected in the groundwater samples collected during CY 2010 from eight aquifer wells in the East Fork Regime. The S-2 Site is the source of elevated nitrate concentrations in the groundwater from wells GW-251, GW-253, GW-606, GW-698, and GW-934. As in previous years, the CY 2010 sampling results show the highest nitrate concentrations in the aquifer occur in groundwater immediately downgradient to the east of the S-2 Site (GW-253) in the southwestern section of Y-12 (Figure A.7). The data for Westbay™ well GW-934 show that nitrate concentrations above 10 mg/L occur at least 9,000 ft downgradient of the site (Figure A.7). Furthermore, data for well GW-934 indicate transport of nitrate via discrete groundwater flow pathways at depths greater than 200 ft bgs in the Maynardville Limestone (Figure A.16). The ports with elevated nitrate probably intercept the most active flow paths; the other five ports in the well yield samples with nitrate concentrations less than 10 mg/L (Appendix E). The elevated uranium concentrations in groundwater reflect transport/migration from one or more unspecified sources upgradient of well GW-605, and from the Oil Skimmer Basin (GW-154 and GW-223). As shown below, the highest concentrations of uranium were reported for well GW-154, located near the former Oil Skimmer Basin.

Table 15. East Fork Regime CY 2010: elevated nitrate and uranium concentrations in surveillance monitoring aquifer wells

Well Location/Number		Nitrate (mg/L)		Uranium (mg/L)	
		Jan-Apr 2010	July-Nov 2010	Jan-Apr 2010	July-Nov 2010
Western Y-12 Area	GW-253	580	NS	<	NS
	GW-251	28.8	NS	NA	NS
Central Y-12 Area	GW-698	99.4	143	NA	NA
Eastern Y-12 Area	GW-154	NA	NA	0.4	0.39
	GW-223	.	.	0.046	0.038
	GW-605	<	<	0.11	0.11
	GW-606	10	11	<	<
(229 ft bgs)	GW-934-09	NS	12.2	NS	<
(259 ft bgs)	GW-934-07	NS	12.4	NS	<
(379 ft bgs)	GW-934-01	NS	13.2	NS	<
	MCL	10		0.03	

Note: "." = Not detected; "<" = Less than MCL; NS = Not sampled; NA = Not analyzed

The CY 2010 sampling results support the historical long-term concentration trends (Table B.10), with time-series plots of the nitrate and uranium data generally showing:

- A decreasing nitrate trend for well GW-251 dominated by wide seasonal fluctuations (Figure A.27), with the highest concentrations typically evident during seasonally high-flow conditions (April and May). The relationship with seasonal flow conditions suggests that the nitrate concentrations are influenced by local inflow of nitrate-contaminated seasonal recharge and that the well intercepts active groundwater pathways. Also, the overall decrease in nitrate levels in the groundwater from this well probably reflects continued reduced flux of nitrate in the Maynardville Limestone west of the S-2 Site (closed in 1951) and the long-term effectiveness of natural attenuation processes.

- Indeterminate concentration trends for nitrate in wells GW-253, GW-698, and GW-934 (insufficient data to trend), and for uranium in wells GW-154 and GW-605. These trends are illustrated by the historical data for wells GW-253 and GW-154 (Figure A.27). The relatively unchanged nitrate levels at well GW-253 suggest minimal long-term change in the flux of nitrate east of the S-2 Site in the groundwater pathways monitored by the well. Such minimal changes in the rate of nitrate flux seem unusual considering that the S-2 Site was closed more than 50 years ago and nitrate is highly mobile in groundwater. The uranium data obtained since 1991 for well GW-154 (Figure A.27) is dominated by conspicuous "peak" concentrations evident in January 1991 (0.81 mg/L) and July 2001 (1.37 mg/L). The latter result corresponds with a sharp spike in the groundwater elevation in the well. This relationship suggests wide temporal changes in the advective flux of uranium in the shallow groundwater flow system near this well.

- Increasing concentration trends for uranium in well GW-223 and for nitrate in well GW-606 (Figure A.27). The uranium levels indicated by the most recent sampling results for well GW-223 show concentrations that are an order-of-magnitude higher than the uranium data for samples collected from January 1989 to January 1990. The Oil Skimmer Basin, closed along with New Hope Pond in 1988, is the suspected source of the uranium. The long-term increase in uranium concentrations reflects a corresponding increase in the flux of uranium in the groundwater flowpaths intercepted by the well. The increasing trend in nitrate concentrations at well GW-606 generally began with the change from conventional to low-flow sampling (October 1997). Therefore, it is uncertain that the higher nitrate concentrations reflect an increase in the flux of nitrate from the S-2 Site along groundwater flowpaths monitored by the well. The nitrate concentrations in samples collected from the well since July 2002 show wide fluctuations, but a generally indeterminate trend.

Volatile Organic Compounds

Groundwater samples collected during CY 2010 from 21 aquifer wells in the East Fork Regime contained one or more dissolved VOCs at individual or summed concentrations of 5 µg/L or more (Table B.10). As shown in Table 16, the maximum concentrations of PCE, TCE, c12DCE, 11DCE, VC, CTET, chloroform, MC, and/or benzene exceed drinking water MCLs. The presence of VOCs reflects transport/migration of the intermingled plume(s) of dissolved VOCs in the Maynardville Limestone (Figure A.8). The groundwater samples with the highest PCE and CTET concentrations at Westbay ™ well GW-934 are from the same sampling ports (GW-934-01, GW-934-07, and GW-934-09) that had elevated nitrate concentrations (Table 15). The VOC (and nitrate) results indicate that these ports intercept the most active (permeable) groundwater flowpaths in the Maynardville Limestone.

Table 16. East Fork Regime CY 2010: maximum VOC concentrations in surveillance monitoring aquifer wells

Location and Well	Maximum Concentration (µg/L)								
	Chloroethenes					Chloromethanes			Petrol.
	PCE	TCE	c12DCE	11DCE	VC	CTET	Chloroform	MC	Benzene
Western Y-12 Area									
GW-251	85	31	<	.	.	.	<	.	.
GW-253	600	420	230	<	85	20	<	.	.
GW-618	<	5.4	<	.	.	.	.	.	.
GW-619	<	<	<	.	.	.	.	.	.
Central Y-12 Area									
GW-686	.	.	<	.	.	.	.	.	.
GW-690	50	<	<	.	.	.	.	.	.
GW-691	290	<	<	.	.	.	.	.	.
GW-692	<	13	<	.	.	.	.	.	.
GW-698	140	480	<	.	.	<	<	.	.
GW-700	17	8	190	.	.	.	.	.	.
GW-820	490	420	2,500	13	73	.	.	.	.
Eastern Y-12 Area									
GW-148	.	.	<	.	.	.	.	.	.
GW-153	.	.	.	.	.	71	<	.	.
GW-223	45	17	<	.	6.1	.	.	.	.
GW-381	<	.	<	.	.	3,900	1,900	7	.
GW-382	34	5.9	<	.	.	460	110	57	.
GW-605	130	150	210	<	<	93	<	.	.
GW-606	5.5	.	.	.	.	29	<	.	.
GW-934-12	<	<	<	.	.	600	<	.	.
GW-934-11	11	<	<	.	.	190	140	<	<
GW-934-09	330	56	<	11	.	2,700	190	.	.
GW-934-07	630	64	<	13	.	4,100	240	.	.
GW-934-05	25	8	<	<	.	350	150	<	<
GW-934-04	17	7	<	<	.	380	140	<	<
GW-934-02	69	13	<	<	.	760	350	10	6
GW-934-01	2,600	67	<	12	.	2,500	190	.	.
Union Valley									
GW-170	<	<	.	.	.	<	<	.	<
GW-230	.	.	<	.	<	.	.	.	.
MCL	5	5	70	7	2	5	80*	5	5

Note: “. “ = Not detected; “<”= Less than the MCL; J = Estimated value; * = MCL for total trihalomethanes (byproducts of drinking water disinfection with chlorine)

The maximum concentrations of summed VOCs (PCE, TCE, c12DCE, VC, CTET, and/or benzene) in the CY 2010 groundwater samples from wells GW-170 (8.5 µg/L) and GW-230 (8.9 µg/L) indicate that the dissolved VOC plume extends eastward from Y-12 (parallel with geologic strike in the Maynardville Limestone) into Union Valley east of the ORR boundary along Scarboro Road (Figure A.8). None of the CY 2010 sampling results for the wells in Union Valley exceed the applicable drinking water MCLs.

The CY 2010 VOC results for the aquifer wells support the long-term summed VOC (e.g., chloroethenes) concentration trends (Table B.10), and time-series plots of the VOC data generally show:

- Variable but generally decreasing trends for chloroethene and/or chloromethane concentrations for eight wells (GW-153, GW-223, GW-230, GW-382, GW-618, GW-619, GW-690, and GW-700), as illustrated by the summed concentration of chloromethanes detected in well GW-382 and chloroethenes in well GW-618 (Figure A.28). The decreasing concentration trends reflect reduced flux of VOCs from the applicable source areas and the long-term effects of natural attenuation processes. The decrease in VOC concentrations at well GW-382 between May 1995 and September 1999 may reflect a sampling method bias with higher concentrations in samples obtained with the conventional method.

- Indeterminate concentration trends for chloroethenes and/or chloromethanes (Table B.10) in groundwater from seven wells (GW-222, GW-251, GW-253, GW-686, GW-691, GW-698, and GW-820). These trends are illustrated by the summed chloroethene concentrations detected in the groundwater samples from wells GW-251 and GW-698 (Figure A.28). The summed VOC concentrations at well GW-251 show clearly seasonal fluctuations, with high concentrations evident in samples collected during seasonally high flow conditions (April and May). As noted previously regarding nitrate levels in well GW-251, this relationship suggests seasonal inflow of contaminated recharge in groundwater flowpaths intercepted by the well. The VOC concentrations at well GW-698 occasionally show seasonal fluctuations that are opposite of the relationship shown at well GW-251. Higher VOC concentrations evident during seasonally low flow conditions (October/November) suggest recharge of less contaminated groundwater that dilute the VOC concentrations during high flow conditions.

- Increasing concentration trends at wells GW-148 (chloroethenes) and GW-605 (chloroethenes and chloromethanes). The sampling history for well GW-148 includes several time gaps, but results for c12DCE show a generally increasing trend from February 1995 (3 µg/L) to March 2010 (19 µg/L). The increasing trends at well GW-605 (Figure A.28) are evident in the low-flow sampling results. The VOC concentrations show seasonal fluctuations with high concentrations typically evident in samples collected during seasonally low flow conditions (July). This relationship suggests seasonal inflow of uncontaminated recharge via the groundwater flowpaths intercepted by the monitored interval in the well. The increasing VOC concentration trends probably reflect increased flux in the groundwater flowpaths monitored by the well.

- A combination of indeterminate trends for summed chloroethenes and decreasing trends for summed chloromethanes in groundwater from wells GW-381 and GW-606 (Table B.10). The divergent trends suggest different source areas and/or flowpaths for the different types of VOCs detected at these wells.

Divergent concentration trends for individual chloroethenes may reflect biologically mediated degradation at wells GW-223 and GW-253. For instance, historic data for well GW-253 (located near the S-2, Figure A.8) between February 1989 and January 2010 show increasing concentrations of c12DCE (60 µg/L to 230 µg/L), while concentrations of PCE (760 µg/L to 600 µg/L) and TCE (470 µg/L to 420 µg/L) have remained fairly stable (indeterminate trend).

Gross Alpha and Gross Beta

Groundwater samples collected during CY 2010 from 15 aquifer wells in the East Fork Regime contained gross alpha activity and/or gross beta activity above the MDA and corresponding TPU (Appendix E.3). As shown in Table 17, only three of these wells had elevated gross alpha activity (>15 pCi/L) or gross beta activity (>50 pCi/L). Elevated gross alpha and gross beta activity at these aquifer wells reflect the transport/migration of radiological contaminants (primarily uranium isotopes) from the S-2 Site (GW-253), one or more sources upgradient of well GW-605, and the Oil Skimmer Basin (GW-154). Note that one of the samples collected during CY 2010 from well GW-223 at the Oil Skimmer Basin had gross alpha activity equal to the 15 pCi/L screening level, and samples from the well have elevated (and increasing) total uranium concentrations (see Table 15).

Table 17. East Fork Regime CY 2010: elevated gross alpha activity and gross beta activity in surveillance monitoring aquifer wells

Well	Date Sampled	Gross Alpha (pCi/L)				Gross Beta (pCi/L)			
		MDA	Activity ± TPU			MDA	Activity ± TPU		
Western Y-12 Area									
GW-253	01/27/10	3.68	23.9	±	5.05	5.33		<	
Eastern Y-12 Area									
GW-154	02/02/10	2.26	455	±	73.4	6.96	125	±	20.7
GW-154	08/18/10	1.73	277	±	45.4	6.28	50.3	±	9.25
GW-605	01/05/10	2.36	43.4	±	8.31	4.53		<	
GW-605	07/21/10	2.9	37.5	±	7.69	4.74		<	
Screening Level		15				50			

Note: “<" = Less than the screening level

The gross alpha and gross beta activity reported for the samples collected during CY 2010 support the long-term trends indicated by historical data (Table B.10). Time-series plots of the gross alpha and/or gross beta activity reported for each applicable well generally show:

- Widely variable, indeterminate long-term trends for gross alpha activity at wells GW-154, GW-253, and GW-605 and for gross beta activity at well GW-154. These trends (Figure A.29) suggest minimal relative change in the flux of uranium isotopes in hydrostratigraphic intervals monitored by the wells. These indeterminate trends for these wells are consistent with the indeterminate long-term total uranium concentration trends evident for these wells (Table B.10).

4.1.3 Chestnut Ridge Regime

The CY 2010 groundwater sampling results for 40 wells on Chestnut Ridge meet the requirements of surveillance monitoring in the Chestnut Ridge Regime. Most of these wells continue to yield uncontaminated groundwater. Data for wells GW-205 and GW-757 suggest the geochemical influence of cement grout, such as strongly basic pH and unusually high potassium concentrations (and associated gross beta activity). Aside from these potential artifacts, VOCs were the contaminants most frequently detected in the groundwater samples collected during CY 2010, with at least one principal compound detected (>1 µg/L) in samples from six wells (Table 18).

Table 18. Chestnut Ridge Regime CY 2010: maximum VOC concentrations in surveillance monitoring wells

Well	Maximum Concentration (µg/L)						
	Chloroethenes			Chloroethanes		Freons	
	PCE	c12DCE	11DCE	111TCA	11DCA	TCFM	F113
Near CRSP:							
GW-177	.	.	4.3	2.8	19	NR	NR
GW-322	3 J	.	44	16	72	42	3 J
GW-608	.	.	2 J	1 J	5 J	1 J	.
GW-609	1 J	.	.	.	.	.	.
GW-798	11	11	6.6	.	.	13	NR
IL IV:							
GW-305	.	.	9	14	38	.	NR
MCL	5	70	7	200	NA	NA	NA

Note: TCFM = trichlorofluoromethane; F113 = 1,1,2-trichloro-1,2,2-trifluoroethane;
“. “ = Not detected; J = Estimated value; NR = Not reported; NA = Not applicable

The CRSP are the source of the VOCs in the groundwater at five of these wells (GW-177, GW-322, GW-608, GW-609, and GW-798). Historical operation of the eastern and western waste disposal trench areas at the CRSP emplaced an elongated plume of dissolved VOCs in the groundwater that currently extends more than 700 ft east-northeast along the ridge crest (parallel with geologic strike) and at least 300 ft to the north and south down the ridge flanks (Figure A.8). As shown in Table 18, PCE, 11DCE, 111TCA, 11DCA, and TCFM are the VOCs detected most frequently in samples from CRSP monitoring wells. The maximum concentration of PCE and/or 11DCE reported for wells GW-322 and GW-798 exceed respective drinking water MCLs.

Historic data show that 111TCA, 11DCA, and 11DCE are the primary VOCs near the western disposal trench area and PCE and 12DCE are the principal VOCs near the eastern disposal trench area. Elongation of the VOC plume along the axis of the ridge and the distribution of plume constituents relative to source trenches indicate primarily west-to-east groundwater flow/contaminant transport in strike-parallel flowpaths (e.g., bedding-plane fractures). However, detection of VOCs in groundwater from wells located south and southeast of the site (down dip and perpendicular to strike) suggests that conduit transport from the site also occurs.

Over time, the concentrations of the primary components of the plume (PCE and 111TCA) have decreased while the concentrations of degradation products (11DCE and 11DCA) have increased or remained stable, which suggests active biotic and/or chemical degradation processes. The annual maximum concentration of degradation products (11DCE and 11DCA) is currently higher than the parent compound (111TCA) at wells GW-177, GW-322, and GW-608.

Except for well GW-608, the CY 2010 sampling results for wells near the CRSP generally continue the long-term decreasing or indeterminate concentration trends indicated by historical VOC data (Table B.11), as illustrated by the VOC data for wells GW-322 and GW-798 (Figure A.30). The 111TCA concentrations at well GW-322 show a steadily decreasing trend, with the summed concentration of degradation products (11DCA and 11DCE) increasing from March 1988 through January 1998 then decreasing concurrently with 111TCA (Figure A.30). The VOC data for well GW-798 shows an overall indeterminate trend characterized by peak concentrations in January 2003, January 2007, and February 2009 (Figure A.30).

Before April 2010, VOCs have not been detected in the seven samples collected from well GW-608 since January 1996.

The groundwater samples collected from well GW-305 during CY 2010 contained 11DCE, 11DCA, and 111TCA (Table 18). The source of the VOCs in the groundwater from the well is unconfirmed. Along with the historical data, the CY 2010 monitoring results continue the concentration trends evident after the sequential detection of 111TCA, 11DCA, and 11DCE beginning in January 1992 (Figure A.30). The data show the arrival of the parent compound (111TCA) followed four years later by the related degradation products (11DCA and 11DCE). As shown by results for January 2001 and November 2010, 111TCA concentrations have decreased (20 µg/L–12.4 µg/L), 11DCE concentrations have remained fairly stable (4.1 µg/L–7.59 µg/L), and 11DCA concentrations have increased (12 µg/L–39.3 µg/L).

4.2 EXIT PATHWAY/PERIMETER MONITORING

This section describes results of groundwater and surface water quality monitoring performed during CY 2010 in areas where contaminants associated with Y-12 are most likely to be transported beyond the boundary of the DOE ORR. Separate discussions of the monitoring data obtained from respective networks of exit pathway/perimeter sampling locations in the Bear Creek, East Fork, and Chestnut Ridge hydrogeologic regimes are provided.

4.2.1 Bear Creek Regime

The CY 2010 monitoring results and historical data for the monitoring wells, springs, and surface water sampling locations listed from upstream to downstream in Table 19 meet exit pathway/perimeter monitoring requirements. These locations are (1) three monitoring wells that are located in a perimeter region (Exit Pathway Picket W, Figure A.12), (2) six springs that represent natural groundwater discharge locations, and (3) 19 surface water stations that measure water quality in strategic locations along Bear Creek. For this report, these sampling locations are assigned to three areas: Upper, Middle, and Lower Bear Creek. Upper Bear Creek encompasses the surface water sampling locations upstream (east) of the confluence of NT-2 with Bear Creek (Figure A.11), including two sampling locations in Bear Creek (BCK-11.97 and BCK-12.34) and sampling locations in NT-1 (NT-01) and NT-2 (S07). Middle Bear Creek encompasses the surface water sampling stations and springs that are located along Bear Creek between NT-2 and NT-9 (Figure A.11), including two springs (SS-4 and SS-5), four sampling locations in Bear Creek (BCK-09.20, BCK-09.40, BCK-11.54, and BCK-11.84), and sampling locations in NT-3 (EMWNT-03A and NT-03), NT-4 (NT-04 and EMW-VWUNDER), NT-5 (EMWNT-05 and EMW-VWEIR), NT-7 (NT-07), and NT-8 (NT-08). The lower Bear Creek sampling locations (downstream of NT-9) include the monitoring wells listed in Table 19, four springs (SS-6, SS-6.6, SS-7, and SS-8), and three surface water stations in Bear Creek (BCK-03.30, BCK-04.55, and BCK-07.87) (Figure A.11).

Table 19. Bear Creek Regime CY 2010: sampling locations used for exit pathway/perimeter monitoring

Bear Creek Area	Monitoring Wells		Springs	Surface Water Stations	
	Well Number	Monitored Interval Depth (ft bgs)		Bear Creek Main Channel	Bear Creek Tributaries
Upper	-		-	BCK-12.34 BCK-11.97	NT-01 NT-02 (S07)
Middle	-		SS-4 SS-5	BCK-11.84 BCK.11.54 BCK-09.40 BCK-09.20	EMWNT-03A NT-03 NT-04 EMW-VWUNDER (NT-4) EMWNT-05 EMW-VWEIR (NT-5) NT-07 NT-08
Lower	GW-712 GW-713 GW-714	441.5 - 457.5 305.0 - 315.2 115.1 - 145.0	SS-6 SS-6.6 SS-7 SS-8	BCK-07.87 BCK-04.55 BCK-03.30	-

4.2.1.1 Upper Bear Creek

The chemical quality of surface water in Upper Bear Creek is primarily controlled by inflow of groundwater containing the principal components of the contaminant plume emplaced during historical operations of the S-3 Ponds. To the west of this site, contaminated groundwater discharges from the aquitard (Nolichucky Shale) as base flow into NT-1, which enters Bear Creek about 2,500 ft downstream of the site. The highly contaminated groundwater in the Nolichucky Shale extends west of NT-1 where it upwells into the shallow flow system and ultimately discharges into NT-2, which enters the main channel of Bear Creek about 1,400 ft downstream of its confluence with NT-1 (Figure A.11). In addition to the influx of contaminants from the NT-1 and NT-2 catchments, contaminated groundwater in the Maynardville Limestone discharges into Bear Creek via seeps and springs along the main channel of the creek.

As shown in Table 20 (sampling locations listed from upstream to downstream), monitoring results obtained during CY 2010 show that nitrate, uranium, and PCE concentrations in Upper Bear Creek remain above respective screening levels, with the highest levels of nitrate, PCE, and radioactivity in NT-01 and highest uranium concentrations in the main channel of Bear Creek.

Table 20. Upper Bear Creek CY 2010: maximum contaminant concentrations

Sampling Point	Nitrate (mg/L)	Uranium (mg/L)	PCE (µg/L)	Radioactivity (pCi/)	
				U-238	Tc-99
NT-01	**980**	**0.0989**	**58**	**32**	**3,740**
S07	NA	.	.	0.556	NA
BCK-12.34	NA	**0.218**	**9.4**	NA	547
BCK-11.97	**32.1**	**0.119**	.	NA	NA
Screening Level	10	0.03	5	-	900

Note: "." = Not detected; **BOLD** = Exceeds screening level; NA = not analyzed.

These results are generally consistent with historical data and show that contaminants associated with historical operations at Y-12 continue to substantially impact the quality of surface water in Upper Bear Creek.

4.2.1.2 Middle Bear Creek

Surface water quality in Middle Bear Creek is impacted by contaminants from the S-3 Site (nitrate, uranium, and radioactivity), the BYBY/HCDA (uranium and VOCs), and the BCBG WMA (uranium, VOCs, and radioactivity). Also, results of a study by the U.S. Geological Survey show that much of Middle Bear Creek loses flow to the Maynardville Limestone, particularly the section of the channel immediately south of the OLF WMA. This section of the main channel of Bear Creek plays an important role in transferring contaminants from the creek into the groundwater flow system (DOE 1997a) which discharges from springs SS-4 and SS-5 located downgradient of this losing reach of Bear Creek.

As shown in Table 21 (sampling locations listed from upstream to downstream), elevated concentrations (i.e., >screening level) of one or more of the principal contaminants in the Bear Creek Regime were reported for nine of the exit pathway sampling locations in Middle Bear Creek. The highest nitrate concentrations were reported for surface water stations located in the main Channel of Bear Creek nearest to the S-3 Site (BCK-11.84 and BCK-11.54). The highest uranium levels were reported for the sampling locations NT-03 and NT-08, west of the BCBG WMA (Figure A.11). The uranium results for stations located in Bear Creek (BCK-11.84, BCK-11.54, BCK-09.40, and BCK-09.20) show steadily decreasing concentrations with distance downstream. The highest VOC concentrations were reported for surface water stations at the BCBG (NT-07 and NT-08).

Table 21. Middle Bear Creek CY 2010: maximum contaminant concentrations

Sampling Point	Nitrate (mg/L)	Uranium (mg/L)	Chloroethenes (µg/L)					Radioactivity (pCi/L)	
			PCE	TCE	c12DCE	11DCE	VC	U-238	Tc-99
BCK-11.84	**74**	**0.182**	.	.	.	.	.	60.4	287
EMWNT-03A	NA	0.0257 Q	.	.	.	.	.	10.2 Q	NA
NT-03	0.02	**0.259**	.	.	.	.	.	NA	.
BCK-11.54	**43**	**0.113**	.	.	.	.	.	NA	210
EMW-VWUNDER	NA	.	.	.	.	.	.	0.25	NA
NT-04	NA	.	.	.	3.5 J	.	.	1.35	NA
EMWNT-05	NA	.	.	.	.	.	.	0.85	NA
EMW-VWWEIR	NA	0.00583	.	.	.	.	.	2.06	NA
SS-4	**11.6**	**0.0432**	.	2 J	1 J	.	.	[**26**]	[24]
NT-07	0.058	0.018	**35**	**29**	**130**	6.8	**10**	5.92	NA
NT-08	3.8	**0.296**	**27**	**30**	**150**	4.4	**4.1**	NA	24.4
BCK-09.40	4.12	**0.0539**	.	.	.	.	.	NA	NA
SS-5	6.1	**0.0374**	.	.	2.7	.	.	NA	27.5
BCK-09.20	NA	**0.0524**	1.2	1.2	6.6	.	.	NA	29.6
Screening Level	10	0.03	5	5	70	7	2	- /[15]	900/[50]

Note: "**.**" = Not detected; J = Estimated concentration; NA = Not analyzed; **BOLD** = Exceeds screening level; Q = inconsistent with other measurements from the location; [ ] = gross alpha and gross beta activity.

These monitoring results are generally consistent with historical data and show that contaminants associated with Y-12, particularly total uranium (and gross alpha activity) and VOCs, continue to impact the quality of surface water in Middle Bear Creek.

4.2.1.3 Lower Bear Creek

The quality of groundwater and surface water in Lower Bear Creek is substantially less impacted by contaminants present in upstream areas of BCV. As shown by the CY 2010 monitoring results summarized in Table 22 (sampling locations listed from upstream to downstream), the only result reported above a respective screening level was the uranium concentration at surface water station BCK-07.87.

Table 22. Lower Bear Creek CY 2010: maximum contaminant concentrations

Sampling Point	Nitrate (mg/L)	Uranium (mg/L)	Summed VOCs (µg/L)	Radioactivity (pCi/L)	
				U-238	Tc-99
Monitoring Wells					
GW-712	0.018	.	.	.	.
GW-713	0.015	.	.	.	.
GW-714	0.55	.	.	0.689	.
Springs					
SS-6	0.86	0.007	.	2.64	.
SS-6.6	2.2	0.0276	.	10.3	14.2
SS-7	0.42	0.0051	.	1.34	.
SS-8	0.12	.	.	0.367	.
Surface Water					
BCK-07.87	6.8	**0.0513**	.	17.2	36.2
BCK-04.55	2	0.0186	.	7.37	.
BCK-03.30	1.6	0.0155	.	5.04	.
Screening Level	10	0.03	MCL or >5 µg/L	-	900
Note: "**.**" = Not detected; J = estimated value; **BOLD** = Exceeds screening level.					

The CY 2010 monitoring results are generally consistent with respective historical data and show that contaminants associated with Y-12 continue to impact the quality of surface water in Lower Bear Creek. Sampling results for the exit pathway monitoring wells indicate no significant impact on groundwater quality.

Based on the monitoring results for CY 2010 (Tables 20, 21, and 22), the principal groundwater contaminants are detected in Upper Bear Creek, Middle Bear Creek, and Lower Bear Creek. However, the data show the limited extent of elevated concentrations in the main channel of Bear Creek, as demonstrated by the first location (farthest upstream) with results below the applicable screening level for nitrate (BCK-09.20), uranium (BCK-04.55), summed VOCs of 5 µg/L (BCK-07.87).

4.2.2 East Fork Regime

The CY 2010 monitoring results and respective historical data for the monitoring wells, springs, and surface water sampling locations listed in Table 23 meet the requirements of exit pathway/perimeter monitoring for the East Fork Regime. The monitoring wells are located near the eastern end of Y-12 and are hydraulically downgradient of NHP/Lake Reality and all but three of the wells (GW-151, GW-220, and

GW-832) are within 500 ft of the ORR boundary along Scarboro Road (Figure A.13). The surface water stations in the East Fork Regime (200A6 and Station 8) are in the south-central part of Y-12 (Figure A.13).

Table 23. East Fork Regime CY 2010: sampling locations for exit pathway/perimeter monitoring

Monitoring Wells/ Monitored Interval Depth				Springs	Surface Water Stations	
Well Number	**Depth (ft bgs)**	**Well Number**	**Depth (ft bgs)**	**Union Valley**	**UEFPC**	**North of Pine Ridge**
GW-151 GW-220 GW-722 GW-733	85.0 - 110.0 31.0 - 45.2 75.0 - 644.3 240.1 - 256.5	GW-744 GW-747 GW-748 GW-816 GW-832	55.0 - 69.5 60.8 - 73.0 14.2 - 27.2 2.9 - 15.8 4.0 - 11.8	SCR7.1SP SCR7.8SP	200A6 Station 8	GHK2.51WSW NPR12.0SW NPR23.0SW

In addition to the surface water stations within the East Fork Regime, two springs located along South Illinois Avenue east of Y-12 (Figure A.13) and three sampling stations (GHK2.51WSW, NPR12.0SW, and NPR23.0SW) located in drainage features along the ORR boundary north of Pine Ridge (Figure A.14) also serve as exit pathway/perimeter monitoring locations. Sampling results for these locations showed principal contaminant concentrations below screening levels.

4.2.2.1 Groundwater

At least one of the groundwater samples collected during CY 2010 from the five exit pathway wells located in the Maynardville Limestone (GW-151, GW-220, GW-722, GW-733, and GW-832) had summed concentrations of dissolved VOCs of at least 5 µg/L. Each of these wells are located within 1,000 ft of the groundwater extraction well (GW-845) being used to capture the VOC plume in the groundwater extending from the eastern end of Y-12 into Union Valley east of the ORR boundary along Scarboro Road (see Section 2.3.1.1 and Figure A.13). As shown in Table 24, the data for these wells contained concentrations above the applicable drinking water MCL for CTET (all wells), PCE (three wells), TCE (two wells), and c12DCE (one well).

Table 24. East Fork Regime CY 2010: maximum VOC concentrations in exit pathway/perimeter monitoring wells

Well	Maximum Concentration (µg/L)					
	Chloroethenes				Chloromethanes	
	PCE	TCE	c12DCE	11DCE	CTET	Chloroform
GW-151	**780**	**130**	**72**	2.1	**1,200**	65
GW-220	**520**	**100**	55	2 J	**920**	62
GW-722-22	4.7	1.6	.	.	**12**	1.3
GW-722-20	11	2.4	.	.	**37**	9.3
GW-722-17	4.7	1.2	.	.	**24**	5.4
GW-722-14	2.2	1.1	.	.	**15**	1.5
GW-733	.	.	.	.	**5.4**	.
GW-832	**9.3**	1.9	1.3	.	**11**	1.5
MCL	5	5	70	7	5	NA

Note: "." = Not detected; J = Estimated concentration ; NA = Not applicable; **BOLD** = Exceeds MCL.

These results are consistent with historical data and illustrate the range of VOC concentrations within in the shallow karst network (GW-151, GW-220, and GW-832) and deeper bedrock intervals (GW-722 and GW-733) in the Maynardville Limestone at the east end of Y-12. The CY 2010 monitoring results continue the long-term concentration trends indicated by historical VOC data for these wells (Table B.10), as illustrated by the decreasing PCE trends for sampling ports in Westbay well GW-722 (e.g., GW-722-14), the indeterminate PCE trend for well GW-832, and the increasing PCE trends for wells GW-151 and GW-220 (Figure A.31). Although chloroethene concentrations are highest and show a generally increasing trend at paired wells GW-151 and GW-220, there is no evidence of eastward migration of the plume beyond these wells (Figure A.8 and Table 24). The VOC concentration trends evident for some wells, particularly CTET at Westbay well GW-722, suggest a direct response to the long-term operation of groundwater extraction well GW-845 (Figure A.32).

Samples from springs SCR7.1SP and SCR7.8SP in Union Valley were analyzed for VOCs and only TCE was detected (1 µg/L) in the sample from spring SCR7.1SP.

4.2.2.2 Surface Water

Maximum concentrations reported for CY 2010 samples, summarized in Table 25 (sampling stations are listed from upstream to downstream along UEFPC), show that nitrate, uranium, or gross alpha activity was detected at three of the surface water sampling stations used for exit pathway/perimeter monitoring.

Table 25. East Fork Regime CY 2010: maximum contaminant concentrations in exit pathway/perimeter surface water sampling locations

Sampling Point	Nitrate (mg/L)	Uranium (mg/L)	Summed VOCs (µg/L)	Radioactivity (pCi/L)	
				Alpha	Beta
UEFPC					
200A6	NA	**0.1**	NA	NA	NA
Station 8	NA	**0.047**	NA	**19.7**	13.8
North of Pine Ridge					
GHK2.51WSW	0.069	.	.	.	.
NPR12.0SW	.	.	2 Q	.	.
NPR23.0SW	.	.	**8** Q	.	.
Screening Level	10	0.03	5	15	50

Note: "." = not detected (or below MDA); NA = not analyzed; **BOLD** = Exceeds screening level; Q = inconsistent with other measurements for the location (both stations were resampled and VOCs were not detected).

The CY 2010 uranium concentrations for surface water stations 200A6 and Station 8 exceed the drinking water MCL (0.03 mg/L) and continue the indeterminate long-term concentration trend indicated by historical uranium results (Table B.10). Principal groundwater contaminant concentrations evident at these locations during CY 2010 reflect the continued impact of legacy Y-12 operations on the quality of surface water in UEFPC upstream of the ORR boundary. The August 2008 samples from stations NPR12.0SW and NPR23.0SW both contained PCE, however PCE was not detected in any of the previous samples or the verification samples collected in November 2010. Therefore these PCE detections are considered to be outliers (artifacts of the analytical or sample handling environment).

Although not a principal groundwater contaminant because of very low solubility, mercury is a primary contaminant of soils and surface water in the East Fork Regime as a legacy of historical operations at Y-12. Mercury is consistently detected at low levels only in groundwater very close to known sources of mercury. Extensive surface water sampling (flow proportionate and grab samples) is performed by other monitoring programs (e.g., NPDES and CERCLA) and the annual monitoring results are briefly addressed here to provide general information regarding mercury concentrations in UEFPC. Station 17 is a NPDES permit monitoring station located in UEFPC on the south side of Bear Creek Road (Figure A.13) downstream (north) of Lake Reality where the creek exits the ORR. The mercury concentration reported for 176 surface water samples collected during CY 2010 from Station 17 (excluding filtered and duplicate samples) ranged from 0.0000439 mg/L (August 2010) to 0.0041496 mg/L (December 2010), which exceeds the drinking water MCL (0.002 mg/L).

4.2.3 Chestnut Ridge Regime

The CY 2010 monitoring results reported for the springs and surface water sampling stations listed in Table 26 serve as the exit pathway/perimeter monitoring locations in the Chestnut Ridge Regime.

Table 26. Chestnut Ridge Regime CY 2010: sampling locations used for exit pathway/perimeter monitoring

Groundwater		Surface Water	
SCR1.25SP SCR2.1SP SCR2.2SP	SCR3.5SP SCR4.3SP	SCR1.5SW SCR3.5SW S17	MCK 1.4 MCK 2.0 MCK 2.05 UNC SW-1

4.2.3.1 Groundwater

The springs used for exit pathway/perimeter monitoring in the Chestnut Ridge Regime are located in four of the primary surface drainage features that traverse the southern flank of Chestnut Ridge, exit the ORR, and discharge into the Melton Hill Lake south of Bethel Valley Road (Figure A.17). The CY 2010 monitoring results for these springs are consistent with respective historical data and show that the springs discharge uncontaminated calcium-magnesium-bicarbonate groundwater characterized by: (1) a wide range of calcium:magnesium ratios; (2) variable but generally low molar proportions (<5%) of chloride, potassium, and sodium; (3) slightly elevated sulfate concentrations at spring SCR4.3SP that probably reflect dissolution of locally disseminated sulfides; and (4) low concentrations of several trace metals, notably barium, iron, manganese, and strontium. Results for nitrate and uranium are either non-detect values or within the range of background levels in the Chestnut Ridge Regime. Excluding a trace level (1 µg/L) of chloromethane detected at SCR-4.3SP (suspected analytical artifact), VOCs were not detected in the groundwater samples collected from the springs. Gross alpha activity was not detected, and gross beta activity was detected (above the associated MDA) in only one semiannual sample from two of the springs. These gross beta results (3.18 pCi/L at spring SCR3.5SP and 4.55 pCi/L at spring SCR4.3SP) indicate natural background radiation. The CY 2010 monitoring results suggest that operations at Y-12 have not impacted the quality of groundwater discharged from natural springs located in the surface drainage features that traverse the Chestnut Ridge Regime.

4.2.3.2 Surface Water

The surface water sampling stations used for exit pathway/perimeter monitoring in the Chestnut Ridge Regime during CY 2010 are located in Dunaway Branch (SCR1.5SW) at the western boundary of the regime; near the headwaters of SCR2 (UNC SW-1); in McCoy Branch downstream of the FCAP (MCK 2.05 and MCK 2.0), upstream of Rogers Quarry (SCR3.5SW), and near the confluence with the Clinch River (MCK 1.4); and in tributary SCR5 downstream of KHQ (S17) near the southeastern boundary of the regime (Figure A.17).

Analytical results for the surface water samples collected from McCoy Branch during CY 2010 indicate contamination immediately downstream of the FCAP at MCK 2.0 and MCK 2.05. These surface water sampling stations are located upstream (MCK 2.05) and downstream (MCK 2.0) of the FCAP Discharge Treatment Wetland, which was constructed as part of the CERCLA remedial action specified in the ROD for the site (DOE 1996). Samples from MCK 2.05 are representative of FCAP "influent" to the wetland and samples from MCK 2.0 are representative of "effluent" from the wetland (DOE 2011). Historical data show that the surface water samples from both locations are distinguished by elevated concentrations of sulfate and arsenic. The sulfate concentrations in the samples collected in March and September 2010 from MCK 2.05 (26 mg/L and 21 mg/L, respectively) and MCK 2.0 (29 mg/L and 21 mg/L, respectively) exceed background levels. The monitoring results obtained during CY 2010 show that the maximum arsenic concentrations at MCK 2.05 (0.16 mg/L) and MCK 2.0 (0.019 mg/L) are above the drinking water MCL (0.01 mg/L). At station MCK 1.4, located about 4,000 ft downstream from MCK 2.0 south of Bethel Valley Road (Figure A.17), arsenic was not detected in either of the samples collected in CY 2010 (March and September). Nevertheless, the elevated arsenic and sulfate levels reported for samples from MCK 2.0 and MCK 2.05 show continued impacts on surface water quality in upper McCoy Branch near the FCAP.

The CY 2010 monitoring results for surface water stations located in the other drainage features in the Chestnut Ridge Regime show non-detect values or background levels of nitrate, except for the nitrate concentration (8.09 mg/L) in the April 2010 sample from station S17. The CY 2010 nitrate result confirms the nitrate result (6.94 mg/L) in the October 2009 sample from the location that was significantly higher than previous measurements (e.g., 2.17 mg/L in April 2008). The results for CY 2008 through CY 2010 suggest an increasing nitrate concentration trend in surface water exiting the Chestnut Ridge Regime. Surface water station S17, in SCR5 north of Bethel Valley Road, is located downstream and downgradient from several areas where sanitary sewer sludge was applied. The application area nearest to station S17 is the Upper Hayfield 2 Site (Figure A.17).

Uranium was detected at low levels in the April 2010 samples from stations S17 (0.0011 mg/L) and SCR1.5SW (0.00058 mg/L). Cadmium was detected for the first time in the sample from station S17 (0.005 mg/L), and future monitoring results will determine if this result is an outlier (suspected artifact) or reflects a change in water quality. None of the surface water samples collected during CY 2010 contained VOCs. Gross alpha activity was detected (i.e., above the associated MDA) at low levels (<6 pCi/L) in one surface water sample from SCR3.5SW and UNC SW-1, and gross beta activity was detected at similar levels at MCK 2.0 and MCK 2.05. The low activity levels are indicative of natural background radiation and/or analytical variability.

Historical and current waste management operations do not appear to have significantly affected surface-water quality in these drainage features. The only potential impact to surface water quality may be from sewer sludge application areas.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The groundwater and surface water quality data obtained during CY 2010 are generally consistent with: (1) the presence of the principal Y-12 groundwater contaminants from known and suspected source areas in the Bear Creek Regime, East Fork Regime, and Chestnut Ridge Regime; (2) the types of contaminants from respective source areas in each regime and the overall pattern and extent of contaminant transport in each regime; and (3) the long-term contaminant concentration trends evident for the respective groundwater and surface water sampling locations in each regime. This report includes monitoring results for 236 sampling locations: 204 monitoring wells, 10 springs, and 22 surface water stations.

The CY 2010 monitoring results reported for 62 wells (41 aquitard wells and 21 aquifer wells) meet surveillance monitoring requirements in the Bear Creek Regime. Groundwater samples from 21 of the aquitard wells and 16 of the aquifer wells had elevated concentrations of one or more of the principal contaminants at Y-12, with the highest concentrations reported for samples from wells located near the former S-3 Ponds, the former BYBY/HCDA, and the BCBG WMA. Analytical results for most of these wells do not indicate any significant change in the overall extent of groundwater contamination in the Bear Creek Regime or the relative distribution of contaminants from the primary source areas. Chloroethenes (PCE, TCE, 12DCE, 11DCE, and VC) are the most widespread groundwater contaminants, with elevated concentrations of one or more of these VOCs reported for 31 wells.

The CY 2010 exit pathway/perimeter monitoring in the Bear Creek Regime is reported for 19 surface water stations along Bear Creek (including seven northern tributaries), six springs that discharge into Bear Creek, and three aquifer wells at the westernmost Exit Pathway Picket (Picket W). None of the groundwater samples from the Picket W wells had elevated concentrations of the principal groundwater contaminants at Y-12, but elevated concentrations of one or more of the contaminants were detected in surface water samples from seven sampling stations in Bear Creek (BCK-12.34, BCK-11.97, BCK-11.84, BCK-11.54, BCK-09.40, BCK-09.20, and BCK-07.87), four tributaries (NT-1, NT-3, NT-7, and NT-8), and two springs (SS-4 and SS-5). These results are generally consistent with historical data and show that contaminant concentrations in Bear Creek decrease with distance from each of the principal source areas (the S-3 Site, BYBY/HCDA, and BCBG WMA), including inflow of contaminated water from the northern tributaries of the creek that drain these sites. At station BCK-04.55, which is located where Bear Creek turns north at the westernmost extent of the Bear Creek Regime, the CY 2010 concentrations of all principal contaminants were below applicable screening levels.

The CY 2010 monitoring results for applicable surveillance and exit-pathway/perimeter sampling locations in the Bear Creek Regime continue the long-term contaminant concentration trends indicated by historical data for each applicable sampling location. Increasing concentrations are evident for at least one principal contaminant detected in samples from nine monitoring wells (eight aquitard wells and one aquifer well). These monitoring locations are near the S-3 Site (three wells), the OLF WMA (two wells), and the BCBG WMA (four wells). Decreasing or indeterminate (not increasing or decreasing) trends are evident for at least one contaminant detected in samples from 32 wells, nine surface water stations, and two springs. Monitoring wells with elevated concentrations of more than one principal contaminant that have different trends for each contaminant (e.g., increasing nitrate trend and decreasing or indeterminate VOC trend), reflect different sources and/or transport flowpaths for the different contaminants. Divergent concentration trends for individual chloroethenes at one well (GW-068) at the BCBG WMA and two wells (GW-229 and GW-365) at the OLF WMA are likely attributable to the effects of biotic and/or chemical degradation processes.

The CY 2010 monitoring results reported for 45 aquitard wells and 28 aquifer wells (including five wells located in Union Valley east of the ORR boundary along Scarboro Road) meet the requirements of surveillance monitoring in the East Fork Regime. Groundwater samples from seven of the aquitard wells and 21 of the aquifer wells had elevated concentrations of one or more of the principal contaminants at Y-12. Aquitard wells with the highest inorganic and radiological contaminant concentrations are located in a portion of the western Y-12 area impacted by the contaminant plume emplaced during historical operations of the former S-3 Ponds. Extremely high (>20,000 µg/L) VOC concentrations were reported for the groundwater near Building 9201-5 and very high (>1,000 µg/L) VOC concentrations were reported for wells near the Y-12 Salvage Yard, the WCPA, NHP, and former UST locations (Rust Garage and East End Garage). Aquifer wells with the highest contaminant concentrations are located immediately downgradient (east) of the former S-2 Ponds in the western Y-12 area, within the co-mingled VOC plume from multiple sources in the central Y-12 area, and in the eastern Y-12 area near NHP/Lake Reality and Oil Skimmer Basin. Chloromethanes (CTET, chloroform, and MC) are not commonly present in the western and central Y-12 areas, but are the primary VOCs detected in groundwater in the eastern Y-12 area. Analytical results for these wells do not indicate any significant change in the overall extent of groundwater contamination in the East Fork Regime or the relative distribution of contaminants from the primary source areas.

The CY 2010 monitoring results reported for 16 sampling locations, including nine monitoring wells, two springs and five surface water stations meet the requirements of exit-pathway/perimeter monitoring for the East Fork Regime. Elevated concentrations of one or more of the principal groundwater contaminants at Y-12 were reported for at least one of the samples from five of the wells (VOCs) and two of the surface water sampling stations (uranium and gross alpha activity). Sampling results for some of the wells exhibit a direct response (i.e., lower VOC concentrations) to the operation of the groundwater extraction well used to help capture the plume and deter continued migration of VOCs into Union Valley. Uranium concentrations reported for the surface water sampling stations suggest the continued impact of legacy Y-12 operations on the quality of surface water in UEFPC upstream of the ORR boundary. Note that mercury is a primary concern in the surface water of the East Fork Regime and results of flow-proportionate sampling performed under other monitoring programs are not directly addressed in this report. Because of low solubility and other geochemical considerations, mercury is consistently detected only in groundwater samples very near source areas, and is not considered to be a principal groundwater contaminant.

The CY 2010 monitoring results for applicable surveillance and exit-pathway/perimeter sampling locations in the East Fork Regime continue the long-term contaminant concentration trends indicated by historical data for each applicable sampling location. Increasing concentrations are evident for at least one of the principal contaminants detected in samples from 16 wells, and decreasing or indeterminate (not increasing or decreasing) concentration trends are evident for at least one contaminant detected in samples from 50 wells and two surface water stations. Monitoring wells with elevated concentrations of more than one principal contaminant commonly have different trends for each contaminant (e.g., increasing nitrate trend and decreasing or indeterminate VOC trend), which reflects different sources, transport flowpaths, and/or geochemical attenuation characteristics for the different contaminants. The effects of biotic and/or chemical degradation processes are the likely cause of divergent concentration trends for individual chloroethenes at wells 55-3A, 56-2C, GW-223, GW-253, and GW-383. Historic data for the wells show decreasing and/or indeterminate trends for concentrations of parent compounds (PCE and/or TCE), with increasing trends for concentrations of degradation products (c12DCE, 11DCE, and/or VC).

The CY 2010 sampling results for 41 wells located on Chestnut Ridge meet the requirements of surveillance monitoring in the Chestnut Ridge Regime, and results for six wells indicate former operations at Y-12 have impacted groundwater quality. One or more VOCs were detected in groundwater samples from well GW-305 at Industrial Landfill IV and five wells near the CRSP. Concentrations above applicable drinking water MCLs were reported for PCE (GW-798) and 11DCE (GW-305 and GW-322). Analytical results for these wells do not indicate any significant change in the overall extent of VOC-contaminated groundwater in the regime or the relative distribution of contaminants. Additionally, the CY 2010 sampling results continue the VOC concentration trends indicated by historical data for the wells at the CRSP and are consistent with the recent trends evident since the initial detection of VOCs in well GW-305.

The CY 2010 monitoring results reported for five natural springs and seven surface water sampling stations located in major drainage features that traverse the southern flank of Chestnut Ridge meet the requirements of exit-pathway/perimeter monitoring in the Chestnut Ridge Regime. The principal groundwater contaminants at Y-12 were either not detected or were detected at concentrations within the range of background levels in the samples from each spring and most surface water stations in the regime. Nitrate concentrations were elevated (8.06 mg/L), but below the drinking water MCL (10 mg/L) at station S17 in the southeastern portion of the regime. This result suggests an increasing nitrate concentration trend in SCR5 that may reflect runoff from areas on Chestnut Ridge where sewer sludge was applied. Also, the CY 2010 sampling results for sampling stations in McCoy Branch show elevated concentrations of arsenic (>0.01 mg/L) and sulfate (>20 mg/L) immediately downstream of the FCAP, but not farther downstream where this drainage feature exits the ORR.

Based on groundwater and surface water monitoring data obtained during CY 2010, the following observations were noted and/or actions are recommended:

- The apparently increasing trend in nitrate concentrations noted at surface water station S17 in the Chestnut Ridge Regime may reflect transport from sludge application areas via runoff and/or infiltration with subsequent groundwater discharge to surface water. It is suggested to collect a surface water sample for nitrate analysis soon after a significant rain event (>one-half inch in 24 hours) and another sample during base flow (within two weeks of the storm flow sample). The results of these precipitation-related samples could help determine characteristics of nitrate flux in SCR5. Additionally, the sampling frequency could be increased to better assess the nitrate concentration trend. Contemporaneous surface water samples should be collected at several locations along SCR5 to evaluate nitrate discharge areas.

- Wells GW-265 and GW-268 (formerly granted Inactive status) should be sampled annually to detect and/or evaluate any impacts to groundwater from soil remediation work being performed at the Old Salvage Yard.

- It is recommended to perform a quantitative-based assessment of the relative stability of the groundwater contaminant plume(s) at Y-12. This assessment could include two tasks: (1) update plume maps to show the current extent of selected contaminants (e.g., specific VOCs and nitrate) and (2) use the Mann-Kendall test to determine the relative stability of each solute plume based on concentration trends at individual wells.

- Some VOC results obtained using PDB samplers were lower than results obtained using the low-flow method. For example, PCE results were much lower than expected at three wells (GW-014, GW-289 and GW-315) in the Bear Creek Regime and six wells (56-2C, GW-220, GW-337, GW-383, GW-700, and GW-820) in the East Fork Regime. Studies have indicated that the PDB sampling method is appropriate for analysis for PCE concentrations. However, these results indicate that low-flow sampling may be the more conservative method for VOC analyses at these wells. It is suggested to limit the use of PDB samplers when PCE is a known contaminant.

- A significant decrease or increase in contaminant concentrations observed in groundwater samples from a few monitoring wells since implementation of low-flow sampling has been interpreted to reflect a sampling method bias. However, this change in concentrations also may reflect bio-fouling of the well screen and/or filter pack. The pumping rates to purge and collect samples from monitoring wells have been maintained electronically by the Y-12 GWPP since CY 2006. It is suggested to perform a review of this data in conjunction with monitoring well inspection records, down-hole camera surveys, and water quality data. The results of the review could be used to identify wells with potentially decreased performance (permeability of the filter pack and/or well screen). Selected wells would be candidates for rehabilitation (e.g., surging or swabbing) using a workover rig, with subsequent monitoring results used to evaluate the effectiveness of rehabilitation methods.

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APPENDIX A

FIGURES

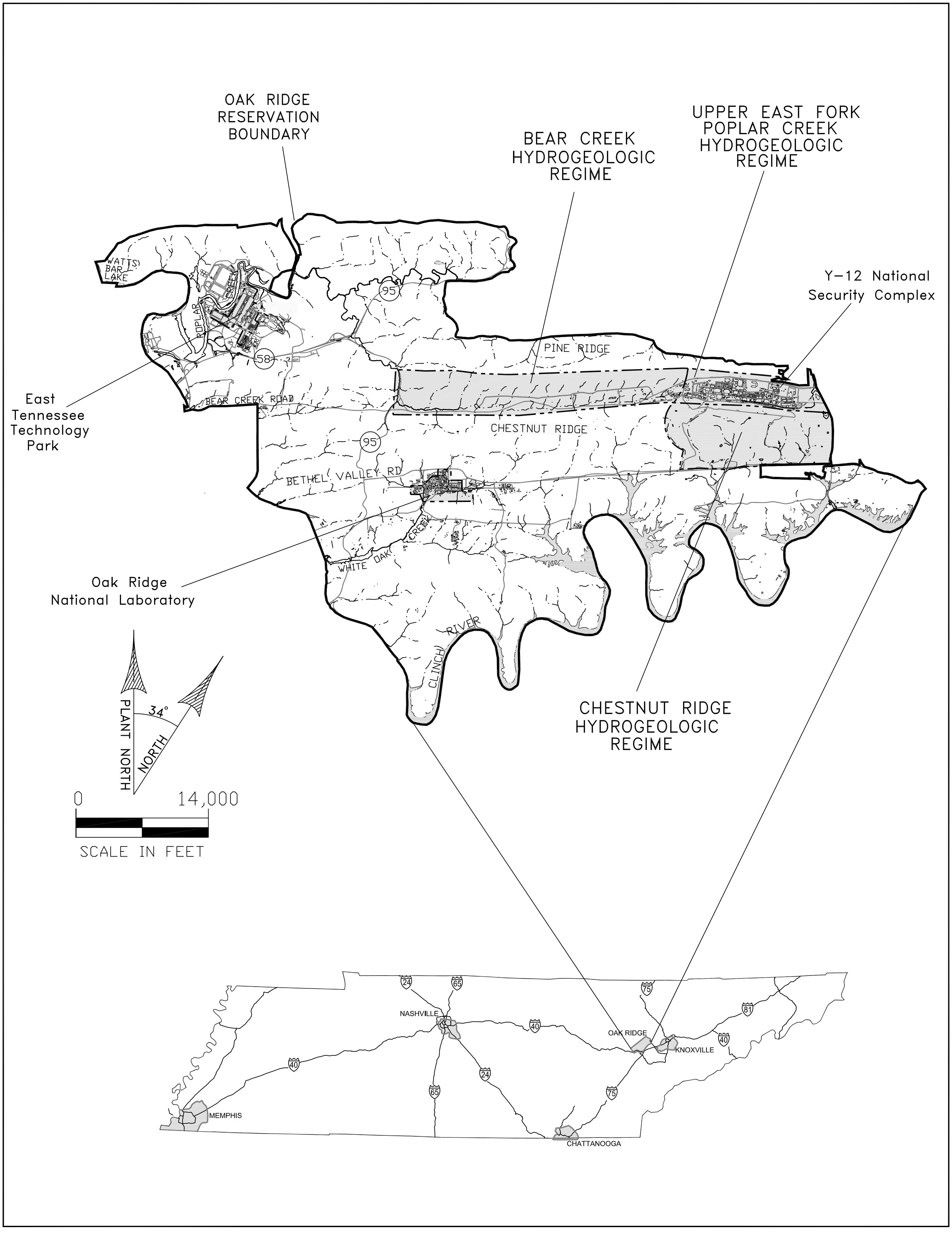
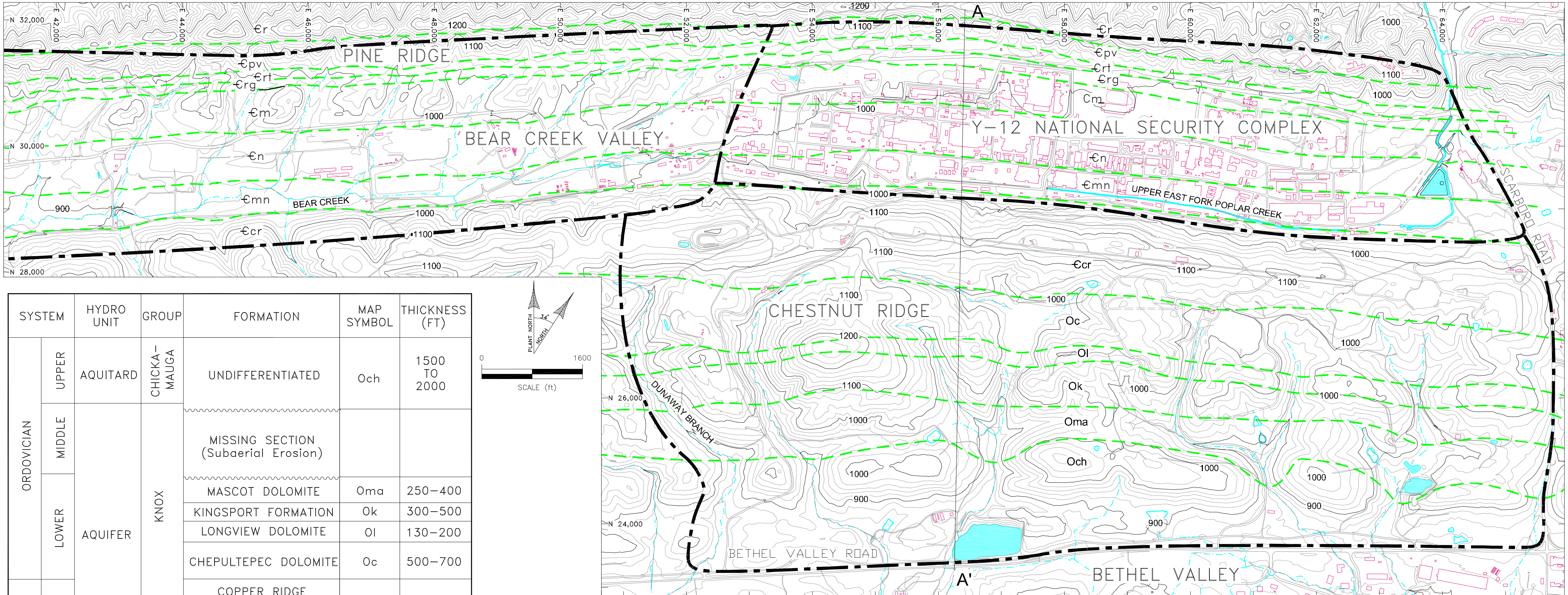
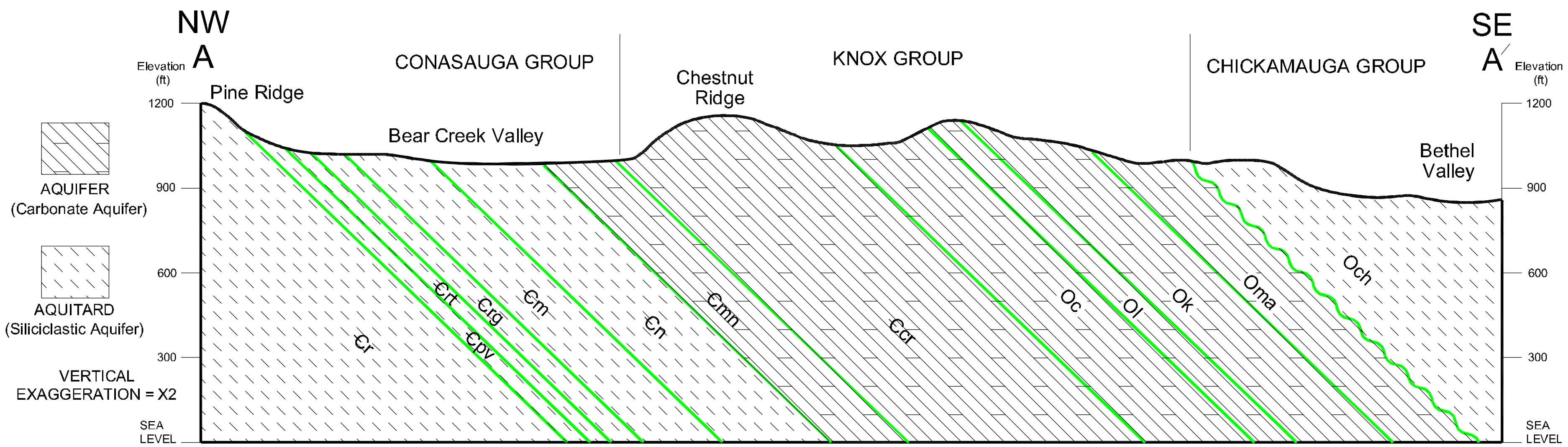


Fig. A.1. Hydrogeologic regimes at the Y-12 National Security Complex.



SYSTEM		HYDRO UNIT	GROUP	FORMATION	MAP SYMBOL	THICKNESS (FT)
ORDOVICIAN	UPPER	AQUITARD	CHICKA-MAUGA	UNDIFFERENTIATED	Och	1500 TO 2000
	MIDDLE	AQUIFER	KNOX	MISSING SECTION (Subaerial Erosion)		
	LOWER			MASCOT DOLOMITE	Oma	250–400
				KINGSPORT FORMATION	Ok	300–500
				LONGVIEW DOLOMITE	Ol	130–200
				CHEPULTEPEC DOLOMITE	Oc	500–700
CAMBRIAN	UPPER			COPPER RIDGE DOLOMITE	€cr	800–1,100
			CONASAUGA	MAYNARDVILLE LIMESTONE	€mn	418–450
	MIDDLE	AQUITARD		NOLICHUCKY SHALE	€n	490–590
				MARYVILLE LIMESTONE	€m	346–445
				ROGERSVILLE SHALE	€rg	90–120
				RUTLEDGE LIMESTONE	€rt	90–120
				PUMPKIN VALLEY SHALE	€pv	260–320
	LOWER			ROME	€r	NOT DETERMINED

SOURCES: King and Haas 1987
Hatcher et al. 1992



GENERALIZED GEOLOGIC CROSS SECTION

GWMR_02

Fig. A.2. Topography and bedrock geology at the Y-12 National Security Complex.

Elvado: GWMR_03

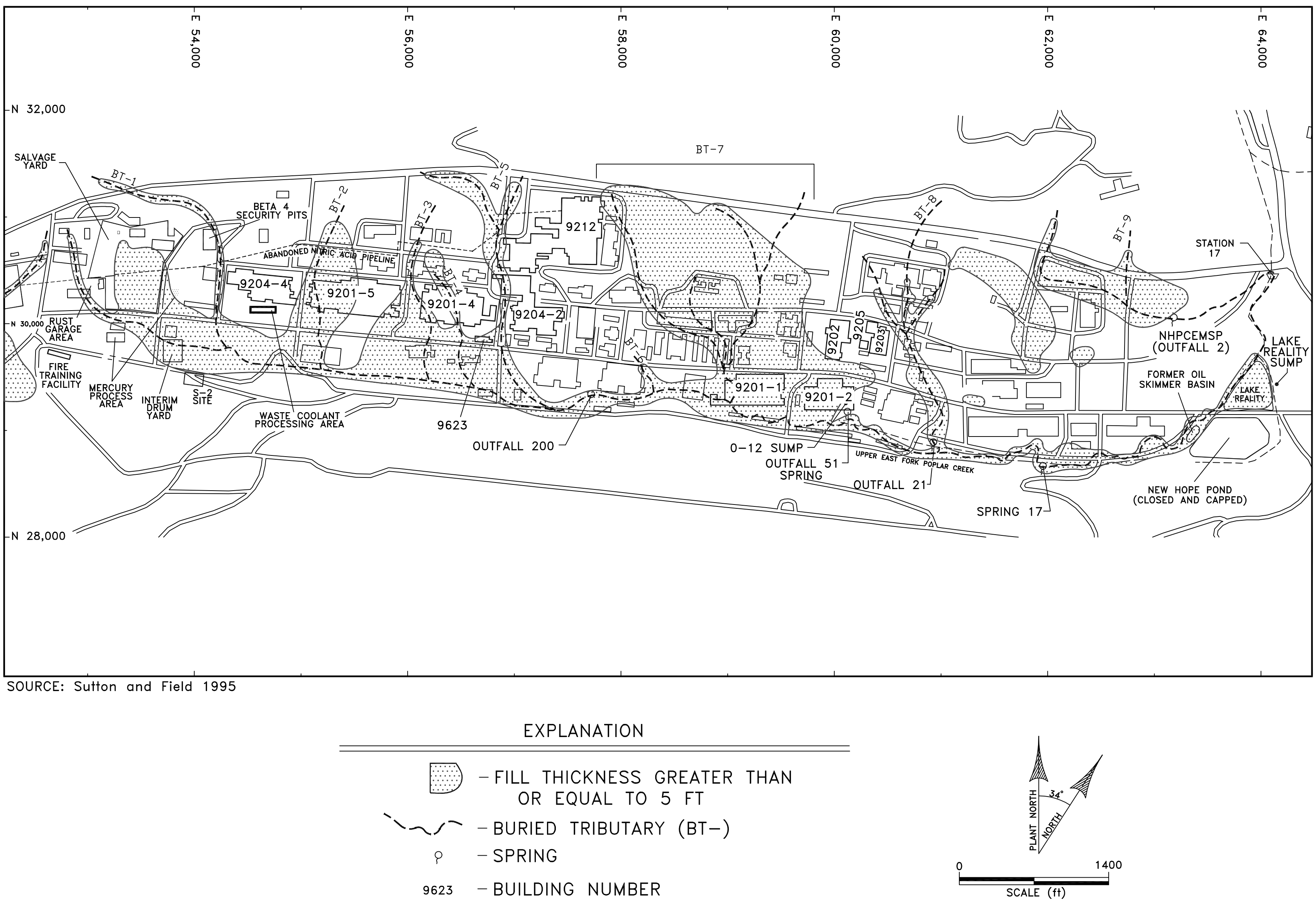
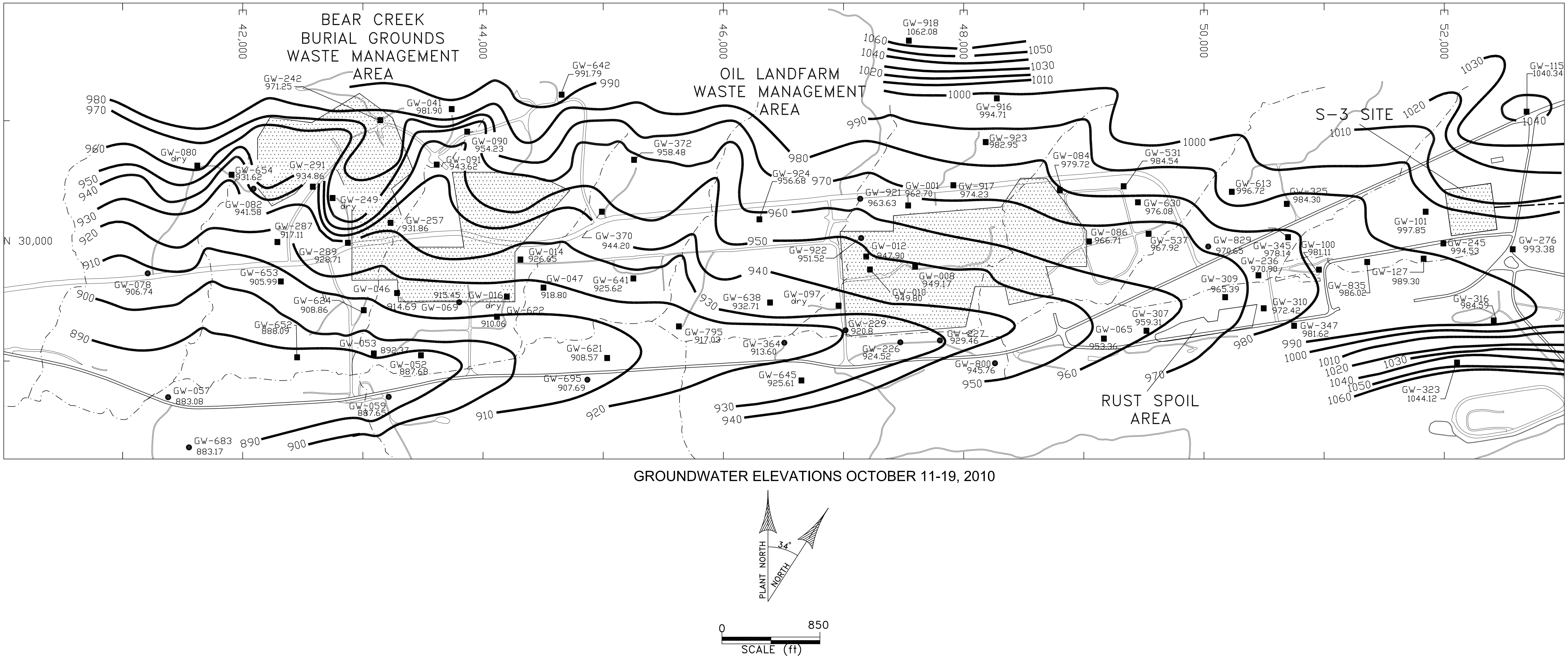


Fig. A.3. Fill areas and pre-construction drainage features in the Upper East Fork Poplar Creek Hydrogeologic Regime.



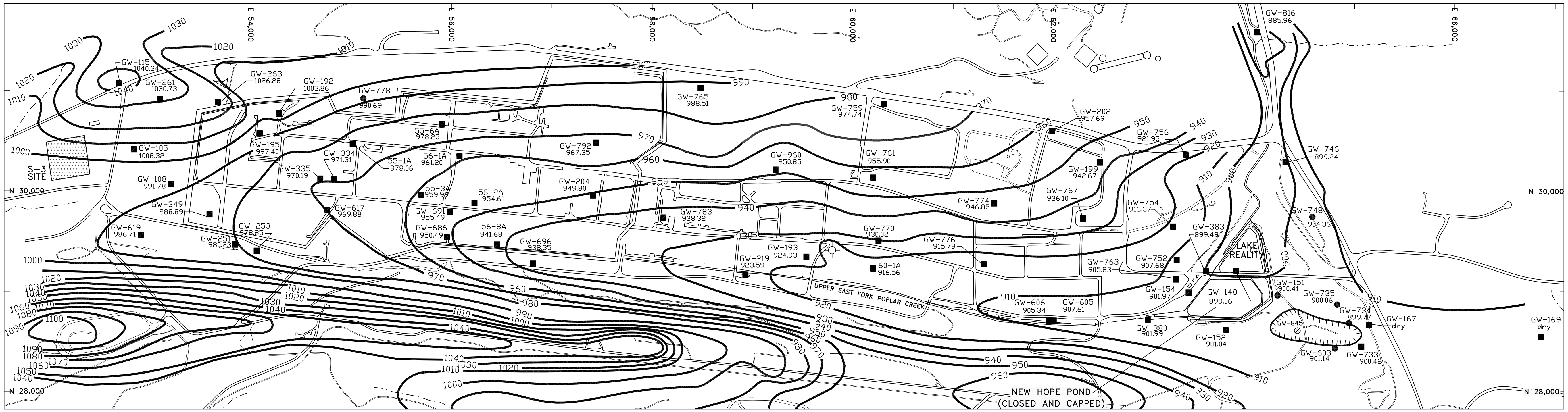
GROUNDWATER ELEVATIONS OCTOBER 11-19, 2010

EXPLANATION

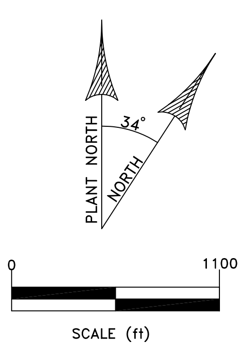
- ■ WATER TABLE INTERVAL MONITORING WELL
- ● BEDROCK INTERVAL MONITORING WELL
- WATER-LEVEL ISOPLETH (ft msl)
- SURFACE DRAINAGE FEATURE

Elvado: GWMR10_04

Fig. A.4. Groundwater elevations in the Bear Creek Hydrogeologic Regime, October 2010.



GROUNDWATER ELEVATIONS OCTOBER 11 - NOVEMBER 2, 2010



EXPLANATION

■ WATER TABLE INTERVAL MONITORING WELL

● BEDROCK INTERVAL MONITORING WELL

980 APPROXIMATE WATER-LEVEL ISOPLETH (ft msl)

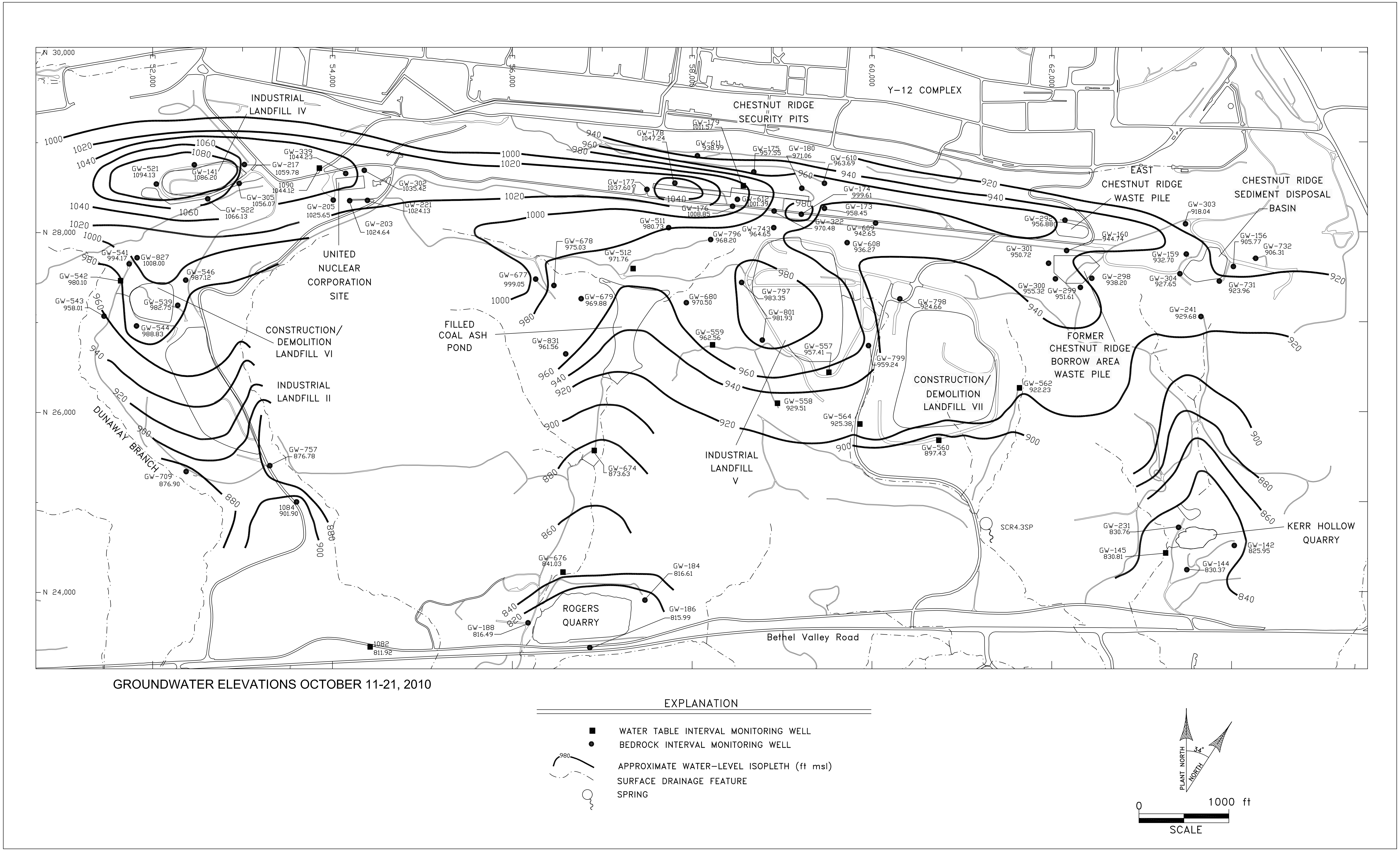
SURFACE DRAINAGE FEATURE

BUILDING 9201-2 SUMP

GW-845 EXTRACTION WELL AND APPROXIMATE ZONE OF INFLUENCE

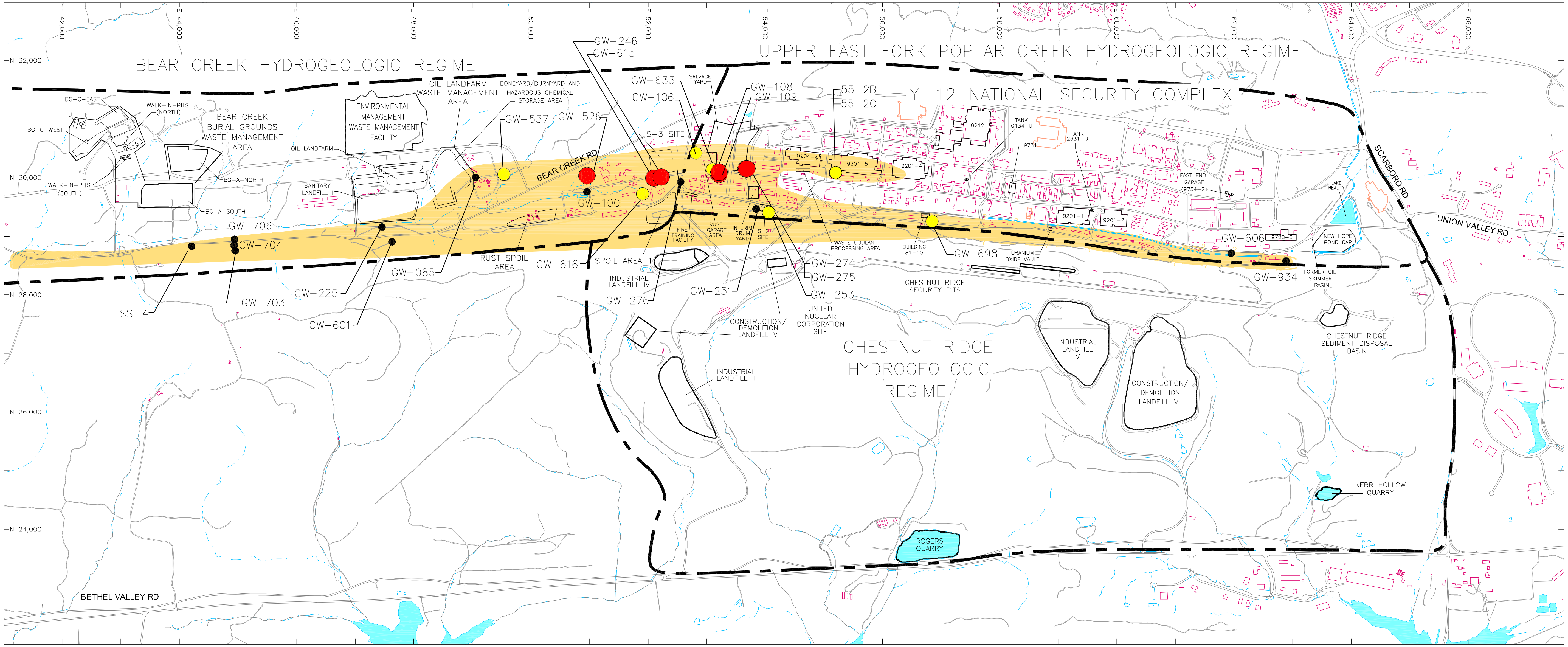
Elvado: GWMR10_05

Fig. A.5. Groundwater elevations in the Upper East Fork Poplar Creek Hydrogeologic Regime, October/November 2010.



Elvado: GWMR10_06

Fig. A.6. Groundwater elevations in the Chestnut Ridge Hydrogeologic Regime, October 2010.



SOURCES: U.S. Department of Energy 1997a
U.S. Department of Energy 1998

EXPLANATION

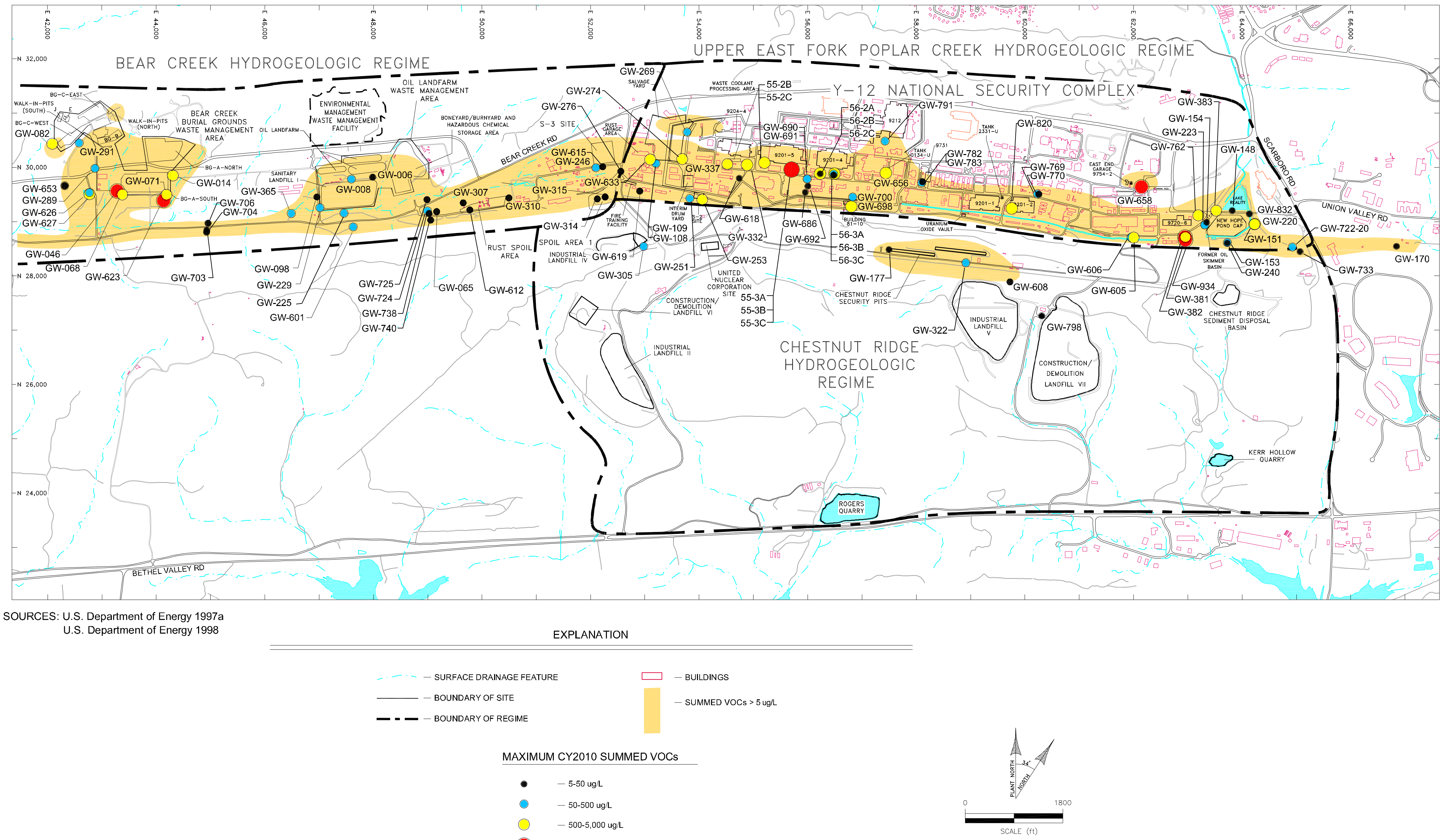
- SURFACE DRAINAGE FEATURE
- BOUNDARY OF SITE
- BOUNDARY OF REGIME
- BUILDINGS
- NITRATE > 10 mg/L (NITRATE AS "N")

MAXIMUM CY2010 NITRATE

- 10-100 mg/L
- 100-1,000 mg/L
- >1,000 mg/L

Elvado: GWMR10_07

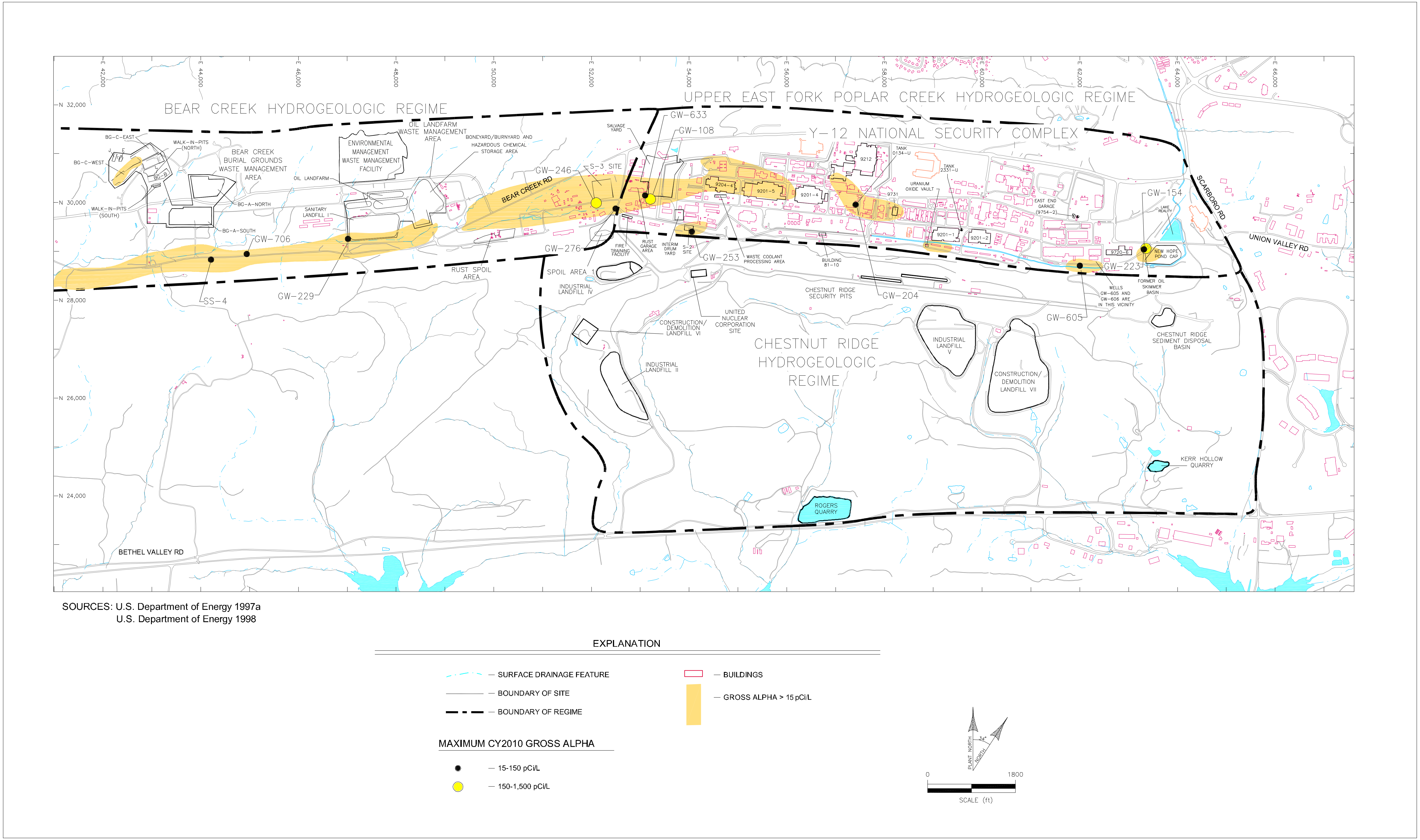
Fig. A.7. Generalized extent of nitrate in groundwater at the Y-12 National Security Complex.



SOURCES: U.S. Department of Energy 1997a
U.S. Department of Energy 1998

Elvado: GWMR10_08

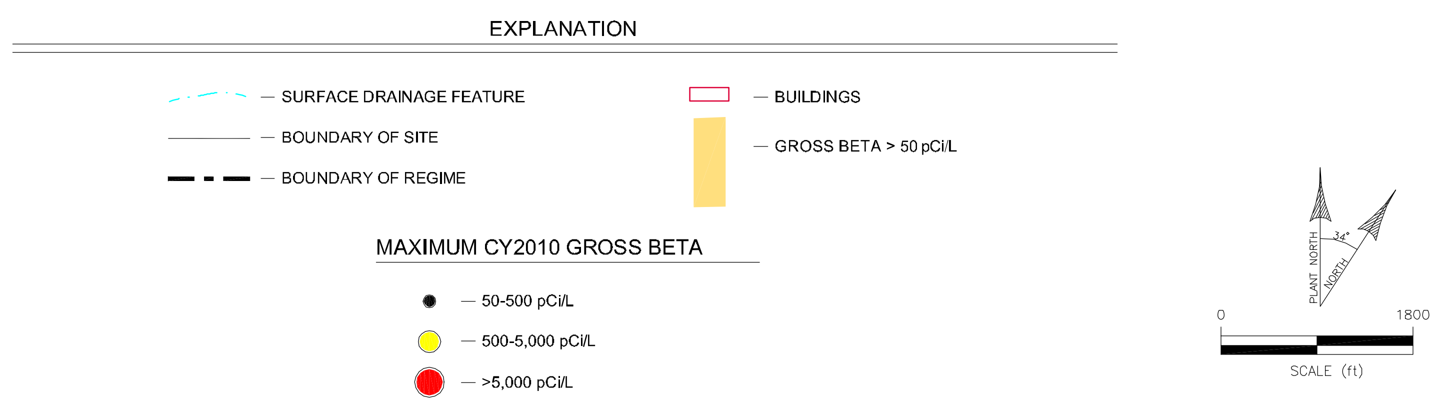
Fig. A.8. Generalized extent of volatile organic compounds in groundwater at the Y-12 National Security Complex.



Elvado: GWMR10_09

Fig. A.9. Generalized extent of gross alpha activity in groundwater at the Y-12 National Security Complex.

SOURCES: U.S. Department of Energy 1997a
U.S. Department of Energy 1998



Elvado: GWMR10_10

Fig. A.10. Generalized extent of gross beta activity in groundwater at the Y-12 National Security Complex.

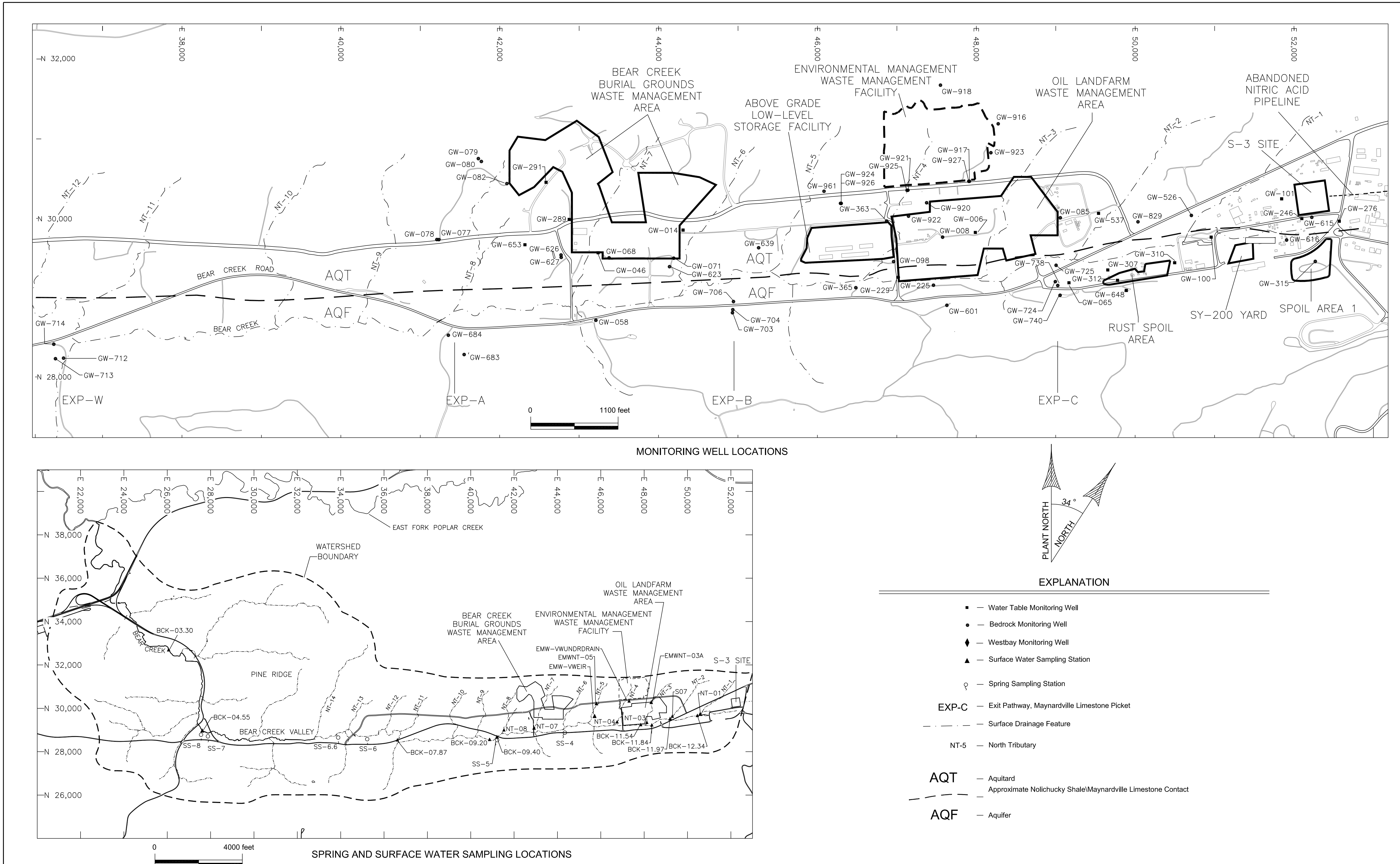
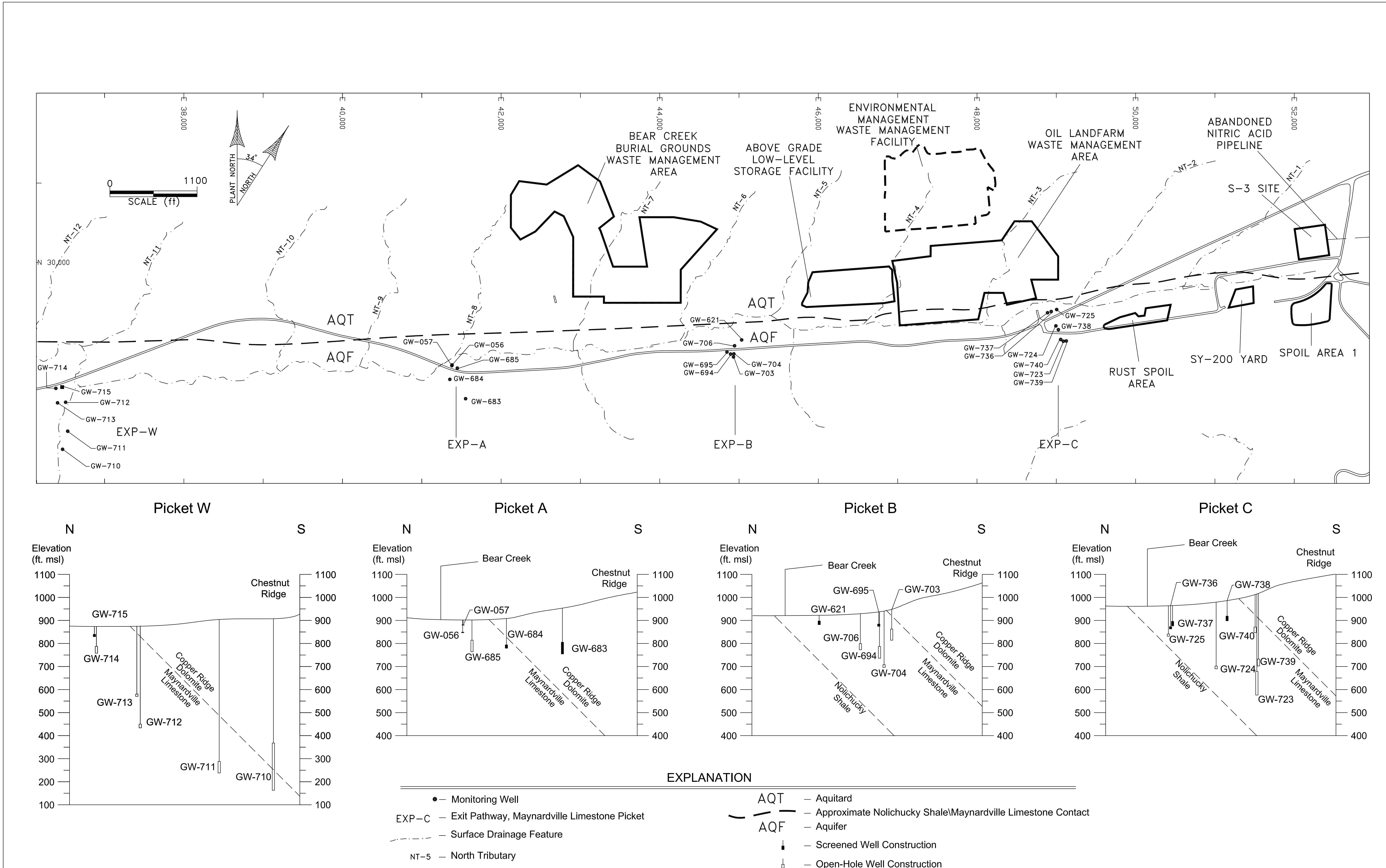


Fig. A.11. CY 2010 sampling locations in the Bear Creek Hydrogeologic Regime.



Elvado: GWMR_BCexp

Fig. A.12. Components of Maynardville Limestone exit pathway pickets A, B, C, and W.

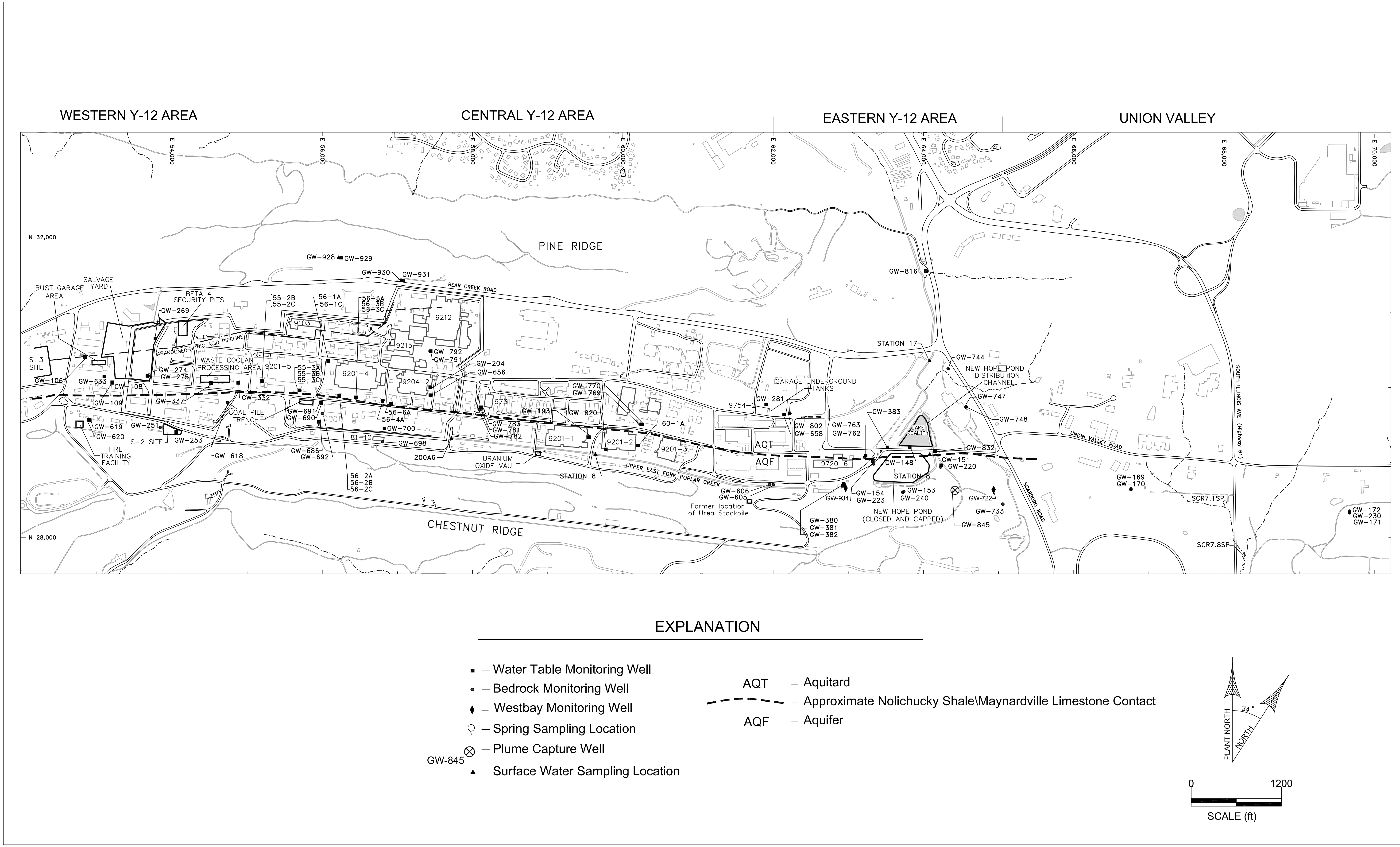
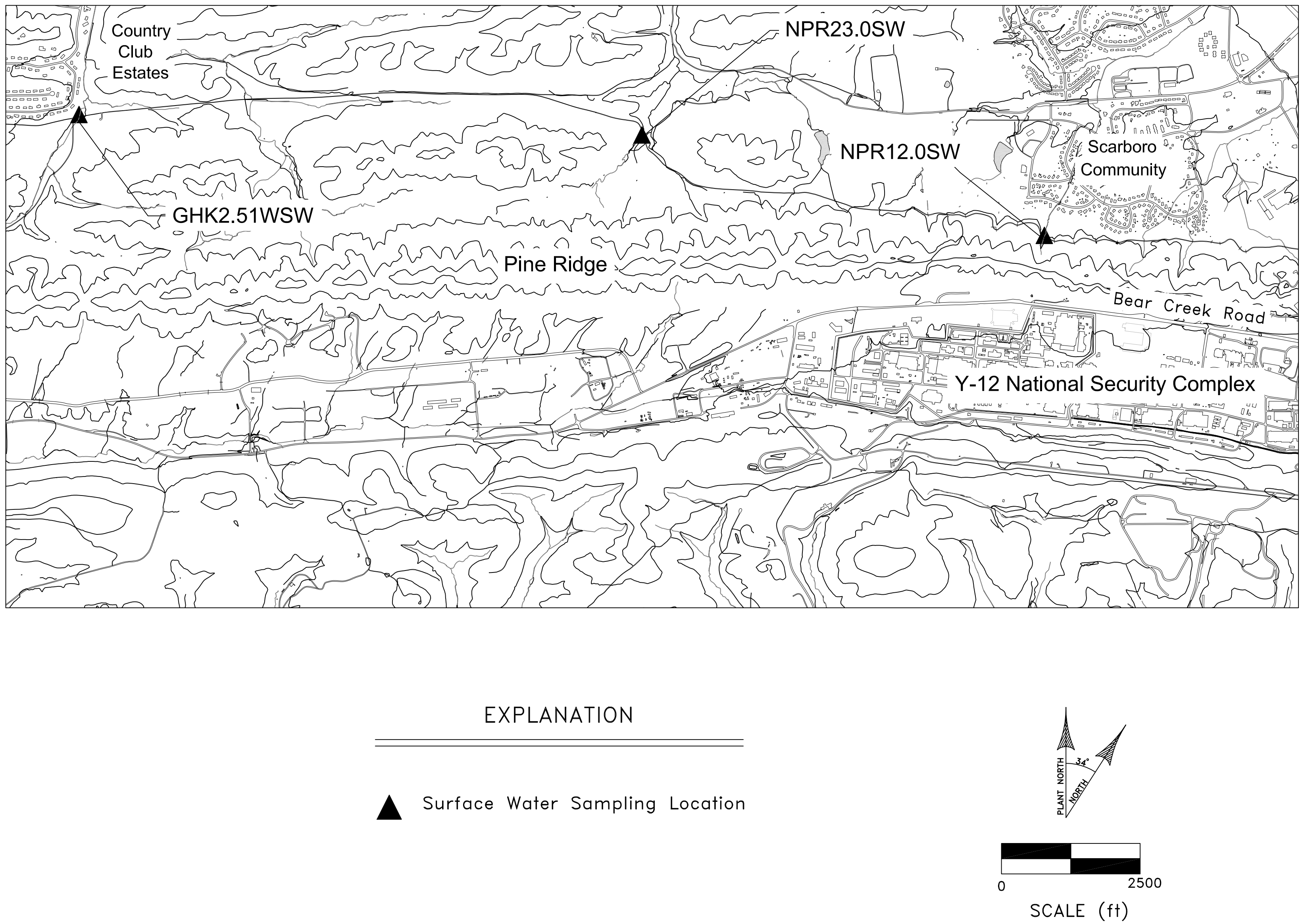
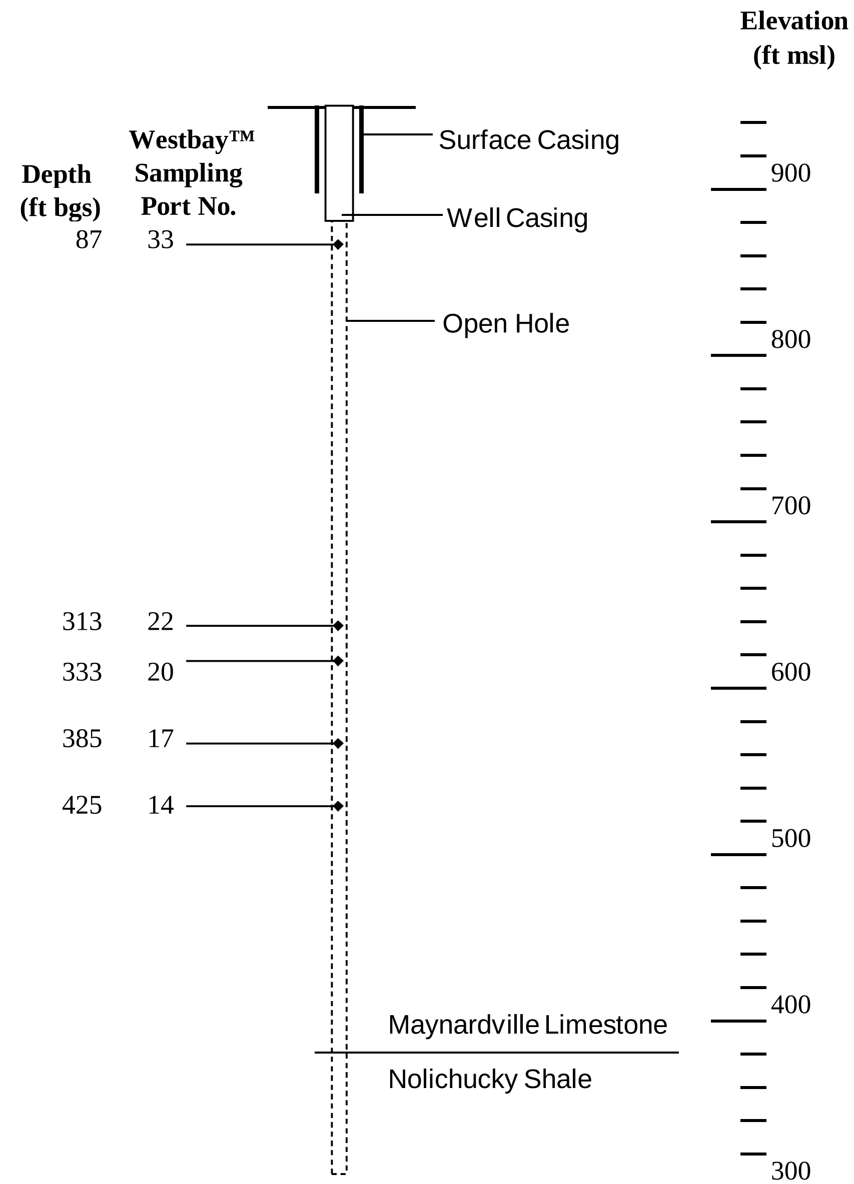


Fig. A.13. CY 2010 sampling locations in the Upper East Fork Poplar Creek Hydrogeologic Regime and in Union Valley.



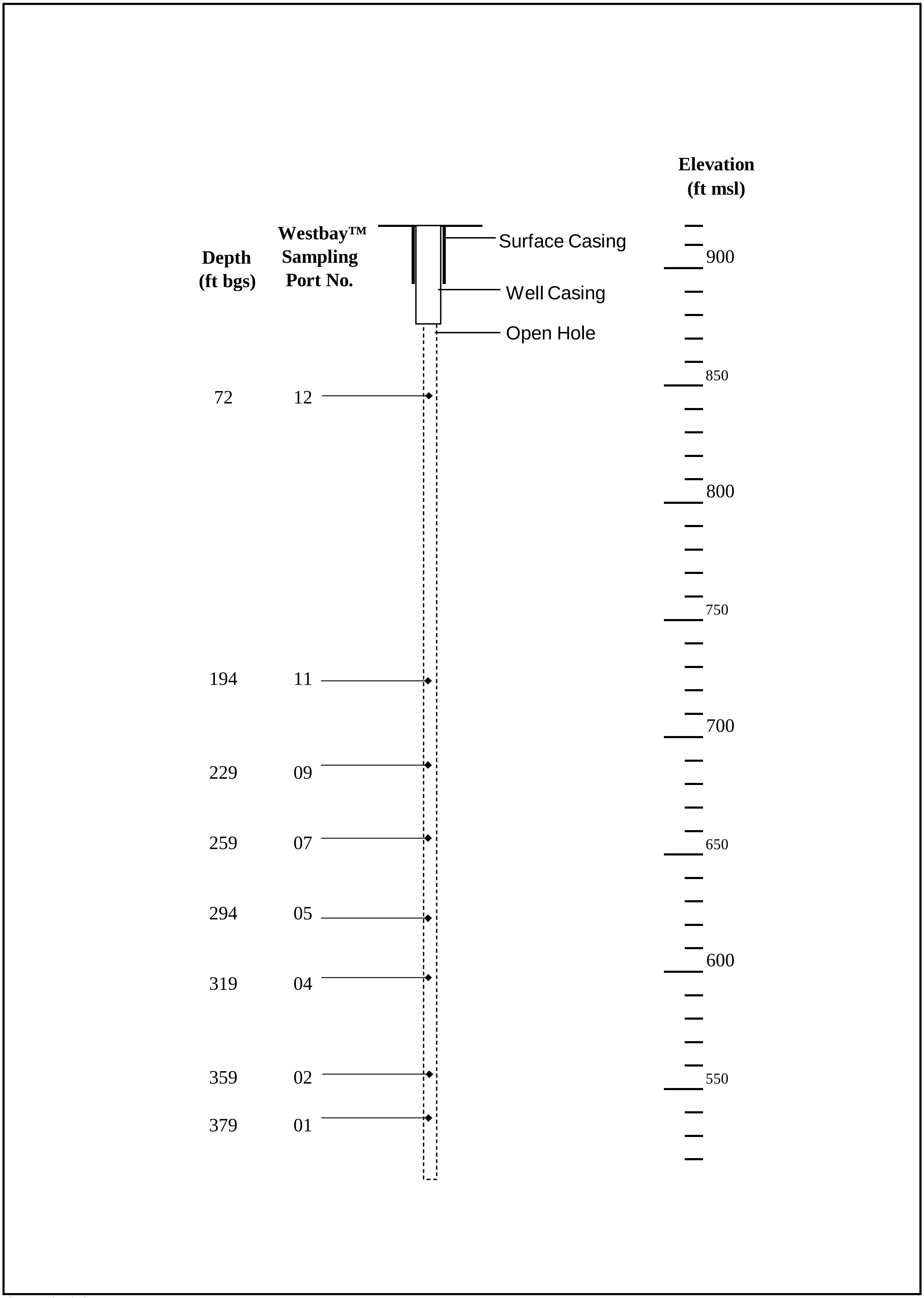
Elvado: GWMR10_14

Fig. A.14. CY 2010 surface water sampling locations north of Pine Ridge.



GWMR10_15.xls

Fig. A.15. Westbay™ monitoring system sampling port depths in well GW-722.



GWMR10_16.xlsx

Fig. A.16. Westbay™ monitoring system sampling port depths in well GW-934.

Elvado: GWMR10_17

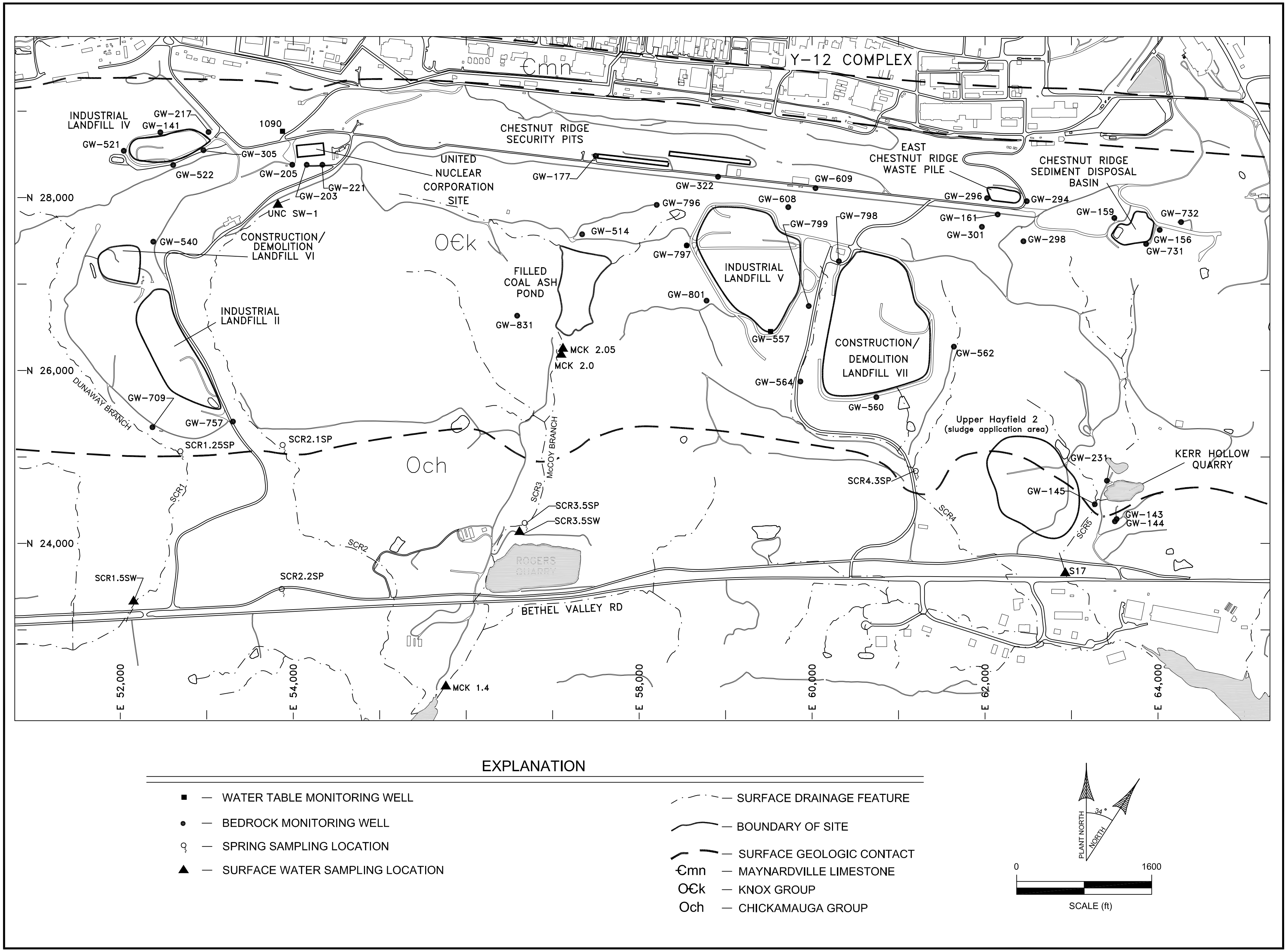
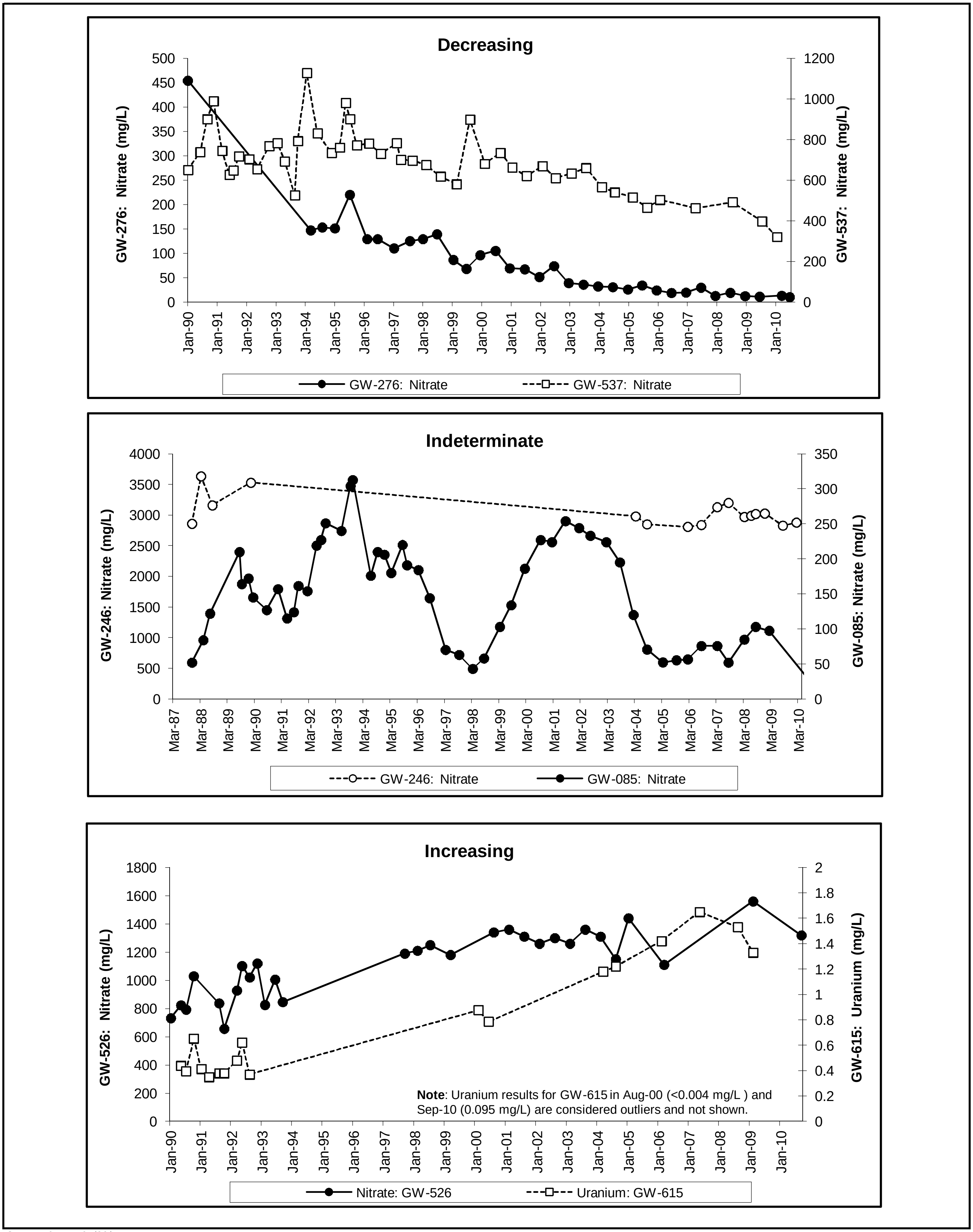
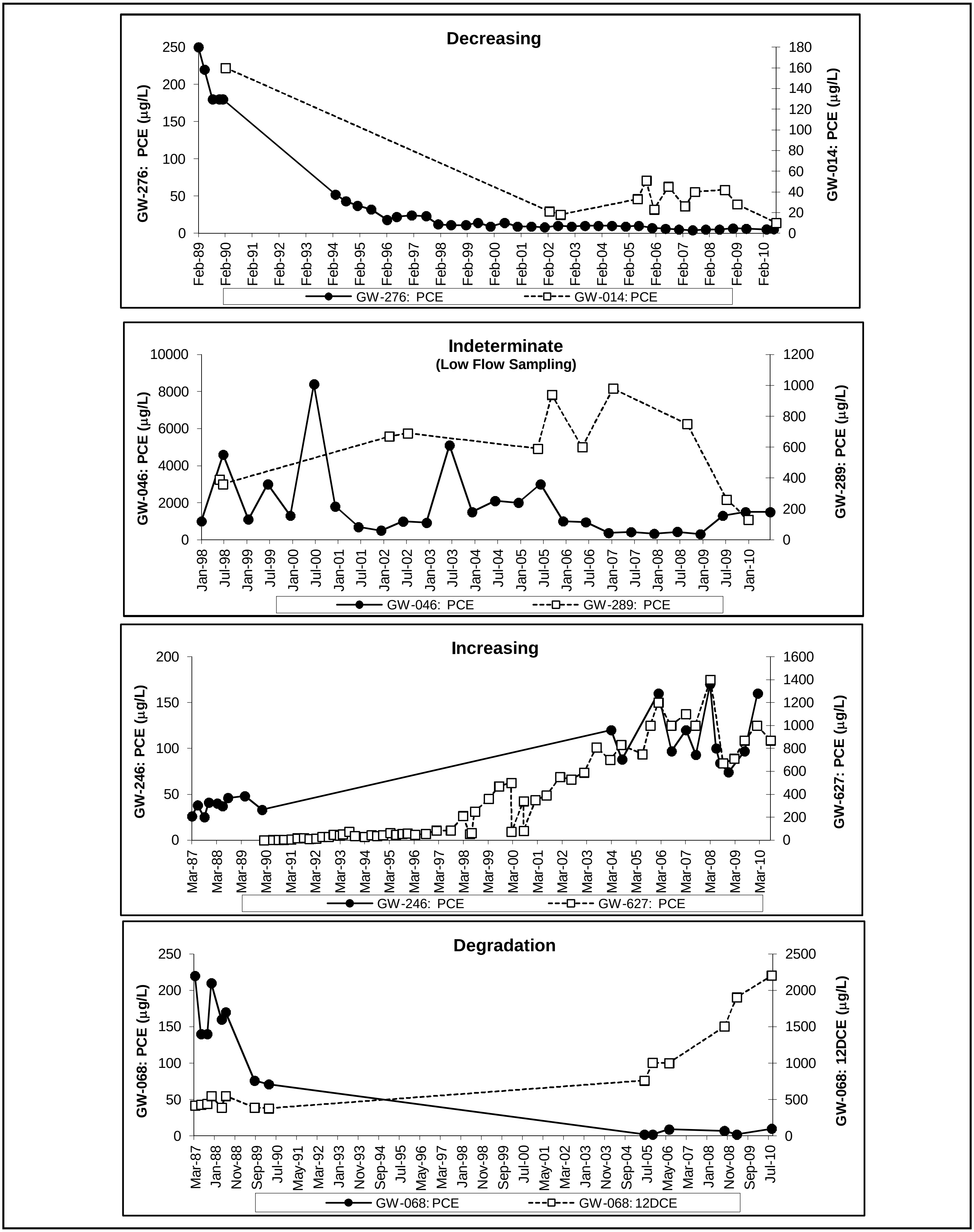


Fig. A.17. CY 2010 sampling locations in the Chestnut Ridge Hydrogeologic Regime.



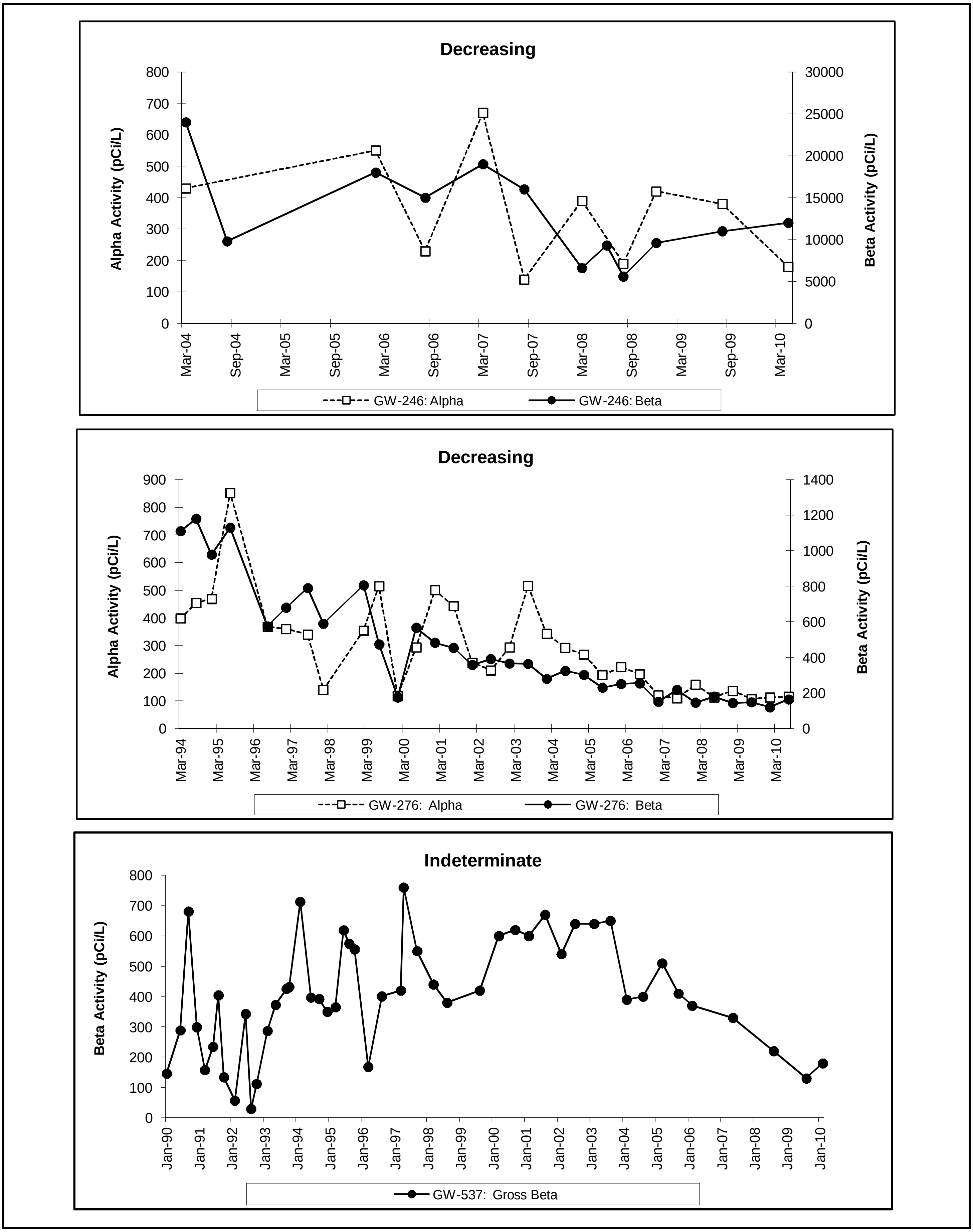
GWMR10 05/20/11

Fig. A.18. Bear Creek Regime CY 2010: nitrate and/or uranium concentration trends in surveillance monitoring aquitard wells GW-085, GW-246, GW-276, GW-526, GW-537, and GW-615.



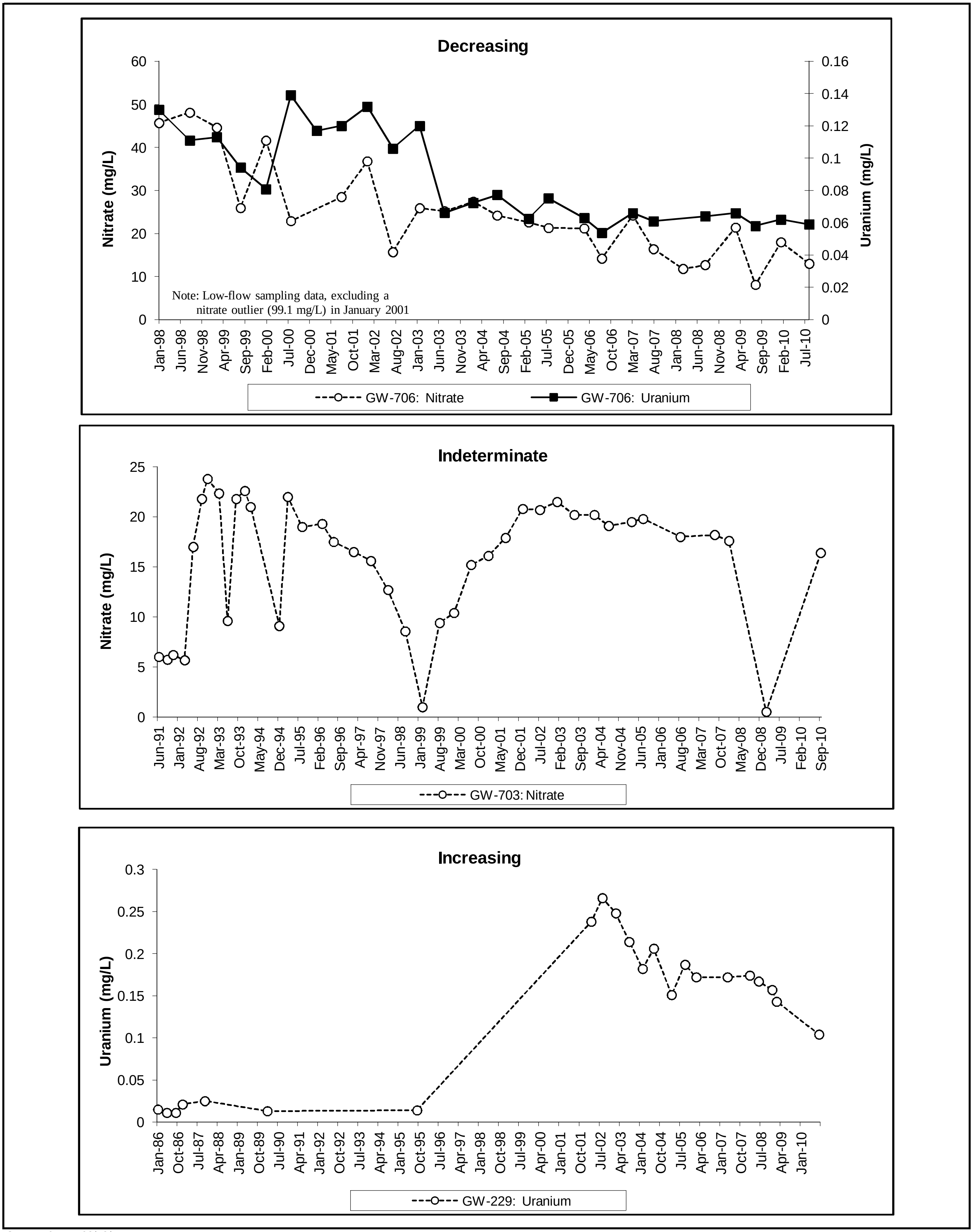
GWMR10 11/29/11

Fig. A.19. Bear Creek Regime CY 2010: VOC concentration trends in surveillance monitoring aquitard wells GW-014, GW-046, GW-068, GW-246, GW-276, GW-289, and GW-627.



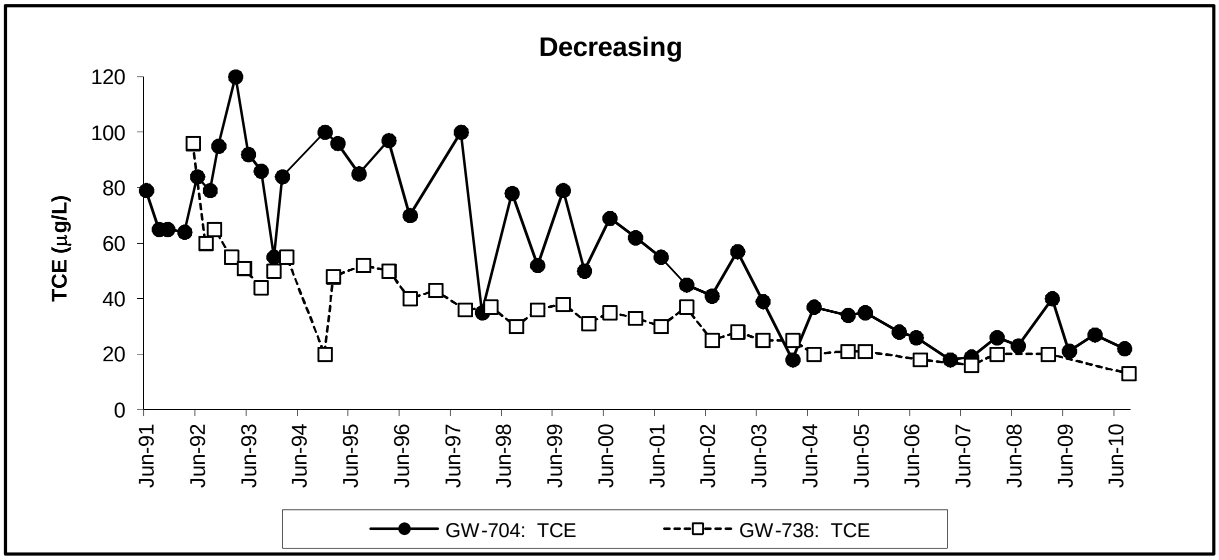
GWMR10 08/15/11

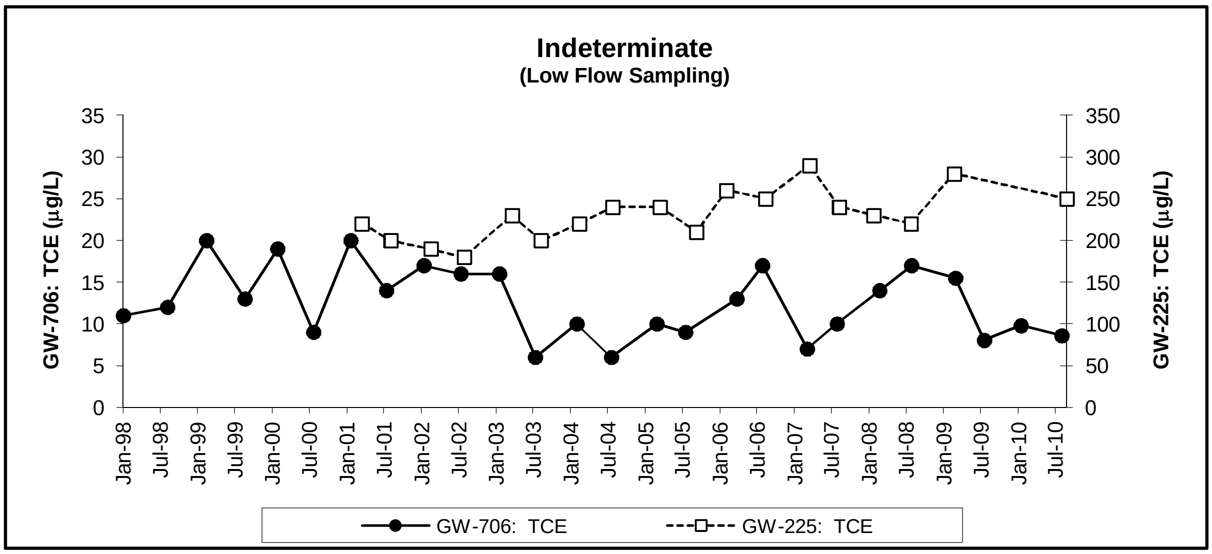
Fig. A.20. Bear Creek Regime CY 2010: gross alpha and/or gross beta activity trends in surveillance monitoring aquitard wells GW-246, GW-276, and GW-537.

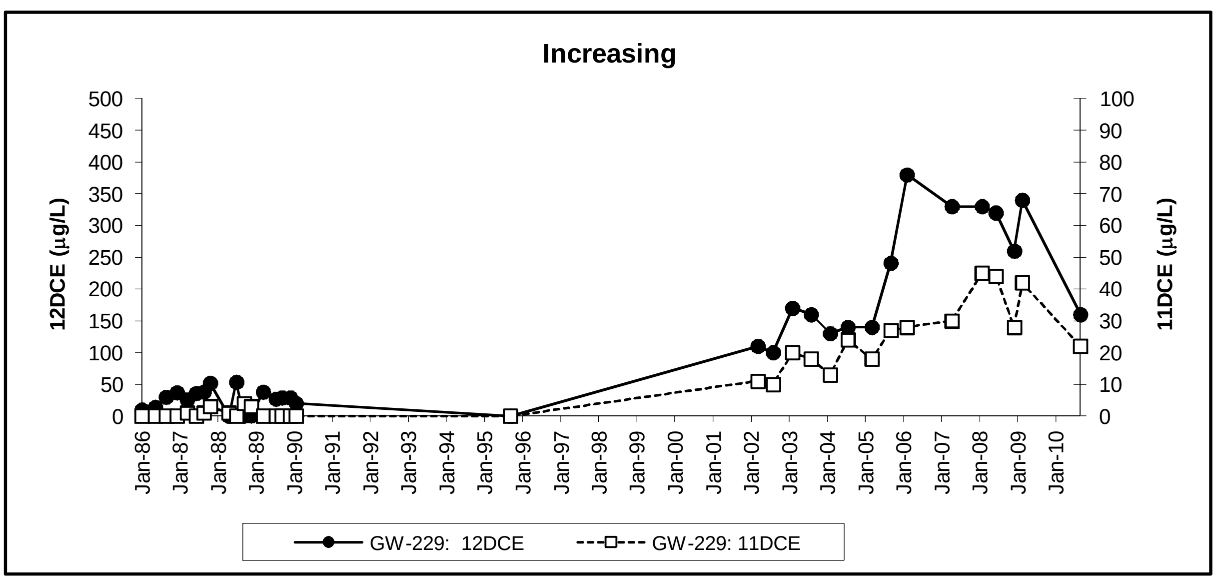


GWMR10 08/18/11

Fig. A.21. Bear Creek Regime CY 2010: nitrate and/or uranium concentration trends in surveillance monitoring aquifer wells GW-229, GW-703, and GW-706.

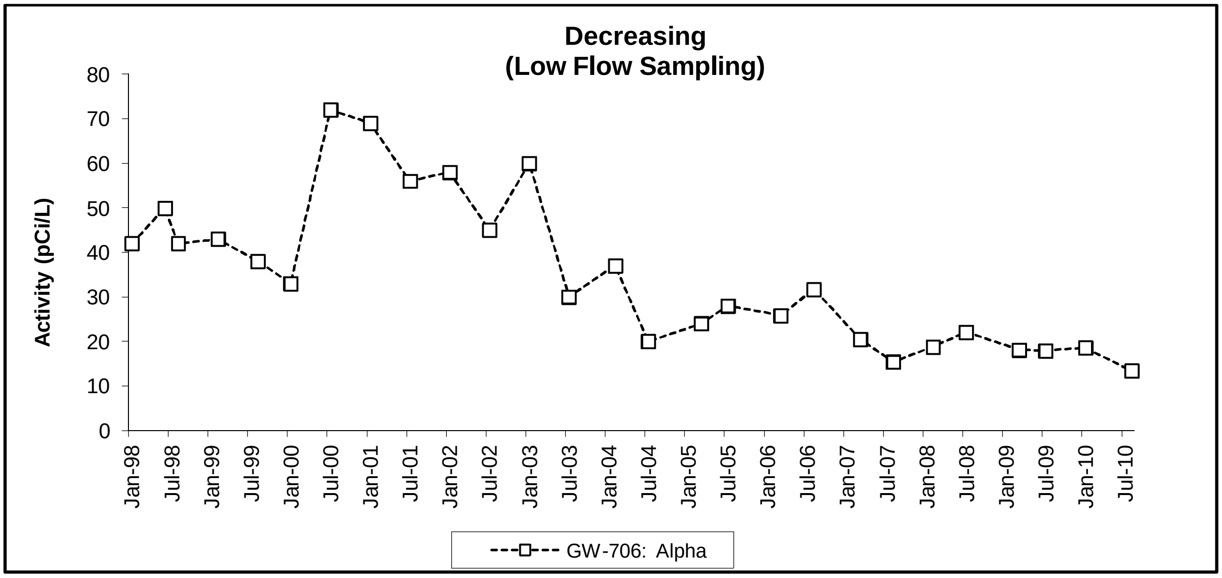


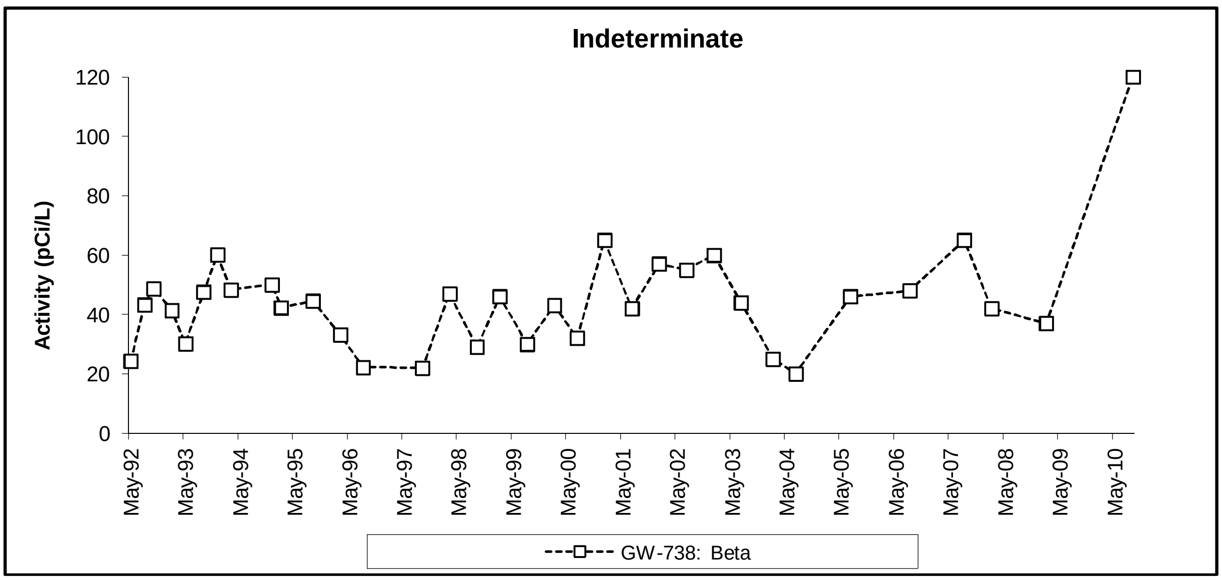


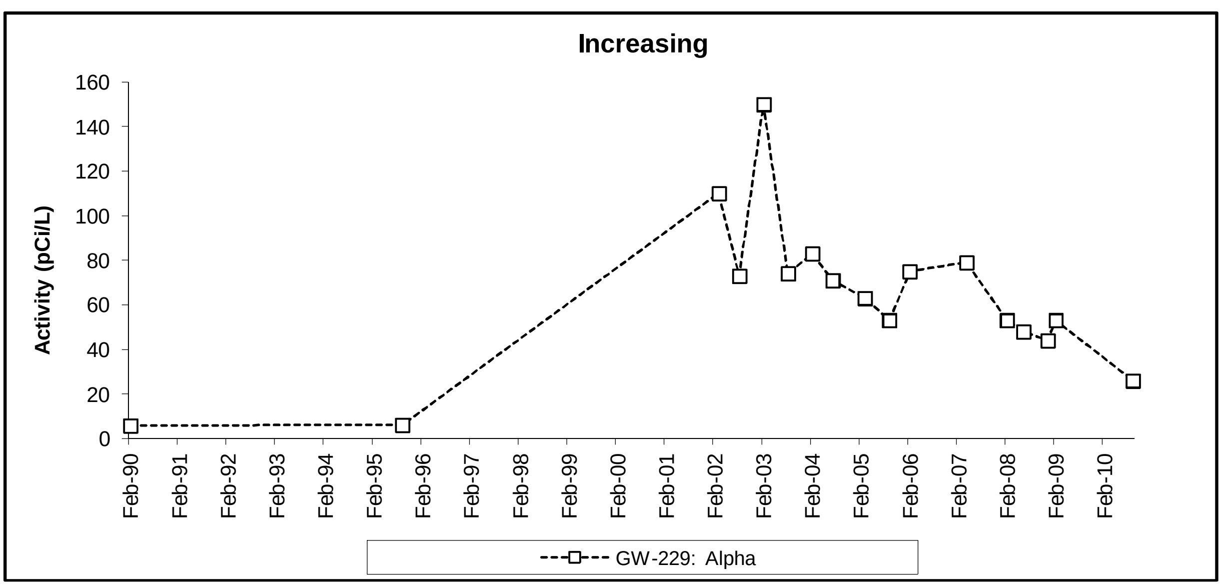


GWMR10 08/18/11

Fig. A.22. Bear Creek Regime CY 2010: selected VOC concentration trends in surveillance monitoring aquifer wells GW-225, GW-229, GW-704, GW-706, and GW-738.

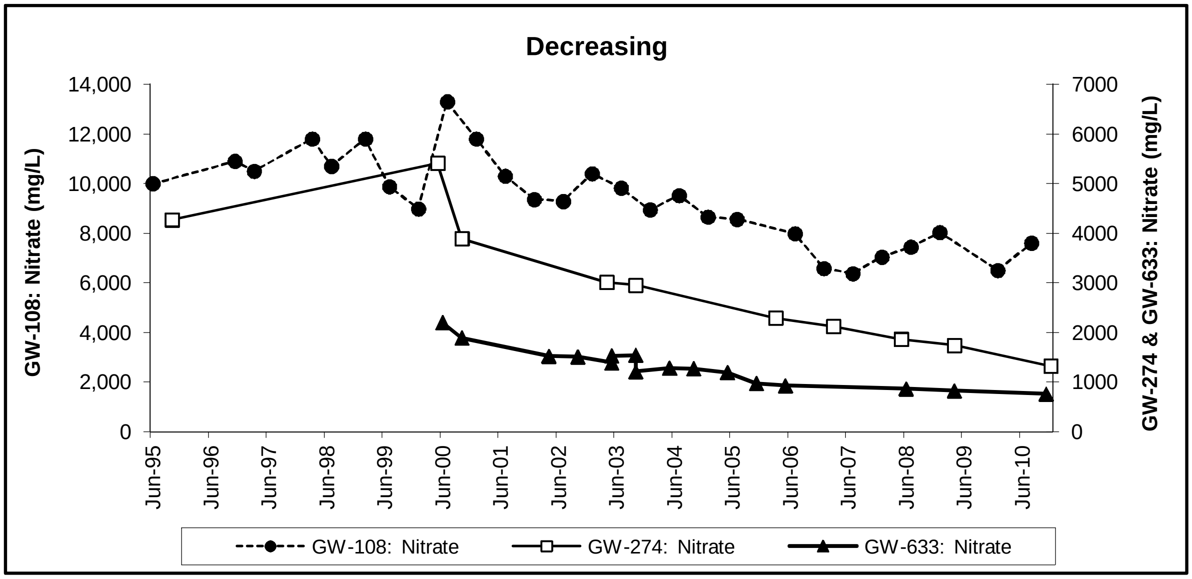


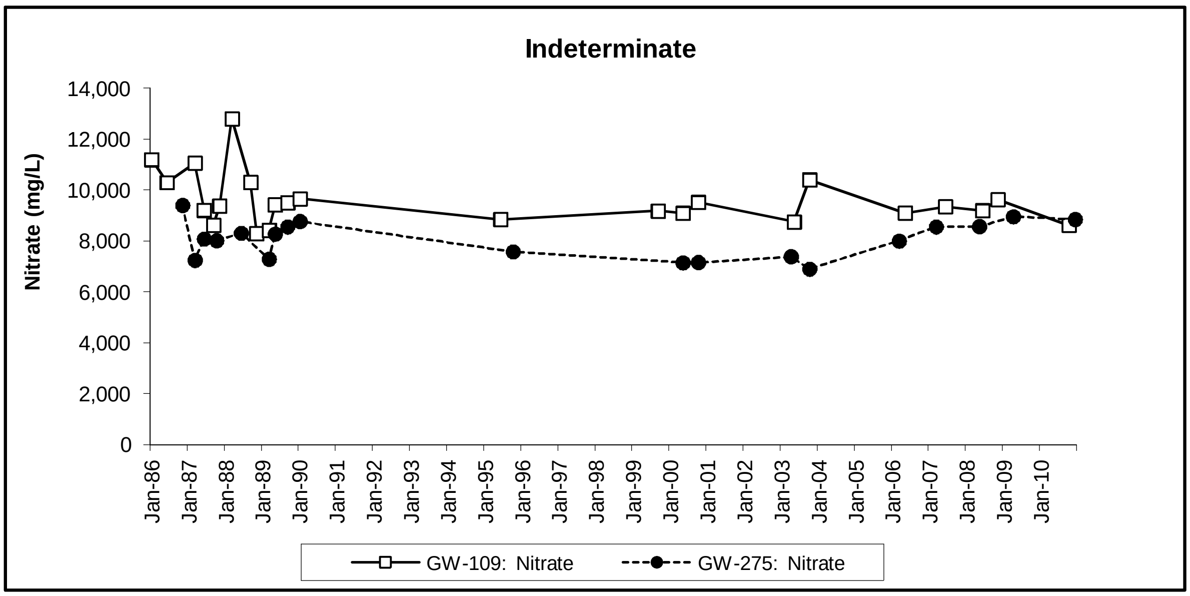


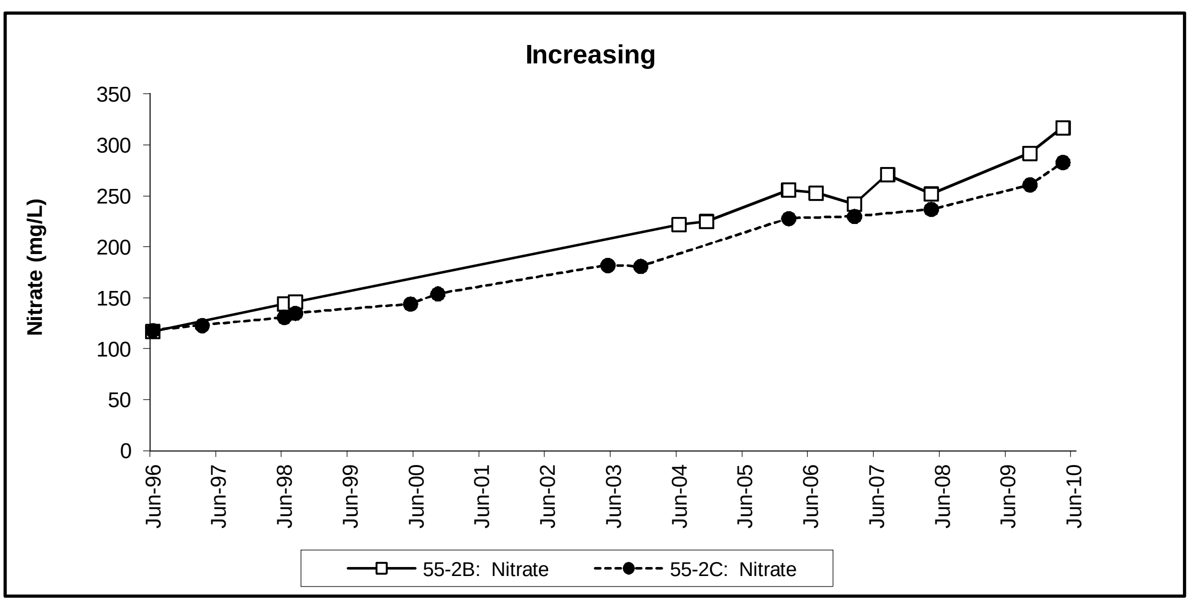


GWMR10 08/18/11

Fig. A.23. Bear Creek Regime CY 2010: gross alpha and/or gross beta activity trends in surveillance monitoring aquifer wells GW-229, GW-706, and GW-738.

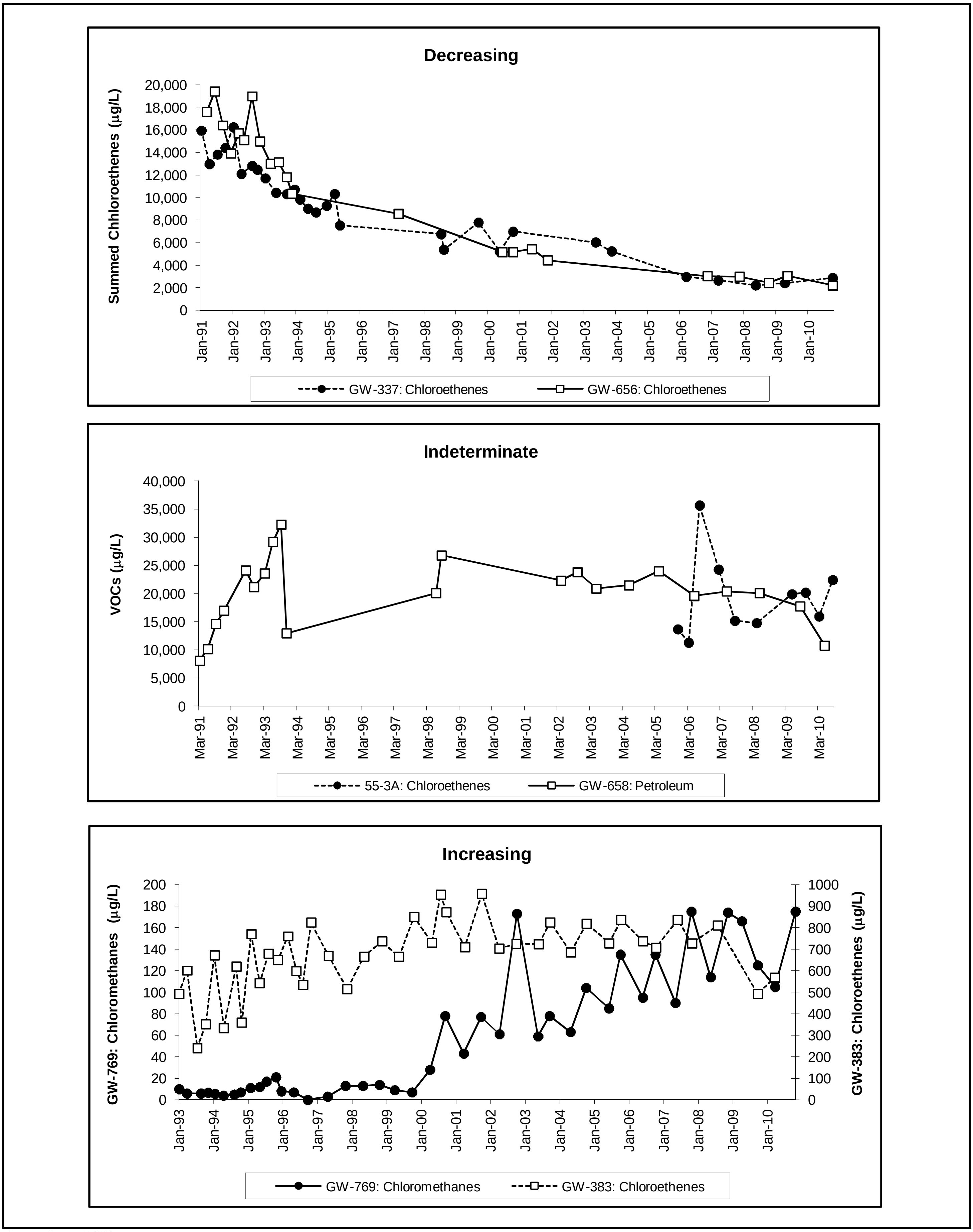






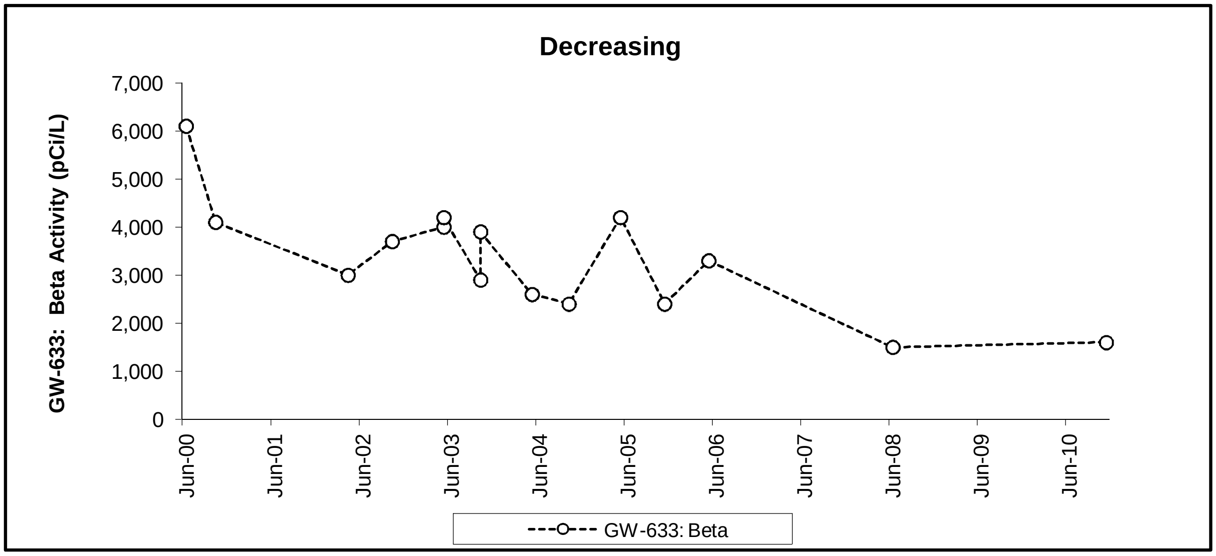
GWMR10 08/18/11

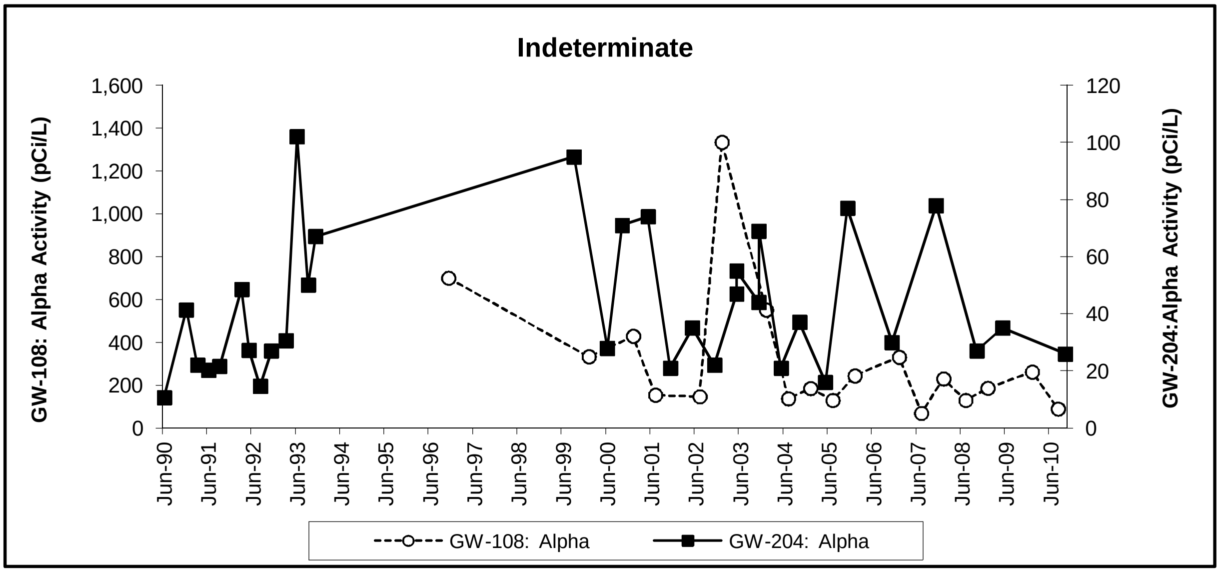
Fig. A.24. East Fork Regime CY 2010: nitrate concentration trends in surveillance monitoring aquitard wells 55-2B, 55-2C, GW-108, GW-109, GW-274, GW-275, and GW-633.

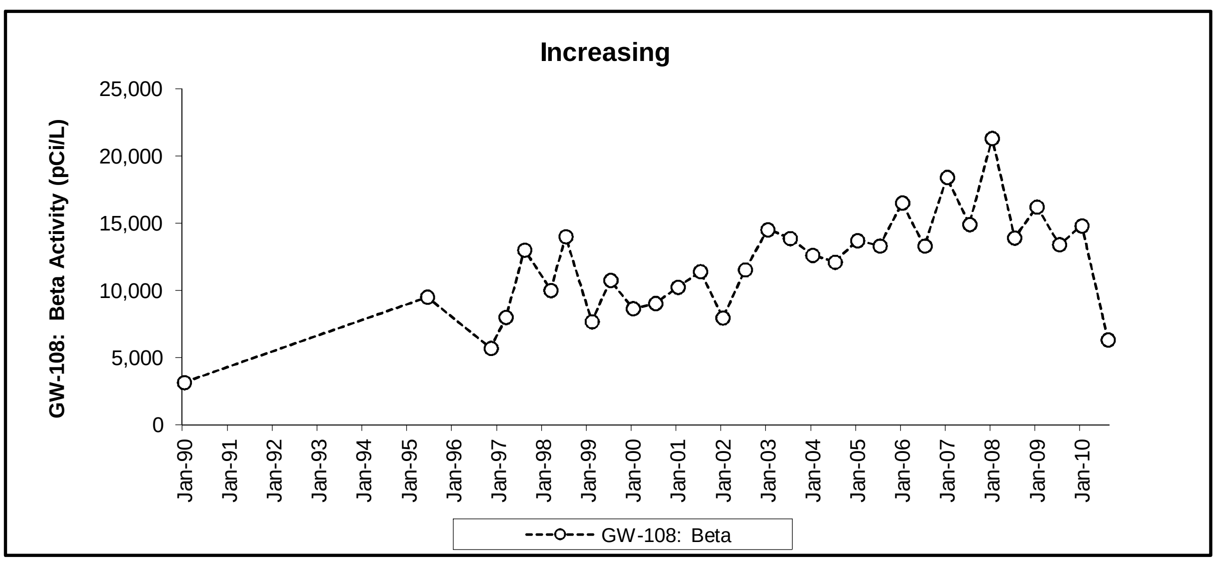


GWMR10 08/23/11

Fig. A.25. East Fork Regime CY 2010: summed VOC concentration trends in surveillance monitoring aquitard wells 55-3A, GW-337, GW-383, GW-656, GW-658, and GW-769.

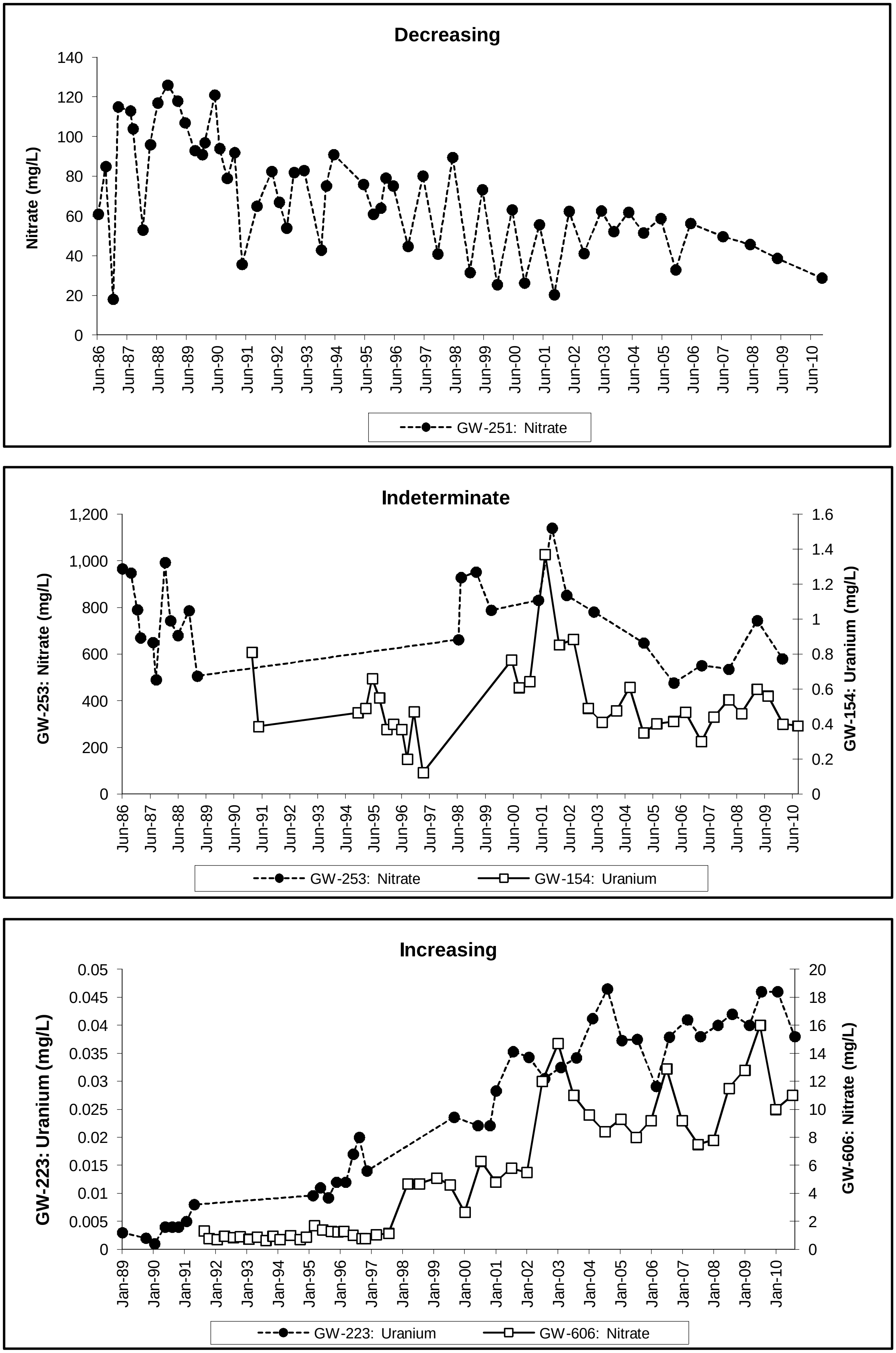






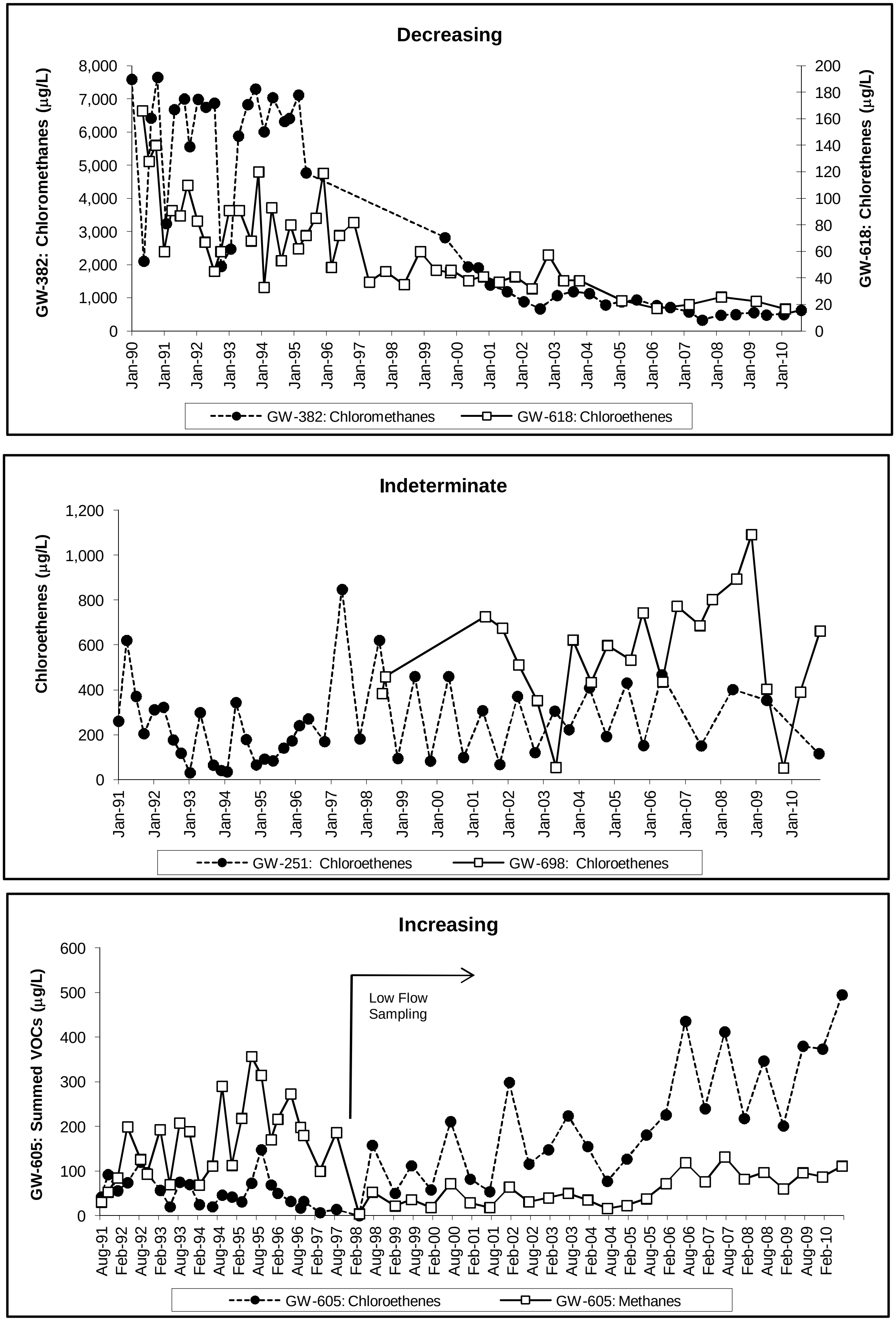
GWMR10 08/25/11

Fig. A.26. East Fork Regime CY 2010: gross alpha and/or gross beta activity trends in surveillance monitoring aquitard wells GW-108, GW-204, and GW-633.



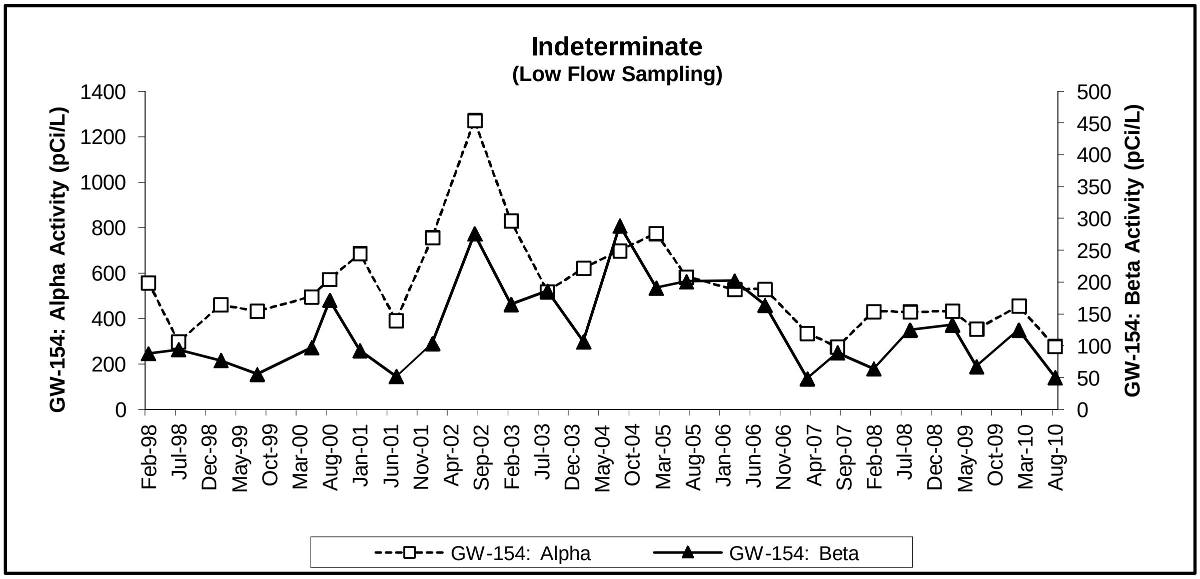
GWMR10 05/20/11

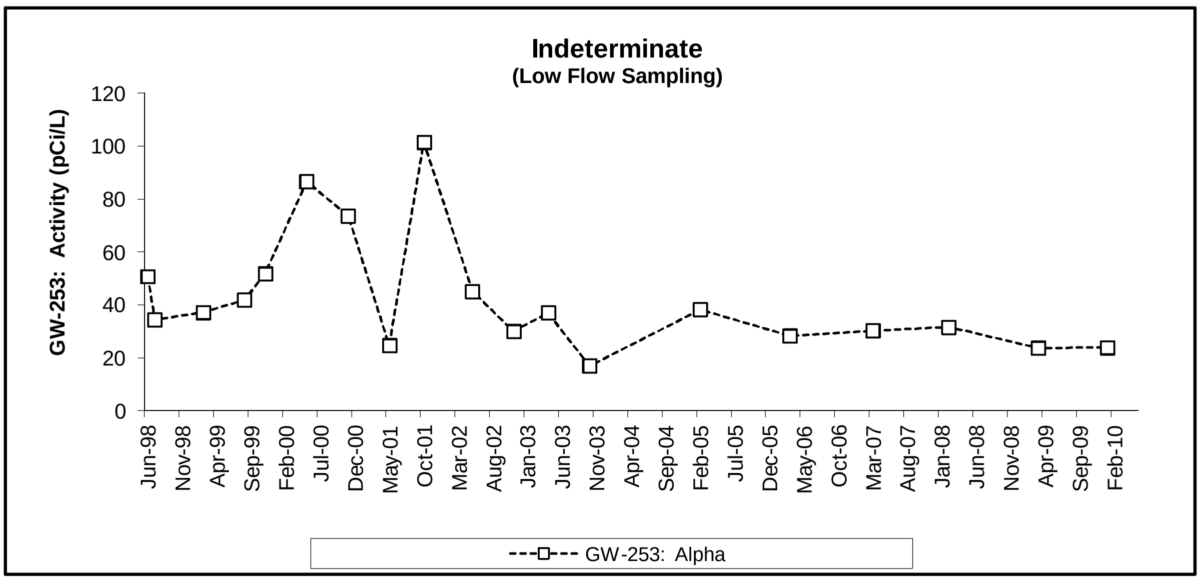
Fig. A.27. East Fork Regime CY 2010: nitrate and/or uranium concentration trends in surveillance monitoring aquifer wells GW-154, GW-223, GW-251, GW-253, and GW-606.

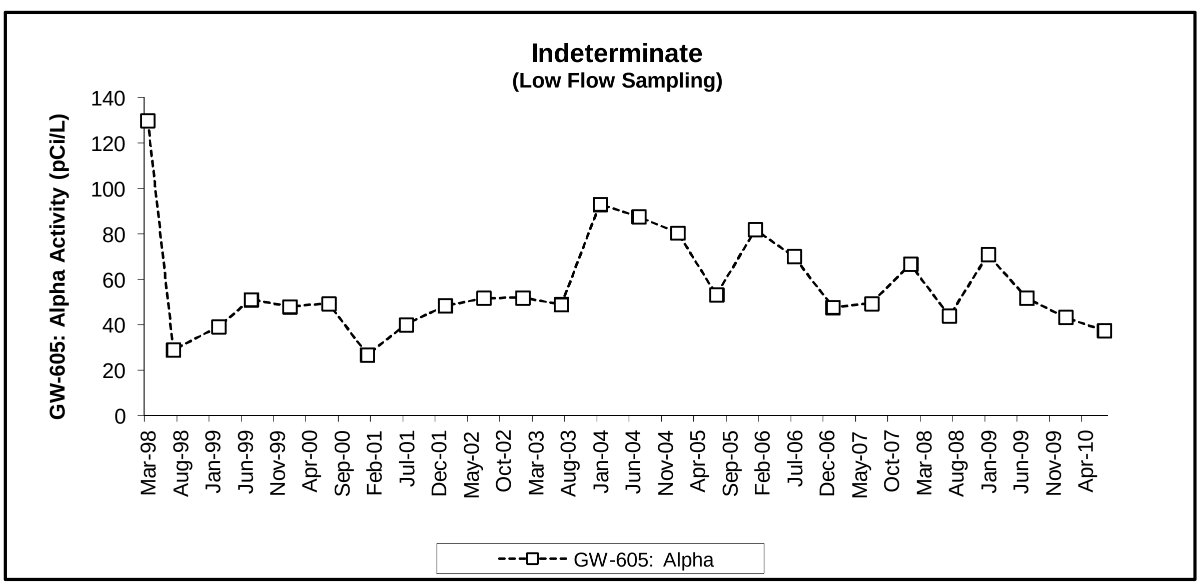


GWMR10 08/25/11

Fig. A.28. East Fork Regime CY 2010: selected VOC concentration trends in surveillance monitoring aquifer wells GW-251, GW-382, GW-605, GW-618, and GW-698.

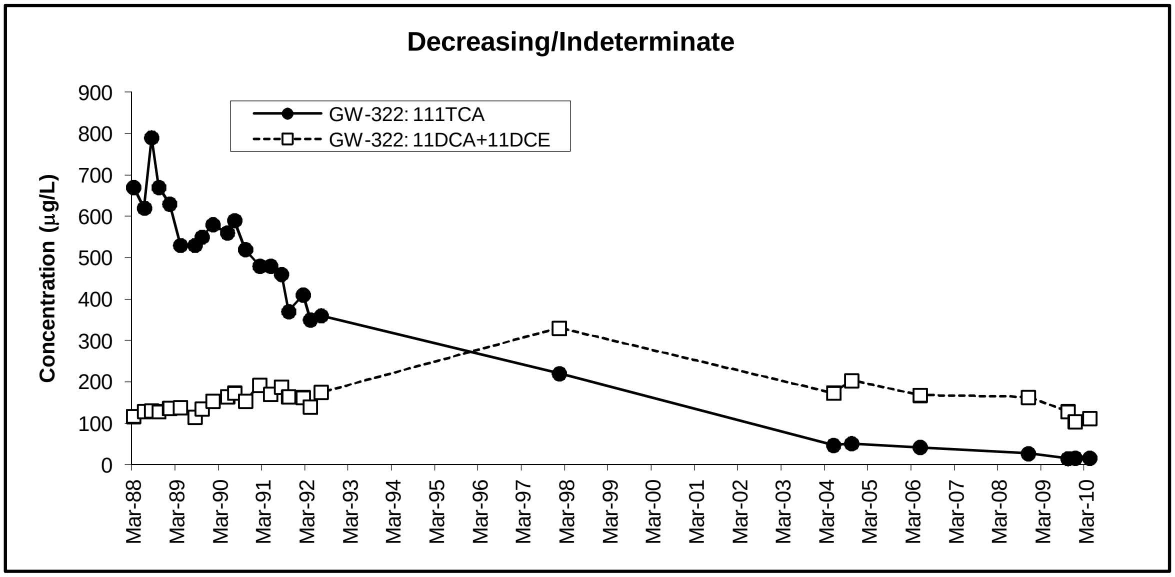


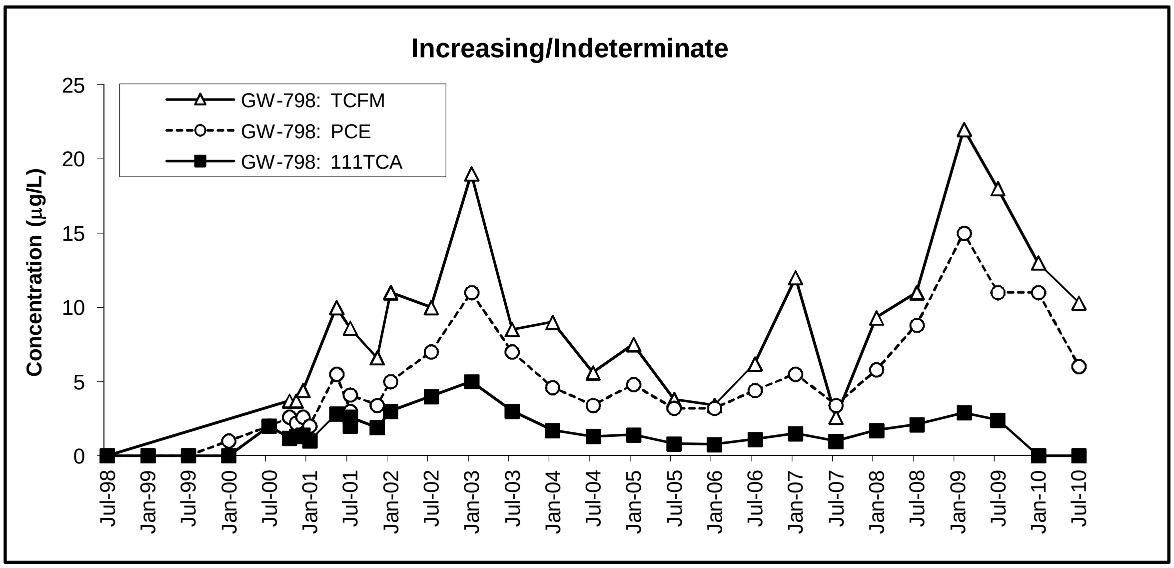


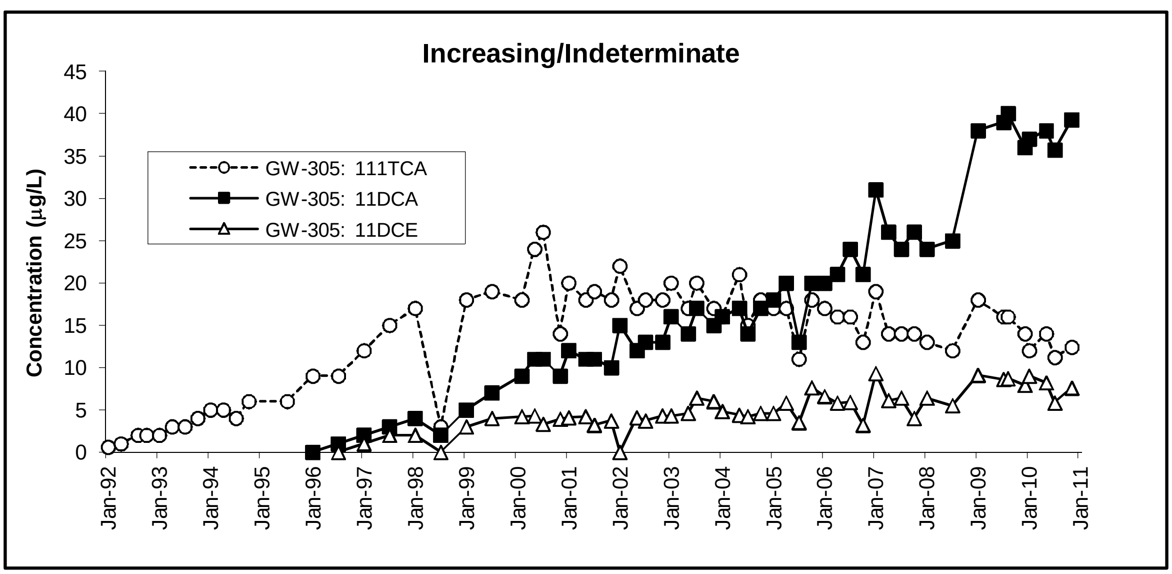


GWMR10 08/26/11

Fig. A.29. East Fork Regime CY 2010: gross alpha and/or gross beta activity trends in surveillance monitoring aquifer wells GW-154, GW-253, and GW-605.

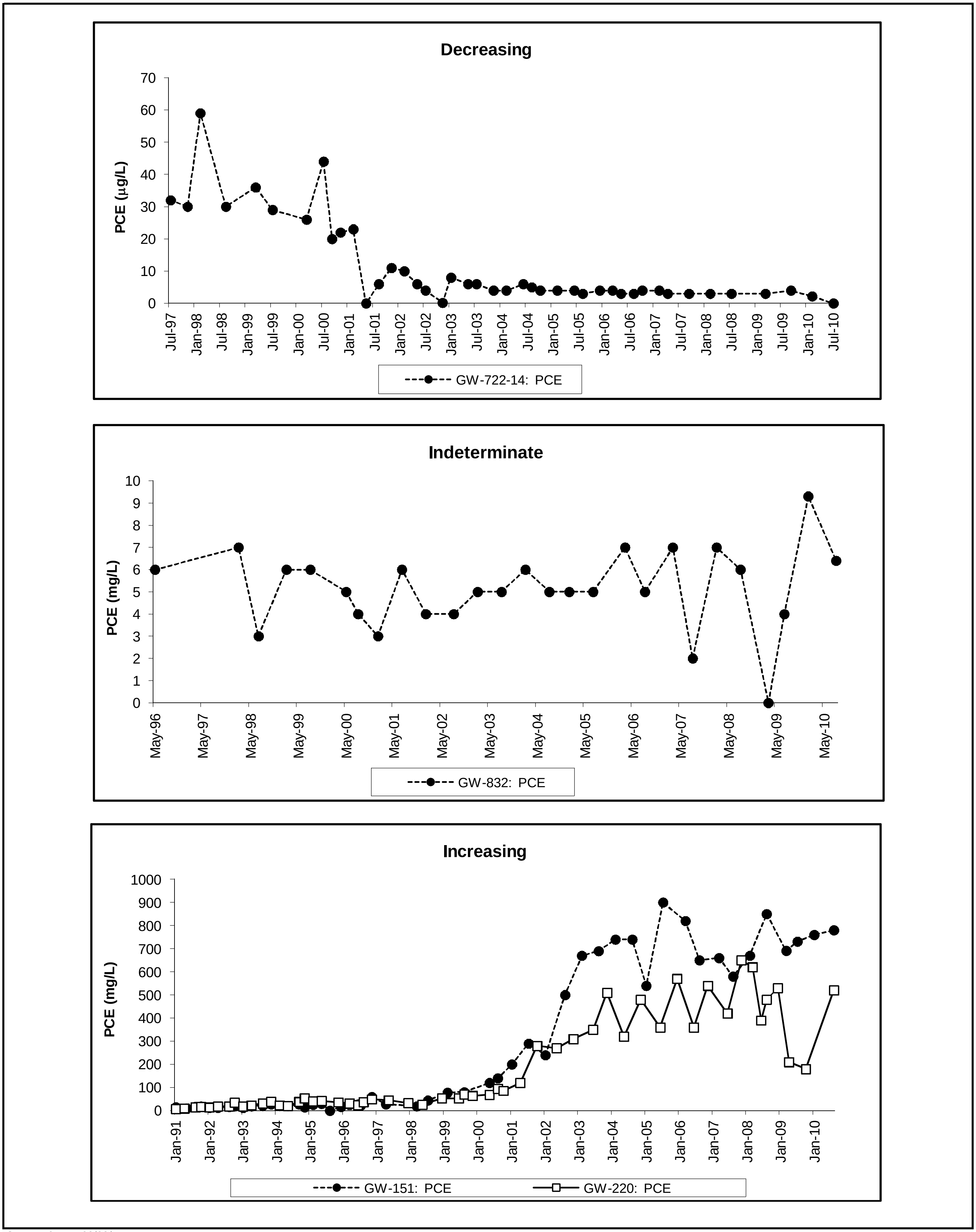






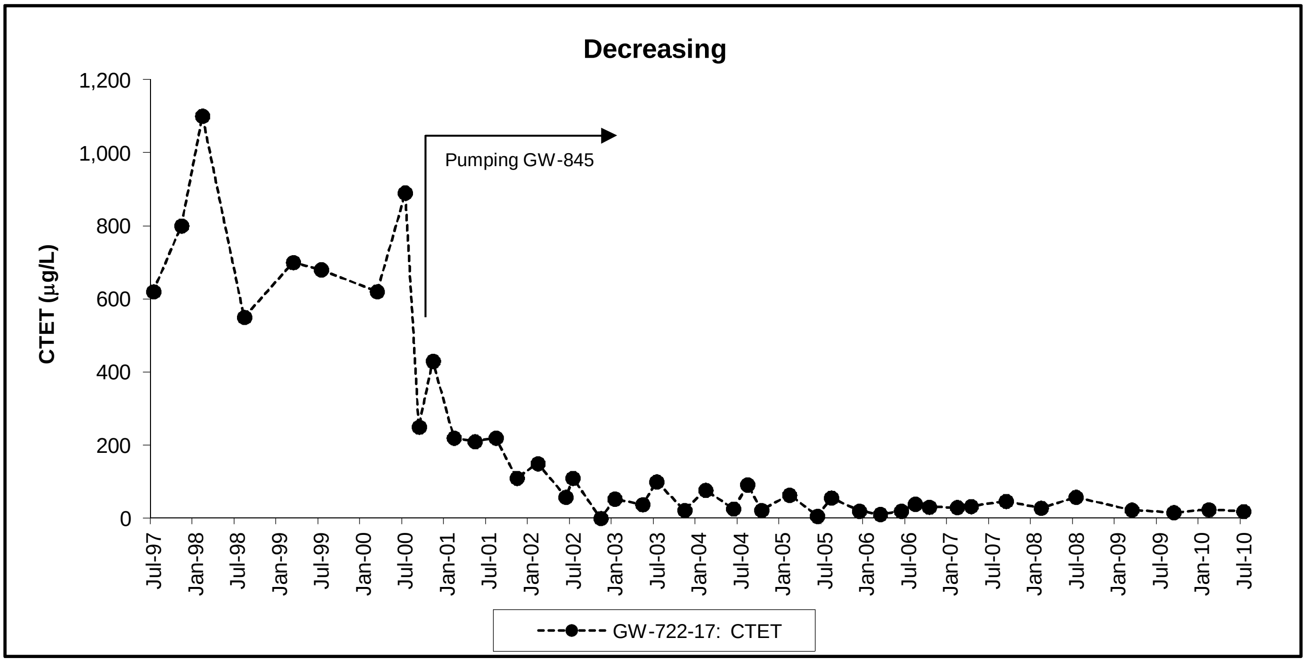
GWMR10 09/08/11

Fig. A.30. Chestnut Ridge Regime CY 2010: VOC trends in surveillance monitoring wells GW-305, GW-322, and GW-798.



GWMR10 09/08/11

Fig. A.31. East Fork Regime CY 2010: PCE concentration trends in exit pathway monitoring wells GW-151, GW-220, GW-722-14, and GW-832.



GWMR10 09/08/11

Fig. A.32. East Fork Regime CY 2010: CTET concentration trend in exit pathway monitoring well GW-722-17.

APPENDIX B

TABLES

Table B.1. Summary of CY 2010 sampling and analysis plan addenda

Addendum No.	Effective Date	Modification to the CY 2010 Sampling and Analysis Plan [1]
2010-01	03/08/10	Adds four new wells to each quarterly monitoring schedule. Wells GW-928, GW-929, GW-930, and GW-931 were installed to replace destroyed wells. Baseline sampling for the Standard Parameter Suite is to be conducted for four quarterly sampling events.
2010-02	01/19/10	Corrects the bottle list for the wells scheduled for sample collection using a passive diffusion bag sampler.
2010-03	05/10/10	Adds analysis for metals by ICP-MS for the sample collected from well GW-724.
2010-04	04/14/10	Removes well 56-8A from sampling schedule for CY 2010 because the well was dry during the past three sampling attempts.
2010-05	06/20/10	Adds sample collection from eight zones of Westbay™ well GW-934 during the third quarter sampling event.
2010-06	10/25/10	Adds sample collection from well GW-058 during the third and fourth quarter sampling events because elevated principal contaminants were noted during CY 2009.
2010-07	11/16/10	Adds sample collection from well GW-220 during the fourth quarter sampling event; accidentally dropped during the first quarter.
2010-08	10/11/10	New bottle lists set up to add gross alpha, gross beta, and technetium-99 to samples collected during the fourth quarter from 11 wells in the East Fork Regime.
2010-09	10/25/10	Adds collection of a confirmatory sample during the fourth quarter sampling event from two surface water stations located north of Pine Ridge because low levels of tetrachloroethene were reported for the third quarter samples.
2010-10	03/25/10	Adds sample collection from well GW-246 during the second quarter event because gross beta activity was higher than expected in the first quarter sample.

Note:
1 Modification to the *Y-12 Groundwater Protection Program Groundwater and Surface Water Sampling and Analysis Plan for Calendar Year 2010* (B&W Y-12 2009a).

Table B.2. CY 2010 groundwater and surface water sampling dates in the Bear Creek Hydrogeologic Regime

BJC [1]									CERCLA ROD (●), Detection (□), and Baseline (○) Monitoring
								RCRA Post-Closure Corrective Action Monitoring	
GWPP [2]							DOE Order Exit Pathway/Perimeter Monitoring		
						DOE Order Surveillance Monitoring			
Sampling Point [3]	Functional Area [4]	CY 2010 Sampling Date [5]							
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter				
GW-006	OLF	02/03/10	.	.	.	x		●	
GW-008	OLF	01/04/10	.	07/21/10	.	x		●	
GW-014	BG	.	.	08/16/10	.	●			
GW-046	BG	01/04/10	.	07/21/10	.	x		●	
GW-058	BG	.	.	08/26/10	10/19/10	●			
GW-065	OLF	02/09/10	.	08/30/10	.	●			
GW-068	BG	.	.	08/23/10	.	●			
GW-071	BG	**02/03/10 D**	.	08/23/10	.	●			
GW-077	BG	01/18/10	.	08/13/10	.	x			●
GW-078	BG	01/18/10	.	08/13/10	.	x			●
GW-079	BG	01/18/10	.	08/06/10	.	x			●
GW-080	BG	**01/18/10 D**	.	**08/06/10 D**	.	x			●
GW-082	BG	01/27/10	.	.	.	●			
GW-085	OLF	.	.	08/30/10	.	●			
GW-098	OLF	.	.	08/30/10	.	●			
GW-100	S3	.	.	09/13/10	.	●			
GW-101	S3	.	.	09/16/10	.	●			
GW-225	OLF	.	.	08/30/10	.	●			
GW-229	OLF	.	.	09/07/10	.	●			
GW-246	S3	02/16/10	04/20/10	.	.	●			
GW-276	S3	01/04/10	04/06/10	07/15/10	.	x		●	
GW-289	BG	01/28/10	.	.	.	●			
GW-291	BG	.	.	**08/24/10 D**	.	●			
GW-307	RS	.	.	09/20/10	.	●			
GW-310	RS	.	.	09/21/10	.	●			
GW-312	RS	.	.	09/21/10	.	●			
GW-315	SPI	.	.	08/16/10	.	●			
GW-363*	EMWMF	02/08/10	04/20/10	08/16/10		x			□
GW-363	EMWMF	02/09/10	04/21/10	08/17/10		x			□
GW-365	OLF	.	.	09/07/10	.	●			
GW-526	S3	.	.	09/22/10	.	●			
GW-537	OLF	02/08/10	.	.	.	●			
GW-601	OLF	.	.	09/07/10	.	●			
GW-615	S3	.	.	09/15/10	.	●			
GW-616	S3	02/17/10	.	.	.	●			
GW-623	BG	.	.	08/26/10	.	●			
GW-626	BG	02/02/10	.	.	.	●			

Table B.2 (continued)

BJC [1] / GWPP [2]		CY 2010 Sampling Date [5]				DOE Order Surveillance Monitoring	DOE Order Exit Pathway/Perimeter Monitoring	RCRA Post-Closure Corrective Action Monitoring	CERCLA ROD (●), Detection (□), and Baseline (○) Monitoring
Sampling Point [3]	**Functional Area [4]**	**1st Quarter**	**2nd Quarter**	**3rd Quarter**	**4th Quarter**				
GW-627	BG	02/03/10	.	08/26/10	.	●			
GW-639*	EMWMF	02/08/10	04/19/10	08/16/10		x			□
GW-639	EMWMF	02/09/10	04/20/10	08/17/10		x			□
GW-648	RS	02/03/10	.	08/16/10	.	●			
GW-653	BG	.	.	08/16/10	.	●			
GW-683	EXP-A	01/18/10	.	08/13/10	.	x			●
GW-684	EXP-A	01/18/10	.	08/06/10	.	x			●
GW-703	EXP-B	.	.	**09/08/10 D**	.	●			
GW-704	EXP-B	01/18/10	.	08/06/10	.	x			●
GW-706	EXP-B	01/18/10	.	08/06/10	.	x			●
GW-712	EXP-W	01/05/10	.	07/21/10	.		x	●	
GW-713	EXP-W	01/04/10	.	07/19/10	.		x	●	
GW-714	EXP-W	01/05/10	.	07/19/10	.		x	●	
GW-724	EXP-C	.	.	09/09/10	.	●			
GW-725	EXP-C	.	.	09/09/10	.	●			
GW-738	EXP-C	.	.	09/09/10	.	●			
GW-740	EXP-C	.	.	09/13/10	.	●			
GW-829	OLF	02/09/10	.	.	.	●			
GW-916*	EMWMF	02/17/10	04/22/10	08/11/10		x			□
GW-916	EMWMF	.	.	08/12/10		x			□
GW-917	EMWMF	**02/16/10 D**	04/14/10	08/09/10		x			□
GW-918	EMWMF	02/10/10	04/14/10	08/11/10		x			□
GW-920	EMWMF	02/08/10	**04/13/10 D**	08/16/10		x			□
GW-921	EMWMF	02/09/10	04/19/10	08/10/10		x			□
GW-922	EMWMF	02/08/10	04/12/10	**08/10/10 D**		x			□
GW-923*	EMWMF	02/09/10	04/14/10	08/10/10		x			□
GW-923	EMWMF	.	04/15/10	08/12/10		x			□
GW-923	EMWMF	02/10/10	04/19/10	08/10/10		x			□
GW-924	EMWMF	02/09/10	04/20/10	08/10/10		x			□
GW-925*	EMWMF	02/10/10	04/21/10	08/11/10		x			□
GW-925	EMWMF	02/10/10	04/21/10	08/10/10		x			□
GW-926	EMWMF	.	.	08/11/10		x			□
GW-927	EMWMF	02/16/10	04/14/10	08/09/10		x			□
GW-961	EMWMF	02/17/10	04/22/10	08/11/10		x			□

Table B.2 (continued)

BJC[1] / GWPP[2] Sampling Point[3]	Functional Area[4]	CY 2010 Sampling Date[5] 1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	DOE Order Surveillance Monitoring	DOE Order Exit Pathway/Perimeter Monitoring	RCRA Post-Closure Corrective Action Monitoring	CERCLA ROD (●), Detection (□), and Baseline (○) Monitoring
BCK-03.30	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-04.55	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-07.87	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-09.20	EXP-SW	02/17/10	.	07/15/10	.		x		●
BCK-09.20	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-09.40	EXP-SW	01/20/10	.	.	.		●		
BCK-11.54	EXP-SW	02/17/10	.	07/15/10	.		x		●
BCK-11.54	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-11.84	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-11.97	EXP-SW	01/19/10	.	.	.		●		
BCK-12.34	EXP-SW	02/17/10	.	07/15/10	.		x		●
BCK-12.34	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
BCK-12.34	EXP-SW	03/15/10	.	.	.		x		●
EMWNT-03A	EXP-SW	02/08/10	04/21/10	08/11/10			x		□
EMWNT-05	EXP-SW	02/08/10	04/12/10	08/12/10			x		□
EMW-VWEIR	EXP-SW	02/08/10	04/12/10	08/09/10			x		□
EMW-VWUND	EXP-SW	02/08/10	04/12/10	08/09/10			x		□
NT-01	EXP-SW	**01/13/10 D**	**04/20/10 D**	**07/14/10 D**	**10/01/10 D**		●		
NT-01	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
NT-03	EXP-SW	02/17/10	.	07/15/10	.		x		●
NT-03	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
NT-04	EXP-SW	02/08/10	04/12/10	08/09/10			x		□
NT-07	EXP-SW	02/03/10	.	**07/21/10 D**	.		x		○
NT-08	EXP-SW	02/17/10	.	07/15/10	.		x		○
NT-08	EXP-SW	**03/09/10 D**	**06/28/10 D**	**08/30/10 D**	.		x		●
S07 (NT-02)	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
SS-4	EXP-SW	**01/20/10 D**	.	.	.		●		
SS-4	EXP-SW	02/17/10	.	07/15/10	.		x		●
SS-5	EXP-SW	02/17/10	.	07/15/10	.		x		●
SS-5	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
SS-6	EXP-SW	01/06/10	.	07/22/10	.		x	●	
SS-6.6	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
SS-7	EXP-SW	03/09/10	06/28/10	08/30/10	.		x		●
SS-8	EXP-SW	**03/09/10 D**	**06/28/10 D**	**08/30/10 D**	.		x		●

Table B.2 (continued)

__Notes__:

1 Groundwater and surface water sampling performed for monitoring programs managed by Bechtel Jacobs Company LLC (BJC).

2 Groundwater and surface water sampling performed for the Y-12 Groundwater Protection Program (GWPP), managed by Babcock & Wilcox Technical Services Y-12, LLC.

x - Denotes the DOE Order monitoring category (surveillance or exit pathway/perimeter) fulfilled by samples collected under programs managed by BJC. Although the CY 2010 samples were collected for various monitoring purposes, all of the data meet DOE Order monitoring requirements. Surveillance and exit pathway/perimeter monitoring data evaluations are provided in Section 4.

3 BCK - Bear Creek Kilometer
EMW-VWUND - EMW-VWUNDRDRAIN; outfall for an underdrain installed to lower the water table and relieve hydrostatic pressure beneath the EMWMF liners.
GW - Groundwater Monitoring Well
NT - Northern Tributary (to Bear Creek)
SS - Spring sampling location (south side of Bear Creek)

4 BG - Bear Creek Burial Grounds Waste Management Area
EMWMF - Environmental Management Waste Management Facility
EXP-A - Exit Pathway (Maynardville Limestone) Picket A
EXP-B - Exit Pathway Picket B
EXP-C - Exit Pathway Picket C
EXP-SW - Exit Pathway (Bear Creek) Surface Water
EXP-W - Exit Pathway Picket W
OLF - Oil Landfarm Waste Management Area
RS - Rust Spoil Area
S3 - S-3 Site
SPI - Spoil Area I

5 **.** - Not sampled
D - Duplicate sample collected on specified date
* - Field measurements obtained on the initial date shown, with laboratory samples collected on subsequent days; dependent upon groundwater volume in well after purging.

Table B.3. CY 2010 groundwater and surface water sampling dates in the Upper East Fork Poplar Creek Hydrogeologic Regime

BJC[1]									
GWPP[2]									
Sampling Point[3]	Functional Area[4]	CY 2010 Sampling Date[5]				DOE Order Surveillance Monitoring	DOE Order Exit Pathway/Perimeter Monitoring	RCRA Post-Closure Corrective Action Monitoring	CERCLA ROD Monitoring
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter				
55-2B	GRID B3	.	04/19/10	.	.	●			
55-2C	GRID B3	.	**04/19/10 D**	.	.	●			
55-3A	B9201-5	03/01/10	.	08/05/10	.	●			
55-3B	B9201-5	03/01/10	.	08/05/10	.	●			
55-3C	B9201-5	03/01/10	.	08/05/10	.	●			
56-1A	Y12	03/04/10	.	.	.	●			
56-1C	Y12	03/04/10	.	.	.	●			
56-2A	GRID C3	02/16/10	.	.	.	●			
56-2B	GRID C3	02/16/10	.	.	.	●			
56-2C	GRID C3	02/16/10	.	.	.	●			
56-3A	Y12	03/03/10	.	.	.	●			
56-3B	Y12	03/03/10	.	.	.	●			
56-3C	Y12	03/03/10	.	.	.	●			
56-4A	Y12	03/01/10	.	.	.	●			
56-6A	Y12	.	.	.	10/18/10	●			
60-1A	Y12	.	04/13/10	.	.	●			
GW-106	S3	.	.	.	10/19/10	●			
GW-108	S3	01/06/10	.	08/04/10	.	x		●	
GW-109	S3	.	.	.	10/21/10	●			
GW-148	NHP	**03/08/10 D**	.	.	.	●			
GW-151	NHP	01/28/10	.	08/16/10	.		x		●
GW-153	NHP	.	04/14/10	.	.	●			
GW-154	NHP	02/02/10	.	08/18/10	.	x			●
GW-169	EXP-UV	01/27/10	.	08/19/10	.	x			●
GW-170	EXP-UV	**01/27/10 D**	.	**08/19/10 D**	.	x			●
GW-171	EXP-UV	.	.	08/04/10	.	x			●
GW-172	EXP-UV	.	.	08/04/10	.	x			●
GW-193	T2331	01/06/10	.	08/12/10	.	x		●	
GW-204	T0134	.	.	.	10/28/10	●			
GW-220	NHP	.	.	08/03/10	.		●		
GW-223	NHP	01/28/10	.	08/17/10	.	x			●
GW-230	EXP-UV	.	.	08/04/10	.	x			●
GW-240	NHP	.	04/14/10	.	.	●			
GW-251	S2	.	.	.	**10/20/10 D**	●			
GW-253	S2	01/27/10	.	.	.	x			●
GW-269	SY	.	.	.	12/09/10	●			
GW-274	SY	.	.	.	12/09/10	●			
GW-275	SY	.	.	.	12/09/10	●			
GW-281	FF	.	05/24/10	.	.	x			●

Table B.3 (continued)

BJC[1]									CERCLA ROD Monitoring
								RCRA Post-Closure Corrective Action Monitoring	
GWPP[2]							DOE Order Exit Pathway/Perimeter Monitoring		
						DOE Order Surveillance Monitoring			
Sampling Point[3]	Functional Area[4]	CY 2010 Sampling Date[5] 1st Quarter	2nd Quarter	3rd Quarter	4th Quarter				
GW-332	WCPA	.	.	.	11/16/10	●			
GW-337	WCPA	.	.	.	10/26/10	●			
GW-380	NHP	01/28/10	.	08/18/10	.	x			●
GW-381	NHP	.	04/14/10	.	.	●			
GW-382	NHP	02/03/10	.	08/18/10	.	x			●
GW-383	NHP	.	04/14/10	.	.	●			
GW-605	EXP-I	**01/05/10 D**	.	**07/21/10 D**	.	x		●	
GW-606	EXP-I	01/05/10	.	07/21/10	.	x		●	
GW-618	EXP-E	02/22/10	.	.	.	x			●
GW-619	FTF	.	**04/15/10 D**	.	.	●			
GW-620	FTF	.	04/15/10	.	.	●			
GW-633	RG	.	.	.	11/22/10	●			
GW-656	T0134	.	.	.	10/28/10	●			
GW-658	FF	.	05/24/10	.	.	x			●
GW-686	CPT	.	.	.	11/03/10	●			
GW-690	CPT	.	.	.	11/03/10	●			
GW-691	CPT	.	04/14/10	.	11/02/10	●			
GW-692	CPT	.	.	.	**11/02/10 D**	●			
GW-698	B8110	.	04/13/10	.	11/03/10	●			
GW-700	B8110	**02/16/10 D**	.	.	.	●			
GW-722-14	EXP-J	02/18/10	.	.	.		x		●
GW-722-14	EXP-J	.	.	07/29/10	.		●		
GW-722-17	EXP-J	02/18/10	.	.	.		x		●
GW-722-17	EXP-J	.	.	07/29/10	.		●		
GW-722-20	EXP-J	02/18/10	.	.	.		x		●
GW-722-20	EXP-J	.	.	08/02/10	.		●		
GW-722-22	EXP-J	02/18/10	.	.	.		x		●
GW-722-22	EXP-J	.	.	08/02/10	.		●		
GW-722-33	EXP-J	02/18/10	.	.	.		x		●
GW-722-33	EXP-J	.	.	08/04/10	.		●		
GW-733	EXP-J	01/05/10	.	07/21/10	.		x	●	
GW-744	GRID K1	.	.	08/03/10	.		●		
GW-747	GRID K2	.	.	08/04/10	.		●		
GW-748	GRID K2	.	.	**08/10/10 D**	.		●		
GW-762	GRID J3	**02/02/10 D**	.	**08/19/10 D**	.	x			●
GW-763	GRID J3	.	04/14/10	.	.	●			
GW-769	GRID G3	.	04/14/10	.	11/16/10	●			
GW-770	GRID G3	.	04/14/10	.	.	●			
GW-781	GRID E3	03/10/10	.	.	.	●			

Table B.3 (continued)

BJC [1] / GWPP [2]		CY 2010 Sampling Date [5]				DOE Order Surveillance Monitoring	DOE Order Exit Pathway/Perimeter Monitoring	RCRA Post-Closure Corrective Action Monitoring	CERCLA ROD Monitoring
Sampling Point [3]	**Functional Area [4]**	**1st Quarter**	**2nd Quarter**	**3rd Quarter**	**4th Quarter**				
GW-782	GRID E3	03/10/10	.	.	.	●			
GW-783	GRID E3	03/03/10	.	.	.	●			
GW-791	GRID D2	02/16/10	.	.	.	●			
GW-791	GRID D2	02/17/10	.	.	.	●			
GW-802	FF	.	05/24/10	.	.	x			●
GW-816	EXP-SR	02/24/10	.	.	.		●		
GW-820	B9201-2	.	.	.	11/16/10	●			
GW-832	NHP	01/28/10	.	08/16/10	.		x		●
GW-928	GRID C1	03/08/10	04/21/10	08/18/10	11/09/10	●			
GW-929	GRID C1	03/08/10	04/21/10	08/18/10	11/10/10	●			
GW-930	GRID D1	03/09/10	04/22/10	08/19/10	11/09/10	●			
GW-931	GRID D1	03/09/10	04/22/10	08/19/10	11/08/10	●			
GW-934-01	NHP	.	.	08/10/10	.	●			
GW-934-02	NHP	.	.	08/11/10	.	●			
GW-934-04	NHP	.	.	08/11/10	.	●			
GW-934-05	NHP	.	.	08/11/10	.	●			
GW-934-07	NHP	.	.	08/11/10	.	●			
GW-934-09	NHP	.	.	08/12/10	.	●			
GW-934-11	NHP	.	.	08/17/10	.	●			
GW-934-12	NHP	.	.	08/16/10	.	●			
GHK2.51WSW	EXP-SW	.	.	**08/09/10 D**	.		●		
NPR12.0SW	EXP-SW	.	.	08/09/10	11/04/10		●		
NPR23.0SW	EXP-SW	.	.	08/09/10	11/04/10		●		
SCR7.1SP	EXP-SW	02/17/10	.	.	.		x		●
SCR7.8SP	EXP-SW	02/17/10	.	.	.		x		●
200A6*	EXP-SW	01/21/10	.	07/13/10	.		x		●
200A6	EXP-SW	03/11/10	.	08/04/10	.		x		●
STATION 8*	EXP-SW	01/21/10	.	07/13/10	.		x		●
STATION 8	EXP-SW	03/11/10	.	08/04/10	.		x		●

Notes:

1 Groundwater and surface water sampling performed for monitoring programs managed by Bechtel Jacobs Company LLC (BJC).

Table B.3 (continued)

Notes: (continued)

2	Groundwater and surface water sampling performed for the Y-12 Groundwater Protection Program (GWPP), managed by Babcock & Wilcox Technical Services Y-12, LLC.		
	x	-	Denotes the DOE Order monitoring category (surveillance or exit pathway/perimeter) fulfilled by samples collected under programs managed by BJC. Although the CY 2010 samples were collected for various monitoring purposes, all of the data meet DOE Order monitoring requirements. Surveillance and exit pathway/perimeter monitoring data evaluations are provided in Section 4.
3	GHK	-	Gum Hollow Branch Kilometer (surface water sampling station)
	GW	-	Groundwater Monitoring Well (also locations beginning with number 5 or 6)
	NPR	-	North of Pine Ridge near the Scarboro Community (surface water sampling station)
	200A6	-	Storm drain outfall (surface water sampling station)
	SCR	-	Spring sampling location in Union Valley (prefix)
	SP	-	Spring sampling location (prefix or suffix)
	STATION 8	-	Surface water sampling location in Upper East Fork Poplar Creek, central Y-12
	STATION 17	-	Surface water sampling location in Upper East Fork Poplar Creek, eastern Y-12
	SW	-	Surface water sampling location (suffix)
4	B8110	-	Building 81-10
	B9201-2	-	Building 9201-2
	B9201-5	-	Building 9201-5
	CPT	-	Coal Pile Trench
	EXP-E	-	Exit Pathway Picket E
	EXP-I	-	Exit Pathway Picket I
	EXP-J	-	Exit Pathway Picket J
	EXP-SR	-	Along Scarboro Road in the gap through Pine Ridge
	EXP-SW	-	Surface water or spring sampling station
	EXP-UV	-	East of the Oak Ridge Reservation boundary in Union Valley
	FF	-	Fuel Facility (Building 9754-2)
	GRID	-	Comprehensive Groundwater Monitoring Plan Grid Location
	NHP	-	New Hope Pond
	RG	-	Rust Garage Area
	S2	-	S-2 Site
	S3	-	S-3 Site
	SY	-	Y-12 Salvage Yard
	T0134	-	Tank 0134-U
	T2331	-	Tank 2331-U
	UOV	-	Uranium Oxide Vault
	WCPA	-	Waste Coolant Processing Area
	Y12	-	Y-12 Complex
5	**.**	-	Not sampled.
	D	-	Duplicate sample collected on specified date (shown in bold typeface).
	*	-	Two sets of surface water samples collected; a stormflow sample on the first date shown and a base flow sample collected later during the first and third quarters.

Table B.4. CY 2010 groundwater and surface water sampling dates in the Chestnut Ridge Hydrogeologic Regime

BJC[1] / GWPP[2]										
Sampling Point[3]	Functional Area[4]	CY 2010 Sampling Date[5] 1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	DOE Order Surveillance Monitoring	DOE Order Exit Pathway/Perimeter Monitoring	CERCLA ROD (●) and Baseline (○) Monitoring	RCRA Post-Closure Detection (●) and Corrective Action (○) Monitoring	Solid Waste Disposal Facility Detection (●) and Assessment (○) Monitoring
1090	UNCS	01/27/10	.	08/25/10	.	x		●		
GW-141	LIV	01/14/10	.	07/28/10	.	x				●
GW-143	KHQ	.	.	07/15/10	.	x			●	
GW-144	KHQ	.	.	07/15/10	.	x			●	
GW-145	KHQ	.	.	08/24/10	.	x			●	
GW-156	CRSDB	.	.	**07/16/10 D**	.	x			●	
GW-159	CRSDB	.	.	07/16/10	.	x			●	
GW-161	ECRWP	01/06/10	.	07/22/10	.	x			●	
GW-177	CRSP	01/06/10	.	07/26/10	.	x			○	
GW-203	UNCS	02/03/10	.	08/24/10	.	x		●		
GW-205	UNCS	01/07/10	.	08/02/10	.	x				○
GW-205	UNCS	02/03/10	.	08/24/10	.	x		●		
GW-217	LIV	01/07/10	.	07/29/10	.	x				○
GW-221	UNCS	02/03/10	.	08/24/10	.	x		●		
GW-231	KHQ	.	.	**07/13/10 D**	.	x			●	
GW-294	ECRWP	**01/06/10 D**	.	**07/23/10 D**	.	x			●	
GW-296	ECRWP	01/06/10	.	07/23/10	.	x			●	
GW-298	ECRWP	01/07/10	.	07/22/10	.	x			●	
GW-301	CRBAWP	**01/05/10 D**	.	**07/26/10 D**	.	x			○	
GW-305	LIV	01/07/10	05/12/10	07/26/10	11/02/10	x				○
GW-322	CRSP	.	**04/21/10 D**	.	.	●				
GW-514	FCAP	.	04/07/10	.	.	●				
GW-521	LIV	01/07/10	.	07/26/10	.	x				○
GW-522	LIV	**01/07/10 D**	.	**07/26/10 D**	.	x				○
GW-540	CDLVI	01/11/10	.	07/28/10	.	x				●
GW-557	LV	01/12/10	.	07/27/10	.	x				●
GW-560	CDLVII	01/11/10	.	08/03/10	.	x				●
GW-562	CDLVII	01/11/10	.	08/03/10	.	x				●
GW-564	CDLVII	**01/11/10 D**	.	**08/02/10 D**	.	x				●
GW-608	CRSP	.	04/12/10	.	.	●				
GW-609	CRSP	.	04/12/10	.	.	●				
GW-709	LII	01/12/10	.	07/28/10	.	x				●
GW-731	CRSDB	.	.	08/18/10	.	x			●	
GW-732	CRSDB	.	.	08/18/10	.	x			●	
GW-757	LII	01/11/10	.	07/28/10	.	x				●
GW-796	LV/CDLVII	01/11/10	.	07/28/10	.	x				●

Table B.4 (continued)

Sampling Point[3]	Functional Area[4]	CY 2010 Sampling Date[5]: 1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	GWPP[2]: DOE Order Surveillance Monitoring	GWPP[2]: DOE Order Exit Pathway/Perimeter Monitoring	BJC[1]: CERCLA ROD (●) and Baseline (○) Monitoring	BJC[1]: RCRA Post-Closure Detection (●) and Corrective Action (○) Monitoring	BJC[1]: Solid Waste Disposal Facility Detection (●) and Assessment (○) Monitoring
GW-797	LV	01/07/10	.	07/27/10	.	**x**				●
GW-798	CDLVII	01/12/10	.	07/29/10	.	**x**				●
GW-799	LV	01/11/10	.	07/27/10	.	**x**				●
GW-801	LV	01/11/10	.	07/27/10	.	**x**				●
GW-831	FCAP	01/06/10	.	07/27/10	.	**x**			○	
MCK 1.4	EXP-SW	03/01/10	.	09/01/10	.		**x**	●		
MCK 2.0	EXP-SW	03/01/10	.	09/01/10	.		**x**	●		
MCK 2.05	EXP-SW	**03/01/10 D**	.	**09/01/10 D**	.		**x**	●		
S17	EXP-SW	.	04/06/10	.	.		●			
SCR1.25SP	EXP-SW	03/01/10	.	09/01/10	.		**x**	○		
SCR1.5SW	EXP-SW	.	04/06/10	.	.		●			
SCR2.1SP	EXP-SW	.	04/06/10	.	.		●			
SCR2.2SP	EXP-SW	.	04/06/10	.	.		●			
SCR3.5SP	EXP-SW	03/01/10	.	09/01/10	.		**x**	○		
SCR3.5SW	EXP-SW	.	04/06/10	.	.		●			
SCR4.3SP	EXP-SW	01/11/10	.	07/28/10	.		**x**			●
UNC SW-1	EXP-SW	03/01/10	.	08/04/10	.		**x**			●

Notes:

1 Groundwater and surface water sampling performed under monitoring programs managed by Bechtel Jacobs Company LLC (BJC).

2 Surface water sampling performed under the Y-12 Groundwater Protection Program (GWPP) managed by Babcock & Wilcox Technical Services Y-12, LLC.

x - Denotes the DOE Order monitoring category (site surveillance or exit pathway/perimeter) fulfilled by samples collected under programs managed by BJC. Although the CY 2010 samples were collected for various monitoring purposes, all of the data meet DOE Order monitoring requirements. Surveillance and exit pathway/perimeter monitoring data evaluations are provided in Section 4.

Table B.4 (continued)

Notes: (continued)

3	GW	-	Groundwater monitoring well (also 1090)
	MCK	-	McCoy Branch Kilometer
	SCR	-	South Chestnut Ridge (tributary prefix)
	SP	-	Spring sampling location (suffix)
	SW	-	Surface water sampling location (suffix)
4	CDLVII	-	Construction/Demolition Landfill VII
	CRBAWP	-	Chestnut Ridge Borrow Area Waste Pile (formerly)
	CRSDB	-	Chestnut Ridge Sediment Disposal Basin
	CRSP	-	Chestnut Ridge Security Pits
	ECRWP	-	East Chestnut Ridge Waste Pile
	EXP-SW	-	Exit Pathway (spring or surface water sampling location)
	FCAP	-	Filled Coal Ash Pond
	KHQ	-	Kerr Hollow Quarry
	LII	-	Industrial Landfill II
	LIV	-	Industrial Landfill IV
	LV	-	Industrial Landfill V
	UNCS	-	United Nuclear Corporation Site
5	**.**	-	Not Sampled.
	D	-	Duplicate sample collected on specified date (shown in bold typeface).

Table B.5. Field measurements and laboratory analytes for CY 2010 groundwater and surface water samples obtained by the Y-12 GWPP

Field Measurements	**Analytical Method** [1]	**Reporting Limit** [2]	**Units** [3]
Depth to Water	NA	NA	ft
Water Temperature	NA	NA	Celsius
pH	NA	NA	pH units
Conductivity	NA	NA	µmho/cm
Dissolved Oxygen	NA	NA	ppm
Oxidation-Reduction Potential	NA	NA	mV
Miscellaneous Laboratory Analytes			
Total Dissolved Solids	SM 2540C 18	1	mg/L
Total Suspended Solids	SM 2540D 18	1	mg/L
Anions			
Carbonate	SM 2320B 18	1	mg/L
Bicarbonate	SM 2320B 18	1	mg/L
Chloride	EPA-300.0	0.2	mg/L
Fluoride	SM 4500F 18	0.1	mg/L
Nitrate (as Nitrogen)	EPA-300.0	0.05	mg/L
Sulfate	EPA-300.0	0.25	mg/L
Metals/Cations			
Aluminum	SW846-6010B	0.2	mg/L
Antimony	SW846-6020	0.0025	mg/L
Arsenic	SW846-6020	0.005	mg/L
Barium	SW846-6010B	0.004	mg/L
Beryllium	SW846-6010B	0.0005	mg/L
Boron	SW846-6010B	0.1	mg/L
Cadmium	SW846-6020	0.0025	mg/L
Calcium	SW846-6010B	0.2	mg/L
Chromium	SW846-6020	0.01	mg/L
Cobalt	SW846-6010B	0.02	mg/L
Copper	SW846-6010B	0.02	mg/L
Iron	SW846-6010B	0.05	mg/L
Lead	SW846-6020	0.0005	mg/L
Lithium	SW846-6010B	0.01	mg/L
Magnesium	SW846-6010B	0.2	mg/L
Manganese	SW846-6010B	0.005	mg/L
Mercury	SW846-7470/A	0.00005	mg/L
Molybdenum	SW846-6010B	0.05	mg/L
Nickel	SW846-6020	0.005	mg/L
Potassium	SW846-6010B	2	mg/L
Selenium	SW846-6020	0.01	mg/L
Silver	SW846-6010B	0.02	mg/L

Table B.5 (continued)

Metals/Cations (continued)	Analytical Method [1]	Reporting Limit [2]	Units [3]
Sodium	SW846-6010B	0.2	mg/L
Strontium	SW846-6010B	0.005	mg/L
Thallium	SW846-6020	0.0005	mg/L
Thorium	SW846-6010B	0.2	mg/L
Uranium	SW846-6020	0.0005	mg/L
Vanadium	SW846-6010B	0.02	mg/L
Zinc	SW846-6010B	0.05	mg/L
Volatile Organic Compounds		**CRQL [4]**	
Acetone	SW846-8260B UP	10	µg/L
Acetonitrile	SW846-8260B UP	10	µg/L
Acrolein	SW846-8260B UP	10	µg/L
Acrylonitrile	SW846-8260B UP	5	µg/L
Benzene	SW846-8260B UP	5	µg/L
Bromochloromethane	SW846-8260B UP	5	µg/L
Bromodichloromethane	SW846-8260B UP	5	µg/L
Bromoform	SW846-8260B UP	5	µg/L
Bromomethane	SW846-8260B UP	5	µg/L
2-Butanone	SW846-8260B UP	5	µg/L
Carbon disulfide	SW846-8260B UP	5	µg/L
Carbon tetrachloride	SW846-8260B UP	5	µg/L
Chlorobenzene	SW846-8260B UP	5	µg/L
Chloroethane	SW846-8260B UP	5	µg/L
2-Chloroethyl vinyl ether	SW846-8260B UP	10	µg/L
Chloroform	SW846-8260B UP	5	µg/L
Chloromethane	SW846-8260B UP	5	µg/L
Dibromochloromethane	SW846-8260B UP	5	µg/L
1,2-Dibromo-3-chloropropane	SW846-8260B UP	10	µg/L
1,2-Dibromoethane	SW846-8260B UP	5	µg/L
Dibromomethane	SW846-8260B UP	5	µg/L
1,2-Dichlorobenzene	SW846-8260B UP	5	µg/L
1,4-Dichlorobenzene	SW846-8260B UP	5	µg/L
1,4-Dichloro-2-butene	SW846-8260B UP	5	µg/L
trans-1,4-Dichloro-2-butene	SW846-8260B UP	5	µg/L
Dichlorodifluoromethane	SW846-8260B UP	5	µg/L
1,1-Dichloroethane	SW846-8260B UP	5	µg/L
1,2-Dichloroethane	SW846-8260B UP	5	µg/L
1,1-Dichloroethene	SW846-8260B UP	5	µg/L
cis-1,2-Dichloroethene	SW846-8260B UP	5	µg/L
trans-1,2-Dichloroethene	SW846-8260B UP	5	µg/L
1,2-Dichloropropane	SW846-8260B UP	5	µg/L
cis-1,3-Dichloropropene	SW846-8260B UP	5	µg/L
trans-1,3-Dichloropropene	SW846-8260B UP	5	µg/L

Table B.5 (continued)

Volatile Organic Compounds (cont'd)	Analytical Method [1]	CRQL [4]	Units [3]
Ethanol	SW846-8260B UP	200	µg/L
Ethylbenzene	SW846-8260B UP	5	µg/L
Ethyl methacrylate	SW846-8260B UP	5	µg/L
2-Hexanone	SW846-8260B UP	5	µg/L
Iodomethane	SW846-8260B UP	5	µg/L
4-Methyl-2-pentanone	SW846-8260B UP	5	µg/L
Methylene chloride	SW846-8260B UP	5	µg/L
Styrene	SW846-8260B UP	5	µg/L
1,1,1,2-Tetrachloroethane	SW846-8260B UP	5	µg/L
1,1,2,2-Tetrachloroethane	SW846-8260B UP	5	µg/L
Tetrachloroethene	SW846-8260B UP	5	µg/L
Toluene	SW846-8260B UP	5	µg/L
1,1,1-Trichloroethane	SW846-8260B UP	5	µg/L
1,1,2-Trichloroethane	SW846-8260B UP	5	µg/L
Trichloroethene	SW846-8260B UP	5	µg/L
Trichlorofluoromethane	SW846-8260B UP	5	µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	SW846-8260B UP	5	µg/L
1,2,3-Trichloropropane	SW846-8260B UP	10	µg/L
Vinyl acetate	SW846-8260B UP	10	µg/L
Vinyl chloride	SW846-8260B UP	2	µg/L
Total Xylene	SW846-8260B UP	5	µg/L
Radiological Analytes		**Target MDA [5]**	
Gross Alpha Activity	EPA-900.0	5	pCi/L
Gross Beta Activity	EPA-900.0	10	pCi/L
Technetium-99	Y/P65-7060	15	pCi/L
Uranium-234, 235, & 238	Y/P65-7061	0.4	pCi/L

Notes:

1 NA - not applicable

Analytical methods from:

- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods* (U.S. Environmental Protection Agency 1996)
- *Methods for Chemical Analysis of Water and Wastes* (U.S. Environmental Protection Agency 1983)
- BWXT Y-12 Analytical Chemistry Organization Control Procedures: (Y/P65-7060 and Y/P65-7061)

2 The lowest concentration reported.

NA - not applicable

Table B.5 (continued)

Notes: (continued)

3	ft	-	feet
	µg/L	-	micrograms per liter
	µmho/cm	-	micromhos per centimeter
	mg/L	-	milligrams per liter
	mV	-	millivolts
	NTU	-	nephelometric turbidity units
	ppm	-	parts per million
	pCi/L	-	picoCuries per liter
4	CRQL	-	contract-required quantitation limit; estimated values are reported below this level and above the instrument detection limit. Results below the instrument detection limit are reported as not detected at the CRQL.
5	MDA	-	minimum detectable activity. The target MDA may be obtained under optimal analytical conditions; actual MDAs are sample-specific and, in some cases, may vary significantly from the target value.

Table B.6. Depth-to-water measurements and groundwater elevations for selected wells in the Bear Creek Hydrogeologic Regime, October 2010

Well Number	Location [1]	Hydrogeologic Unit		Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
		Aquifer	Aquitard				
GW-001	OLF		●	981.00	10/14/10	18.30	962.70
GW-008	OLF		●	965.39	10/14/10	16.22	949.17
GW-010	OLF		●	952.70	10/14/10	2.90	949.80
GW-012	OLF		●	955.57	10/14/10	7.67	947.90
GW-014	BG		●	934.50	10/14/10	7.85	926.65
GW-016	BG		●	928.81	10/14/10	dry	.
GW-041	BG		●	1008.10	10/14/10	26.20	981.90
GW-046	BG		●	921.17	10/14/10	6.48	914.69
GW-047	BG		●	929.00	10/14/10	10.20	918.80
GW-052	BG	●		905.70	10/14/10	18.02	887.68
GW-053	BG	●		903.42	10/14/10	11.05	892.37
GW-057	EXP-A	●		890.20	10/14/10	7.12	883.08
GW-059	BG	●		912.70	10/14/10	25.05	887.65
GW-065	OLF	●		982.50	10/13/10	29.14	953.36
GW-069	BG		●	927.60	10/14/10	12.15	915.45
GW-078	BG		●	918.10	10/14/10	11.36	906.74
GW-080	BG		●	981.00	10/14/10	dry	.
GW-082	BG		●	964.00	10/14/10	22.42	941.58
GW-084	OLF		●	997.18	10/18/10	17.46	979.72
GW-086	OLF		●	982.80	10/18/10	16.09	966.71
GW-090	BG		●	961.88	10/14/10	7.65	954.23
GW-091	BG		●	952.62	10/14/10	9.00	943.62
GW-097	OLF		●	945.41	10/14/10	dry	.
GW-100	S3	●		987.40	10/13/10	6.29	981.11
GW-101	S3		●	1007.40	10/13/10	9.55	997.85
GW-115	S3		●	1055.01	10/13/10	14.67	1040.34
GW-127	S3		●	1005.90	10/13/10	16.60	989.30
GW-226	OLF	●		943.57	10/14/10	19.05	924.52
GW-227	OLF	●		946.46	10/14/10	17.00	929.46
GW-229	OLF	●		949.00	10/14/10	28.20	920.80
GW-236	S3	●		983.21	10/13/10	12.31	970.90
GW-242	BG		●	978.69	10/14/10	7.44	971.25
GW-245	S3		●	1009.08	10/13/10	14.55	994.53
GW-249	BG		●	991.15	10/14/10	dry	.
GW-257	BG		●	961.68	10/14/10	29.82	931.86
GW-276	S3		●	1001.57	10/13/10	8.19	993.38
GW-287	BG		●	927.04	10/14/10	9.93	917.11
GW-289	BG		●	948.73	10/14/10	20.02	928.71

Table B.6 (continued)

Well Number	Location [1]	Hydrogeologic Unit		Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
		Aquifer	Aquitard				
GW-291	BG		●	948.66	10/14/10	13.80	934.86
GW-307	RS	●		993.14	10/13/10	33.83	959.31
GW-309	RS	●		988.17	10/13/10	22.78	965.39
GW-310	RS	●		995.52	10/13/10	23.10	972.42
GW-316	SPI	●		1047.17	10/12/10	62.58	984.59
GW-323	SPI	●		1130.11	10/11/10	85.99	1044.12
GW-325	S3		●	1003.00	10/18/10	18.70	984.30
GW-345	S3		●	999.63	10/18/10	21.49	978.14
GW-347	S3	●		1001.05	10/13/10	19.43	981.62
GW-364	OLF	●		936.16	10/14/10	22.56	913.60
GW-370	BG		●	960.81	10/14/10	16.61	944.20
GW-372	BG		●	983.16	10/14/10	24.68	958.48
GW-531	LD		●	1004.61	10/18/10	20.07	984.54
GW-537	OLF		●	976.65	10/18/10	8.73	967.92
GW-613	S3		●	1013.58	10/18/10	16.86	996.72
GW-621	EXP-B	●		925.45	10/14/10	16.88	908.57
GW-622	BG		●	924.16	10/14/10	14.10	910.06
GW-624	BG		●	922.15	10/14/10	13.29	908.86
GW-630	LD		●	986.65	10/18/10	10.57	976.08
GW-638	OLF		●	941.77	10/14/10	9.06	932.71
GW-641	BG		●	946.66	10/14/10	21.04	925.62
GW-642	BG		●	1014.95	10/14/10	23.16	991.79
GW-645	OLF	●		1006.40	10/14/10	80.79	925.61
GW-652	BG	●		900.83	10/14/10	12.74	888.09
GW-653	BG		●	931.84	10/14/10	25.85	905.99
GW-654	BG		●	940.79	10/14/10	9.17	931.62
GW-683	EXP-A	●		972.23	10/18/10	89.06	883.17
GW-695	EXP-B	●		939.54	10/14/10	31.85	907.69
GW-795	AGLLSF		●	926.18	10/14/10	9.15	917.03
GW-800	OLF	●		964.36	10/14/10	18.60	945.76
GW-829	OLF		●	985.95	10/18/10	15.30	970.65
GW-835	S3	●		1000.91	10/13/10	14.89	986.02
GW-916	EMWMF		●	1002.85	10/19/10	8.14	994.71
GW-917	EMWMF		●	997.10	10/18/10	22.87	974.23
GW-918	EMWMF		●	1067.96	10/18/10	5.88	1062.08
GW-921	EMWMF		●	971.29	10/18/10	7.66	963.63
GW-922	EMWMF		●	956.91	10/18/10	5.39	951.52
GW-923	EMWMF		●	1016.73	10/18/10	33.78	982.95
GW-924	EMWMF		●	968.90	10/18/10	12.22	956.68

Table B.6 (continued)

Notes:

1

AGLLSF	-	Above Grade Low-Level Storage Facility
BG	-	Bear Creek Burial Grounds Waste Management Area
EMWMF	-	Environmental Management Waste Management Facility
EXP-A	-	Exit Pathway (Maynardville Limestone) Picket A
EXP-B	-	Exit Pathway (Maynardville Limestone) Picket B
LD	-	Lysimeter Demonstration Site
OLF	-	Oil Landfarm Waste Management Area
RS	-	Rust Spoil Area
S3	-	S-3 Site
SPI	-	Spoil Area I

2 The measuring point is the surveyed elevation of a mark on either the top of the innermost well casing or the top of dedicated sampling equipment, in feet above mean sea level.

3 The depth to water is in feet below the measuring point.

4 The groundwater elevation (measuring point depth to water) is in feet above mean sea level.

Table B.7. Depth-to-water measurements and groundwater elevations for selected wells in the Upper East Fork Poplar Creek Hydrogeologic Regime, October-November 2010

Well Number	Location [1]	Hydrogeologic Unit		Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
		Aquifer	Aquitard				
55-1A	GRIDB2		●	986.91	10/27/10	8.85	978.06
55-3A	B9201-5		●	972.46	10/21/10	12.47	959.99
55-6A	B9103		●	989.29	10/21/10	11.04	978.25
56-1A	Y12		●	969.25	10/21/10	8.05	961.20
56-2A	GRIDC3		●	963.53	10/21/10	8.92	954.61
56-8A	Y12	●		962.46	10/21/10	20.78	941.68
60-1A	Y12	●		929.66	10/13/10	13.10	916.56
GW-105	S3		●	1018.20	10/13/10	9.88	1008.32
GW-108	S3		●	999.00	10/13/10	7.22	991.78
GW-115	S3		●	1055.01	10/13/10	14.67	1040.34
GW-148	NHP	●		907.76	10/13/10	8.70	899.06
GW-151	NHP	●		916.17	10/11/10	15.76	900.41
GW-152	NHP	●		921.18	10/11/10	20.14	901.04
GW-154	NHP	●		911.70	10/13/10	9.73	901.97
GW-167	EXP	●		931.95	10/11/10	dry	.
GW-169	EXP-UV	●		932.12	10/11/10	dry	.
GW-192	B4		●	1008.83	10/27/10	4.97	1003.86
GW-193	T2331	●		934.17	10/27/10	9.24	924.93
GW-195	B4		●	1002.90	10/27/10	5.50	997.40
GW-199	GRIDI1		●	961.08	10/13/10	18.41	942.67
GW-202	RDS		●	968.02	10/13/10	10.33	957.69
GW-204	T0134		●	958.74	11/02/10	8.94	949.80
GW-219	UOV	●		935.83	10/13/10	12.24	923.59
GW-251	S2	●		1003.80	10/12/10	23.57	980.23
GW-253	S2	●		1004.24	10/12/10	25.39	978.85
GW-255	S2	●		1027.13	10/12/10	50.60	976.53
GW-261	SY		●	1049.99	10/13/10	19.26	1030.73
GW-263	SY		●	1057.73	10/13/10	31.45	1026.28
GW-334	WC		●	983.73	10/21/10	12.42	971.31
GW-335	WC		●	981.88	10/21/10	11.69	970.19
GW-349	S2	●		993.50	11/01/10	4.61	988.89
GW-380	NHP	●		913.55	10/13/10	11.56	901.99
GW-383	NHP		●	908.77	10/13/10	9.28	899.49
GW-603	EXP-J		●	961.32	10/11/10	60.18	901.14
GW-605	EXP-I	●		919.06	10/13/10	11.45	907.61
GW-606	EXP-I	●		919.59	10/13/10	14.25	905.34

Table B.7 (continued)

Well Number	Location [1]	Hydrogeologic Unit		Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
		Aquifer	Aquitard				
GW-617	EXP-E	●		985.28	10/21/10	15.40	969.88
GW-619	FTF	●		1015.42	10/12/10	28.71	986.71
GW-686	CPT	●		963.76	10/11/10	13.27	950.49
GW-691	CPT	●		968.59	10/21/10	13.10	955.49
GW-696	B8110	●		969.78	10/21/10	31.43	938.35
GW-733	EXP-J	●		959.84	10/11/10	59.42	900.42
GW-734	EXP-J	●		939.93	10/11/10	40.16	899.77
GW-735	EXP-J		●	924.46	10/11/10	24.40	900.06
GW-746	GRIDK1		●	906.88	10/13/10	7.64	899.24
GW-748	GRIDK2		●	911.19	10/13/10	6.83	904.36
GW-752	GRIDJ3		●	912.78	10/13/10	5.10	907.68
GW-754	GRIDJ2		●	928.78	10/13/10	12.41	916.37
GW-756	GRIDJ1		●	928.11	10/13/10	6.16	921.95
GW-759	GRIDG1		●	994.01	10/13/10	19.27	974.74
GW-761	GRIDG2		●	968.23	10/13/10	12.33	955.90
GW-763	GRIDJ3		●	915.03	10/13/10	9.20	905.83
GW-765	GRIDE1		●	1008.54	10/13/10	20.03	988.51
GW-767	GRIDI2		●	948.54	10/13/10	12.44	936.10
GW-770	GRIDG3		●	944.72	10/13/10	14.70	930.02
GW-774	GRIDH2		●	963.16	10/13/10	16.31	946.85
GW-776	GRIDH3		●	931.25	10/13/10	15.46	915.79
GW-778	GRIDB2		●	1001.84	10/21/10	11.15	990.69
GW-783	GRIDE3		●	948.49	10/28/10	10.17	938.32
GW-792	GRIDD2		●	992.74	10/27/10	25.39	967.35
GW-816	EXP-SR		●	898.42	10/13/10	12.46	885.96
GW-960	GRIDF2		●	963.26	10/13/10	12.41	950.85

Table B.7 (continued)

Notes:

1	B4	-	Beta-4 Security Pits
	B8110	-	Building 81-10
	B9103	-	Building 9103
	B9201-2	-	Building 9201-2
	CPT	-	Coal Pile Trench
	EXP	-	Exit Pathway (Maynardville Limestone) monitoring well -E, -I, or -J: Maynardville Limestone Picket -SR: Along Scarboro Road in the gap through Pine Ridge -UV: Offsite in Union Valley
	FTF	-	Fire Training Facility
	GRID	-	Comprehensive Groundwater Monitoring Plan Grid Location
	NHP	-	New Hope Pond
	RDS	-	Ravine Disposal Site
	S2	-	S-2 Site
	S3	-	S-3 Site
	SY	-	Y-12 Plant Salvage Yard
	T0134	-	Tank 0134-U
	T2331	-	Tank 2331-U
	UOV	-	Uranium Oxide Vault
	WC	-	Waste Coolant Processing Area
	Y12	-	Y-12 Complex

2 The measuring point is the surveyed elevation of a mark on either the top of the innermost well casing or the top of dedicated sampling equipment, in feet above mean sea level.

3 The depth to water is in feet below the measuring point.

4 The groundwater elevation (measuring point depth to water) is in feet above mean sea level.

Table B.8. Depth-to-water measurements and groundwater elevations for selected wells in the Chestnut Ridge Hydrogeologic Regime, October 2010

Well Number	Location [1]	Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
1082	ORSF	837.28	10/11/10	25.36	811.92
1084	ORSF	965.40	10/11/10	63.50	901.90
1090	UNCS	1104.48	10/12/10	60.36	1044.12
GW-141	LIV	1186.23	10/21/10	100.03	1086.20
GW-142	KHQ	971.15	10/11/10	145.20	825.95
GW-144	KHQ	913.54	10/11/10	83.17	830.37
GW-145	KHQ	840.24	10/11/10	9.43	830.81
GW-156	CRSDB	1049.28	10/11/10	143.51	905.77
GW-159	CRSDB	1051.38	10/11/10	118.68	932.70
GW-160	CRBAWP	1093.09	10/11/10	148.35	944.74
GW-173	CRSP	1115.00	10/12/10	156.55	958.45
GW-174	CRSP	1116.66	10/12/10	117.05	999.61
GW-175	CRSP	1084.19	10/12/10	126.64	957.55
GW-176	CRSP	1125.30	10/12/10	116.45	1008.85
GW-177	CRSP	1158.20	10/12/10	120.60	1037.60
GW-178	CRSP	1143.49	10/12/10	96.25	1047.24
GW-179	CRSP	1128.00	10/12/10	116.43	1011.57
GW-180	CRSP	1104.14	10/12/10	133.08	971.06
GW-184	RQ	927.63	10/11/10	111.02	816.61
GW-186	RQ	831.32	10/11/10	15.33	815.99
GW-188	RQ	837.09	10/11/10	20.60	816.49
GW-203	UNCS	1105.45	10/12/10	80.81	1024.64
GW-205	UNCS	1104.14	10/12/10	78.49	1025.65
GW-217	LIV	1177.03	10/12/10	117.25	1059.78
GW-221	UNCS	1106.16	10/12/10	82.03	1024.13
GW-231	KHQ	849.67	10/11/10	18.91	830.76
GW-241	CRSDB	982.84	10/11/10	53.16	929.68
GW-292	ECRWP	1073.00	10/12/10	116.12	956.88
GW-298	CRBAWP	1049.01	10/11/10	110.81	938.20
GW-299	CRBAWP	1053.86	10/11/10	102.25	951.61
GW-300	CRBAWP	1073.12	10/11/10	117.80	955.32
GW-301	CRBAWP	1086.55	10/11/10	135.83	950.72
GW-302	UNCS	1141.84	10/12/10	106.42	1035.42
GW-303	CRSDB	1007.16	10/11/10	89.12	918.04
GW-304	CRSDB	1045.49	10/11/10	117.84	927.65
GW-305	LIV	1183.72	10/11/10	127.65	1056.07
GW-322	CRSP	1134.98	10/12/10	164.50	970.48
GW-339	UNCS	1124.83	10/12/10	80.60	1044.23

Table B.8 (continued)

Well Number	Location [1]	Measuring Point [2]	Date Measured	Depth to Water [3]	Groundwater Elevation [4]
GW-511	CRSP	1093.21	10/12/10	112.48	980.73
GW-512	FCAP	1001.54	10/12/10	29.78	971.76
GW-521	LIV	1182.88	10/11/10	88.75	1094.13
GW-522	LIV	1175.48	10/11/10	109.35	1066.13
GW-539	LII	1093.20	10/11/10	110.45	982.75
GW-541	CDLVI	1058.40	10/11/10	64.23	994.17
GW-542	CDLVI	1051.81	10/11/10	71.71	980.10
GW-543	CDLVI	1024.01	10/11/10	66.00	958.01
GW-544	CDLVI	1045.19	10/11/10	56.36	988.83
GW-546	CDLVI	1072.21	10/11/10	85.09	987.12
GW-557	LV	1081.36	10/12/10	123.95	957.41
GW-558	SSCR	981.42	10/12/10	51.91	929.51
GW-559	SSCR	1102.79	10/12/10	140.23	962.56
GW-560	CDLVII	949.05	10/11/10	51.62	897.43
GW-562	CDLVII	934.69	10/11/10	12.46	922.23
GW-564	CDLVII	938.07	10/11/10	12.69	925.38
GW-608	CRSP	1075.38	10/11/10	139.11	936.27
GW-609	CRSP	1112.31	10/12/10	169.66	942.65
GW-610	CRSP	1059.44	10/12/10	95.75	963.69
GW-611	CRSP	1048.38	10/13/10	109.39	938.99
GW-612	CRSP	1131.03	10/12/10	129.64	1001.39
GW-674	FCAP	883.79	10/11/10	10.16	873.63
GW-676	FCAP	846.50	10/11/10	5.47	841.03
GW-677	FCAP	1030.40	10/12/10	31.35	999.05
GW-678	FCAP	1000.70	10/12/10	25.67	975.03
GW-679	FCAP	1026.90	10/12/10	57.02	969.88
GW-680	FCAP	1001.50	10/12/10	31.00	970.50
GW-709	LII	906.81	10/11/10	29.91	876.90
GW-731	CRSDB	1049.38	10/11/10	125.42	923.96
GW-732	CRSDB	1064.29	10/11/10	157.98	906.31
GW-743	CRSP	1100.36	10/12/10	135.71	964.65
GW-757	LII	961.64	10/11/10	84.86	876.78
GW-796	LV	1052.62	10/12/10	84.42	968.20
GW-797	LV	1060.00	10/12/10	76.65	983.35
GW-798	CDLVII	1006.00	10/11/10	81.34	924.66
GW-799	LV	981.29	10/12/10	22.05	959.24
GW-801	LV	1097.16	10/12/10	115.23	981.93
GW-827	CDLVI	1051.60	10/11/10	43.60	1008.00
GW-831	FCAP	1091.29	10/12/10	129.73	961.56

Table B.8 (continued)

Notes:

1

CDLVI	-	Construction/Demolition Landfill VI
CDLVII	-	Construction/Demolition Landfill VII
CRBAWP	-	Chestnut Ridge Borrow Area Waste Pile
CRSDB	-	Chestnut Ridge Sediment Disposal Basin
CRSP	-	Chestnut Ridge Security Pits
ECRWP	-	East Chestnut Ridge Waste Pile
FCAP	-	Filled Coal Ash Pond
KHQ	-	Kerr Hollow Quarry
LII	-	Industrial Landfill II
LIV	-	Industrial Landfill IV
LV	-	Industrial Landfill V
ORSF	-	Oak Ridge Sludge Farm
RQ	-	Rogers Quarry
SSCR	-	South Side Chestnut Ridge
UNCS	-	United Nuclear Corporation Site

3 The measuring point is the surveyed elevation of a mark on either the top of the innermost well casing or the top of dedicated sampling equipment, in feet above mean sea level.

4 The depth to water is in feet below the measuring point.

5 The groundwater elevation (measuring point - depth to water) is in feet above mean sea level.

Table B.9 Concentration trends for the principal contaminants detected at CY 2010 sampling locations in the Bear Creek Hydrogeologic Regime

Sampling Location [1]	Hydro. Unit [2]		Contaminant Type and Long-Term Trend [3] (○ = indeterminate, ✚ = increasing, ▼= decreasing)							
	AQT	AQF	Inorganics [4]		VOCs [5]				Radioactivity [6]	
			NO^3	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
GW-006	●		.	.	▼	▼	.	.	.	.
GW-008	●		NA	.	✚	✚	.	.	.	.
GW-014	●		.	.	▼	▼	.	.	.	.
GW-046	●		NA	.	○	○	○	○	.	.
GW-058		●	.	.	.	.	.	.	.	.
GW-065		●	.	.	○	.	.	.	.	.
GW-068	●		.	.	✚	○	.	✚	.	.
GW-071	●		.	.	▼	▼	.	▼	.	.
GW-077	●		NA	.	.	.	.	.	NA	NA
GW-078	●		NA	.	.	.	.	.	NA	NA
GW-079	●		NA	.	.	.	.	.	NA	NA
GW-080	●		NA	.	.	.	.	.	NA	NA
GW-082	●		.	.	○	○	.	○	.	.
GW-085	●		○	.	.	.	.	.	.	.
GW-098	●		.	.	▼	.	.	.	.	.
GW-100		●	▼	.	.	.	.	.	.	.
GW-101	●		.	.	.	.	.	.	.	.
GW-225		●	▼	.	○	.	.	.	.	.
GW-229		●	.	✚	✚	○	.	○	✚	.
GW-246	●		○	○	✚	.	✚	.	▼	▼
GW-276	●		▼	▼	▼	.	.	.	▼	▼
GW-289	●		.	.	○	.	.	.	.	.
GW-291	●		.	.	○	.	.	.	.	.
GW-307		●	.	.	▼	.	.	.	.	.
GW-310		●	.	.	▼	.	.	.	.	.
GW-312		●	.	.	○	.	.	.	.	.
GW-315		●	.	.	.	.	.	.	.	.
GW-363	●		NA	.	.	NA	.	.	NA	NA
GW-365		●	.	.	▼	.	.	.	.	.
GW-526	●		✚	.	.	.	.	.	.	.
GW-537	●		.	.	▼	.	.	.	.	○
GW-601		●	▼	.	▼	.	.	.	.	.
GW-615	●		○	✚	.	.	○	.	.	.
GW-616	●		○	.	.	.	.	.	.	.
GW-623	●		.	.	○	○	○	○	.	.
GW-626	●		.	.	✚	✚	✚	.	.	.
GW-627	●		.	.	✚	✚	.	.	.	.
GW-639	●		NA	.	.	NA	.	.	NA	NA
GW-648		●	.	.	.	.	.	.	.	.
GW-653	●		.	.	✚	.	.	.	.	.
GW-683		●	.	.	.	.	.	.	.	.
GW-684		●	.	.	.	.	.	.	.	.

Table B.9 (continued)

Sampling Location [1]	Hydro. Unit [2]		Contaminant Type and Long-Term Trend [3] (○ = indeterminate, ✚ = increasing, ▼= decreasing)							
			Inorganics [4]		VOCs [5]				Radioactivity [6]	
	AQT	AQF	NO[3]	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
GW-703		●	○	.	▼	.	.	.	.	.
GW-704		●	▼	.	▼	.	.	.	.	.
GW-706		●	▼	▼	○	.	.	.	▼	.
GW-712		●	.	.	.	.	.	.	.	.
GW-713		●	.	.	.	.	.	.	.	.
GW-714		●	.	.	.	.	.	.	.	.
GW-724		●	.	.	○	.	.	.	.	.
GW-725		●	.	.	○	.	.	.	.	.
GW-738		●	.	.	▼	.	.	.	.	○
GW-740		●	.	.	▼	.	.	.	.	.
GW-829	●		.	.	.	.	.	.	.	.
GW-916	●		NA	.	.	NA	.	.	NA	NA
GW-917	●		NA	.	.	NA	.	.	NA	NA
GW-918	●		NA	.	.	NA	.	.	NA	NA
GW-920	●		NA	.	.	NA	.	.	NA	NA
GW-921	●		NA	.	.	NA	.	.	NA	NA
GW-922	●		NA	.	.	NA	.	.	NA	NA
GW-923	●		NA	.	.	NA	.	.	NA	NA
GW-924	●		NA	.	.	NA	.	.	NA	NA
GW-925	●		NA	.	.	NA	.	.	NA	NA
GW-926	●		NA	.	.	NA	.	.	NA	NA
GW-927	●		NA	.	.	NA	.	.	NA	NA
GW-961	●		NA	.	.	NA	.	.	NA	NA
BCK-03.30	.	.	.	.	.	.	.	.	NA	NA
BCK-04.55	.	.	.	.	.	.	.	.	.	.
BCK-07.87	.	.	.	○	.	.	.	.	NA	NA
BCK-10.20	.	.	.	○	○	.	.	.	NA	NA
BCK-10.40	.	.	.	○	.	.	.	.	○	.
BCK-11.54	.	.	○	○	.	.	.	.	NA	NA
BCK-11.84	.	.	○	○	.	.	.	.	NA	NA
BCK-11.97	.	.	○	○	.	.	.	.	○	○
BCK-12.34	.	.	.	○	○	.	.	.	NA	NA
EMWNT-03A	.	.	NA	.	.	.	.	.	.	.
EMWNT-05	.	.	NA	.	.	.	.	.	.	.
EMW-VWEIR	.	.	NA	.	.	.	.	.	NA	NA
EMW-VWUND	.	.	NA	.	.	NA	.	.	NA	NA
NT-01	.	.	○	○	○	.	○	.	.	.
NT-02 (S07)	.	.	.	.	.	.	.	.	NA	NA
NT-03	.	.	.	.	.	.	.	.	NA	NA
NT-04	.	.	NA	.	.	NA	.	.	NA	NA
NT-07	.	.	.	.	▼	▼	.	.	NA	NA
NT-08	.	.	.	▼	▼	▼	.	.	NA	NA
SS-4	.	.	○	○	.	.	.	.	○	.
SS-5	.	.	.	○	.	.	.	.	.	.
SS-6	.	.	.	.	.	.	.	.	.	.

Table B.9 (continued)

Sampling Location[1]	Hydro. Unit[2]		Contaminant Type and Long-Term Trend[3] (○ = indeterminate, ✚ = increasing, ▼= decreasing)							
	AQT	AQF	Inorganics[4]		VOCs[5]				Radioactivity[6]	
			NO^3	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
SS-6.6	.	.	.	.	.	.	.	.	NA	NA
SS-7	.	.	.	.	.	.	.	.	NA	NA
SS-8	.	.	.	.	.	.	.	.	NA	NA

Notes:

1 The exit pathway/perimeter monitoring locations are in bold typeface.

2 Hydrostratigraphic Unit

AQF - Monitored interval in the formations comprising the aquifer
AQT - Monitoring interval in the formations comprising the aquitard

3 Trend types were interpreted from data tables or plots of concentration changes over time.

. - Not a contaminant (criteria defined below, in notes 4, 5, and 6).
NA - Not analyzed
Q - Results inconsistent (higher) with respect to historical data.
○ - Indeterminate trend: insufficient data, fairly stable trend, affected by sampling methods, or highly fluctuating with no clear upward or downward trend.
▼ - Generally decreasing trend
✚ - Generally increasing trend.

4 CY 2010 nitrate (NO^3) concentration greater than or equal to 10 mg/L.
Total uranium (U) concentration greater than or equal to 0.03 mg/L.

5 Summed CY 2010 concentration of a VOC group (see below) greater than or equal to 5µg/L.

Ethenes = Summed chloroethenes (PCE, TCE, 12DCE, 11DCE, vinyl chloride
Ethanes = Summed chloroethanes (111TCA, 11DCE, chloroethane)
Methanes = Summed chloromethanes (carbon tetrachloride, chloroform, methylene chloride)
Petrol = Summed petroleum hydrocarbons (benzene, toluene, ethylbenzene, xylene)

6 Maximum CY 2010 gross alpha activity greater than or equal to 15 pCi/L
Maximum CY 2010 gross beta activity greater than or equal to 50 pCi/L

Table B.10 Concentration trends for the principal contaminants detected at CY 2010 sampling locations in the Upper East Fork Poplar Creek Hydrogeologic Regime

Sampling Location [1]	Hydro. Unit [2]		Contaminant Type and Long-Term Trend [3] (○ = indeterminate, ✚ = increasing, ▼ = decreasing)							
			Inorganics [4]		VOCs [5]				Radioactivity [6]	
	AQT	AQF	NO^3	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
55-2B	●		✚	.	▼	▼	.	.	NA	NA
55-2C	●		✚	NA	▼	▼	.	.	.	.
55-3A	●		.	.	○	○	.	.	.	.
55-3B	●		.	.	○	○	.	.	.	.
55-3C	●		.	.	○	○	.	.	.	.
56-1A	●		.	.	.	.	.	.	.	.
56-1C	●		.	.	.	.	.	.	.	.
56-2A	●		.	.	▼	.	.	.	.	.
56-2B	●		.	.	○	.	.	.	.	.
56-2C	●		NA	NA	▼	.	.	.	NA	NA
56-3A	●		.	.	▼	.	.	.	.	.
56-3B	●		.	.	○	.	.	.	.	.
56-3C	●		.	.	○	.	.	.	.	.
56-4A	●		.	.	.	.	.	.	.	.
56-6A	●		.	.	.	.	.	.	.	.
60-1A		●	.	.	.	.	.	.	.	.
GW-106	●		○	.	.	.	.	.	.	.
GW-108	●		▼	.	✚	.	○	.	○	✚
GW-109	●		○	.	▼	.	▼	.	.	.
GW-148		●	.	.	✚	.	.	.	.	.
GW-151		●	.	.	✚	.	✚	.	.	.
GW-153		●	.	.	.	.	▼	.	.	.
GW-154		●	NA	○	.	.	.	.	○	○
GW-169		●	.	NA	.	.	.	.	.	.
GW-170		●	.	NA	.	.	.	.	.	.
GW-171		●	NA	NA	.	.	.	.	NA	NA
GW-172		●	NA	NA	.	.	.	.	NA	NA
GW-193		●	NA	NA	NA	NA	NA	NA	NA	NA
GW-204	●		NA	.	NA	NA	NA	NA	○	.
GW-220		●	NA	NA	✚	.	✚	.	NA	NA
GW-223		●	.	✚	▼	.	.	.	✚	.
GW-230		●	NA	NA	▼	.	.	.	NA	NA
GW-240		●	NA	NA	.	.	.	.	NA	NA
GW-251		●	▼	.	○	.	.	.	.	.
GW-253		●	○	.	○	.	○	.	○	.
GW-269	●		NA	NA	✚	○	.	.	NA	NA
GW-274	●		▼	.	✚	.	○	✚	.	○
GW-275	●		○	.	.	.	.	.	.	.
GW-281	●		NA	NA	.	.	.	.	NA	NA
GW-332	●		NA	NA	▼	▼	.	.	NA	NA
GW-337	●		NA	NA	▼	▼	.	.	NA	NA
GW-380		●	.	.	.	.	.	.	.	.

Table B.10 (continued)

Sampling Location [1]	Hydro. Unit [2]		Contaminant Type and Long-Term Trend [3] (○ = indeterminate, ✚ = increasing, ▼= decreasing)							
			Inorganics [4]		VOCs [5]				Radioactivity [6]	
	AQT	AQF	NO^{3}	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
GW-381		●	NA	NA	○	.	▼	.	NA	NA
GW-382		●	.	.	▼	.	▼	.	.	.
GW-383	●		.	.	✚	.	.	.	.	.
GW-605		●	.	○	✚	.	✚	.	○	.
GW-606		●	✚	.	○	.	▼	.	.	.
GW-618		●	.	.	▼	.	.	.	.	.
GW-619		●	.	.	▼	.	.	.	.	.
GW-620		●	.	.	.	.	.	.	.	.
GW-633	●		▼	.	✚	.	○	✚	○	▼
GW-656	●		NA	NA	▼	▼	.	.	NA	NA
GW-658	●		NA	NA	.	○	.	○	NA	NA
GW-686		●	.	NA	○	.	.	.	NA	NA
GW-690		●	.	NA	▼	.	.	.	NA	NA
GW-691		●	.	NA	○	.	.	.	NA	NA
GW-692		●	.	NA	○	.	.	.	NA	NA
GW-698		●	○	NA	○	.	○	.	NA	NA
GW-700		●	NA	NA	▼	.	.	.	NA	NA
GW-722-14		●	.	.	▼	.	▼	.	.	.
GW-722-17		●	.	.	▼	.	▼	.	.	.
GW-722-20		●	.	.	▼	.	▼	.	.	.
GW-722-22		●	.	.	▼	.	▼	.	.	.
GW-722-33		●	.	.	.	.	.	.	.	.
GW-733		●	NA	NA	.	.	▼	.	.	.
GW-744	●		.	.	.	.	.	.	.	.
GW-747	●		.	.	.	.	.	.	.	.
GW-748	●		.	.	.	.	.	.	.	.
GW-762	●		.	.	✚	○	.	.	.	.
GW-763	●		NA	NA	.	.	.	.	NA	NA
GW-769	●		NA	NA	✚	.	✚	.	NA	NA
GW-770	●		NA	NA	.	.	✚	.	NA	NA
GW-781	●		.	.	.	.	.	.	.	.
GW-782	●		.	.	▼	○	.	.	.	.
GW-783	●		NA	NA	▼	.	.	.	NA	NA
GW-791	●		.	.	▼	.	.	.	.	.
GW-802	●		NA	NA	.	.	.	.	NA	NA
GW-816	●		.	.	.	.	.	.	.	.
GW-820		●	NA	NA	○	.	.	.	NA	NA
GW-832		●	.	.	○	.	▼	.	.	.
GW-928	●		.	.	.	.	.	.	.	.
GW-929	●		.	.	.	.	.	.	.	.
GW-930	●		.	.	.	.	Q	.	.	.
GW-931	●		.	.	.	.	.	.	.	.
GW-934-01		●	○	.	○	○	○	.	.	.
GW-934-02		●	.	.	○	.	○	○	.	.
GW-934-04		●	.	.	○	.	○	○	.	.

Table B.10 (continued)

Sampling Location [1]	Hydro. Unit [2]		Contaminant Type and Long-Term Trend [3] (○ = indeterminate, ✚ = increasing, ▼= decreasing)							
	AQT	AQF	Inorganics [4]		VOCs [5]				Radioactivity [6]	
			NO^3	U	Ethenes	Ethanes	Methanes	Petrol.	Alpha	Beta
GW-934-05		●	.	.	○	.	○	.	.	.
GW-934-07		●	○	.	○	○	○	.	.	.
GW-934-09		●	○	.	○	○	○	.	.	.
GW-934-11		●	.	.	○	.	○	.	.	.
GW-934-12		●	.	.	○	.	○	.	.	.
200A6	.	.	NA	○	NA	NA	NA	NA	NA	NA
GHK2.51WSW	.	.	.	.	.	.	.	.	.	.
NPR12.0SW	.	.	.	.	.	.	.	.	.	.
NPR23.0SW	.	.	.	.	.	.	.	.	.	.
SCR7.1SP	.	.	NA	NA	.	.	.	.	NA	NA
SCR7.8SP	.	.	NA	NA	.	.	.	.	NA	NA
STATION 8	.	.	NA	○	NA	NA	NA	NA	.	.

Notes:

1 The exit pathway/perimeter monitoring locations are in bold typeface.

2 Hydrostratigraphic Unit

AQF - Monitored interval in the formations comprising the aquifer
AQT - Monitored interval in the formations comprising the aquitard

3 Trend types were interpreted from data tables or plots of concentration changes over time.

. - Not a contaminant (criteria defined below, in notes 4, 5, and 6).
NA - Not analyzed
Q - Elevated concentration, unsupported by other samples from the location (suspect data)
○ - Indeterminate trend: insufficient data, fairly stable trend, affected by sampling methods, or highly fluctuating with no clear upward or downward trend.
▼ - Generally decreasing trend
✚ - Generally increasing trend.

4 CY 2010 nitrate (NO^3) concentration greater than or equal to 10 mg/L.
Total uranium (U) concentration greater than or equal to 0.03 mg/L.

5 Summed CY 2010 concentration of a solvent group (see below) greater than or equal to 5µg/L.

Ethenes = Summed chloroethenes (PCE, TCE, 12DCE, 11DCE, vinyl chloride)
Ethanes = Summed chloroethanes (111TCA, 11DCE, chloroethane)
Methanes = Summed chloromethanes (carbon tetrachloride, chloroform, methylene chloride)
Petrol = Summed petroleum hydrocarbons (benzene, ethylbenzene, toluene, and total xylene)

6 Maximum CY 2010 gross alpha activity greater than or equal to 15 pCi/L
Maximum CY 2010 gross beta activity greater than or equal to 50 pCi/L

Table B.11 Concentration trends for contaminants detected at CY 2010 sampling locations in the Chestnut Ridge Hydrogeologic Regime

Sampling Location [1]	Contaminant Type and Long-Term Trend [2] (○ = indeterminate, ✚ = increasing, ▼ = decreasing)					
	VOCs [3]				Radioactivity [4]	
	Ethenes	Ethanes	Methanes	Freons	Alpha	Beta
1090	NA	NA	NA	NA	NA	NA
GW-141	.	.	.	.	.	.
GW-143	.	.	.	NA	.	.
GW-144	.	.	.	NA	.	.
GW-145	.	.	.	NA	.	.
GW-156	NA	NA	NA	NA	NA	NA
GW-159	NA	NA	NA	NA	NA	NA
GW-161	.	.	.	NA	.	.
GW-177	○	▼	.	NA	.	.
GW-203	NA	NA	NA	NA	.	.
GW-205	NA	NA	NA	NA	.	○
GW-217	.	.	.	.	.	.
GW-221	NA	NA	NA	NA	.	.
GW-231	.	.	.	NA	.	.
GW-294	.	.	.	NA	.	.
GW-296	.	.	.	NA	.	.
GW-298	.	.	.	NA	.	.
GW-301	.	.	.	NA	NA	NA
GW-305	○	○	.	.	.	.
GW-322	○	▼	.	▼	.	.
GW-514						
GW-521	.	.	.	.	.	.
GW-522	.	.	.	.	.	.
GW-540	.	.	.	.	.	.
GW-557	.	.	.	.	.	.
GW-560	.	.	.	.	.	.
GW-562	.	.	.	.	.	.
GW-564	.	.	.	.	.	.
GW-608	▼	▼	.	○	.	.
GW-609	▼	.	.	.	.	.
GW-709	.	.	.	.	.	.
GW-731	NA	NA	NA	NA	NA	NA
GW-732	NA	NA	NA	NA	NA	NA
GW-757	.	.	.	.	.	.
GW-796	.	.	.	.	.	.
GW-797	.	.	.	.	.	.
GW-798	○	○	.	○	.	.
GW-799	.	.	.	.	.	.
GW-801	.	.	.	.	.	.
GW-831	.	.	.	NA	NA	NA

Table B.11 (continued)

Sampling Location[1]	Contaminant Type and Long-Term Trend[2] (○ = indeterminate, ✚ = increasing, ▼= decreasing)					
	VOCs[3]				Radioactivity[4]	
	Ethenes	Ethanes	Methanes	Freons	Alpha	Beta
MCK 1.4	NA	NA	NA	NA	.	.
MCK 2.0	NA	NA	NA	NA	.	.
MCK 2.05	NA	NA	NA	NA	.	.
S17	.	.	.	.	.	.
SCR1.25SP	.	.	.	NA	.	.
SCR1.5SW	.	.	.	.	.	.
SCR2.1SP	.	.	.	.	.	.
SCR2.2SP	.	.	.	.	.	.
SCR3.5SP	.	.	.	NA	.	.
SCR3.5SW	.	.	.	.	.	.
SCR4.3SP	.	.	.	.	.	.
UNC SW-1	NA	NA	NA	NA	.	.

<u>Notes</u>:

1 The exit pathway/perimeter monitoring locations are in bold typeface.

2 Trend types were interpreted from data tables or plots of concentration changes over time.

- . - Not a contaminant (criteria defined below, in notes 3 and 4).
- NA - Not analyzed
- ○ - Indeterminate trend: fairly stable trend, insufficient data.
- ▼ - Generally decreasing trend
- ✚ - Generally increasing trend.

3 Summed CY 2010 concentration of a VOC group (see below) greater than or equal to 1µg/L. (excluding trace levels of common laboratory reagents or suspected artifacts).

Ethenes = Summed chloroethenes (PCE, TCE, 12DCE, 11DCE, vinyl chloride)
Ethanes = Summed chloroethanes (111TCA, 11DCE, chloroethane)
Methanes = Summed chloromethanes (carbon tetrachloride, chloroform, methylene chloride)
Freons = Summed chlorofluorocarbons (1,1,2-trifluoroethane and trichlorofluoromethane)

Note that individual compounds have different long-term concentration trends at wells GW-177, GW-305 and GW-322.

4 Maximum CY 2010 gross alpha activity greater than or equal to 15 pCi/L
Maximum CY 2010 gross beta activity greater than or equal to 50 pCi/L

APPENDIX C

MONITORING WELL CONSTRUCTION DETAILS

EXPLANATION

Hydrogeologic Regime:

BC - Bear Creek Hydrogeologic Regime
CR - Chestnut Ridge Hydrogeologic Regime
EF - Upper East Fork Poplar Creek Hydrogeologic Regime

Location:

B8110 - Building 81-10
B9201-2 - Building 9201-2
B9201-5 - Building 9201-5
BG - Bear Creek Burial Grounds WMA
CDLVII - Construction/Demolition Landfill VII
CPT - Coal Pile Trench
CRBAWP - Chestnut Ridge Borrow Area Waste Pile (former site)
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
EMWMF - Environmental Management Waste Management Facility
EXP - Exit Pathway Monitoring Location:
Maynardville Limestone Picket (-A, -B, -C, -E, -I, -J, and -W)
Along Scarboro Road in the gap through Pine Ridge (-SR)
East of Scarboro Road in Union Valley (-UV)
FCAP - Filled Coal Ash Pond
FF - Fuel Facility (Building 9754-2)
GRID - Comprehensive Groundwater Monitoring Plan Grid Location (MMES 1990b)
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V
NHP - New Hope Pond
OLF - Oil Landfarm WMA
RG - Rust Garage Area
RS - Rust Spoil Area
S2 - S-2 Site
S3 - S-3 Site
SPI - Spoil Area I
SY - Y-12 Salvage Yard
T0134 - Tank 0134-U
T2331 - Tank 2331-U, near Building 9201-1
UNCS - United Nuclear Corporation Site
WCPA - Waste Coolant Processing Area
Y12 - Y-12 Complex

EXPLANATION (continued)

General Information:

Depth	-	Feet below ground surface (rounded to nearest 0.1 ft)
Coordinates	-	Y-12 grid system (rounded to nearest foot)
Measuring Point	-	Top of well casing (TOC) or top of Well Wizard™ (TOWW)
Elevation	-	Feet above mean sea level (rounded to nearest 0.01 ft)
Tag Depth	-	Depth to the bottom of the well (feet below the TOC), taken from the CY 2003 comprehensive well inspection program
.	-	Not applicable or not available

Geologic Information (regarding the monitored interval):

Hydrostratigraphic Unit:

AQF	-	Aquifer (Maynardville Limestone and Knox Group)
AQT	-	Aquitard (other formations of the Conasauga Group)

Geologic Formation:

OCk	-	Knox Group, undifferentiated
Cc	-	Conasauga Group, undifferentiated
Cm	-	Maryville Limestone
Cn	-	Nolichucky Shale
Cmn	-	Maynardville Limestone
Cpv	-	Pumpkin Valley Shale
Crg	-	Rogersville Shale
Cr	-	Rome Formation

Aquifer Zone:

BDR	-	Bedrock interval (monitored interval top is in fresh rock)
WT	-	Water table interval (monitored interval top is above fresh rock)
Depth	-	Feet below ground surface (rounded to nearest 0.1 ft)

Conductor (Surface) Casing and Well Casing:

Depth	-	Feet below ground surface (rounded to nearest 0.1 ft)
Diameter	-	Outside or inside dimensions, in inches
PVC40	-	Polyvinyl chloride, schedule 40
SS304	-	Stainless steel, schedule 304
STL	-	Carbon steel
S/gal	-	Galvanized steel
SF25/SJ55	-	Steel; American Petroleum Institute Grade

EXPLANATION (continued)

Monitored Interval:

Top	-	Depth to top of filter pack or open-hole (feet below ground surface)
Bottom	-	Depth to bottom of filter pack or open-hole (feet below ground surface)
Screen Material:		
PVC/sl	-	PVC, slotted
SS/ppk	-	Stainless steel prepack screen, spiral wound
SS/sl	-	Stainless steel, slotted
SS/sw	-	Stainless steel, spiral wound
Slot Size	-	size of screen or slot openings, in inches

NOTE:

Data compiled from the *Updated Subsurface Data Base for Bear Creek Valley, Chestnut Ridge, and parts of Bethel Valley on the U.S. Department of Energy Oak Ridge Reservation* (BWXT 2003b) and subsequent updates maintained electronically.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	1090	55-2B	55-2C	55-3A	55-3B	55-3C	56-1A	56-1C	56-2A	56-2B
Hydrogeologic Regime	CR	EF	EF	EF	EF	EF	EF	EF	EF	EF
Functional Area	UNCS	GRIDB3	GRIDB3	B9201-5	B9201-5	B9201-5	Y12	Y12	GRIDC3	GRIDC3
General Information										
Date Installed	1982	1983	08/22/83	1983	1983	1983	1983	08/25/83	1983	1983
Total Depth Drilled	96.7	27.6	75.9	14.3	38.1	77.5	19.0	75.3	15.1	38.8
East Coordinate	53,853	55,199	55,203	55,695	55,699	55,703	56,079	56,077	56,229	56,226
North Coordinate	28,718	30,085	30,085	29,959	29,959	29,959	30,351	30,355	29,881	29,884
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOWW	TOWW
Measuring Point Elevation	1,104.48	977.42	977.02	972.46	973.32	974.34	969.25	969.49	963.53	962.45
Ground Surface Elevation	1,101.58	976.17	976.07	971.59	971.57	971.76	968.72	968.89	962.52	962.21
Tag Depth-(TOC)	98.02	27.69	76.00	14.25	37.98	77.43	18.95	73.45	15.03	38.63
Geologic Information										
Hydrostratigraphic Unit	AQF	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT
Geologic Formation	OCk	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn
Aquifer Zone	WT	WT	BDR	WT	WT	BDR	WT	BDR	WT	WT
Weathered Rock-Depth	.	10.0	14.5	7.0	5.0	7.0	2.0	6.0	.	.
Fresh Rock-Depth	.	.	47.2	.	.	.	.	10.0	.	.
Conductor Casing										
Casing Depth	.	.	15.5	.	.	.	.	7.0	.	.
Outside Diameter	.	.	4.5	.	.	.	.	4.5	.	.
Inside Diameter	.	.	.	.	.	.	.	.	.	.
Casing Material	.	.	STL	.	.	.	.	STL	.	.
Well Casing								.		
Borehole Depth	96.7	27.6	75.9	14.3	38.1	77.5	19.0	75.3	15.1	38.8
Borehole Diameter	8	6	6	6	6	6	6	6	6	6
Casing Depth	.	22.6	70.9	9.3	33.1	72.5	14.0	70.3	10.1	33.8
Outside Diameter	6.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Inside Diameter	.	4	4	4	4	4	4	4	4	4
Casing Material	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40
Monitored Interval										
Top-Depth	.	19.6	67.9	6.3	30.1	69.5	11.0	67.3	7.1	30.8
Midpoint-Depth	.	23.6	71.9	10.3	34.1	73.5	15.0	71.3	11.1	34.8
Pump Intake-Depth	84.80	25.00	73.30	12.13	33.75	72.42	15.97	.	12.00	35.80
Bottom of Screen-Depth	.	27.6	75.9	14.3	38.1	77.5	19.0	75.3	15.1	38.8
Bottom-Depth	96.7	27.6	75.9	14.3	38.1	77.5	19.0	75.3	15.1	38.8
Top-Elevation	.	956.57	908.17	965.29	941.47	902.26	957.72	901.59	955.42	931.41
Midpoint-Elevation	.	952.57	904.17	961.29	937.47	898.26	953.72	897.59	951.42	927.41
Pump Intake-Elevation	1016.78	951.22	902.82	959.46	937.82	899.34	952.75	.	950.53	926.45
Bottom-Elevation	1,004.88	948.57	900.17	957.29	933.47	894.26	949.72	893.59	947.42	923.41
Screen Length	.	5	5	5	5	5	5	5	5	5
Screen Material	PVC/sl	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	56-2C EF GRIDC3	56-3A EF Y12	56-3B EF Y12	56-3C EF Y12	56-4A EF Y12	56-6A EF Y12	60-1A EF Y12	GW-006 BC OLF	GW-008 BC OLF	GW-014 BC BG
General Information										
Date Installed	08/18/83	1983	1983	08/02/83	1983	1983	30540	09/17/83	09/21/83	09/29/83
Total Depth Drilled	77.3	17.8	33.4	55.5	12.1	21.0	23.2	46.8	25.5	13.2
East Coordinate	56,231	56,453	56,478	56,449	56,802	56,915	60,200	47,988	47,596	44,308
North Coordinate	29,885	29,867	29,866	29,859	29,820	29,783	29,226	29,818	29,783	29,848
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	965.11	963.03	964.33	962.86	962.07	960.28	929.66	963.33	965.39	934.50
Ground Surface Elevation	962.44	962.35	962.74	962.36	960.10	958.12	929.29	959.90	962.11	931.50
Tag Depth-(TOC)	77.03	17.92	30.85	55.35	12.60	20.97	23.10	51.08	26.69	14.50
Geologic Information										
Hydrostratigraphic Unit	AQT	AQT	AQT	AQT	AQT	AQT	AQF	AQT	AQT	AQT
Geologic Formation	Cn	Cn	Cn	Cn	Cn	Cn	Cmn	Cn	Cn	Cn
Aquifer Zone	BDR	WT	WT	BDR	WT	WT	WT	WT	WT	WT
Weathered Rock-Depth	11.5	3.5	.	8.0	8.5	.	.	6.5	0.6	4.0
Fresh Rock-Depth	17.0	.	.	.	.	.	.	16.5	.	.
Conductor Casing										
Casing Depth	11.5	.	.	.	.	.	.	.	.	.
Outside Diameter	4.5	.	.	.	.	.	.	.	.	.
Inside Diameter	.	.	.	.	.	.	.	.	.	.
Casing Material	STL	.	.	.	.	.	.	.	.	.
Well Casing								.		
Borehole Depth	77.3	17.8	33.4	55.5	12.1	21.0	23.2	46.8	25.5	13.2
Borehole Diameter	6	6	6	6	6	6	6	4.5	4.5	6
Casing Depth	72.3	12.8	28.4	50.5	7.1	16.0	18.2	37.3	15.7	10.0
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	4.5	2.37	2.37	2.37
Inside Diameter	4	4	4	4	4	4	4	2	2	2
Casing Material	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	SS304	SS304	SS304
Monitored Interval										
Top-Depth	69.3	9.8	25.4	47.5	4.1	13.0	15.2	15.3	13.0	5.0
Midpoint-Depth	73.3	13.8	29.4	51.5	8.1	17.0	19.2	31.1	19.3	9.1
Pump Intake-Depth	72.30	14.82	26.91	52.00	9.53	16.34	20.13	.	17.70	9.00
Bottom of Screen-Depth	77.3	17.8	33.4	55.5	12.1	21.0	23.2	42.3	20.7	12.0
Bottom-Depth	77.3	17.8	33.4	55.5	12.1	21.0	23.2	46.8	25.5	13.2
Top-Elevation	893.14	952.55	937.34	914.86	956.00	945.12	914.09	944.60	949.11	926.50
Midpoint-Elevation	889.14	948.55	933.34	910.86	952.00	941.12	910.09	928.85	942.86	922.40
Pump Intake-Elevation	890.11	947.53	935.83	910.36	950.57	941.78	909.16	.	944.39	922.50
Bottom-Elevation	885.14	944.55	929.34	906.86	948.00	937.12	906.09	913.10	936.61	918.30
Screen Length	5	5	5	5	5	5	5	5	5	2
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	GW-046	GW-058	GW-065	GW-068	GW-071	GW-077	GW-078	GW-079	GW-080	GW-082
Hydrogeologic Regime	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
Functional Area	BG	BG	OLF	BG	BG	BG	BG	BG	BG	BG
General Information										
Date Installed	10/27/83	03/06/84	03/14/84	03/22/84	03/25/84	03/29/84	03/30/84	03/23/84	03/24/84	03/17/84
Total Depth Drilled	20.5	45.2	35.0	85.0	220.6	100.5	21.1	65.0	30.0	35.0
East Coordinate	43,284	43,211	49,167	43,377	44,191	41,234	41,209	41,616	41,621	42,090
North Coordinate	29,562	28,714	29,185	29,500	29,495	29,729	29,730	30,630	30,622	30,434
Measuring Point	TOWW	TOC	TOC	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	921.17	913.30	982.50	924.61	928.90	919.30	918.10	981.20	981.00	964.00
Ground Surface Elevation	918.13	910.00	979.70	921.20	925.40	914.70	914.50	977.20	977.10	960.52
Tag Depth-(TOC)	23.85	48.90	36.89	86.10	218.40	104.10	23.40	64.70	33.00	38.45
Geologic Information										
Hydrostratigraphic Unit	AQT	AQF	AQF	AQT	AQT	AQT	AQT	AQT	AQT	AQT
Geologic Formation	Cn	Cmn	Cmn	Cn	Cn	Cn	Cn	Crg	Crg	Cm
Aquifer Zone	WT	BDR	WT	BDR	BDR	BDR	BDR	BDR	WT	BDR
Weathered Rock-Depth	7.7	.	.	.	5.5	7.0	6.5	4.0	3.5	7.0
Fresh Rock-Depth	.	20.8	30.1	25.0	16.0	13.0	8.5	26.5	23.5	23.0
Conductor Casing										
Casing Depth	.	.	.	.	16.0	35.0	.	.	.	25.0
Outside Diameter	.	.	.	.	10.63	4.5	.	.	.	6.5
Inside Diameter	.	.	.	.	10	4	.	.	.	.
Casing Material	.	.	.	.	PVC40	STL	.	.	.	STL
Well Casing			.							
Borehole Depth	20.5	45.2	35.0	85.0	220.6	100.5	21.1	65.0	30.0	35.0
Borehole Diameter	6	4	4	8.75	8.75	3.88	6.5	6.5	6.5	4
Casing Depth	8.1	42.2	29.0	71.9	198.4	90.3	16.1	59.9	24.7	29.4
Outside Diameter	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Inside Diameter	2	2	2	2	2	2	2	2	2	2
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304
Monitored Interval										
Top-Depth	5.0	38.8	24.5	70.0	195.1	87.4	11.7	49.9	20.8	24.1
Midpoint-Depth	12.7	41.5	29.3	76.8	207.1	93.9	16.4	57.4	25.3	29.3
Pump Intake-Depth	12.00	43.70	.	77.59	208.50	.	.	61.80	.	31.50
Bottom of Screen-Depth	18.1	44.2	34.0	82.1	219.0	100.3	21.1	64.9	29.7	34.4
Bottom-Depth	20.3	44.2	34.0	83.6	219.0	100.3	21.1	64.9	29.7	34.4
Top-Elevation	913.13	871.20	955.20	851.20	730.30	827.30	902.80	927.30	956.30	936.42
Midpoint-Elevation	905.48	868.50	950.45	844.40	718.35	820.85	898.10	919.80	951.85	931.27
Pump Intake-Elevation	906.17	866.30	.	843.61	716.90	.	.	915.40	.	929.00
Bottom-Elevation	897.83	865.80	945.70	837.60	706.40	814.40	893.40	912.30	947.40	926.12
Screen Length	10	2	5	10.2	20.6	10	5	5	5	5
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-085 BC OLF	GW-098 BC OLF	GW-100 BC S3	GW-101 BC S3	GW-106 EF S3	GW-108 EF S3	GW-109 EF S3	GW-141 CR LIV	GW-143 CR KHQ	GW-144 CR KHQ
General Information										
Date Installed	03/22/84	09/21/84	09/12/84	09/12/84	09/26/84	09/26/84	09/27/84	09/04/87	10/24/85	10/24/85
Total Depth Drilled	62.0	104.0	20.7	17.5	75.0	58.6	147.6	156.0	253.0	195.0
East Coordinate	49,058	46,959	50,957	51,844	52,843	53,207	53,207	52,463	63,522	63,502
North Coordinate	30,003	29,452	29,759	30,241	30,418	30,070	30,056	28,755	24,257	24,255
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	983.57	945.95	987.40	1,007.40	1,016.92	999.00	997.82	1,186.23	913.98	913.54
Ground Surface Elevation	979.80	942.40	984.60	1,005.10	1,014.50	995.80	995.30	1,183.45	911.04	910.48
Tag Depth-(TOC)	62.34	105.65	17.87	19.18	74.10	58.30	125.45	158.81	252.70	194.34
Geologic Information										
Hydrostratigraphic Unit	AQT	AQT	AQF	AQT	AQT	AQT	AQT	AQF	AQF	AQF
Geologic Formation	Cn	Cn	Cmn	Cn	Cn	Cn	Cn	OCk	OCk	OCk
Aquifer Zone	BDR	BDR	WT	WT	BDR	BDR	BDR	BDR	BDR	BDR
Weathered Rock-Depth	2.0	1.0	14.0	14.0	12.5	4.0	5.0	.	.	.
Fresh Rock-Depth	40.0	7.5	.	17.5	.	.	16.0	57.0	18.0	40.0
Conductor Casing										
Casing Depth	.	20.0	0.3	2.7	20.0	20.7	20.0	65.0	20.0	40.0
Outside Diameter	.	10.63	7	7	10.63	10.63	10.63	10.75	10.63	12.5
Inside Diameter	.	10	.	.	10	10	10	10	9.87	11.75
Casing Material	.	PVC40	S/GAL	S/GAL	PVC40	PVC40	PVC40	SF25	PVC40	PVC40
Well Casing										
Borehole Depth	62.0	104.0	20.7	17.5	75.0	58.6	147.6	156.0	205.0	195.0
Borehole Diameter	4	9	6.5	6.5	9	9	9	10	10	11
Casing Depth	53.8	82.4	10.2	12.3	61.9	46.7	102.9	144.5	205.0	150.0
Outside Diameter	2.37	4.5	2.37	2.37	4.5	4.5	4.5	4.5	6.62	4.5
Inside Diameter	2	4	2	2	4	4	4	4	6.12	4
Casing Material	SS304	SS304	PVC	PVC	PVC	PVC40	PVC40	SS304	SF25	PVC40
Monitored Interval										
Top-Depth	48.4	76.6	3.8	10.1	53.3	41.0	96.6	141.0	205.0	148.0
Midpoint-Depth	53.6	90.3	12.3	13.8	64.2	49.8	112.6	148.5	229.0	171.5
Pump Intake-Depth	51.20	96.40	.	15.70	67.58	49.80	113.50	147.70	226.10	170.90
Bottom of Screen-Depth	58.8	103.4	14.2	16.3	70.9	55.7	121.9	155.2	.	190.0
Bottom-Depth	58.8	104.0	20.7	17.5	75.0	58.6	128.5	156.0	253.0	195.0
Top-Elevation	931.40	865.80	980.80	995.00	961.20	954.80	898.70	1,042.45	706.04	762.48
Midpoint-Elevation	926.20	852.10	972.35	991.30	950.35	946.00	882.75	1,034.95	682.04	738.98
Pump Intake-Elevation	928.57	845.95	.	989.40	946.92	946.00	881.82	1035.73	684.98	739.54
Bottom-Elevation	921.00	838.40	963.90	987.60	939.50	937.20	866.80	1,027.45	658.04	715.48
Screen Length	5	21	4	4	9	9	19	10.7	.	40
Screen Material	SS/sw	SS/sw	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl	SS/sw	.	PVC/sl
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	.	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	48	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	6	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-145 CR KHQ	GW-148 EF NHP	GW-151 EF NHP	GW-153 EF NHP	GW-154 EF NHP	GW-156 CR CRSDB	GW-159 CR CRSDB	GW-161 CR ECRWP	GW-169 EF EXP-UV	GW-170 EF EXP-UV
General Information										
Date Installed	10/14/85	07/30/85	08/14/85	10/31/85	07/30/85	10/18/85	10/18/85	07/07/87	09/16/86	04/01/86
Total Depth Drilled	110.0	11.1	96.5	60.0	11.2	157.6	157.0	400.0	34.8	156.9
East Coordinate	63,266	63,817	64,232	63,728	63,346	64,020	63,496	62,146	66,854	66,843
North Coordinate	24,441	29,202	28,958	28,613	28,987	27,626	27,764	27,805	28,545	28,545
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOWW	TOWW
Measuring Point Elevation	840.24	907.76	916.17	921.68	911.70	1,049.28	1,051.38	1,093.54	932.12	932.64
Ground Surface Elevation	837.29	904.53	913.06	918.53	908.60	1,046.94	1,048.79	1,090.91	929.95	930.70
Tag Depth-(TOC)	113.49	13.93	99.63	60.84	13.35	157.65	155.87	402.88	36.23	156.16
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF
Geologic Formation	OCk	Cmn	Cmn	Cmn	Cmn	OCk	OCk	OCk	Cmn	Cmn
Aquifer Zone	BDR	WT	BDR	BDR	WT	BDR	BDR	BDR	WT	BDR
Weathered Rock-Depth	.	11.1	.	.	11.2	84.0	.	65.0	.	.
Fresh Rock-Depth	12.0	.	12.0	14.0	.	93.0	100.0	95.5	.	30.0
Conductor Casing										
Casing Depth	12.0	.	12.0	29.0	.	94.0	123.0	108.0	.	30.0
Outside Diameter	12.5	.	12.5	10.63	.	10.75	10.75	12.5	.	8.63
Inside Diameter	11.75	.	11.75	9.88	.	10	10	.	.	.
Casing Material	PVC40	.	PVC40	PVC40	.	SF25	SF25	SF25	.	PVC40
Well Casing										
Borehole Depth	110.0	11.1	96.5	60.0	11.2	157.0	157.0	350.0	42.0	104.0
Borehole Diameter	11	8	11	11	8	8.5	8.5	11	8	6.62
Casing Depth	88.5	5.6	86.0	49.5	5.7	147.0	147.0	350.0	29.7	104.0
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.62	2.37	4.38
Inside Diameter	4	4	4	4	4	4	4	.	2	4
Casing Material	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40	SF25	PVC40	STL
Monitored Interval										
Top-Depth	86.0	4.6	85.0	45.0	4.7	145.0	145.0	350.0	28.7	104.0
Midpoint-Depth	98.0	7.9	90.8	52.5	8.0	151.3	151.0	375.0	31.8	130.5
Pump Intake-Depth	100.00	7.80	90.80	52.90	8.40	150.70	148.40	.	.	124.10
Bottom of Screen-Depth	108.5	10.6	96.0	59.5	10.7	157.0	157.0	.	34.7	.
Bottom-Depth	110.0	11.1	96.5	60.0	11.2	157.6	157.0	400.0	34.8	156.9
Top-Elevation	751.29	899.93	828.06	873.53	903.90	901.94	903.79	740.91	901.25	826.70
Midpoint-Elevation	739.29	896.68	822.31	866.03	900.65	895.64	897.79	715.91	898.20	800.25
Pump Intake-Elevation	737.24	896.76	822.27	865.68	900.20	896.28	900.38	.	.	806.64
Bottom-Elevation	727.29	893.43	816.56	858.53	897.40	889.34	891.79	690.91	895.15	773.80
Screen Length	20	5	10	10	5	10	10	.	5	.
Screen Material	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl	.	PVC/sl	.
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	.	0.01	.
Open-Hole Length	.	.	.	.	.	.	.	50	.	52.9
Open-Hole Diameter	.	.	.	.	.	.	.	11	.	3.88

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Well Number Hydrogeologic Regime Functional Area	GW-171 EF EXP-UV	GW-172 EF EXP-UV	GW-177 CR CRSP	GW-193 EF T2331	GW-203 CR UNCS	GW-204 EF T0134	GW-205 CR UNCS	GW-217 CR LIV	GW-220 EF NHP	GW-221 CR UNCS
General Information										
Date Installed	02/26/86	05/05/86	10/24/85	08/04/89	10/24/85	08/30/89	10/25/85	08/13/87	08/22/85	10/24/85
Total Depth Drilled	31.2	133.9	145.0	18.5	156.0	17.5	164.0	180.0	45.2	158.0
East Coordinate	69,654	69,579	57,497	59,536	54,190	57,411	54,008	53,020	64,225	54,389
North Coordinate	28,403	28,358	28,483	29,344	28,356	29,956	28,363	28,758	28,949	28,359
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	920.72	926.69	1,158.20	934.17	1,105.45	958.74	1,104.14	1,177.03	915.64	1,106.16
Ground Surface Elevation	918.55	922.85	1,155.52	931.11	1,102.34	955.47	1,101.46	1,174.29	912.74	1,103.36
Tag Depth-(TOC)	32.64	137.50	150.69	21.17	157.61	20.23	155.56	179.13	49.00	159.34
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQT	AQF	AQF	AQF	AQF
Geologic Formation	Cmn	Cmn	OCk	Cmn	OCk	Cc	OCk	OCk	Cmn	OCk
Aquifer Zone	WT	BDR	BDR	WT	BDR	WT	BDR	BDR	BDR	BDR
Weathered Rock-Depth	.	15.0	62.0	2.5	86.0	10.0	100.0	55.0	.	36.0
Fresh Rock-Depth	.	19.0	98.0	.	93.0	.	146.0	75.0	11.0	90.0
Conductor Casing										
Casing Depth	.	35.0	82.0	5.0	94.0	.	154.0	81.7	13.0	92.0
Outside Diameter	.	8.63	10.75	9.63	10.75	.	10.75	10.75	12.5	6.63
Inside Diameter	.	.	10	.	10	.	10	10	11.75	.
Casing Material	.	SF25	SF25	STL	SF25	.	SF25	SF25	PVC40	SF25
Well Casing										
Borehole Depth	31.2	105.0	145.0	18.5	156.0	17.5	164.0	180.0	45.2	158.0
Borehole Diameter	8	6.62	8	8	8.5	6	10	10	11	6
Casing Depth	26.8	105.0	133.0	8.2	146.0	7.3	154.0	166.8	34.7	148.0
Outside Diameter	2.37	4.38	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Inside Diameter	2	4	4	4	4	4	4	4	4	4
Casing Material	PVC40	STL	PVC40	SS304	PVC40	SS304	PVC40	SS304	PVC40	PVC40
Monitored Interval										
Top-Depth	25.8	105.0	130.0	5.5	144.0	6.5	143.0	165.2	31.0	146.0
Midpoint-Depth	28.5	119.4	137.5	12.0	150.0	11.9	148.0	172.6	38.1	152.0
Pump Intake-Depth	.	123.20	.	13.90	146.90	11.70	147.30	172.10	41.10	149.20
Bottom of Screen-Depth	31.2	.	143.0	18.5	156.0	17.3	153.0	177.4	44.7	158.0
Bottom-Depth	31.2	133.8	145.0	18.5	156.0	17.3	153.0	180.0	45.2	158.0
Top-Elevation	892.75	817.85	1,025.52	925.61	958.34	948.97	958.46	1,009.09	881.74	957.36
Midpoint-Elevation	890.05	803.45	1,018.02	919.14	952.34	943.57	953.46	1,001.69	874.64	951.36
Pump Intake-Elevation	.	799.69	.	917.17	955.45	943.74	954.16	1002.23	871.64	954.16
Bottom-Elevation	887.35	789.05	1,010.52	912.66	946.34	938.17	948.46	994.29	867.54	945.36
Screen Length	4.4	.	10	10.3	10	10	10	10.6	10	10
Screen Material	PVC/sl	.	PVC/sl	SS/sw	PVC/sl	SS/sw	PVC/sl	SS/sw	PVC/sl	PVC/sl
Slot Size	0.01	.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	28.8	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	3.63	.	.	.	.	.	.	.	.

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Well Number Hydrogeologic Regime Functional Area	GW-223 EF NHP	GW-225 BC OLF	GW-229 BC OLF	GW-230 EF EXP-UV	GW-231 CR KHQ	GW-240 EF NHP	GW-246 BC S3	GW-251 EF S2	GW-253 EF S2	GW-269 EF SY
General Information										
Date Installed	08/21/85	10/08/85	10/30/85	05/12/86	10/02/85	10/31/85	03/11/86	04/08/86	04/11/86	06/16/86
Total Depth Drilled	90.5	200.0	55.0	406.4	35.0	29.5	76.0	51.0	50.0	30.0
East Coordinate	63,311	47,461	47,017	69,617	63,410	63,726	52,098	53,843	54,057	53,779
North Coordinate	28,938	29,155	29,256	28,388	24,725	28,604	29,992	29,467	29,404	30,649
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	911.62	943.11	949.00	923.11	849.67	922.90	1,009.19	1,003.80	1,004.24	1,027.81
Ground Surface Elevation	908.97	940.21	945.71	919.57	846.90	919.50	1,006.07	1,001.60	1,001.60	1,025.38
Tag Depth-(TOC)	93.57	203.30	51.45	409.48	37.70	32.55	76.50	50.04	50.51	33.50
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQF	AQT	AQF	AQF	AQT
Geologic Formation	Cmn	Cmn	Cmn	Cmn	OCk	Cmn	Cn	Cmn	Cmn	Cm
Aquifer Zone	BDR	BDR	BDR	BDR	BDR	BDR	WT	BDR	WT	WT
Weathered Rock-Depth	.	.	.	19.0	.	.	26.0	32.5	.	10.0
Fresh Rock-Depth	10.0	25.0	30.0	38.0	10.5	14.0	.	.	.	.
Conductor Casing										
Casing Depth	11.0	32.0	37.0	31.0	11.0	14.0	27.0	.	.	.
Outside Diameter	12.5	10.75	10.75	8.63	10.63	12.5	12.5	.	.	.
Inside Diameter	11.75	10	10	.	10	12	12	.	.	.
Casing Material	PVC40	STL	STL	STL	PVC40	PVC40	PVC40	.	.	.
Well Casing										
Borehole Depth	90.5	150.0	40.0	341.0	35.0	29.5	76.0	51.0	50.0	30.0
Borehole Diameter	11	10	10	5.5	11	11	11	8.25	8.25	10
Casing Depth	80.0	150.0	40.0	341.0	24.5	24.0	46.5	37.5	37.0	23.7
Outside Diameter	4.5	4.5	4.5	4.38	4.5	4.5	6.5	4.5	4.5	4.5
Inside Diameter	4	4	4	4	4	4	6	4	4	4
Casing Material	PVC40	STL	STL	STL	PVC40	PVC40	PVC40	PVC40	PVC40	PVC40
Monitored Interval										
Top-Depth	79.0	150.0	40.0	341.0	22.8	21.0	34.2	35.0	36.2	21.9
Midpoint-Depth	84.8	175.0	47.5	373.7	28.9	25.3	55.1	43.0	43.1	26.0
Pump Intake-Depth	84.40	190.10	44.70	383.50	28.70	26.60	59.40	42.80	41.60	28.10
Bottom of Screen-Depth	90.0	.	.	.	34.5	29.0	74.6	47.1	46.7	29.4
Bottom-Depth	90.5	200.0	55.0	406.4	35.0	29.5	76.0	51.0	50.0	30.0
Top-Elevation	829.97	790.21	905.71	578.57	824.10	898.50	971.87	966.60	965.40	1,003.48
Midpoint-Elevation	824.22	765.21	898.21	545.87	818.00	894.25	950.97	958.60	958.50	999.43
Pump Intake-Elevation	824.62	750.11	901.00	536.11	818.17	892.90	946.69	958.80	960.04	997.31
Bottom-Elevation	818.47	740.21	890.71	513.17	811.90	890.00	930.07	950.60	951.60	995.38
Screen Length	10	.	.	.	10	5	28.1	9.6	9.7	5.7
Screen Material	PVC/sl	.	.	.	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl	PVC/sl
Slot Size	0.01	.	.	.	0.01	0.01	0.03	0.01	0.01	0.02
Open-Hole Length	.	50	15	65.4	.	.	.	.	.	.
Open-Hole Diameter	.	4	4	3.63	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-274 EF SY	GW-275 EF SY	GW-276 BC S3	GW-281 EF FF	GW-289 BC BG	GW-291 BC BG	GW-293 CR ECRWP	GW-294 CR ECRWP	GW-296 CR ECRWP	GW-298 CR ECRWP
General Information										
Date Installed	06/09/86	05/30/86	07/15/86	08/20/86	11/20/86	11/14/86	06/11/87	05/01/87	05/11/87	07/27/87
Total Depth Drilled	35.0	65.5	18.5	17.5	40.8	14.2	214.0	128.0	147.0	190.0
East Coordinate	53,673	53,688	52,557	61,907	42,875	42,583	62,321	62,483	62,023	62,445
North Coordinate	30,152	30,151	29,926	29,771	29,982	30,449	28,112	27,958	27,994	27,495
Measuring Point	TOWW	TOWW	TOWW	TOC	TOWW	TOWW	TOC	TOC	TOC	TOC
Measuring Point Elevation	995.60	995.53	1,001.57	946.10	948.73	948.66	1,063.90	1,083.60	1,090.99	1,049.01
Ground Surface Elevation	992.94	993.08	998.70	946.53	946.32	944.53	1,061.70	1,083.67	1,088.29	1,046.40
Tag Depth-(TOC)	36.12	68.47	21.34	14.85	43.14	19.92	216.40	130.76	148.16	189.36
Geologic Information										
Hydrostratigraphic Unit	AQT	AQT	AQT	AQT	AQT	AQT	AQF	AQF	AQF	AQF
Geologic Formation	Cn	Cn	Cn	Cn	Cm	Cm	OCk	OCk	OCk	OCk
Aquifer Zone	WT	BDR	WT	WT	WT	WT	BDR	BDR	BDR	BDR
Weathered Rock-Depth	3.0	5.0	18.5	17.5	24.0	8.0	57.0	62.0	67.0	65.0
Fresh Rock-Depth	35.0	35.0	.	.	38.0	.	110.0	87.0	81.5	80.0
Conductor Casing										
Casing Depth	.	38.0	.	.	.	.	57.8	74.5	86.5	83.3
Outside Diameter	.	10.63	.	.	.	.	10.75	10.75	10.75	10.75
Inside Diameter	.	10	.	.	.	.	10	10	10	10
Casing Material	.	PVC40	.	.	.	.	SF25	SF25	SF25	SF25
Well Casing										
Borehole Depth	35.0	65.5	18.5	17.5	40.8	17.0	197.0	128.0	147.0	190.0
Borehole Diameter	8	10	8	6	9	9	10	10	10	10
Casing Depth	28.5	54.8	13.0	5.0	30.6	8.7	197.0	117.6	136.3	176.0
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	6.62	4.5	4.5	4.5
Inside Diameter	4	4	4	4	4	4	.	4	4	4
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	SF25	SS304	SS304	SS304
Monitored Interval										
Top-Depth	25.8	53.3	11.3	4.0	28.9	6.7	197.0	113.0	134.4	171.1
Midpoint-Depth	30.4	59.4	14.9	9.5	34.9	10.5	205.5	120.5	140.7	180.6
Pump Intake-Depth	30.80	62.60	14.10	.	35.60	14.3	.	.	.	.
Bottom of Screen-Depth	33.9	65.2	18.3	15.0	40.6	13.7	.	128.0	146.8	186.0
Bottom-Depth	35.0	65.5	18.5	15.0	40.8	14.2	214.0	128.0	147.0	190.0
Top-Elevation	967.14	939.78	987.40	942.53	917.42	938.42	864.70	970.67	953.89	875.30
Midpoint-Elevation	962.54	933.68	983.80	937.03	911.47	934.67	856.20	963.17	947.59	865.85
Pump Intake-Elevation	962.10	930.53	984.57	.	910.73	930.86	.	.	.	.
Bottom-Elevation	957.94	927.58	980.20	931.53	905.52	930.92	847.70	955.67	941.29	856.40
Screen Length	5.4	10.4	5.3	10	10	5	.	10.4	10.5	10
Screen Material	SS/sw	SS/sw	SS/sw	SS/sl	SS/sw	SS/sw	.	SS/sw	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	.	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	17	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	6	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-301 CR CRBAWP	GW-305 CR LIV	GW-307 BC RS	GW-310 BC RS	GW-312 BC RS	GW-315 BC SPI	GW-322 CR CRSP	GW-332 EF WCPA	GW-337 EF WCPA	GW-363 BC EMWMF
General Information										
Date Installed	07/02/87	08/25/87	07/15/87	07/23/87	09/22/87	09/25/87	09/02/87	08/11/87	08/12/87	03/16/88
Total Depth Drilled	182.0	179.6	41.6	27.1	41.0	104.0	193.0	24.1	22.1	75.0
East Coordinate	61,964	52,962	49,655	50,497	49,778	52,268	58,912	54,882	54,519	46,872
North Coordinate	27,662	28,548	29,346	29,437	29,216	29,455	28,241	30,058	30,057	29,961
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	1,086.55	1,183.72	993.14	995.52	996.70	1,047.45	1,134.98	981.24	987.48	957.91
Ground Surface Elevation	1,083.94	1,181.07	991.01	992.40	994.13	1,044.84	1,131.81	979.55	984.12	955.41
Tag Depth-(TOC)	165.23	181.06	43.60	30.47	42.10	105.98	191.99	27.07	25.33	77.27
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQT	AQT	AQT
Geologic Formation	OCk	OCk	Cmn	Cmn	Cmn	Cmn	OCk	Cn	Cn	Cn
Aquifer Zone	BDR	BDR	WT	WT	WT	BDR	BDR	WT	WT	BDR
Weathered Rock-Depth	94.0	53.0	41.6	27.1	.	54.0	49.0	6.0	.	9.0
Fresh Rock-Depth	136.0	84.0	.	.	.	71.0	120.0	.	.	21.0
Conductor Casing										
Casing Depth	105.0	64.0	.	.	.	84.4	61.0	.	.	36.0
Outside Diameter	10.75	10.75	.	.	.	10.75	10.75	.	.	10.75
Inside Diameter	10	10	.	.	.	10	10	.	.	10
Casing Material	SF25	SF25	NONE	.	.	SF25	SF25	.	.	STL
Well Casing					.					
Borehole Depth	163.5	179.6	41.6	27.1	41.0	104.0	135.0	24.1	22.1	50.0
Borehole Diameter	10	10	10	10	12	10	10	10	10	9.5
Casing Depth	151.0	168.9	30.9	21.8	30.5	93.3	128.0	18.7	16.7	48.3
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	7	4.5	4.5	6.62
Inside Diameter	4	4	4	4	4	4	.	4	4	.
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	STL	SS304	SS304	SF25
Monitored Interval										
Top-Depth	148.5	165.3	28.7	19.5	29.6	90.0	128.0	16.8	15.0	50.0
Midpoint-Depth	156.0	172.5	35.2	23.3	35.3	97.0	160.5	20.5	18.6	62.5
Pump Intake-Depth	157.40	173.40	36.37	25.00	32.43	97.40	182.30	21.30	16.60	62.50
Bottom of Screen-Depth	161.0	179.6	41.6	27.1	40.5	103.3	.	24.1	22.1	.
Bottom-Depth	163.5	179.6	41.6	27.1	41.0	104.0	193.0	24.1	22.1	75.0
Top-Elevation	935.44	1,015.77	962.31	972.90	964.53	954.84	1,003.81	962.75	969.12	905.41
Midpoint-Elevation	927.94	1,008.62	955.86	969.10	958.83	947.84	971.31	959.10	965.57	892.91
Pump Intake-Elevation	926.55	1007.62	954.64	967.35	961.70	947.45	949.48	958.24	967.48	892.91
Bottom-Elevation	920.44	1,001.47	949.41	965.30	953.13	940.84	938.81	955.45	962.02	880.41
Screen Length	10	10.7	10.7	5.3	10	10	.	5.4	5.4	.
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	.	SS/sw	SS/sw	.
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	.	0.01	0.01	.
Open-Hole Length	.	.	.	.	.	.	65	.	.	25
Open-Hole Diameter	.	.	.	.	.	.	6	.	.	6

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-365 BC OLF	GW-380 EF NHP	GW-381 EF NHP	GW-382 EF NHP	GW-383 EF NHP	GW-514 CR FCAP	GW-521 CR LIV	GW-522 CR LIV	GW-526 BC S3	GW-537 BC OLF
General Information										
Date Installed	05/02/88	08/19/88	04/25/88	04/11/88	04/04/88	03/24/88	09/14/88	09/20/88	06/13/88	09/14/88
Total Depth Drilled	150.0	15.5	60.4	173.0	24.1	195.0	136.0	195.5	123.0	24.5
East Coordinate	46,490	62,938	62,948	62,956	63,522	57,341	52,040	52,612	50,708	49,539
North Coordinate	29,150	28,714	28,715	28,716	29,201	27,575	28,541	28,377	30,033	30,057
Measuring Point	TOWW	TOWW	TOWW	TOC	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	935.58	913.55	913.36	913.17	908.77	1,001.22	1,182.88	1,175.48	998.25	976.65
Ground Surface Elevation	933.03	913.66	913.44	913.16	906.00	998.66	1,179.46	1,172.04	995.34	974.49
Tag Depth-(TOC)	152.49	15.80	61.01	173.20	26.54	197.13	136.70	197.10	123.80	27.35
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQT	AQF	AQF	AQF	AQT	AQT
Geologic Formation	Cmn	Cmn	Cmn	Cmn	Cn	OCk	OCk	OCk	Cn	Cn
Aquifer Zone	BDR	WT	BDR	BDR	WT	BDR	BDR	BDR	BDR	WT
Weathered Rock-Depth	11.0	15.5	13.5	12.7	11.5	44.0	.	85.0	3.5	14.9
Fresh Rock-Depth	15.0	.	26.0	17.0	.	92.0	54.0	130.0	23.6	.
Conductor Casing										
Casing Depth	18.5	.	13.5	12.7	5.0	105.0	60.5	90.0	23.6	.
Outside Diameter	11.75	.	13	10.75	10.75	10.75	10.75	10.75	10.75	.
Inside Diameter	11	.	.	10	10	10	10	10	10	.
Casing Material	STL	.	STL	STL	STL	STL	STL	STL	STL	.
Well Casing	.									
Borehole Depth	126.7	15.5	49.3	125.0	24.1	174.0	136.0	195.5	101.0	24.5
Borehole Diameter	10.75	10	9.5	9.5	8.75	9.5	9.5	9.5	9.5	8.75
Casing Depth	124.2	4.8	47.8	123.2	18.1	172.3	124.9	184.6	99.7	8.0
Outside Diameter	6.62	4.5	6.62	6.62	4.5	6.62	4.5	4.5	6.62	4.5
Inside Diameter	.	.	.	.	4	.	4	4	.	4
Casing Material	SF25	SS304	SF25	SF25	SS304	SF25	SS304	SS304	SF25	SS304
Monitored Interval										
Top-Depth	126.7	2.8	49.3	125.0	16.6	174.0	123.2	183.0	101.0	4.8
Midpoint-Depth	138.4	9.2	54.9	149.0	20.1	184.5	129.6	189.2	112.0	14.1
Pump Intake-Depth	145.45	12.60	55.50	.	20.50	189.40	129.00	187.60	112.10	22.80
Bottom of Screen-Depth	.	15.2	.	.	23.1	.	135.2	195.0	.	23.0
Bottom-Depth	150.0	15.5	60.4	173.0	23.6	195.0	136.0	195.3	123.0	23.3
Top-Elevation	806.33	910.86	864.14	788.16	889.40	824.66	1,056.26	989.04	894.34	969.69
Midpoint-Elevation	794.68	904.51	858.59	764.16	885.90	814.16	1,049.86	982.89	883.34	960.44
Pump Intake-Elevation	145.45	901.05	857.96	.	885.47	809.22	1050.48	984.48	883.25	951.65
Bottom-Elevation	783.03	898.16	853.04	740.16	882.40	803.66	1,043.46	976.74	872.34	951.19
Screen Length	.	10.4	.	.	5	.	10.3	10.4	.	15
Screen Material	.	SS/sw	.	.	SS/sw	.	SS/sw	SS/sw	.	SS/sw
Slot Size	.	0.01	.	.	0.01	.	0.01	0.01	.	0.01
Open-Hole Length	23.3	.	11.1	48	.	21	.	.	22	.
Open-Hole Diameter	6	.	6.1	6.13	.	6	.	.	6.1	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-540 CR LII	GW-557 CR LV	GW-560 CR CDLVII	GW-562 CR CDLVII	GW-564 CR CDLVII	GW-601 BC OLF	GW-605 EF EXP-I	GW-606 EF EXP-I	GW-608 CR CRSP	GW-609 CR CRSP
General Information										
Date Installed	06/02/89	12/02/88	12/30/88	01/13/89	01/27/89	08/31/89	03/19/91	03/20/91	10/05/89	10/18/90
Total Depth Drilled	171.5	139.0	117.0	133.0	88.0	356.0	40.5	175.0	220.0	269.0
East Coordinate	52,371	59,520	60,743	61,640	59,865	47,629	62,002	61,951	59,724	60,040
North Coordinate	27,489	26,450	25,692	26,276	25,873	28,903	28,707	28,708	27,889	28,109
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	1,072.31	1,081.36	949.05	934.69	938.07	1,002.80	919.06	919.59	1,075.38	1,112.31
Ground Surface Elevation	1,069.38	1,078.63	945.76	931.86	935.12	999.09	916.97	916.98	1,071.00	1,109.70
Tag Depth-(TOC)	173.83	136.07	82.90	61.24	78.74	358.61	42.00	174.36	219.80	268.80
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF
Geologic Formation	OCk	OCk	OCk	OCk	OCk	Cmn	Cmn	Cmn	OCk	OCk
Aquifer Zone	BDR	WT	WT	WT	WT	BDR	BDR	BDR	BDR	BDR
Weathered Rock-Depth	110.0	113.8	92.0	.	.	8.0	.	.	.	.
Fresh Rock-Depth	150.0	134.0	.	52.0	72.0	54.0	9.5	10.8	140.0	107.0
Conductor Casing										
Casing Depth	154.0	85.0	.	.	.	41.4	9.5	64.7	148.0	107.0
Outside Diameter	10.75	10.75	.	.	.	11.75	11.75	7	10.75	10.75
Inside Diameter	10	10	.	.	.	11	11	6.4	10	10
Casing Material	STL	STL	.	.	.	STL	SJ55	SJ55	STL	SJ55
Well Casing									.	
Borehole Depth	171.5	138.0	117.0	60.0	81.0	319.0	40.5	175.0	150.0	269.0
Borehole Diameter	9.25	9.5	9.5	9.5	9.5	10.63	10.6	9.63	15.5	9.5
Casing Depth	161.2	115.8	49.0	38.0	55.3	317.2	29.7	161.0	.	258.7
Outside Diameter	4.5	4.5	4.5	4.5	4.5	7	4.25	4.25	.	4.5
Inside Diameter	4	4	4	4	4	.	4	4	.	4.25
Casing Material	SS304	SS304	SS304	SS304	SS304	STL	SS304	SS304	.	SS304
Monitored Interval										
Top-Depth	158.5	112.9	45.2	36.0	52.0	318.5	28.2	155.0	148.0	256.4
Midpoint-Depth	165.0	125.5	57.1	48.0	66.5	337.3	34.1	163.0	184.0	262.7
Pump Intake-Depth	166.10	123.60	59.40	48.20	65.50	341.29	33.90	166.40	210.62	261.40
Bottom of Screen-Depth	171.5	135.8	69.0	58.0	75.3	.	39.7	171.0	.	269.0
Bottom-Depth	171.5	138.0	69.0	60.0	81.0	356.0	39.9	171.0	220.0	269.0
Top-Elevation	910.88	965.73	900.56	895.86	883.12	680.59	888.77	761.98	923.00	853.30
Midpoint-Elevation	904.38	953.18	888.66	883.86	868.62	661.84	882.92	753.98	887.00	847.00
Pump Intake-Elevation	903.31	955.06	886.35	883.69	869.57	657.80	883.06	750.59	860.38	848.31
Bottom-Elevation	897.88	940.63	876.76	871.86	854.12	643.09	877.07	745.98	851.00	840.70
Screen Length	10.3	20	20	20	20	.	10	10	.	10.3
Screen Material	SS/sl	SS/sw	SS/sw	SS/sw	SS/sw	.	SS/sw	SS/ppk	.	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	.	0.01	0.01	.	0.01
Open-Hole Length	.	.	.	.	.	37.5	.	.	72	.
Open-Hole Diameter	.	.	.	.	.	6.25	.	.	9.5	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	**GW-615**	**GW-616**	**GW-618**	**GW-619**	**GW-620**	**GW-623**	**GW-626**	**GW-627**	**GW-633**	**GW-639**
Hydrogeologic Regime	**BC**	**BC**	**EF**	**EF**	**EF**	**BC**	**BC**	**BC**	**EF**	**BC**
Functional Area	**S3**	**S3**	**EXP-E**	**FTF**	**FTF**	**BG**	**BG**	**BG**	**RG**	**EMWMF**
General Information										
Date Installed	02/13/90	03/10/90	03/15/90	03/27/90	03/27/90	08/02/90	12/15/89	12/11/89	05/03/90	06/15/90
Total Depth Drilled	245.0	269.0	37.0	40.8	75.0	349.0	78.0	270.0	15.0	125.5
East Coordinate	52,224	51,907	54,738	52,906	52,895	44,138	42,772	42,774	53,100	45,260
North Coordinate	30,009	29,724	29,798	29,563	29,565	29,388	29,535	29,505	30,145	29,626
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	1,017.55	1,011.81	985.14	1,015.42	1,015.57	925.21	942.87	943.51	996.43	940.95
Ground Surface Elevation	1,014.17	1,009.81	982.64	1,012.74	1,012.84	922.01	939.95	940.39	996.66	937.98
Tag Depth-(TOC)	246.84	270.59	38.30	43.63	77.91	277.93	80.92	270.96	15.15	129.64
Geologic Information										
Hydrostratigraphic Unit	AQT	AQT	AQF	AQF	AQF	AQT	AQT	AQT	AQT	AQT
Geologic Formation	Cn	Cn	Cmn	Cmn	Cmn	Cn	Cn	Cn	Cn	Cn
Aquifer Zone	BDR	BDR	WT	WT	WT	BDR	BDR	BDR	WT	BDR
Weathered Rock-Depth	15.0	35.0	25.0	40.0	41.0	16.0	2.0	3.0	8.5	3.0
Fresh Rock-Depth	40.0	42.0	27.0	.	70.0	38.0	64.0	43.0	.	20.0
Conductor Casing										
Casing Depth	84.5	45.6	27.5	.	42.5	218.0	62.5	47.5	.	31.0
Outside Diameter	11.75	11.75	10.75	.	10.75	7	11.75	11.75	.	11.75
Inside Diameter	11	11	10	.	10	6.54	11	11	.	11
Casing Material	SJ55	SJ55	SJ55	.	SJ55	SJ55	SJ55	SJ55	.	SJ55
Well Casing						.				
Borehole Depth	222.5	219.7	37.0	40.8	75.0	274.5	78.0	254.0	15.0	95.5
Borehole Diameter	10.63	10.63	9.5	9.5	9.5	6	9.5	10.63	10.5	10
Casing Depth	221.2	217.8	26.7	30.0	64.2	244.0	67.7	252.7	5.0	94.5
Outside Diameter	7	7	4.5	4.5	4.5	2.37	4.5	7	4.5	7
Inside Diameter	6.54	6.54	4.25	4.25	4.25	2	4.25	6.54	4	6.54
Casing Material	SF25	SF25	SS304	SS304	SS304	SS304	SS304	SF25	PVC	SF25
Monitored Interval										
Top-Depth	222.5	219.1	26.0	26.8	61.7	238.1	63.0	254.0	3.5	95.5
Midpoint-Depth	233.8	244.1	31.5	33.8	68.4	256.2	70.5	262.0	9.3	110.5
Pump Intake-Depth	.	263.00	32.50	35.20	70.30	.	73.30	255.90	12.20	.
Bottom of Screen-Depth	.	.	37.0	40.8	75.0	274.2	77.7	.	15.0	.
Bottom-Depth	245.0	269.0	37.0	40.8	75.0	274.2	78.0	270.0	15.0	125.5
Top-Elevation	791.67	790.71	956.64	985.94	951.14	683.91	876.95	686.39	993.16	842.48
Midpoint-Elevation	780.42	765.76	951.14	978.94	944.49	665.86	869.45	678.39	987.41	827.48
Pump Intake-Elevation	.	746.81	950.14	977.52	942.57	.	866.67	684.51	984.43	.
Bottom-Elevation	769.17	740.81	945.64	971.94	937.84	647.81	861.95	670.39	981.66	812.48
Screen Length	.	.	10.3	10.8	10.8	30.2	10	.	10	.
Screen Material	.	.	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	.	PVC/sl	.
Slot Size	.	.	0.01	0.01	0.01	0.01	0.01	.	0.01	.
Open-Hole Length	22.5	49.9	.	.	.	.	.	16	.	30
Open-Hole Diameter	6.25	6.25	.	.	.	.	.	6.25	.	6.25

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	GW-648	GW-653	GW-656	GW-658	GW-683	GW-684	GW-686	GW-690	GW-691	GW-692
Hydrogeologic Regime	BC	BC	EF	EF	BC	BC	EF	EF	EF	EF
Functional Area	RS	BG	T0134	FF	EXP-A	EXP-A	CPT	CPT	CPT	CPT
General Information										
Date Installed	09/17/90	08/10/90	07/19/90	08/31/90	12/03/90	10/09/90	10/18/90	10/24/90	10/24/90	10/25/90
Total Depth Drilled	80.1	39.0	21.5	19.1	197.5	129.6	17.0	53.0	20.0	53.0
East Coordinate	49,888	42,317	57,439	62,146	41,552	41,354	55,956	55,990	55,983	56,001
North Coordinate	29,088	29,660	29,895	29,638	28,282	28,525	29,540	29,787	29,794	29,653
Measuring Point	TOC	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOWW	TOWW	TOWW
Measuring Point Elevation	1,029.20	931.84	954.79	944.81	972.23	898.83	963.76	967.36	968.59	964.38
Ground Surface Elevation	1,026.50	928.85	954.90	942.04	969.45	895.53	964.43	967.71	968.09	964.55
Tag Depth-(TOC)	82.47	41.53	20.60	20.64	199.83	132.21	16.23	53.25	20.39	53.05
Geologic Information										
Hydrostratigraphic Unit	AQF	AQT	AQT	AQT	AQF	AQF	AQF	AQF	AQF	AQF
Geologic Formation	Cmn	Cn	Cn	Cn	OCk	Cmn	Cmn	Cmn	Cmn	Cmn
Aquifer Zone	WT	WT	WT	WT	BDR	BDR	WT	BDR	WT	BDR
Weathered Rock-Depth	49.5	3.5	12.0	1.5	22.0	.	17.0	24.0	20.0	23.0
Fresh Rock-Depth	.	35.0	.	.	26.0	9.5	.	.	.	.
Conductor Casing										
Casing Depth	64.5	.	.	3.5	82.0	87.0	.	26.0	.	25.0
Outside Diameter	10.75	.	.	10.75	11.75	11.75	.	10.5	.	10.5
Inside Diameter	10	.	.	10	11	11	.	10	.	10
Casing Material	SJ55	.	.	SJ55	SJ55	SJ55	.	PVC40	.	PVC40
Well Casing	.									
Borehole Depth	80.1	39.0	21.5	19.1	197.5	129.6	16.0	53.0	20.0	53.0
Borehole Diameter	9.5	9.5	9.5	9.5	10.63	10.5	12	8.5	12	8.5
Casing Depth	70.1	29.0	10.7	8.8	146.0	113.8	6.0	42.8	10.0	43.0
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Inside Diameter	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304
Monitored Interval										
Top-Depth	65.0	26.3	8.3	6.9	133.9	106.4	4.0	40.8	8.0	41.0
Midpoint-Depth	72.6	32.7	14.9	13.0	165.4	118.0	10.0	46.8	14.0	47.0
Pump Intake-Depth	.	33.50	18.10	13.80	171.20	119.70	15.67	48.40	14.50	48.20
Bottom of Screen-Depth	80.1	39.0	20.7	18.8	196.8	128.4	16.0	52.8	20.0	53.0
Bottom-Depth	80.1	39.0	21.5	19.1	196.8	129.6	16.0	52.8	20.0	53.0
Top-Elevation	961.50	902.55	946.60	935.14	835.55	789.13	960.43	926.91	960.09	923.55
Midpoint-Elevation	953.95	896.20	940.00	929.04	804.10	777.53	954.43	920.91	954.09	917.55
Pump Intake-Elevation	.	895.34	936.79	928.21	798.23	775.83	948.76	919.36	953.59	916.38
Bottom-Elevation	946.40	889.85	933.40	922.94	772.65	765.93	948.43	914.91	948.09	911.55
Screen Length	10	10	10	10	50.8	14.6	10	10	10	10
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/ppk	SS/ppk	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-698 EF B8110	GW-700 EF B8110	GW-703 BC EXP-B	GW-704 BC EXP-B	GW-706 BC EXP-B	GW-709 CR LII	GW-712 BC EXP-W	GW-713 BC EXP-W	GW-714 BC EXP-W	GW-722 EF EXP-J
General Information										
Date Installed	11/02/90	10/03/90	12/07/90	12/20/90	01/27/91	04/05/91	06/20/91	01/13/92	01/24/92	08/09/91
Total Depth Drilled	75.0	31.0	182.0	256.0	182.5	80.6	457.5	315.2	145.0	644.3
East Coordinate	56,804	56,828	44,931	44,935	44,944	52,372	36,507	36,434	36,435	64,926
North Coordinate	29,277	29,453	28,806	28,845	28,946	25,344	28,233	28,236	28,422	28,532
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOC
Measuring Point Elevation	970.09	960.18	955.29	945.33	929.47	906.81	877.89	881.43	875.88	953.71
Ground Surface Elevation	970.09	957.78	951.80	941.99	925.78	903.84	873.61	877.83	872.30	951.04
Tag Depth-(TOC)	74.88	33.19	185.29	258.65	185.79	83.52	460.53	318.39	146.90	642.68
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF	AQF
Geologic Formation	Cmn	Cmn	Cmn	Cmn	Cmn	OCk	OCk	Cmn	Cmn	Cmn
Aquifer Zone	BDR	WT	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR
Weathered Rock-Depth	42.0	31.0	7.0	16.0	17.0	39.0	12.0	26.8	27.0	54.0
Fresh Rock-Depth	.	.	10.0	23.0	27.0	43.0	66.0	63.8	35.0	73.0
Conductor Casing										
Casing Depth	42.0	.	.	21.0	40.3	50.0	44.8	80.2	40.5	56.2
Outside Diameter	10.5	.	.	11.75	11.75	11.75	11.75	.	11.75	10.75
Inside Diameter	10	.	.	11	11	11	11	.	11	10
Casing Material	PVC40	.	.	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55
Well Casing										
Borehole Depth	75.0	31.0	135.0	246.0	157.0	80.6	441.5	305.0	115.1	75.0
Borehole Diameter	8.5	12	10.63	10.63	10.6	10.6	10.6	10.6	10.6	6
Casing Depth	65.0	21.0	132.8	243.5	155.1	70.4	440.2	303.7	113.8	74.5
Outside Diameter	4.5	4.5	7	7	7	4.25	7	7	7	4.5
Inside Diameter	4.25	4.25	6.54	6.54	6.54	4	6.54	6.54	6.54	4
Casing Material	SS304	SS304	SF25	SF25	SF25	SS304	SF25	SF25	SF25	SJ55
Monitored Interval										
Top-Depth	63.0	19.0	133.8	244.5	156.1	68.7	441.5	305.0	115.1	74.5
Midpoint-Depth	69.0	25.0	157.9	250.3	169.3	74.7	449.5	310.1	130.1	359.4
Pump Intake-Depth	71.00	26.10	158.50	250.20	174.80	75.50	446.20	307.40	138.40	.
Bottom of Screen-Depth	75.0	31.0	.	.	.	80.4	.	.	.	.
Bottom-Depth	75.0	31.0	182.0	256.0	182.5	80.6	457.5	315.2	145.0	644.3
Top-Elevation	907.09	938.78	818.00	697.49	769.68	835.14	432.11	572.83	757.20	876.54
Midpoint-Elevation	901.09	932.78	793.90	691.74	756.48	829.19	424.11	567.73	742.25	591.64
Pump Intake-Elevation	899.09	931.68	793.29	691.83	750.97	828.31	427.39	570.43	733.88	.
Bottom-Elevation	895.09	926.78	769.80	685.99	743.28	823.24	416.11	562.63	727.30	306.74
Screen Length	10	10	.	.	.	10	.	.	.	.
Screen Material	SS/sw	SS/sw	.	.	.	SS/sw	.	.	.	.
Slot Size	0.01	0.01	.	.	.	0.01	.	.	.	.
Open-Hole Length	.	.	48.2	11.5	26.4	.	16	10.2	29.9	569.8
Open-Hole Diameter	.	.	6.25	6.5	6.25	.	6.25	6.25	6.25	3.5

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	GW-724	GW-725	GW-731	GW-732	GW-735	GW-738	GW-740	GW-744	GW-747	GW-748
Hydrogeologic Regime	BC	BC	CR	CR	EF	BC	BC	EF	EF	EF
Functional Area	EXP-C	EXP-C	CRSDB	CRSDB	EXP-J	EXP-C	EXP-C	GRIDK1	GRIDK2	GRIDK2
General Information										
Date Installed	08/12/91	08/27/91	09/12/91	09/11/91	10/30/91	11/21/91	12/20/91	01/08/92	01/28/92	01/30/92
Total Depth Drilled	301.6	142.5	180.4	190.6	83.0	90.1	190.0	69.5	73.3	27.2
East Coordinate	48,995	48,989	63,863	64,268	64,872	49,026	49,055	64,324	64,570	64,579
North Coordinate	29,198	29,405	27,464	27,717	28,867	29,150	29,027	30,282	29,730	29,741
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOC
Measuring Point Elevation	979.75	961.63	1,049.38	1,064.29	924.46	983.31	1,020.25	907.43	911.06	911.19
Ground Surface Elevation	976.62	958.26	1,045.75	1,060.65	921.34	980.36	1,016.95	905.05	911.68	911.71
Tag Depth-(TOC)	293.60	145.42	178.53	192.84	81.81	91.78	192.67	69.28	75.7	29.80
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQT	AQF	AQF	AQT	AQT	AQT
Geologic Formation	Cmn	Cmn	OCk	OCk	Cn	Cmn	Cmn	Cpv	Cm	Cm
Aquifer Zone	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR
Weathered Rock-Depth	33.5	14.0	95.4	85.0	19.0	12.0	38.1	9.6	3.9	8.0
Fresh Rock-Depth	40.0	17.5	129.4	96.0	77.5	15.1	45.1	14.6	5.4	11.8
Conductor Casing										
Casing Depth	40.0	21.0	122.0	100.7	25.5	16.5	46.9	27.6	17.2	.
Outside Diameter	11.75	11.75	11.75	11.75	11.75	11.75	11.75	10.75	10.75	.
Inside Diameter	11	11	11	11	11	11	11	10	10	.
Casing Material	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55	SJ55	.
Well Casing										
Borehole Depth	289.6	132.5	175.4	189.5	83.0	90.1	165.6	69.5	73.3	27.2
Borehole Diameter	10.6	10.6	10.6	10.6	10.6	10.6	10.6	9.87	9.87	9.87
Casing Depth	288.3	131.2	165.2	179.3	67.9	67.3	164.3	57.0	62.6	17.0
Outside Diameter	7	7	4.5	4.5	4.5	4.5	7	4.5	4.5	4.5
Inside Diameter	6.54	6.54	4.25	4.25	4.25	4.25	6.54	4.25	4.25	4.25
Casing Material	SF25	SF25	SS304	SS304	SS304	SS304	SF25	SS304	SS304	SS304
Monitored Interval										
Top-Depth	289.6	132.5	164.0	178.3	67.5	63.5	165.6	55.0	60.8	14.8
Midpoint-Depth	295.6	137.5	171.4	184.2	73.4	75.8	177.8	62.3	66.9	21.0
Pump Intake-Depth	294.40	137.10	169.90	184.40	73.58	78.60	183.70	65.10	62.0	17.52
Bottom of Screen-Depth	.	.	175.2	189.3	77.9	87.3	.	66.9	72.5	26.9
Bottom-Depth	301.6	142.5	178.7	190.0	79.2	88.0	190.0	69.5	73.0	27.2
Top-Elevation	687.02	825.76	881.75	882.35	853.84	916.86	851.35	850.05	844.28	896.91
Midpoint-Elevation	681.02	820.76	874.40	876.50	847.99	904.61	839.15	842.80	838.18	890.71
Pump Intake-Elevation	682.25	821.13	875.88	876.29	847.76	901.81	833.25	839.93	843.06	894.19
Bottom-Elevation	675.02	815.76	867.05	870.65	842.14	892.36	826.95	835.55	832.08	884.51
Screen Length	.	.	10	10	10	20	.	9.9	9.9	9.9
Screen Material	.	.	SS/sw	SS/sw	SS/sw	SS/sw	.	SS/sw	SS/sw	SS/sw
Slot Size	.	.	0.01	0.01	0.01	0.01	.	0.01	0.01	0.01
Open-Hole Length	12	10	.	.	.	.	24.4	.	.	.
Open-Hole Diameter	6.25	6.25	.	.	.	.	6.25	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	GW-757	GW-762	GW-763	GW-769	GW-770	GW-781	GW-782	GW-783	GW-791	GW-792
Hydrogeologic Regime	CR	EF	EF	EF	EF	EF	EF	EF	EF	EF
Functional Area	LII	GRIDJ3	GRIDJ3	GRIDG3	GRIDG3	GRIDE3	GRIDE3	GRIDE3	GRIDD2	GRIDD2
General Information										
Date Installed	04/24/92	05/15/92	05/13/92	06/04/92	06/04/92	08/10/92	08/12/92	08/13/92	09/21/92	09/24/92
Total Depth Drilled	166.5	60.2	17.0	61.4	20.0	69.6	36.0	16.3	70.6	29.2
East Coordinate	53,303	63,193	63,220	60,230	60,255	58,118	58,099	58,113	57,423	57,442
North Coordinate	25,410	29,115	29,117	29,510	29,505	29,711	29,719	29,734	30,483	30,481
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	961.64	915.56	915.03	944.43	944.72	947.89	947.73	948.49	992.13	992.74
Ground Surface Elevation	958.65	911.85	911.38	941.53	941.67	944.66	944.48	945.81	988.51	989.60
Tag Depth-(TOC)	168.54	62.04	20.41	62.73	21.68	71.07	38.23	17.98	72.45	31.99
Geologic Information										
Hydrostratigraphic Unit	AQF	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT
Geologic Formation	OCk	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cm	Cm
Aquifer Zone	BDR	BDR	WT	BDR	WT	BDR	BDR	WT	BDR	WT
Weathered Rock-Depth	29.5	12.0	17.0	14.2	12.0	0.9	1.0	1.0	14.7	14.5
Fresh Rock-Depth	48.0	14.5	.	.	16.5	14.0	7.5	8.5	26.0	.
Conductor Casing										
Casing Depth	46.8	19.4	.	17.2	.	23.8	.	.	31.5	.
Outside Diameter	10.75	11.75	.	11.75	.	10.75	.	.	10.75	.
Inside Diameter	10.25	11	.	11	.	10	.	.	10	.
Casing Material	SJ55	SJ55	.	SJ55	.	SJ55	.	.	SJ55	.
Well Casing										
Borehole Depth	166.5	60.2	17.0	61.4	20.0	69.6	36.0	16.3	70.6	29.2
Borehole Diameter	9.62	9.87	8	10.62	10.62	9.87	9.87	9.87	9.87	9.87
Casing Depth	135.5	48.2	5.2	49.4	8.5	57.8	25.0	4.2	59.0	18.5
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Inside Diameter	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304
Monitored Interval										
Top-Depth	134.0	46.4	4.0	48.2	7.5	56.0	23.8	3.6	57.5	17.0
Midpoint-Depth	150.3	52.6	10.0	54.3	13.3	62.7	29.9	10.0	64.1	23.0
Pump Intake-Depth	155.00	.	11.80	54.90	13.60	62.80	29.80	10.30	63.80	24.90
Bottom of Screen-Depth	165.5	58.1	15.2	59.3	18.4	68.0	34.9	13.9	68.9	28.2
Bottom-Depth	166.5	58.7	16.0	60.3	19.0	69.3	35.9	16.3	70.6	29.0
Top-Elevation	824.65	865.45	907.38	893.33	934.17	888.66	920.68	942.21	931.01	972.60
Midpoint-Elevation	808.40	859.30	901.38	887.28	928.42	882.01	914.63	935.86	924.46	966.60
Pump Intake-Elevation	803.64	.	899.63	886.63	928.02	881.89	914.73	935.49	924.73	964.74
Bottom-Elevation	792.15	853.15	895.38	881.23	922.67	875.36	908.58	929.51	917.91	960.60
Screen Length	30	9.9	10	9.9	9.9	10.2	9.9	9.7	9.9	9.7
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-796 CR LV	GW-797 CR LV	GW-798 CR CDLVII	GW-799 CR LV	GW-801 CR LV	GW-802 EF FF	GW-816 EF EXP-SR	GW-820 EF B9201-2	GW-829 BC OLF	GW-831 CR FCAP
General Information										
Date Installed	03/04/93	03/16/93	03/18/93	03/25/93	07/01/93	06/25/93	06/02/94	.	03/17/95	07/30/96
Total Depth Drilled	139.7	134.1	135.5	92.0	188.9	26.5	16.1	17.3	115.0	200.0
East Coordinate	58,206	58,550	60,310	59,961	58,780	62,217	64,031	59,773	50,036	56,593
North Coordinate	27,924	27,447	27,265	26,746	26,808	29,655	31,582	29,175	29,953	26,654
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOC	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	1,052.62	1,060.00	1,006.00	981.29	1,097.16	941.83	898.42	929.57	985.95	1,091.29
Ground Surface Elevation	1,048.80	1,056.10	1,002.42	978.10	1,093.82	942.30	894.56	929.67	981.92	1,088.04
Tag Depth-(TOC)	139.82	135.71	134.00	97.58	190.92	25.42	17.99	17.18	118.68	198.06
Geologic Information										
Hydrostratigraphic Unit	AQF	AQF	AQF	AQF	AQF	AQT	AQT	AQF	AQT	AQF
Geologic Formation	OCk	OCk	OCk	OCk	OCk	Cn	Cr	Cmn	Cn	OCk
Aquifer Zone	BDR	BDR	BDR	BDR	BDR	WT	WT	WT	BDR	BDR
Weathered Rock-Depth	102.0	67.1	94.4	60.8	112.5	10.0	.	.	1.3	134.8
Fresh Rock-Depth	103.0	89.0	95.8	62.8	113.4	15.0	.	.	29.0	140.8
Conductor Casing										
Casing Depth	107.6	95.0	99.7	65.0	115.4	.	.	.	.	138.3
Outside Diameter	10.75	10.75	10.75	10.75	10.75	.	.	.	.	10.75
Inside Diameter	10	10	10	10	10	.	.	.	.	10
Casing Material	SJ55	SJ55	SJ55	SJ55	SJ55	.	.	.	.	STL
Well Casing										
Borehole Depth	139.7	134.1	135.5	92.0	188.9	26.5	15.8	.	115.0	200.0
Borehole Diameter	9.5	9.5	9.5	9.5	9.87	10.62	10	.	9.87	9.87
Casing Depth	126.5	123.5	124.5	81.0	178.1	15.5	4.2	.	104.7	183.2
Outside Diameter	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Inside Diameter	4.25	4.25	4.25	4.25	4.25	4	4.25	4	4.25	4.25
Casing Material	SS304	SS304	SS304	SS304	SS304	PVC40	SS304	PVC	SS304	SS304
Monitored Interval										
Top-Depth	122.9	118.0	122.0	78.7	175.8	13.3	2.9	.	102.9	182.0
Midpoint-Depth	129.7	126.1	128.7	85.4	182.4	19.9	9.4	.	108.8	190.8
Pump Intake-Depth	131.20	128.10	125.90	84.80	177.70	.	11.10	15.60	109.50	188.80
Bottom of Screen-Depth	136.4	133.4	134.4	90.9	188.0	25.5	13.6	.	114.5	193.6
Bottom-Depth	136.5	134.1	135.4	92.0	188.9	26.5	15.8	17.3	114.6	199.6
Top-Elevation	925.90	938.10	880.42	899.40	918.02	929.00	891.66	.	879.02	906.04
Midpoint-Elevation	919.10	930.05	873.72	892.75	911.47	922.40	885.21	.	873.17	897.24
Pump Intake-Elevation	917.62	928.00	876.50	893.29	916.16	.	883.42	914.07	872.45	899.29
Bottom-Elevation	912.30	922.00	867.02	886.10	904.92	915.80	878.76	912.37	867.32	888.44
Screen Length	9.9	9.9	9.9	9.9	9.9	10	9.4	.	9.8	10.4
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	PVC/sl	SS/sw	.	SS/sw	SS/sw
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	0.01	.	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number Hydrogeologic Regime Functional Area	GW-832 EF NHP	GW-916 BC EMWMF	GW-917 BC EMWMF	GW-918 BC EMWMF	GW-920 BC EMWMF	GW-921 BC EMWMF	GW-922 BC EMWMF	GW-923 BC EMWMF	GW-924 BC EMWMF	GW-925 BC EMWMF
General Information										
Date Installed	05/09/96	01/29/01	01/22/01	02/02/01	01/16/01	01/31/01	01/17/01	02/01/01	01/29/01	02/05/01
Total Depth Drilled	11.9	36.0	51.0	75.0	55.0	50.0	46.0	102.0	54.0	170.0
East Coordinate	64,134	48,276	47,914	47,549	47,375	47,139	47,147	48,184	46,300	47,128
North Coordinate	29,142	31,186	30,463	31,672	30,193	30,350	30,024	30,822	30,185	30,349
Measuring Point	TOC	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW
Measuring Point Elevation	906.18	1,002.85	997.10	1,067.96	967.43	971.29	956.91	1,016.73	968.90	971.14
Ground Surface Elevation	906.83	1,000.00	994.00	1,065.00	965.00	968.00	955.00	1,013.00	966.00	968.00
Tag Depth-(TOC)	10.36	.	.	.	.	.	.	.	.	.
Geologic Information										
Hydrostratigraphic Unit	AQF	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT	AQT
Geologic Formation	Cmn	Cc	Cm	Cpv	Cn	Cm	Cn	Cm	Cn	Cm
Aquifer Zone	WT	WT	WT	WT	BDR	BDR	BDR	WT	WT	BDR
Weathered Rock-Depth	.	10.0	21.0	.	.	.	10.0	.	21.8	.
Fresh Rock-Depth	.	15.0	27.0	30.0	12.0	13.0	13.0	62.0	22.0	15.0
Conductor Casing										
Casing Depth	.	.	.	.	.	.	.	.	.	.
Outside Diameter	.	.	.	.	.	.	.	.	.	.
Inside Diameter	.	.	.	.	.	.	.	.	.	.
Casing Material	.	.	.	.	.	.	.	.	.	.
Well Casing										
Borehole Depth	11.9	.	.	.	.	.	.	.	.	.
Borehole Diameter	12	.	.	.	.	.	.	.	.	.
Casing Depth	5.9	.	20.0	20.0	24.0	18.0	25.0	40.0	23.0	97.0
Outside Diameter	6.63	.	2.37	.	2.37	2.37	2.37	2.37	2.37	2.37
Inside Diameter	6	.	2.07	.	2.07	2.07	2.07	2.07	2.07	2.07
Casing Material	PVC	.	SS304	SS304	SS304	SS304	SS304	SS304	SS304	SS304
Monitored Interval										
Top-Depth	4.0	13.0	18.0	18.0	22.0	16.0	23.0	36.0	21.0	92.0
Midpoint-Depth	7.9	24.5	34.5	25.5	38.5	33.0	34.5	55.5	37.5	120.0
Pump Intake-Depth	.	.	.	.	.	.	.	.	.	.
Bottom of Screen-Depth	10.9	35.0	50.0	30.0	54.0	48.0	45.0	70.0	53.0	147.0
Bottom-Depth	11.8	36.0	51.0	33.0	55.0	50.0	46.0	75.0	54.0	148.0
Top-Elevation	902.83	.	.	.	.	.	.	.	.	.
Midpoint-Elevation	898.93	.	.	.	.	.	.	.	.	.
Pump Intake-Elevation	.	975.35	959.60	1039.46	925.93	935.29	919.41	958.23	928.40	848.14
Bottom-Elevation	895.03	.	.	.	.	.	.	.	.	.
Screen Length	5	20	30	10	30	30	20	30	30	50
Screen Material	PVC/sl	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw
Slot Size	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Open-Hole Length	.	.	.	.	.	.	.	.	.	.
Open-Hole Diameter	.	.	.	.	.	.	.	.	.	.

APPENDIX C: MONITORING WELL CONSTRUCTION DETAILS, CY 2010

Well Number	GW-926	GW-927	GW-928	GW-929	GW-930	GW-931	GW-934
Hydrogeologic Regime	BC	BC	EF	EF	EF	EF	EF
Functional Area	EMWMF	EMWMF	GRIDC1	GRIDC1	GRIDD1	GRIDD1	NHP
General Information							
Date Installed	02/01/01	02/01/01	12/21/09	12/19/09	12/21/09	12/20/09	11/22/02
Total Depth Drilled	145.0	172.0	44.0	28.6	41.5	19.8	400.4
East Coordinate	46,290	47,906	56,221	56,241	57,053	57,080	62,965
North Coordinate	30,185	30,463	31,726	31,726	31,424	31,421	28,662
Measuring Point	TOWW	TOWW	TOWW	TOWW	TOWW	TOWW	TOC
Measuring Point Elevation	968.94	997.19	1,049.23	1,050.28	1,005.62	1,006.96	916.60
Ground Surface Elevation	966.00	994.00	1,046.83	1,047.82	1,002.47	1,003.62	914.81
Tag Depth-(TOC)	.	.	.	.	.	.	.
Geologic Information							
Hydrostratigraphic Unit	AQT	AQT	AQT	AQT	AQT	AQT	AQF
Geologic Formation	Cn	Cm	Cpv	Cpv	Crt	Crt	Cmn
Aquifer Zone	BDR	BDR	BDR	WT	BDR	WT	BDR
Weathered Rock-Depth	15.0	25.0	21.0	27.5	21.0	16.0	8.5
Fresh Rock-Depth	18.0	30.0	24.0	28.6	23.0	19.8	15.6
Conductor Casing							
Casing Depth	.	.	.	.	.	.	
Outside Diameter	.	.	.	.	.	.	
Inside Diameter	.	.	.	.	.	.	
Casing Material	.	.	.	.	.	.	
Well Casing							
Borehole Depth	.	.	44.0	28.6	41.5	19.8	400.4
Borehole Diameter	.	.	.	.	.	.	.
Casing Depth	113.0	60.0	33.5	18.0	31.0	9.2	
Outside Diameter	2.37	2.37	4.37	4.37	4.37	4.37	
Inside Diameter	2.07	2.07	4	4	4	4	
Casing Material	SS304	SS304	SS304	SS304	SS304	SS304	
Monitored Interval							
Top-Depth	103.0	57.0	31.2	15.0	28.0	6.0	
Midpoint-Depth	124.0	74.5	37.6	21.8	34.8	12.9	
Pump Intake-Depth	.	.					.
Bottom of Screen-Depth	143.0	90.0					
Bottom-Depth	145.0	92.0	44.0	28.6	41.5	19.8	400.4
Top-Elevation	.	.	1,015.63	1,032.82	974.47	997.62	
Midpoint-Elevation	.	.	1,009.23	1,026.02	967.72	990.72	
Pump Intake-Elevation	841.94	919.69					
Bottom-Elevation	.	.	1,002.83	1,019.22	960.97	983.82	514.41
Screen Length	30	30	10	10	10	10	.
Screen Material	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	SS/sw	.
Slot Size	0.01	0.01	0.01	0.01	0.01	0.01	.
Open-Hole Length	.	.	.	.	.	.	
Open-Hole Diameter	.	.	.	.	.	.	

APPENDIX D

CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME

EXPLANATION

Sampling Point:

BCK - Bear Creek Kilometer
EMW-VWUNDER - outfall for an underdrain installed to lower the water table and relieve hydrostatic pressure beneath the EMWMF liner.
GW - Monitoring Well
NT - Northern Tributary (Bear Creek)
SS - South Side (of Bear Creek, spring sampling station)

Location:

BG - Bear Creek Burial Grounds
EMWMF - Environmental Management Waste Management Facility
EXP - Exit Pathway Monitoring Location:
    Maynardville Limestone Picket (-A, -B, -C, -W)
    Spring or Surface Water Location (-SW)
OLF - Oil Landfarm
RS - Rust Spoil Area
S3 - S-3 Site
SPI - Spoil Area I

Monitoring Program:

BJC - managed by Bechtel Jacobs Company LLC
GWPP - managed by Y-12 Groundwater Protection Program

Sample Type:

Dup - Field duplicate sample
NP - No purge (low recovery well, clear stagnant groundwater only)
PDB - Passive diffusion bag sample

Units:

ft - feet (elevations are above mean sea level and depths are below grade)
µg/L - micrograms per liter
m/L - milligrams per liter
mV - millivolts
µmho/cm - micromhos per centimeter
NTU - Nephelometric Turbidity Units
pCi/L - picoCuries per liter
ppm - parts per million

EXPLANATION (continued)

Only the analytes that were detected above the program reporting limits in at least one sample are included in this appendix. Additionally, results that are below the reporting limits are replaced with missing values (e.g., " < ") to emphasize the detected results. The first three sections of this appendix (D.1, D.2, and D.3) include results for all locations except those at the EMWMF, and results for that site are presented in the fourth section (D.4).

The following sections describe the reporting limits and data qualifiers for each sub-appendix. A comprehensive list of the GWPP analytes, analytical methods, and reporting limits is provided in Appendix B, Table B.5.

D.1 Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals:

Results for all of the field measurements, miscellaneous analytes, and major ions are included in this appendix. The reporting limits for the major ions are shown in the following summary.

Analyte	Reporting Limit (µg/L)		Analyte	Reporting Limit (µg/L)	
	GWPP	BJC		GWPP	BJC
Cations			**Anions**		
Calcium	0.2	0.01	Bicarbonate	1.0	NS
Magnesium	0.2	0.05	Carbonate	1.0	NS
Potassium	2.0	0.025	Chloride	0.2	0.1
Sodium	0.2	0.01	Fluoride	0.1	0.05
			Nitrate (as Nitrogen)	0.05	0.1
			Sulfate	0.25	0.1
Note: "NS" - not specified.					

The Y-12 GWPP sampling and analysis plan (SAP) for CY 2010 (B&W Y-12 2009a) specifies trace metal reporting limits and analytical methods that are appropriate for DOE Order monitoring. The laboratories subcontracted by monitoring programs managed by BJC may use reporting limits (sometimes reporting estimated values) that are lower than the GWPP reporting limits for the metals. For this report, the analytical methods for metals used by BJC monitoring programs (EPA-7470, SW846-6010B, SW846-6020, and ASTM-D5174-M) are considered to be functionally equivalent to the methods used by the GWPP (Table B.5). To retain the highest quality data for DOE Order monitoring purposes and to standardize reporting limits for trace metal results obtained from all sources, the GWPP reporting limits were given precedence over the BJC reporting limits (BJC 2010a) shown on the following page. The trace metals shown in bold typeface below were detected in at least one groundwater or surface water sample collected during CY 2010 and are presented in Appendix D.1.

EXPLANATION (continued)

Analyte	Reporting Limit (µg/L)		Analyte	Reporting Limit (µg/L)	
	GWPP	BJC		GWPP	BJC
Aluminum	0.2	0.05*	**Lithium**	0.01	0.01
Antimony	0.0025	0.003	**Manganese**	0.005	0.005
Arsenic	0.005	0.005	**Mercury**	0.00005	0.0002
Barium	0.004	0.005	Molybdenum	0.05	NS
Beryllium	0.0005	0.001	**Nickel**	0.005	0.01
Boron	0.1	0.01*	**Selenium**	0.01	0.0025*
Cadmium	0.0025	0.00013*	Silver	0.02	0.0015*
Chromium	0.01	0.005*	**Strontium**	0.005	0.005
Cobalt	0.02	0.005*	**Thallium**	0.0005	0.001
Copper	0.02	0.005*	Thorium	0.2	NS
Iron	0.05	0.01*	**Uranium**	0.0005	0.004
Lead	0.0005	0.002	Vanadium	0.02	0.01*
			Zinc	0.05	0.01*

Note: * - the GWPP reporting limit is used instead of the BJC reporting limit; "NS" - not specified.

To evaluate the lowest possible mercury concentrations in surface water and potential groundwater contributions, monitoring by BJC included the following results that are not presented in Appendix D.1.

Sampling Location	CY 2010 Mercury Concentration (mg/L) by Method EPA-1631				
	Jan. & Feb.	March	June	July	August
GW-683	0.000006	.	.	.	0.000001
GW-684	<0.0000002	.	.	.	0.0000006
BCK-03.30	.	0.0000148	0.0000023	.	0.0000013
BCK-04.55	.	0.0000076	0.0000042	.	0.000004
BCK-07.87	.	0.0000036	0.0000032	.	0.0000027
BCK-09.20	0.0000047	0.0000022	0.0000028	0.0000119	0.0000025
BCK-11.54	0.0000115	0.0000045	0.0000055	0.0000104	0.0000069
BCK-11.84	.	0.0000052	0.0000069	.	0.0000054
BCK-12.34	0.0000105	0.0000146	0.0000126	0.0000204	0.0000107
NT-01	.	0.0000067	0.0000379	.	**0.0000557**
NT-03	0.0000085	0.0000127	0.0000265	0.0000411	0.0000301
NT-08	0.000002	0.0000039	0.0000041	0.0000097	0.0000036
S07	.	0.0000048	0.0000165	.	0.0000031
SS-4	0.0000118	.	.	0.0000245	.
SS-5	0.0000016	0.0000014	0.000004	0.0000032	0.0000025
SS-6.6	.	0.0000013	0.000006	.	0.0000009
SS-7	.	0.0000007	0.0000016	.	0.0000014
SS-8	.	0.0000037	0.0000015	.	0.0000009

Note: The only result that exceeds the Y-12 GWPP reporting limit is shown in bold typeface (NT-01 in August).

EXPLANATION (continued)

The following symbols and data qualifiers are used in Appendix D.1:

.	-	Not analyzed or not applicable
<	-	Analyzed but not detected at the project reporting level
J	-	Positively identified; estimated concentration
Q	-	Result is inconsistent with historical measurements for the location
R	-	Unusable or rejected; the ion charge balance error (percent difference between summed cation charge and summed anion charge) exceeds 20% or duplicate results differ by an order of magnitude or more (lead results for well GW-703)

EXPLANATION (continued)

D.2 Volatile Organic Compounds:

The Y-12 GWPP reporting limits for volatile organic compounds (Table B.5) and those used for monitoring programs managed by BJC are contract-required quantitation limits. Results below the quantitation limit and above the instrument detection limit are reported as estimated quantities. Therefore, non-detected results are assumed to equal zero for all compounds.

As summarized below, 27 compounds were detected in the CY 2010 groundwater and surface water samples collected in the Bear Creek Regime. Results for these compounds are grouped by similar chemical composition (e.g., chloroethenes) in Appendix D.2.

Compound	No. Detected	Maximum (µg/L)	Compound	No. Detected	Maximum (µg/L)
cis-1,2-Dichloroethene	50	5,000	Toluene	5	20
Trichloroethene	49	3,400	Total Xylene	6	14
Tetrachloroethene	39	1,500	1,2-Dichloroethane	5	6.7
1,1-Dichloroethene	28	340	2-Butanone	5	1.6
1,1-Dichloroethane	23	2,200	Ethylbenzene	4	2 J
Vinyl chloride	18	660	Trichlorofluoromethane	2	2 J
Benzene	13	1,000	1,2-Dichloropropane	2	1.3
Chloroform	11	45	Acetonitrile	1	52 Q
1,1,1-Trichloroethane	10	150	Chlorobenzene	1	12
Chloroethane	9	22	1,4-Dichlorobenzene	1	3 J
Methylene chloride	9	320	Carbon tetrachloride	1	2 J
trans-1,2-Dichloroethene	9	12	Dichlorodifluoromethane	1	2 J
Acetone	8	290	1,1,2-Trichloroethane	1	1.3
1,1,2-Trichloro-1,2,2-trifluoroethane	7	95			

The following symbols and data qualifiers are used in Appendix D.2.

- . - Not analyzed
- < - Analyzed but not detected (also false-positive results)
- J - Positively identified, estimated concentration below the contract-required quantitation limit
- Q - Result is inconsistent with historical measurements for the location

EXPLANATION (continued)

D.3 Radiological Analytes:

Reporting limits for radiological analytes are sample-specific and analyte-specific minimum detectable activities that are reported with each result. The following summary shows the primary radiological analytes relevant to DOE Order monitoring collected during CY 2010 in the Bear Creek Regime.

Analyte	No. of Results	No. Detected	Analyte	No. of Results	No. Detected
Gross Alpha	49	28	Strontium-89/90*	3	1
Gross Beta	49	27	Technetium-99	75	33
Americium-241	2	0	Uranium-234*	58	45
Neptunium-237	2	2	Uranium-235*	58	24
Total Radium Alpha	2	2	Uranium-238	58	43

Note: * = Reported by BJC laboratories in Appendix D.3 as equivalent GWPP analytes:
Sr-90 = Sr-89/90; U-233/234 = U-234; U-235/236 = U-235.

Gross alpha and gross beta results are presented on the first page of Appendix D.3, followed by results for the primary isotopes shown above (pages D.3-2 through D.3-8).

The following notes and qualifiers apply to Appendix D.3:

- Activity - Result in picoCuries per liter (pCi/L)
- TPU - Total propagated uncertainty (two standard deviations); calculation includes the counting error (instrument uncertainty) as reported previously, plus other sources of uncertainty (e.g., volumetric, chemical yield)
- MDA - Minimum detectable activity
- . - Not analyzed or not applicable (TPU is not presented when the result is <MDA)
- < - Analyzed but less than the MDA (not detected)
- Q - Result is inconsistent with historical measurements for the location

EXPLANATION (continued)

D.4 Monitoring data for the EMWMF:

As with previous tables in Appendix D, only the analytes that were detected above the program reporting limits in at least one sample are included. Results for all field measurements and major cations are presented, along with results for 16 metals and four volatile organic compounds.

The following notes and qualifiers apply to Appendix D.4:

.	-	Not analyzed or not applicable (duplicate field measurements)
<	-	Analyzed but not detected at the program reporting level
J	-	Positively identified; estimated concentration
Q	-	Result is inconsistent with historical measurements for the location
Activity	-	Result in picoCuries per liter (pCi/L)
TPU	-	Total propagated uncertainty (two standard deviations); calculation includes the counting error (instrument uncertainty) as reported previously, plus other sources of uncertainty (e.g., volumetric, chemical yield)
MDA	-	Minimum detectable activity
*	-	Field measurements obtained on a previous date, as shown below:

Sampling Location	Date Sampled	Field Measurements	Sampling Location	Date Sampled	Field Measurements
GW-363	02/09/10	02/08/10	GW-923	02/09/10	02/08/10
GW-363	04/21/10	04/20/10	GW-923	04/14/10	04/13/10
GW-363	08/17/10	08/16/10	GW-923	08/10/10	08/09/10
GW-363	11/17/10	11/16/10	GW-923	11/11/10	11/09/10
GW-639	02/09/10	02/08/10	GW-925	02/10/10	02/09/10
GW-639	04/20/10	04/19/10	GW-925	04/21/10	04/20/10
GW-639	08/17/10	08/16/10	GW-925	08/11/10	08/10/10
GW-639	11/18/10	11/17/10	GW-925	11/16/10	11/14/10
GW-916	08/12/10	08/11/10	GW-926	08/11/10	08/10/10
GW-916	11/10/10	11/09/10	GW-926	11/11/10	11/10/10
GW-920	11/09/10	11/08/10	GW-961	11/10/10	11/09/10
GW-922	11/09/10	11/08/10			

EXPLANATION (continued)

Quarterly monitoring at the EMWMF includes analyses for an extensive list of isotopes with low detection limits. The radiological data obtained for sampling locations at the EMWMF are summarized below.

Analyte	No. of Results	No. Detected	Analyte	No. of Results	No. Detected
Actinium-227*	83	6	Plutonium-239/240	84	1
Americium-241	84	3	Plutonium-241	84	0
Americium-243	83	10	Plutonium-242	84	2
Carbon-14	84	0	Plutonium-244	83	0
Cesium-137	84	0	Potassium-40	84	3
Chlorine-36	84	1	Radium-226	84	28
Cobalt-60	84	0	Radium-228	84	6
Curium-242	83	1	**Strontium-90**	84	10
Curium-243/244	83	0	Technetium-99	84	3
Curium-245	84	18	**Thorium-227**	83	6
Curium-246*	84	18	Thorium-228	84	10
Curium-247	84	2	Thorium-229	84	2
Curium-248	83	0	Thorium-230	84	39
Europium-152	84	0	Thorium-231+234*	84	30
Europium-154	84	0	Thorium-232	84	9
Europium-155	83	0	Tritium	84	6
Iodine-129	84	2	Uranium-232	83	1
Neptunium-237	84	1	Uranium-233/234	84	54
Nickel-63	84	1	Uranium-235/236	84	7
Plutonium-236	83	0	**Uranium-238**	84	30
Plutonium-238	84	1	Yttrium-90*	84	10

Results for the isotopes that exceed the MDA (shown above as detected) are presented after the primary isotopic data (beginning on page D.4-10).

* The results for these isotopes are not presented because they are identical to the ones that are included (shown in bold typeface): **Thorium-227** for Actinium-227*; **Curium-245** for Curium-246*; **Strontium-90** for Yttrium-90*; and **Uranium-238** for Thorium231+234*. The pairs of results are identical because the isotopes are in secular equilibrium, with the parent isotope having the longer half-life.

EXPLANATION (continued)

Additional Analytes Not Presented in Appendix D.4 tables:

As shown below, seven semivolatile organic compounds and pesticides/polychlorinated biphenyls (PCBs) were detected in at least one sample from several of the locations at the Environmental Management Waste Management Facility.

Sampling Location	Date Sampled	Compound	Result (µg/L)
Semivolatile Organics			
GW-363	02/09/10	Bis(2-ethylhexyl)phthalate	6.67
GW-918	02/10/10	Bis(2-ethylhexyl)phthalate	12.9
GW-918	08/11/10	Bis(2-ethylhexyl)phthalate	5.02 J
GW-920	02/08/10	Bis(2-ethylhexyl)phthalate	5.83
GW-920	04/13/10	Bis(2-ethylhexyl)phthalate	5.71
GW-920	08/16/10	Bis(2-ethylhexyl)phthalate	5.18
GW-921	02/09/10	Bis(2-ethylhexyl)phthalate	5.12
GW-922	02/08/10	Bis(2-ethylhexyl)phthalate	3.29 J
GW-923	02/09/10	Bis(2-ethylhexyl)phthalate	3.93 J
GW-924	08/10/10	Benzo(a)anthracene	0.184 J
GW-924	08/10/10	Benzo(a)pyrene	0.127 J
GW-924	08/10/10	Benzo(b)fluoranthene	0.168 J
GW-924	08/10/10	Benzo(g,h,i)perylene	0.134 J
GW-924	08/10/10	Indeno(1,2,3-cd)pyrene	0.117 J
GW-925	02/10/10	Bis(2-ethylhexyl)phthalate	5.26
GW-926	02/10/10	Bis(2-ethylhexyl)phthalate	8.61
EMW-VWEIR	04/12/10	Dimethylphthalate	2.53 J
EMW-VWEIR	08/09/10	Bis(2-ethylhexyl)phthalate	3.82 J
EMW-VWUNDER	11/15/10	Bis(2-ethylhexyl)phthalate	3.42 Q
EMWNT-03A	02/08/10	Bis(2-ethylhexyl)phthalate	3.39 J
EMWNT-05	02/08/10	Bis(2-ethylhexyl)phthalate	19.8 Q
EMWNT-05	04/12/10	Bis(2-ethylhexyl)phthalate	4.07 J
NT-04	02/08/10	Bis(2-ethylhexyl)phthalate	3.89 J
NT-04	02/08/10	Dimethylphthalate	7.1 J
Pesticides/PCBs			
GW-922	08/10/10	PCB-1260	0.122 J
GW-923	08/10/10	Methoxychlor	0.0118 J
GW-924	08/10/10	Endrin aldehyde	0.0115 J

Because the concentrations are very low (most are estimated values) and the non-phthalate compounds are detected in only one sample from a location, these results are probably analytical artifacts. Phthalates are plasticizers that are ubiquitous in the laboratory environment.

APPENDIX D.1

FIELD MEASUREMENTS, MISCELLANEOUS ANALYTES, MAJOR IONS, AND TRACE METALS

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-008		GW-046		GW-058		GW-065		GW-068	GW-071	
Functional Area	OLF		BG		BG		OLF		BG	BG	
Date Sampled	01/04/10	07/21/10	01/04/10	07/21/10	08/26/10	10/19/10	02/09/10	08/30/10	08/23/10	02/03/10	
Program	BJC	BJC	BJC	BJC	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	
Sample Type							NP	NP			Dup
Field Measurements											
Time Sampled	12:50	13:10	13:55	10:10	13:30	14:25	8:35	7:35	15:00	13:25	13:25
Measuring Point Elev. (ft)	965.39	965.39	921.17	921.17	913.30	913.30	982.50	982.50	924.61	928.90	928.90
Depth to Water (ft)	13.66	15.07	2.21	4.87	25.00	26.00	21.00	29.00	8.00	7.00	7.00
Groundwater Elevation (ft)	951.73	950.32	918.96	916.30	888.30	887.30	961.50	953.50	916.61	921.90	921.90
Conductivity (μmho/cm)	180	105	268	286	822	785	506	580	587	1,770	1,770
Dissolved Oxygen (ppm)	2	1.98	4.33	0.15	1.09	0.46	6.97	2.23	1.72	1.09	1.09
Oxidation/Reduction (mV)	141	24	190	105	102	113	188	208	14	-276	-276
Temperature (degrees C)	15.1	18.5	14.1	18.1	19.7	18.2	10.9	16.3	25.6	10	10
Turbidity (NTU)	2	4	2	7	.	.	.	.	.	.	.
pH	5.42	5.9	5.84	5.56	6.73	6.83	6.9	6.82	7.59	10.32	10.32
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	.	.	405	309	226	292	414	.	.
Suspended Solids (mg/L)	.	.	.	.	25	<	<	<	2	.	.
Major Ions (mg/L)											
Calcium	12	18	.	.	104	101	70.7	97.3	68.1	.	.
Magnesium	6.5	9.2	.	.	36.1	33.1	11.7	16	17.3	.	.
Potassium	0.9	0.91	.	.	3.23	2.43	<	2.5	9.84	.	.
Sodium	2.3	3.5	.	.	19.1	18.3	1.18	2.61	36.9	.	.
Bicarbonate	.	.	.	.	359	333	213	280	180	.	.
Carbonate	.	.	.	.	<	<	<	<	<	.	.
Chloride	.	.	.	.	35.7	33.1	0.67	3.85	116	.	.
Fluoride	.	.	.	.	0.117	0.105	0.118	0.126	0.122	.	.
Nitrate as N	.	.	.	.	1.3	3.43	<	0.363	<	.	.
Sulfate	.	.	.	.	27.2	25.9	17.2	18.2	5.03	.	.
Charge balance error (%)	.	.	.	.	1.3	1.4	-1.1	1.9	-2.2	.	.
Trace Metals (mg/L)											
Aluminum	<	<	.	.	4.57	1.26	<	<	<	.	.
Arsenic	<	<	.	.	<	<	<	<	0.00996	0.0084	0.00766
Barium	0.094	0.12	.	.	0.102	0.0877	0.0182	0.0224	0.768	.	.
Beryllium	<	<	.	.	<	<	<	<	<	.	.
Boron	<	<	.	.	<	<	<	<	0.108	.	.
Cadmium	<	<	.	.	<	<	<	<	0.00074	<	<
Chromium	<	<	.	.	0.0488	0.0184	<	0.0071	0.00567	<	<
Cobalt	0.03	0.043	.	.	<	<	<	<	<	.	.
Iron	5.5	8.1	.	.	3.04	0.942	<	<	0.298	.	.
Lead	<	<	.	.	<	0.0041	0.00079	<	0.00297	0.00168	0.00067
Lithium	<	<	.	.	<	<	<	<	0.0736	.	.
Manganese	2.7	3.8	.	.	0.0946	0.0235	0.0226	0.015	0.0283	.	.
Mercury	<	<	.	.	<	<	<	<	<	.	.
Nickel	0.025	0.039	.	.	0.0601	0.026	<	<	0.081	<	<
Selenium	<	<	.	.	<	<	<	<	0.0425	<	<
Strontium	0.032	0.045	.	.	0.131	0.135	0.114	0.147	1.9	.	.
Thallium	<	<	.	.	<	<	0.00051	<	<	<	<
Uranium	<	<	<	<	0.0154	0.0272	0.00954	0.00944	<	<	<

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-071	GW-077		GW-078		GW-079		GW-080			
Functional Area	BG	BG		BG		BG		BG			
Date Sampled	08/23/10	01/18/10	08/13/10	01/18/10	08/13/10	01/18/10	08/06/10	01/18/10		08/06/10	
Program	GWPP	BJC	BJC	BJC	BJC	BJC	BJC	BJC		BJC	
Sample Type									Dup		Dup
Field Measurements											
Time Sampled	9:45	9:45	10:40	10:15	11:15	13:10	15:00	13:45	.	15:00	.
Measuring Point Elev. (ft)	928.90	919.30	919.30	918.10	918.10	981.20	981.20	981.00	.	981.00	.
Depth to Water (ft)	9.00	6.40	9.70	5.28	9.00	18.17	23.14	21.02	.	.	.
Groundwater Elevation (ft)	919.90	912.90	909.60	912.82	909.10	963.03	958.06	959.98	.	.	.
Conductivity (μmho/cm)	1,749	402	442	445	509	245	305	177	.	179	.
Dissolved Oxygen (ppm)	0.68	0.91	1.04	1.1	1.85	1.22	0.33	4.71	.	8.62	.
Oxidation/Reduction (mV)	-301	40	-114	105	-110	-114	-176	-51	.	-41	.
Temperature (degrees C)	20.7	12.9	18.6	14.8	17.1	14	17.4	14.6	.	17.1	.
Turbidity (NTU)	.	1	2	1	3	1	4	7	.	18	.
pH	10.42	7.21	7.58	7.4	7.75	7.73	7.58	7.11	.	6.37	.
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	200	200	220	220	120	.	74	74	79	82
Suspended Solids (mg/L)	.	<	<	<	<	<	.	4.8	6.2	13	13
Major Ions (mg/L)											
Calcium	.	56	46	69	66	36	38	7.3	7.6	7.4	7.3
Magnesium	.	13	12	8.6	8.5	3.7	4.1	7.9	8.2	8.2	8.2
Potassium	.	1.7	2.1	0.61	0.94	<	1.2	0.9	0.92	1.2	1.2
Sodium	.	6.2	7.9	3.8	5	3.5	5.4	6.4	6.7	8.5	8.4
Bicarbonate	.	.	.	.	.	.	.	.	.	.	.
Carbonate	.	.	.	.	.	.	.	.	.	.	.
Chloride	.	.	.	.	.	.	.	.	.	.	.
Fluoride	.	.	.	.	.	.	.	.	.	.	.
Nitrate as N	.	.	.	.	.	.	.	.	.	.	.
Sulfate	.	.	.	.	.	.	.	.	.	.	.
Charge balance error (%)	.	.	.	.	.	.	.	.	.	.	.
Trace Metals (mg/L)											
Aluminum	.	<	<	<	<	<	<	<	<	<	<
Arsenic	0.0098	<	<	<	<	<	<	<	<	<	<
Barium	.	0.48	0.43	0.17	0.16	0.24	0.33	0.046	0.044	0.048	0.046
Beryllium	.	<	<	<	<	<	<	<	<	<	<
Boron	.	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<	<
Chromium	0.00476	<	<	<	<	<	<	<	<	<	<
Cobalt	.	<	<	<	<	<	<	<	<	<	<
Iron	.	<	<	<	<	0.51	1.2	9.8	8.8	9.2	9.2
Lead	<	<	<	<	<	<	0.0063	<	<	<	<
Lithium	.	<	<	<	<	<	<	<	<	<	<
Manganese	.	0.06	0.05	0.021	0.023	0.11	0.2	0.21	0.19	0.27	0.26
Mercury	.	.	.	.	.	.	.	.	.	.	.
Nickel	<	<	<	<	<	<	<	<	<	<	<
Selenium	<	<	<	<	<	<	<	<	<	<	<
Strontium	.	1.5	1.2	0.14	0.13	0.14	0.15	0.043	0.043	0.043	0.043
Thallium	<	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	<	<	<

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-082	GW-085	GW-098	GW-100	GW-101	GW-225	GW-229	GW-246		GW-276	
Functional Area	BG	OLF	OLF	S3	S3	OLF	OLF	S3		S3	
Date Sampled	01/27/10	08/30/10	08/30/10	09/13/10	09/16/10	08/30/10	09/07/10	02/16/10	04/20/10	01/04/10	04/06/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	BJC	BJC
Sample Type											
Field Measurements											
Time Sampled	15:00	13:25	9:55	10:55	9:30	14:40	9:00	13:55	8:40	14:00	10:50
Measuring Point Elev. (ft)	964.00	983.57	945.95	987.40	1,007.40	943.11	949.00	1,009.19	1,009.19	1,001.57	1,001.57
Depth to Water (ft)	20.00	15.00	17.00	6.00	9.00	18.00	28.00	12.00	13.11	6.01	6.51
Groundwater Elevation (ft)	944.00	968.57	928.95	981.40	998.40	925.11	921.00	997.19	996.08	995.56	995.06
Conductivity (μmho/cm)	939	683	1,499	1,723	1,019	1,118	1,701	19,130	19,530	404	630
Dissolved Oxygen (ppm)	0.47	1.65	0.28	3.05	0.34	0.22	0.5	0.26	0.51	3.48	3
Oxidation/Reduction (mV)	-108	109	-34	100	-75	88	-34	354	333	309	221
Temperature (degrees C)	11.3	19	18.7	19.6	21.5	22.1	16.1	14.5	15.5	16.1	18.7
Turbidity (NTU)	.	.	.	.	.	.	.	.	.	4	6
pH	6.59	7	6.39	6.71	6.73	7.16	6.38	4.33	4.46	4.29	4.28
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	.	1,600	565	.	863	15,800	.	.	.
Suspended Solids (mg/L)	.	.	.	<	14	.	32	<	.	.	.
Major Ions (mg/L)											
Calcium	.	.	.	290	160	.	199	2510	.	24	.
Magnesium	.	.	.	22.2	26.3	.	35.5	557	.	4.5	.
Potassium	.	.	.	3.07	3.14	.	13.9	35.5	.	4.9	.
Sodium	.	.	.	7.45	17.4	.	78.2	519	.	46	.
Bicarbonate	.	.	.	269	474	.	671	36.4	.	.	.
Carbonate	.	.	.	<	<	.	<	<	.	.	.
Chloride	.	3.56	.	397	45.4	93.6	143	300	.	.	.
Fluoride	.	.	.	<	0.37	.	0.105	4.17	.	.	.
Nitrate as N	.	25.8	.	23.8	8.4	42.6	<	2879	.	.	13
Sulfate	.	7.27	.	22.2	4.26	41.4	12.2	28.1	.	.	.
Charge balance error (%)	.	.	.	-5.7	-2.1	.	-3.2	-5.1	.	.	.
Trace Metals (mg/L)											
Aluminum	.	.	.	<	<	.	<	64.5	.	1.9	.
Arsenic	.	.	.	<	<	.	0.0126	<	.	<	.
Barium	.	.	.	0.66	1.08	.	1.4	2.56	.	0.058	.
Beryllium	.	.	.	<	<	.	<	0.0354	.	0.0021	.
Boron	.	.	.	<	0.125	.	3.85	<	.	<	.
Cadmium	.	.	.	0.00099	<	.	<	0.351	.	0.0076	.
Chromium	.	.	.	0.195	<	.	<	0.00503	.	<	.
Cobalt	.	.	.	<	<	.	<	0.54	.	0.042	.
Iron	.	.	.	0.641	9.86	.	24.1	<	.	<	.
Lead	.	.	.	0.0005	<	.	<	0.0393 Q	.	<	.
Lithium	.	.	.	0.02	<	.	0.109	0.642	.	0.012	.
Manganese	.	.	.	0.0448	3.5	.	5.59	125	.	1.7	.
Mercury	.	.	.	<	<	.	<	0.000741	.	<	.
Nickel	.	.	.	0.19 Q	<	.	0.0586	4.23	.	0.09	.
Selenium	.	.	.	<	<	.	<	<	.	<	.
Strontium	.	.	.	0.555	0.702	.	0.604	9.31	.	0.06	.
Thallium	.	.	.	<	<	.	<	<	.	<	.
Uranium	.	.	.	0.0015	0.00286	.	0.104	0.56	.	0.29	.

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-276	GW-291		GW-307	GW-310	GW-312	GW-365	GW-526	GW-537	GW-601	GW-615
Functional Area	S3	BG		RS	RS	RS	OLF	S3	OLF	OLF	S3
Date Sampled	07/15/10	08/24/10		09/20/10	09/21/10	09/21/10	09/07/10	09/22/10	02/08/10	09/07/10	09/15/10
Program	BJC	GWPP		GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type			Dup								
Field Measurements											
Time Sampled	16:30	8:50	8:50	13:55	11:45	9:10	10:15	9:30	10:55	13:55	9:00
Measuring Point Elev. (ft)	1,001.57	948.66	948.66	993.14	995.52	996.70	935.58	998.25	976.65	1,002.80	1,017.55
Depth to Water (ft)	5.48	12.00	12.00	33.00	22.00	38.00	15.00	14.00	4.00	71.00	13.00
Groundwater Elevation (ft)	996.09	936.66	936.66	960.14	973.52	958.70	920.58	984.25	972.65	931.80	1,004.55
Conductivity (μmho/cm)	707	523	523	921	1,011	235	1,258	9,860	3,320	876	45,700
Dissolved Oxygen (ppm)	1.1	1.39	1.39	0.56	1.98	3.35	0.37	0.27	0.38	0.74	0.62
Oxidation/Reduction (mV)	128	120	120	127	123	106	-79	142	110	76	119
Temperature (degrees C)	25.6	19.5	19.5	22.3	17.5	17.6	15.2	19.8	10.1	20.5	20.1
Turbidity (NTU)	8	.	.	.	.	.	.	.	.	.	.
pH	4.63	6.73	6.73	6.59	6.59	8.23	6.94	8.07	6.57	7.47	7.14
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	270	266	549	570	114	.	.	.	.	59,900
Suspended Solids (mg/L)	.	<	1	<	<	<	.	.	.	.	18
Major Ions (mg/L)											
Calcium	31	84.9	92.2	161	162	27.5	.	.	.	.	7,740
Magnesium	5.8	12.6	14	16.7	15.1	2.49	.	.	.	.	2,030
Potassium	6	<	<	4.2	3.45	6.29	.	.	.	.	108
Sodium	63	10.5	11.3	13.5	22.5	25.6	.	.	.	.	2,880
Bicarbonate	.	278	275	377	348	135	.	.	.	.	71.5
Carbonate	.	<	<	<	<	<	.	.	.	.	<
Chloride	.	2.97	2.8	30.9	76.7	1.35	.	34.3	18.7	85.7	84
Fluoride	.	0.12	0.126	<	0.293	0.165	.	.	.	.	<
Nitrate as N	10	0.078	0.078	0.936	6.05	0.55	.	1,319	320	15	10,999
Sulfate	.	14.5	14.5	86	42.3	17.5	.	3.13	5.64	80.7	<
Charge balance error (%)	.	-1.9	2.9	-0.8	-0.3	-5	.	.	.	.	-7.3
Trace Metals (mg/L)											
Aluminum	2.6	<	<	<	<	<	.	.	.	.	<
Arsenic	<	<	<	<	<	<	.	.	.	.	<
Barium	0.082	0.24	0.261	0.0713	0.077	<	.	.	.	.	326
Beryllium	0.0032	<	<	<	<	<	.	.	.	.	<
Boron	<	1.98	2.17	<	<	<	.	.	.	.	1.16
Cadmium	0.01	<	<	<	<	<	.	.	.	.	<
Chromium	<	0.00384	0.00302	0.0151	<	0.0108	.	.	.	.	<
Cobalt	0.059	<	<	<	<	<	.	.	.	.	<
Iron	<	<	<	<	<	<	.	.	.	.	2.17
Lead	<	0.00103	0.00114	<	<	<	.	.	.	.	<
Lithium	0.014	0.0191	0.0206	<	<	<	.	.	.	.	1.17
Manganese	2.3	0.0812	0.0876	<	<	<	.	.	.	.	8.59
Mercury	<	<	<	<	<	<	.	.	.	.	<
Nickel	0.14	<	<	0.00515	0.00656	<	.	.	.	.	<
Selenium	<	<	<	<	<	<	.	.	.	.	<
Strontium	0.072 E	0.162	0.177	0.267	0.366	0.134	.	.	.	.	292
Thallium	<	<	<	<	<	<	.	.	.	.	<
Uranium	0.38	<	<	0.00194	0.00476	0.00118	.	.	.	.	0.0958 Q

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-616	GW-623	GW-626	GW-627		GW-683		GW-684		GW-703	
Functional Area	S3	BG	BG	BG		EXP-A		EXP-A		EXP-B	
Date Sampled	02/17/10	08/26/10	02/02/10	02/03/10	08/26/10	01/18/10	08/13/10	01/18/10	08/06/10	09/08/10	
Program	GWPP	GWPP	GWPP	GWPP	GWPP	BJC	BJC	BJC	BJC	GWPP	
Sample Type		NP									Dup
Field Measurements											
Time Sampled	10:30	9:00	14:40	8:55	10:30	14:00	14:30	14:30	12:00	8:25	8:25
Measuring Point Elev. (ft)	1,011.81	925.21	942.87	943.51	943.51	972.23	972.23	898.83	898.83	955.29	955.29
Depth to Water (ft)	8.00	6.00	21.00	22.00	25.00	88.67	88.50	15.65	15.60	46.00	46.00
Groundwater Elevation (ft)	1,003.81	919.21	921.87	921.51	918.51	883.56	883.73	883.18	883.23	909.29	909.29
Conductivity (μmho/cm)	2,570	1,490	389	1,339	1,282	314	521	345	518	358	358
Dissolved Oxygen (ppm)	0.45	0.61	0.89	0.64	0.37	4.05	8.34	1.51	0.65	0.64	0.64
Oxidation/Reduction (mV)	48	-84	102	-104	-134	198	-109	123	-72	161	161
Temperature (degrees C)	7	18.8	13.4	8.5	19.9	13.1	18.4	13.5	15.1	19.3	19.3
Turbidity (NTU)	.	.	.	.	.	9	1	2	3	.	.
pH	9.83	9.49	7.42	9.3	9.43	7.18	8.79	7.69	7.46	7.38	7.38
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	191	.	.	200	220	220	250	354	343
Suspended Solids (mg/L)	.	.	1	.	.	8	<	<	<	<	<
Major Ions (mg/L)											
Calcium	.	.	67.6	.	.	51	46	62	61	86.9	85.6
Magnesium	.	.	3.94	.	.	22	23	16	20	30.9	31.2
Potassium	.	.	<	.	.	<	0.57	2.6	3.2	5.89	5.96
Sodium	.	.	5.56	.	.	1.8	1.4	3.7	8.5	14	14.2
Bicarbonate	.	.	200	.	.	200	200	210	210	254	247
Carbonate	.	.	<	.	.	<	<	<	<	<	<
Chloride	16.6	.	2.85	.	.	3.5	2	7.5	16	27.1	27.5
Fluoride	.	.	<	.	.	<	<	<	<	0.183	0.181
Nitrate as N	246	.	<	.	.	0.94	0.31	1.1	2.7	16.4	16.4
Sulfate	16	.	1.41	.	.	17	18	9.5	11	26.4	32.5
Charge balance error (%)	.	.	-2.1	.	.	-0.9	-2.5	-0.5	0.7	0.4	0.3
Trace Metals (mg/L)											
Aluminum	.	.	<	.	.	0.33	<	<	<	<	<
Arsenic	.	.	<	.	.	<	<	<	<	<	<
Barium	.	.	0.216	.	.	0.11	0.14	0.074	0.087	0.106	0.108
Beryllium	.	.	<	.	.	<	<	<	<	<	<
Boron	.	.	<	.	.	<	<	<	<	<	<
Cadmium	.	.	<	.	.	<	<	<	<	<	<
Chromium	.	.	<	.	.	0.014	<	0.013	<	<	<
Cobalt	.	.	<	.	.	<	<	<	<	<	<
Iron	.	.	0.108	.	.	0.73	<	<	<	0.164	0.166
Lead	.	.	<	.	.	<	<	<	<	< R	0.012 R
Lithium	.	.	0.0114	.	.	<	<	0.013	0.015	0.0193	0.0202
Manganese	.	.	<	.	.	0.019	<	<	0.049	0.0825	0.0832
Mercury	.	.	<	.	.	<	<	<	<	<	<
Nickel	.	.	0.00722	.	.	<	<	<	<	0.00696	0.00704
Selenium	.	.	<	.	.	<	<	<	<	<	<
Strontium	.	.	0.137	.	.	0.14	0.15	0.17	0.14	0.272	0.274
Thallium	.	.	<	.	.	<	<	<	<	<	<
Uranium	.	.	<	.	.	0.011	0.0062	0.016	0.016	0.0141	0.0145

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-704		GW-706		GW-712		GW-713			
Functional Area	**EXP-B**		**EXP-B**		**EXP-W**		**EXP-W**			
Date Sampled	**01/18/10**	**08/06/10**	**01/18/10**	**08/06/10**	**01/05/10**	**07/21/10**	**01/04/10**		**07/19/10**	
Program	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**		**BJC**	
Sample Type								**Dup**		**Dup**
Field Measurements										
Time Sampled	10:20	10:15	9:45	10:00	10:00	16:20	17:00	.	17:00	.
Measuring Point Elev. (ft)	945.33	945.33	929.47	929.47	877.89	877.89	881.43	.	881.43	.
Depth to Water (ft)	31.40	36.08	13.31	17.99	33.94	35.62	36.38	.	38.43	.
Groundwater Elevation (ft)	913.93	909.25	916.16	911.48	843.95	842.27	845.05	.	843.00	.
Conductivity (μmho/cm)	496	318	576	937	247	434	385	.	362	.
Dissolved Oxygen (ppm)	1.14	0.36	0.28	0.26	21.85	0.48	22.1	.	1.01	.
Oxidation/Reduction (mV)	106	-23	210	-64	-19	-160	-146	.	-149	.
Temperature (degrees C)	11.7	16	13.48	16.5	4	20.2	7.55	.	20.2	.
Turbidity (NTU)	1	17	7	4	17	1	4	.	3	.
pH	7.21	8.78	6.92	7.55	7.9	8.62	7.51	.	8.82	.
Miscellaneous Analytes										
Dissolved Solids (mg/L)	340	190	410	460	.	.	.	.	.	.
Suspended Solids (mg/L)	<	<	<	<	.	.	.	.	.	.
Major Ions (mg/L)										
Calcium	76	10	94	110	42	43	63	60	11	12
Magnesium	26	24	20	21	31	32	33	31	25	25
Potassium	2.5	21	7.8	6	1.7	2	2.2	2.1	2.5	2.5
Sodium	13	16	20	22	7.6	9	12 J	11	11	11
Bicarbonate	230	130	210	290	.	.	.	.	.	.
Carbonate	<	<	<	<	.	.	.	.	.	.
Chloride	29	27	52	48	.	.	.	.	.	.
Fluoride	<	<	<	<	.	.	.	.	.	.
Nitrate as N	13	1.3	18	13	0.018	<	0.015	<	<	<
Sulfate	22	19	28	21	.	.	.	.	.	.
Charge balance error (%)	-1.8	-2	-0.8	-1.1	.	.	.	.	.	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.1	0.02	0.13	0.14	0.026	0.025	0.042	0.04	0.0077	0.0079
Beryllium	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	0.11	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<	<	<
Iron	0.96	0.29	0.12	<	2.1	0.18	1.5	1.4	0.16	0.17
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	0.012	0.033	0.017	0.014	0.01	<	0.012	0.011	0.012	0.012
Manganese	0.0068	0.015	0.013	0.013	0.031	0.096	0.16	0.16	0.035	0.036
Mercury	.	.	.	.	.	.	.	.	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Selenium	<	<	<	<	<	<	<	<	<	<
Strontium	0.28	0.042	0.37	0.27	0.51	0.48	1.4	1.3	0.18	0.19
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	0.019	<	0.062	0.059	<	<	<	<	<	<

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-714		GW-724	GW-725	GW-738	GW-740	GW-829	BCK-03.30		
Functional Area	**EXP-W**		**EXP-C**	**EXP-C**	**EXP-C**	**EXP-C**	**OLF**	**EXP-SW**		
Date Sampled	**01/05/10**	**07/19/10**	**09/09/10**	**09/09/10**	**09/09/10**	**09/13/10**	**02/09/10**	**03/09/10**	**06/28/10**	**08/30/10**
Program	**BJC**	**BJC**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**BJC**	**BJC**	**BJC**
Sample Type										
Field Measurements										
Time Sampled	14:15	11:10	10:35	9:00	13:40	8:50	10:15	9:45	11:00	9:50
Measuring Point Elev. (ft)	875.88	875.88	979.75	961.63	983.31	1,020.25	985.95	.	.	.
Depth to Water (ft)	29.49	31.33	34.00	14.00	31.00	73.00	11.00	.	.	.
Groundwater Elevation (ft)	846.39	844.55	945.75	947.63	952.31	947.25	974.95	.	.	.
Conductivity (μmho/cm)	334	561	480	903	622	590	529	236	433	462
Dissolved Oxygen (ppm)	14.95	0.59	0.14	0.15	0.49	4.67	5.67	11.28	7.26	5.32
Oxidation/Reduction (mV)	98	-32	72	134	119	170	157	122	53	-17.5
Temperature (degrees C)	8.16	19.8	15.9	16.7	16.7	14.4	8.1	10.25	24.18	22.61
Turbidity (NTU)	16	7	.	.	.	.	.	4	4	5
pH	7.12	7.77	9.13	6.84	6.82	7.2	8.54	4.16	9.35	7.81
Miscellaneous Analytes										
Dissolved Solids (mg/L)	.	.	.	.	498	.	.	190	230	190
Suspended Solids (mg/L)	.	.	.	.	<	.	.	<	<	5
Major Ions (mg/L)										
Calcium	61	64	.	.	148	.	.	40.3	49.7	54.9
Magnesium	24	25	.	.	24.8	.	.	11.3	15.1	15.8
Potassium	0.98	1.3	.	.	3.71	.	.	1.21	1.57	1.85
Sodium	5.4	6.2	.	.	10.1	.	.	4.6	5.02	6.68
Bicarbonate	.	.	.	.	381	.	.	130	160	170
Carbonate	.	.	.	.	<	.	.	<	<	<
Chloride	.	.	71.7	49.7	17.6	.	2.23	9.5	7.1	11
Fluoride	.	.	.	.	<	.	.	<	<	<
Nitrate as N	0.55	0.36	0.055	8.75	9.03	.	9	1.6	0.53	0.63
Sulfate	.	.	16.6	39.9	32.7	.	18	19	32	35
Charge balance error (%)	.	.	.	.	2.7	.	.	-2	-1.8	-1.2
Trace Metals (mg/L)										
Aluminum	<	<	.	.	<	.	.	<	<	0.238
Arsenic	<	<	.	<	<	.	.	<	<	<
Barium	0.082	0.083	.	.	0.069	.	.	0.052	0.0605	0.0704
Beryllium	<	<	.	.	<	.	.	<	<	<
Boron	<	<	.	.	<	.	.	<	<	<
Cadmium	<	<	.	<	<	.	.	<	<	<
Chromium	<	<	.	<	<	.	.	<	<	<
Cobalt	<	<	.	.	<	.	.	<	<	<
Iron	0.26	4.7	.	.	<	.	.	0.13	0.174	0.416
Lead	<	<	.	<	<	.	.	<	<	<
Lithium	<	<	.	.	<	.	.	<	<	<
Manganese	<	0.023	.	.	0.0665	.	.	0.0353	0.0372	0.12
Mercury	.	<	.	.	<	.	.	<	<	<
Nickel	<	<	.	<	<	.	.	<	<	<
Selenium	<	<	.	<	<	.	.	<	<	<
Strontium	0.35	0.33	.	.	0.173	.	.	0.105	0.168	0.182
Thallium	<	<	.	<	<	.	.	<	<	<
Uranium	<	<	.	0.014	0.00314	.	.	0.0155	0.0104	0.015

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	BCK-04.55			BCK-07.87			BCK-09.20			BCK-09.40
Functional Area	EXP-SW			EXP-SW			EXP-SW			EXP-SW
Date Sampled	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	01/20/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	GWPP
Sample Type										
Field Measurements										
Time Sampled	10:25	14:10	13:15	10:10	10:10	11:00	9:45	9:00	9:00	8:55
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	244	443	533	336	540	587	373	444	549	410
Dissolved Oxygen (ppm)	10.01	3.96	5.12	11.52	6.46	6.48	9.3	7.52	10.23	7.82
Oxidation/Reduction (mV)	77	17.5	-4.2	32	58.1	-7	28.6	240	144.8	151
Temperature (degrees C)	10.35	27.34	26.16	9.82	23.1	24.39	11.09	18.8	20.46	8.7
Turbidity (NTU)	5	15	8	5	8	10	3	15	5	.
pH	5.77	9.23	7.19	7.24	9.62	7.79	6.69	7.9	7.49	7.6
Miscellaneous Analytes										
Dissolved Solids (mg/L)	180	180	200	260	310	300	270	290	310	.
Suspended Solids (mg/L)	4	8	6	4	<	<	<	<	<	.
Major Ions (mg/L)										
Calcium	40.8	47.8	55	58.2	68.4	72.3	61.2	68.2	75.6	.
Magnesium	11.7	14.3	15.1	13.7	18	16.2	14.6	18.1	17.3	.
Potassium	1	1.34	1.72	1.27	1.86	2.4	1.38	1.79	2.12	.
Sodium	4.49	4.78	6.88	8.63	10.9	12.9	9.4	10.6	13.9	.
Bicarbonate	140	180	190	170	210	210	170	210	220	.
Carbonate	<	<	<	<	<	<	<	<	<	.
Chloride	11	8.7	13	20	23	23	22	21	26	15.2
Fluoride	<	<	<	<	<	<	<	<	<	.
Nitrate as N	2	0.54	0.68	6.8	5.5	4.7	.	.	.	4.12
Sulfate	9.2	7.1	11	17	16	25	16	16	26	44.5
Charge balance error (%)	-3.3	-3.1	-1.3	-3.9	-1.8	-1.2	3.8	2.6	1.6	.
Trace Metals (mg/L)										
Aluminum	<	0.205	0.614	<	<	<	<	<	<	.
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.0529	0.0775	0.0813	0.0768	0.096	0.097	0.0824	0.0967	0.0996	.
Beryllium	<	<	<	<	<	<	<	<	<	.
Boron	<	<	<	<	<	0.11	<	<	0.103	.
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<	<	.
Iron	0.127	0.844	1.04	0.155	0.196	0.187	0.0746	0.103	0.151	.
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	<	<	<	0.0147	0.0139	0.0142	0.0162	0.0132	0.0136	.
Manganese	0.0594	1.15	0.355	0.0249	0.0181	0.0209	0.0123	0.0079	0.0128	.
Mercury	<	<	<	<	<	<	<	<	<	.
Nickel	<	<	<	<	<	<	<	<	<	<
Selenium	<	<	<	<	<	<	<	<	<	<
Strontium	0.0711	0.0764	0.0979	0.124	0.146	0.162	0.133	0.14	0.165	.
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	0.0186	0.0128	0.0182	0.0497	0.0457	0.0513	0.0497	0.041	0.0524	0.0539

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	BCK-11.54			BCK-11.84			BCK-11.97	BCK-12.34		
Functional Area	EXP-SW			EXP-SW			EXP-SW	EXP-SW		
Date Sampled	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	01/19/10	03/09/10	06/28/10	08/30/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	GWPP	BJC	BJC	BJC
Sample Type										
Field Measurements										
Time Sampled	10:20	10:20	12:30	9:15	9:30	9:15	14:30	14:00	13:30	14:15
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	462	813	938	.	272	124	921	957	1,603	1,492
Dissolved Oxygen (ppm)	7.75	7.39	8.34	.	6.53	5.18	7.24	8.62	7.21	5.54
Oxidation/Reduction (mV)	114	201	73.4	.	102.3	-3	163	159	201	62.6
Temperature (degrees C)	12.13	24.8	26.62	.	23.59	22.78	10.5	15.03	24.1	24.83
Turbidity (NTU)	3.4	8.2	3	.	5	4	.	3.3	3	3
pH	8.2	6.98	8.17	.	9.07	7.72	7.07	7.33	7.39	7.76
Miscellaneous Analytes										
Dissolved Solids (mg/L)	400	590	540	630	860	750	.	830	1,300	1,000
Suspended Solids (mg/L)	<	<	<	<	<	<	.	4	<	<
Major Ions (mg/L)										
Calcium	81.9	100	99.5	118	167	139	.	167	244	193
Magnesium	15.2	21.6	21.5	15.3	20.5	20.5	.	20.7	27	24.1
Potassium	1.63	2.49	3.15	2.29	3.78	4.22	.	3.12	4.83	4.62
Sodium	17	31.6	34.8	29.7	53.9	54.8	.	47.7	74.9	64.6
Bicarbonate	150	210	220	180	230	250	.	210	310	320
Carbonate	<	<	<	<	<	<	.	<	<	<
Chloride	38	49	48	68	84	70	70.3	120	110	88
Fluoride	<	<	<	<	<	<	.	<	0.73	0.74
Nitrate as N	25	43	40	45	74	53	32.1	.	.	.
Sulfate	22	28	26	29	34	38	30.7	31	41	38
Charge balance error (%)	-1.6	-5.9	-4.7	-4.7	-2	-1.9	.	19.4	27.1 R	19.9
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	.	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.138	0.182	0.173	0.191	0.224	0.188	.	0.252	0.317	0.245
Beryllium	<	<	<	<	<	<	.	<	<	<
Boron	<	<	<	<	<	<	.	<	<	<
Cadmium	<	<	<	<	<	<	0.00232	0.007	0.0043	0.0026
Chromium	<	<	<	<	<	<	0.0103	<	<	<
Cobalt	<	<	<	<	<	<	.	<	<	<
Iron	0.1	0.098	0.124	0.111	0.113	0.107	.	0.135	0.106	0.106
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	<	<	<	0.0146	<	0.0116	.	0.0164	0.0128	0.0138
Manganese	0.157	0.0099	0.0105	0.447	0.0178	0.0164	.	1.53	0.526	0.253
Mercury	<	<	<	<	<	<	.	.	<	<
Nickel	<	<	<	<	<	<	0.0132	0.0278	0.0122	<
Selenium	<	<	<	<	<	<	<	<	<	<
Strontium	0.221	0.285	0.297	0.342	0.434	0.415	.	0.434	0.552	0.494
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	0.0609	0.0918	0.113	0.0851	0.159	0.182	0.119	0.12	0.204	0.218

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	NT-01										
Functional Area	EXP-SW										
Date Sampled	01/13/10		03/09/10	04/20/10		06/28/10	07/14/10		08/30/10	11/15/10	
Program	BJC		BJC	BJC		BJC	BJC		BJC	BJC	
Sample Type		Dup			Dup			Dup			Dup
Field Measurements											
Time Sampled	14:55	.	8:50	8:15	.	8:40	8:30	.	8:40	13:00	.
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	841	932	.	.	1,460	.	.	.	980	.	.
Dissolved Oxygen (ppm)	12.75	10.93	.	.	4.73	.	.	.	3.64	.	.
Oxidation/Reduction (mV)	287	86.1	.	.	202	.	.	.	110.6	.	.
Temperature (degrees C)	6.79	10.78	.	.	22.52	.	.	.	22.31	.	.
Turbidity (NTU)	4	5	.	.	2	.	.	.	3	.	.
pH	6.38	6.23	.	.	7.01	.	.	.	6.64	.	.
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	820	.	.	5,300	.	.	.	5,100	.	.
Suspended Solids (mg/L)	.	4	.	.	<	.	.	.	30	.	.
Major Ions (mg/L)											
Calcium	180	160	190	190	888	190	28	28	751	390	390
Magnesium	24	21.4	24	24	99.1	25	3.8	3.8	96.7	46	46
Potassium	2.7	2.75	2.8	3.3	14.9	3.3	1.3	1.3	16	7	7.1
Sodium	23	20.9	24	24	120	25	3.2	3.2	120	52	52
Bicarbonate	.	130	.	.	300	.	.	.	300	.	.
Carbonate	.	<	.	.	<	.	.	.	<	.	.
Chloride	.	19	.	.	68	.	.	.	69	.	.
Fluoride	.	0.52	.	.	1.7	.	.	.	1.5	.	.
Nitrate as N	.	100	.	.	620	.	.	.	980	.	.
Sulfate	.	16	.	.	40	.	.	.	47	.	.
Charge balance error (%)	.	0.4	.	.	4.5	.	.	.	-21.5 R	.	.
Trace Metals (mg/L)											
Aluminum	0.55	0.514	0.59	0.41	0.441	0.59	0.31	0.34	0.714	0.68	0.77
Arsenic	<	<	<	<	<	<	<	<	<	<	<
Barium	0.33	0.335	0.34	0.37	1.93	0.38	0.047	0.049	1.64	0.62	0.62
Beryllium	<	<	<	<	<	<	<	<	<	<	<
Boron	0.14	0.13	0.15	0.11	0.156	0.11	0.29	0.29	0.453	0.18	0.18
Cadmium	0.019	0.0153	0.019	0.016	0.0896	0.016	<	<	0.0666	0.039	0.041
Chromium	<	<	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	0.0254	<	<	<	<	0.015	0.015
Iron	0.13	0.216	0.16	0.31	0.151	0.47	0.29	0.32	0.527	<	0.13
Lead	<	<	<	<	<	<	<	<	<	<	<
Lithium	0.028	0.025	0.029	0.024	0.0508	0.024	0.027	0.027	0.0734	0.023	0.023
Manganese	4.1	3.43	4.2	3.3	18.6	3.4	0.19	0.25	13.8	7.8	7.9
Mercury	<	<	<	<	<	<	<	<	5.6E-05	.	.
Nickel	0.075	0.0612	0.077	0.063	0.267	0.066	<	<	0.208	0.14	0.14
Selenium	<	<	<	<	<	<	<	<	<	<	<
Strontium	0.49	0.439	0.5	0.49	2.04	0.5	0.081	0.081	1.95	0.91	0.91
Thallium	<	<	<	<	<	<	<	<	.	<	<
Uranium	0.016	0.0099	0.016	.	0.0904	.	<	<	0.0989	0.029	0.03

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	NT-03			NT-07		NT-08					
Functional Area	**EXP-SW**			**EXP-SW**		**EXP-SW**					
Date Sampled	**03/09/10**	**06/28/10**	**08/30/10**	**02/03/10**	**07/21/10**	**02/17/10**	**03/09/10**	**06/28/10**		**08/30/10**	
Program	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**		**BJC**	
Sample Type									**Dup**		**Dup**
Field Measurements											
Time Sampled	11:15	10:55	13:15	14:00	14:20	13:58	8:55	14:40	.	11:30	.
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	213	773	717	173	512	.	172	350	.	532	.
Dissolved Oxygen (ppm)	12.56	6.12	5.56	10.35	4.1	.	14.7	7.24	.	5.2	.
Oxidation/Reduction (mV)	128	216	55.1	67	210.7	.	177	240	.	81.2	.
Temperature (degrees C)	14.89	26.1	26.05	8.02	25.76	.	7.22	24.2	.	26.04	.
Turbidity (NTU)	8.2	6.3	4	11	2	.	3.6	15	.	4	.
pH	7.99	7.6	8.24	7.01	7.74	.	7.63	7.48	.	7.59	.
Miscellaneous Analytes											
Dissolved Solids (mg/L)	160	530	420	.	.	150	150	190	190	260	250
Suspended Solids (mg/L)	4	4.6	7	.	.	6.6	21	7.6	5.8	9.8	8
Major Ions (mg/L)											
Calcium	36	118	95.2	31	75	40.6	40.2	56.1	56.7	71.6	72.4
Magnesium	7.17	26.5	25	5.8	10	4.38	4.38	5.42	5.51	9.72	9.81
Potassium	1.38	1.68	2.55	1.2	3.1	1.37	1.36	2.11	2.15	2.64	2.72
Sodium	2.88	5.18	6.61	2.2	6.5	3.84	3.85	4.89	4.98	10.2	10.2
Bicarbonate	76	230	240	90	180	120	120	160	160	200	200
Carbonate	<	<	<	<	<	<	<	<	<	<	<
Chloride	2.2	1.8	2.8	5.5	30	9	9.1	12	12	24	20
Fluoride	<	1.5	1.5	<	<	<	<	<	<	<	<
Nitrate as N	0.02	<	0.016	0.058	0.028	0.037	0.055	0.07	0.072	3.8	3.5
Sulfate	57	190	110	13	20	8.7	8.7	7.1	7	15	15
Charge balance error (%)	-4.2	-2	-0.6	-1.8	0.7	.	-5	-2.5	.	-3.7	.
Trace Metals (mg/L)											
Aluminum	0.273	0.286	0.249	<	<	0.206	0.277	<	<	<	0.217
Arsenic	<	<	<	<	<	<	<	<	<	<	<
Barium	0.0288	0.0592	0.0607	0.032	0.065	0.0684	0.0688	0.0879	0.0894	0.101	0.101
Beryllium	<	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	<	0.4	0.354	0.413	0.703	0.724	0.61	0.806
Cadmium	<	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<	<	<	<
Iron	0.385	0.318	0.298	0.4	0.13	0.362	0.482	0.248	0.338	0.367	0.377
Lead	<	<	<	<	<	<	<	<	<	<	<
Lithium	<	<	<	0.02	0.047	0.0924	0.0922	0.139	0.139	0.093	0.0942
Manganese	0.0386	0.0249	0.0575	0.13	0.52	0.117	0.135	0.111	0.117	0.134	0.136
Mercury	<	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<	<
Selenium	<	<	<	<	<	<	<	<	<	<	<
Strontium	0.157	0.632	0.542	0.064	0.15	0.102	0.102	0.135	0.136	0.173	0.174
Thallium	<	<	<	<	<	<	<	<	<	<	<
Uranium	0.0729	0.259	0.166	0.018	0.015	0.289	0.296	0.227	0.23	0.215	0.217

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	S07			SS-4		SS-5			SS-6	
Functional Area	EXP-SW			EXP-SW		EXP-SW			EXP-SW	
Date Sampled	03/09/10	06/28/10	08/30/10	01/20/10		03/09/10	06/28/10	08/30/10	01/06/10	07/22/10
Program	BJC	BJC	BJC	GWPP		BJC	BJC	BJC	BJC	BJC
Sample Type				Dup						
Field Measurements										
Time Sampled	13:10	14:00	13:45	9:45	8:45	13:15	9:30	10:00	14:50	8:00
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	368	836	1,321	504	504	369	456	569	290	321
Dissolved Oxygen (ppm)	13.37	7.36	5.54	5.16	5.16	8.58	7.3	5.06	9.01	8.41
Oxidation/Reduction (mV)	98	223	64.3	149	149	-13	253	109.5	100.3	127.1
Temperature (degrees C)	14.22	25.4	26.19	10.2	10.2	14.94	18.2	20.56	10.53	15.34
Turbidity (NTU)	10.8	11	3	.	.	3	19	3	5	4
pH	7.54	7.9	7.97	7.1	7.1	7.33	7.9	6.98	7.05	7.09
Miscellaneous Analytes										
Dissolved Solids (mg/L)	350	660	1,000	307	262	230	300	330	.	.
Suspended Solids (mg/L)	4	43	<	12	13	<	<	<	.	.
Major Ions (mg/L)										
Calcium	66.1	115	188	64.9	67.9	53.7	68.4	76.4	34	55
Magnesium	7.85	14.3	21.2	12.9	13.6	16.3	18.9	18	15	20
Potassium	1.35	2.18	2.77	<	<	1.08	1.77	2.05	<	0.57
Sodium	5.34	10.6	15	13.1	13.4	6.58	10.6	14.3	1.2	4.8
Bicarbonate	74	150	200	165	166	180	220	220	.	.
Carbonate	<	<	<	<	<	<	<	<	.	.
Chloride	4.8	6.2	10	25.2	24.6	17	22	26	.	.
Fluoride	<	<	<	0.211	0.2	<	<	<	.	.
Nitrate as N	.	.	.	11.6	11.6	3.9	5.1	6.1	0.19	0.86
Sulfate	10	5.1	6.1	20.2	20.2	15	16	28	.	.
Charge balance error (%)	.	.	.	-3.9	-1.7	-3.7	-2.2	-1.5	.	.
Trace Metals (mg/L)										
Aluminum	0.517	0.255	<	0.61	0.797	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.185	0.302	0.415	0.102	0.106	0.068	0.0958	0.0989	0.057	0.084
Beryllium	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<	<	<
Iron	0.658	0.707	0.106	0.717	0.875	<	0.155	0.11	<	<
Lead	<	<	<	0.000575	<	<	<	<	<	<
Lithium	<	<	<	0.013	0.0131	<	<	<	<	<
Manganese	0.133	0.0512	0.0279	0.132	0.143	<	0.0074	0.0064	0.0072	0.025
Mercury	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Selenium	<	<	<	<	<	<	<	<	<	<
Strontium	0.216	0.386	0.599	0.15	0.156	0.0937	0.138	0.166	0.038	0.082
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	0.0406	0.0432	0.0211	0.0303	0.0374	<	0.007

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	SS-6.6			SS-7		
Functional Area	EXP-SW			EXP-SW		
Date Sampled	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10
Program	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type						
Field Measurements						
Time Sampled	14:25	15:30	13:15	13:50	14:45	10:30
Measuring Point Elev. (ft)	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.
Conductivity (μmho/cm)	264	487	458	253	378	405
Dissolved Oxygen (ppm)	7.8	5.67	5.02	7.78	6.55	6.05
Oxidation/Reduction (mV)	8.7	44.4	18	140.7	38	10.6
Temperature (degrees C)	15.41	26.59	21.32	15.4	21.99	21.21
Turbidity (NTU)	3	12	3	2	7	10
pH	7.01	9.76	7.41	4.92	9.14	6.89
Miscellaneous Analytes						
Dissolved Solids (mg/L)	160	240	250	150	180	160
Suspended Solids (mg/L)	4	18	<	<	6.2	8.2
Major Ions (mg/L)						
Calcium	36.3	54.6	61.8	32.1	39.8	42.9
Magnesium	15.8	14.5	20.7	15.7	18.9	19.1
Potassium	0.633	1.74	0.911	0.793	0.832	0.948
Sodium	1.93	7.35	6.07	2.59	3.87	4.94
Bicarbonate	150	180	220	150	170	180
Carbonate	<	<	<	<	<	<
Chloride	5.4	14	15	5.7	7.5	11
Fluoride	<	<	<	<	<	<
Nitrate as N	0.44	2.2	0.89	0.21	0.25	0.42
Sulfate	7.4	13	15	4.4	5.3	7.5
Charge balance error (%)	-1.9	-2.2	-1.2	-3.6	-0.3	-1.8
Trace Metals (mg/L)						
Aluminum	<	0.326	<	<	0.23	0.292
Arsenic	<	<	<	<	<	<
Barium	0.0629	0.0845	0.093	0.0441	0.0618	0.064
Beryllium	<	<	<	<	<	<
Boron	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<
Chromium	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<
Iron	0.142	0.541	0.232	<	0.541	0.415
Lead	<	<	<	<	<	<
Lithium	<	<	<	<	<	<
Manganese	0.0114	0.235	0.0474	<	0.0466	0.0154
Mercury	<	<	<	<	<	<
Nickel	<	<	<	<	<	<
Selenium	<	<	<	<	<	<
Strontium	0.0486	0.11	0.0973	0.0315	0.0456	0.0542
Thallium	<	<	<	<	<	<
Uranium	<	0.0276	0.008	<	<	0.0051

APPENDIX D.1: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	SS-8					
Functional Area	EXP-SW					
Date Sampled	03/09/10		06/28/10		08/30/10	
Program	BJC		BJC		BJC	
Sample Type		Dup		Dup		Dup
Field Measurements						
Time Sampled	10:50	.	13:30	.	14:00	.
Measuring Point Elev. (ft)	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.
Conductivity (μmho/cm)	220	.	395	.	520	.
Dissolved Oxygen (ppm)	9	.	4.94	.	5.01	.
Oxidation/Reduction (mV)	105.5	.	193	.	3.4	.
Temperature (degrees C)	14.26	.	26.42	.	26.4	.
Turbidity (NTU)	13	.	5	.	9	.
pH	5.28	.	9.1	.	7.02	.
Miscellaneous Analytes						
Dissolved Solids (mg/L)	140	140	170	160	170	170
Suspended Solids (mg/L)	<	4	<	11	<	<
Major Ions (mg/L)						
Calcium	34.1	34.2	42.4	42.3	46.6	46.7
Magnesium	10.5	10.6	14.3	14.3	14.9	14.9
Potassium	0.825	0.802	0.874	0.866	0.976	0.928
Sodium	2.83	2.82	2.84	2.85	3.52	3.57
Bicarbonate	140	130	170	170	180	180
Carbonate	<	<	<	<	<	<
Chloride	5.8	6.1	4.7	4.6	6.5	6.5
Fluoride	<	<	<	<	<	<
Nitrate as N	0.12	0.11	0.041	0.04	0.11	0.11
Sulfate	3.2	3.2	2.4	2.4	3.2	3.2
Charge balance error (%)	-5.6	.	-2.2	.	-1.7	.
Trace Metals (mg/L)						
Aluminum	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<
Barium	0.0355	0.0359	0.051	0.0514	0.0553	0.0551
Beryllium	<	<	<	<	<	<
Boron	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<
Chromium	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<
Iron	0.0779	0.08	0.334	0.305	0.26	0.259
Lead	<	<	<	<	<	<
Lithium	<	<	<	<	<	<
Manganese	0.0284	0.0294	0.359	0.26	0.146	0.143
Mercury	<	<	<	<	<	<
Nickel	<	<	<	<	<	<
Selenium	<	<	<	<	<	<
Strontium	0.04	0.04	0.0489	0.0487	0.0567	0.0565
Thallium	<	<	<	<	<	<
Uranium	<	<	<	<	<	<

APPENDIX D.2

VOLATILE ORGANIC COMPOUNDS

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	**GW-006**	**GW-008**		**GW-014**	**GW-046**		**GW-058**		**GW-065**	
Functional Area	**OLF**	**OLF**		**BG**	**BG**		**BG**		**OLF**	
Date Sampled	**02/03/10**	**01/04/10**	**07/21/10**	**08/16/10**	**01/04/10**	**07/21/10**	**08/26/10**	**10/19/10**	**02/09/10**	**08/30/10**
Program	**GWPP**	**BJC**	**BJC**	**GWPP**	**BJC**	**BJC**	**GWPP**	**GWPP**	**GWPP**	**GWPP**
Sample Type	**PDB**			**PDB**					**NP**	**NP**
Chloroethenes (μg/L)										
Tetrachloroethene	<	42	45	10	1,500	1,500	<	<	<	<
Trichloroethene	2 J	8.7	9	160	760	1,600	<	<	<	5 J
cis-1,2-Dichloroethene	4 J	25	22	1,100	2,700	5,000	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	5 J	12	<	<	<	<	<
1,1-Dichloroethene	<	6.8	5.4	98	130	<	<	<	<	<
Vinyl chloride	<	<	<	170	390	660	<	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	120 J	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	1.3	<	<	<	<	<
1,2-Dichloroethane	<	<	<	2 J	6.7	<	<	<	<	<
1,1-Dichloroethane	7	14	14	190	510	380	<	<	<	<
Chloroethane	<	<	<	8	1.8	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	16	<	<	<	<	<
Methylene chloride	<	<	<	<	18	320	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	1.1	1.1	3 J	250	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	14	<	<	<	<
Chlorofluorocarbons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	.	.	<	.	.	<	<	<	<
Trichlorofluoromethane	<	.	.	<	.	.	<	<	<	<
Dichlorodifluoromethane	<	.	.	<	.	.	<	<	<	<
Miscellaneous (μg/L)										
1,2-Dichloropropane	<	1.3	1.1	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	.	.	<	.	.	<	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	.	<	<	.	<	<	<	<	<	<
Acetonitrile	.	.	.	.	.	.	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-068	GW-071			GW-077		GW-078		GW-079	
Functional Area	BG	BG			BG		BG		BG	
Date Sampled	08/23/10	02/03/10		08/23/10	01/18/10	08/13/10	01/18/10	08/13/10	01/18/10	08/06/10
Program	GWPP	GWPP		GWPP	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type			Dup							
Chloroethenes (μg/L)										
Tetrachloroethene	10	350	320	200	<	<	<	<	<	<
Trichloroethene	93	41	41	26	<	<	<	<	<	<
cis-1,2-Dichloroethene	2,200	21	23	18	<	<	<	<	<	<
trans-1,2-Dichloroethene	4 J	1 J	1 J	<	<	<	<	<	<	<
1,1-Dichloroethene	340	54	53	52	<	<	<	<	<	<
Vinyl chloride	410	3	3	2 J	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	140	150	65	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	4 J	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	1,200	2,200	2,100	1,700	<	<	<	<	<	<
Chloroethane	9	21	22	12	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	2 J	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	160	1,000	990	690	<	<	<	<	<	<
Ethylbenzene	<	2 J	2 J	1 J	<	<	<	<	<	<
Toluene	10	20	19	13	<	<	<	<	<	<
Total Xylene	9	6	6	3 J	<	<	<	<	<	<
Chlorofluorocarbons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	89	95	55	.	.	.	.	.	.
Trichlorofluoromethane	<	<	<	<	.	.	.	.	.	.
Dichlorodifluoromethane	<	<	<	<	.	.	.	.	.	.
Miscellaneous (μg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	.	.	.	.	.	.
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Acetonitrile	<	<	<	<	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-080				GW-082	GW-098	GW-100	GW-101	GW-225	GW-229
Functional Area	BG				BG	OLF	S3	S3	OLF	OLF
Date Sampled	01/18/10		08/06/10		01/27/10	08/30/10	09/13/10	09/16/10	08/30/10	09/07/10
Program	BJC		BJC		GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type		Dup		Dup						
Chloroethenes (µg/L)										
Tetrachloroethene	<	<	<	<	2 J	<	<	<	<	<
Trichloroethene	<	<	<	<	4 J	6	<	<	250	4 J
cis-1,2-Dichloroethene	<	<	<	<	850	1 J	<	<	2 J	160
trans-1,2-Dichloroethene	<	<	<	<	1 J	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	19	2 J	<	<	3 J	22
Vinyl chloride	<	<	<	<	250	<	<	<	<	51
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	3 J	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	500	<	<	<	<	7
Chloroethane	<	<	<	<	12	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	2 J	<
Chloroform	<	<	<	<	<	<	<	<	1 J	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	21	<	<	<	<	9
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	3 J	<	<	<	<	17
Trichlorofluoromethane	.	.	.	.	<	<	<	<	<	<
Dichlorodifluoromethane	.	.	.	.	2 J	<	<	<	<	<
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	.	.	.	.	<	<	<	<	<	3 J
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Acetonitrile	.	.	.	.	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	12

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-246	GW-276		GW-289	GW-291		GW-307	GW-310	GW-312	GW-315
Functional Area	S3	S3		BG	BG		RS	RS	RS	SPI
Date Sampled	02/16/10	01/04/10	07/15/10	01/28/10	08/24/10		09/20/10	09/21/10	09/21/10	08/16/10
Program	GWPP	BJC	BJC	GWPP	GWPP		GWPP	GWPP	GWPP	GWPP
Sample Type				PDB		Dup				PDB
Chloroethenes (µg/L)										
Tetrachloroethene	160	5.2	5.5	130	220	240	<	2 J	<	2 J
Trichloroethene	2 J	<	<	16	23	27	13	4 J	28	1 J
cis-1,2-Dichloroethene	2 J	<	<	4 J	62	73	3 J	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	4 J	<	<	1 J	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	1 J	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	45	<	<	<	<	<	<	<	1 J	<
Methylene chloride	17	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	91	.	.	<	<	<	<	<	<	<
Trichlorofluoromethane	<	.	.	<	2 J	2 J	<	<	<	<
Dichlorodifluoromethane	<	.	.	<	<	<	<	<	<	<
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	.	.	<	<	<	<	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	.	<	<	<	<	<	.
Acetonitrile	<	.	.	.	<	<	<	<	<	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

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Volatile Organic Compounds

Sampling Point	GW-365	GW-601	GW-615	GW-623	GW-626	GW-627		GW-648		GW-653
Functional Area	OLF	OLF	S3	BG	BG	BG		RS		BG
Date Sampled	09/07/10	09/07/10	09/15/10	08/26/10	02/02/10	02/03/10	08/26/10	02/03/10	08/16/10	08/16/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type				NP				PDB	PDB	PDB
Chloroethenes (µg/L)										
Tetrachloroethene	<	3 J	<	1,400	61	1,000	870	<	<	4 J
Trichloroethene	5 J	67	<	3,400	33	360	280	<	<	5 J
cis-1,2-Dichloroethene	36	<	<	190	310	38	39	<	<	34
trans-1,2-Dichloroethene	<	<	<	8	<	5	4 J	<	<	<
1,1-Dichloroethene	15	<	<	110	5 J	45	49	<	<	1 J
Vinyl chloride	4	<	<	48	1 J	56	45	<	<	<
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	1 J	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	5 J	<	<	1,200	14	120	120	<	<	2 J
Chloroethane	<	<	<	<	<	4 J	2 J	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	5 J	<	<	<	<	<
Methylene chloride	<	<	2 J	12	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	2 J	<	<	<	<	<	<
Ethylbenzene	<	<	<	1 J	<	<	<	<	<	<
Toluene	<	<	<	1 J	<	<	<	<	<	<
Total Xylene	<	<	<	3 J	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	9	<	<	<	<	<
Trichlorofluoromethane	<	<	<	<	<	<	<	<	<	<
Dichlorodifluoromethane	<	<	<	<	<	<	<	<	<	<
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	5 J	290	<	<	<	.	.	.
Acetonitrile	<	<	52 Q	<	<	<	<	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-683		GW-684		GW-703		GW-704		GW-706	
Functional Area	EXP-A		EXP-A		EXP-B		EXP-B		EXP-B	
Date Sampled	01/18/10	08/13/10	01/18/10	08/06/10	09/08/10		01/18/10	08/06/10	01/18/10	08/06/10
Program	BJC	BJC	BJC	BJC	GWPP		BJC	BJC	BJC	BJC
Sample Type						Dup				
Chloroethenes (µg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	<	<
Trichloroethene	<	<	<	<	10	9	27	22	9.8	8.6
cis-1,2-Dichloroethene	<	<	<	<	7	7	5.7	2.5	14	20
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	2.1	1.2	1.6	2.9
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	<	<	.	.	.	.
Trichlorofluoromethane	.	.	.	.	<	<	.	.	.	.
Dichlorodifluoromethane	.	.	.	.	<	<	.	.	.	.
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	.	.	.	.	<	<	.	.	.	.
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Acetonitrile	.	.	.	.	<	<	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-712		GW-713				GW-714		GW-724	GW-725
Functional Area	EXP-W		EXP-W				EXP-W		EXP-C	EXP-C
Date Sampled	01/05/10	07/21/10	01/04/10		07/19/10		01/05/10	07/19/10	09/09/10	09/09/10
Program	BJC	BJC	BJC		BJC		BJC	BJC	GWPP	GWPP
Sample Type				Dup		Dup				
Chloroethenes (µg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	1 J	2 J
Trichloroethene	<	<	<	<	<	<	<	<	88	9
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	3 J	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	<	<
Trichlorofluoromethane	.	.	.	.	.	.	.	.	<	<
Dichlorodifluoromethane	.	.	.	.	.	.	.	.	<	<
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	.	.	.	.	.	.	.	.	<	<
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Acetonitrile	.	.	.	.	.	.	.	.	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-738	GW-740	BCK-03.30			BCK-04.55			BCK-07.87		
Functional Area	EXP-C	EXP-C	EXP-SW			EXP-SW			EXP-SW		
Date Sampled	09/09/10	09/13/10	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10
Program	GWPP	GWPP	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type											
Chloroethenes (µg/L)											
Tetrachloroethene	<	<	<	<	<	<	<	<	<	<	<
Trichloroethene	13	42	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)											
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)											
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)											
Benzene	<	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	.	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	<	<	.	.	.	.	.	.	.	.	.
Miscellaneous (µg/L)											
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	<	<	<
2-Butanone	<	<	<	<	1.1	<	<	1.3	<	<	1.4
Acetone	<	<	<	<	<	<	<	<	<	<	<
Acetonitrile	<	<	.	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	BCK-09.20			BCK-11.54			BCK-11.84			BCK-12.34
Functional Area	EXP-SW	EXP-SW	EXP-SW	EXP-SW			EXP-SW			EXP-SW
Date Sampled	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	03/09/10	06/28/10	08/30/10	03/09/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type										
Chloroethenes (μg/L)										
Tetrachloroethene	1.2	<	<	<	<	<	<	<	<	9.4
Trichloroethene	1.2	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	6.6	1.1	<	<	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	.	.	.	.	.	.	.	.	.	.
Miscellaneous (μg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	1.1	<
Acetone	<	<	<	<	<	5.6	<	<	<	<
Acetonitrile	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	BCK-12.34		NT-01			NT-03			NT-07	
Functional Area	EXP-SW		EXP-SW			EXP-SW			EXP-SW	
Date Sampled	06/28/10	08/30/10	01/13/10	04/20/10	08/30/10	03/09/10	06/28/10	08/30/10	02/03/10	07/21/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type			Dup	Dup						
Chloroethenes (µg/L)										
Tetrachloroethene	1.4	0.99 J	43	84	58	<	<	<	35	22
Trichloroethene	<	<	<	<	<	<	<	<	24	29
cis-1,2-Dichloroethene	<	<	1.8	3.2	2.4	<	<	<	81	130
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	4.1	6.8
Vinyl chloride	<	<	<	<	<	<	<	<	8.3	10
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	1.6	3.4
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	11	24
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	3.1	1.9	<	<	<	1.2	1.9
Methylene chloride	<	<	1.6	3.3	1.8	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	<	<	2.9	2.1
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	.	.	.	.	.	.	.	.	.	.
Miscellaneous (µg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	.	.
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	1.4	<	<	<	<	<	6.1	<	<
Acetonitrile	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	NT-08						S07		
Functional Area	EXP-SW						EXP-SW		
Date Sampled	02/17/10	03/09/10	06/28/10		08/30/10		03/09/10	06/28/10	08/30/10
Program	BJC	BJC	BJC		BJC		BJC	BJC	BJC
Sample Type				Dup		Dup			
Chloroethenes (μg/L)									
Tetrachloroethene	27	26	1.1	1.1	<	<	<	<	<
Trichloroethene	30	29	1.5	1.5	<	<	<	<	<
cis-1,2-Dichloroethene	150	150	10	10	4	4	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	4.1	4.4	<	<	<	<	<	<	<
Vinyl chloride	3.9	4.1	<	<	<	<	<	<	<
Chloroethanes (μg/L)									
1,1,1-Trichloroethane	1.7	1.8	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	1.4	1.3	<	<	<	<	<	<	<
1,1-Dichloroethane	9.8	9.5	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)									
Carbon tetrachloride	<	<	<	<	<	<	<	<	<
Chloroform	2	2.1	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)									
Benzene	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (μg/L)									
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	.	.	.	.	.	.	.	.	.
Miscellaneous (μg/L)									
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	1.8	2.4	<	<	7.2
Acetonitrile	.	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	SS-4		SS-5			SS-6				SS-6.6
Functional Area	**EXP-SW**		**EXP-SW**			**EXP-SW**				**EXP-SW**
Date Sampled	**01/20/10**		**03/09/10**	**06/28/10**	**08/30/10**	**01/06/10**	**07/22/10**	**03/09/10**	**06/28/10**	**08/30/10**
Program	**GWPP**		**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**
Sample Type	**Dup**									
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	<	<
Trichloroethene	2 J	2 J	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	1 J	1 J	1.3	2.7	1.2	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	.	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	<	<	.	.	.	.	.	.	.	.
Miscellaneous (μg/L)										
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	.	.	<	<	<
2-Butanone	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Acetonitrile	<	<	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.2: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	SS-7			SS-8					
Functional Area	EXP-SW			EXP-SW					
Date Sampled	03/09/10	06/28/10	08/30/10	03/09/10		06/28/10		08/30/10	
Program	BJC	BJC	BJC	BJC		BJC		BJC	
Sample Type					Dup		Dup		Dup
Chloroethenes (μg/L)									
Tetrachloroethene	<	<	<	<	<	<	<	<	<
Trichloroethene	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)									
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)									
Carbon tetrachloride	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)									
Benzene	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<
Chlorofluorocarbons (μg/L)									
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	.
Dichlorodifluoromethane	.	.	.	.	.	.	.	.	.
Miscellaneous (μg/L)									
1,2-Dichloropropane	<	<	<	<	<	<	<	<	<
1,4-Dichlorobenzene	<	<	<	<	<	<	<	<	<
2-Butanone	<	<	1.6	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<
Acetonitrile	.	.	.	.	.	.	.	.	.
Chlorobenzene	<	<	<	<	<	<	<	<	<

APPENDIX D.3

RADIOLOGICAL ANALYTES

APPENDIX D.3: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Activity	TPU	MDA	Activity	TPU	MDA
GW-008	OLF	01/04/10	BJC		<	.	3.47	<	.	4.13
		07/21/10	BJC		<	.	2.23	<	.	3.18
GW-046	BG	01/04/10	BJC		<	.	3.59	<	.	4.17
		07/21/10	BJC		<	.	2.81	<	.	4.87
GW-058	BG	08/26/10	GWPP		12	4.7	5.2	14	4.4	6.3
		10/19/10	GWPP		9	4.8	6.7	15	5.2	8.9
GW-065	OLF	02/09/10	GWPP	NP	5.7	3.1	3.2	<	.	6.7
		08/30/10	GWPP	NP	10	4.4	5.2	<	.	8.7
GW-068	BG	08/23/10	GWPP		11	4.8	4.6	27	6	8.7
GW-085	OLF	08/30/10	GWPP		<	.	4.8	15	5.2	9.1
GW-100	S3	09/13/10	GWPP		5.4	4.9	4.7	<	.	8.6
GW-101	S3	09/16/10	GWPP		<	.	5.8	<	.	9.8
GW-229	OLF	09/07/10	GWPP		26	7.5	7.6	38	6.4	8.4
GW-246	S3	02/16/10	GWPP		350	61	33	14,000	250	67
		04/20/10	GWPP		180	54	37	12,000	270	78
GW-276	S3	01/04/10	BJC		112	19.7	3.1	120	20.2	6.04
		07/15/10	BJC		115	19.3	2.82	164	26.6	4.5
GW-291	BG	08/24/10	GWPP		<	.	3.9	<	.	5.4
			GWPP	Dup	<	.	1.4	<	.	5.7
GW-307	RS	09/20/10	GWPP		<	.	6.8	<	.	9.3
GW-310	RS	09/21/10	GWPP		<	.	6.3	12	4.9	8.6
GW-312	RS	09/21/10	GWPP		5.3	3.7	4.1	<	.	8.7
GW-526	S3	09/22/10	GWPP		<	.	160	<	.	170
GW-537	OLF	02/08/10	GWPP		<	.	3.3	180	11	7
GW-615	S3	09/15/10	GWPP		<	.	550	<	.	840
GW-626	BG	02/02/10	GWPP		2.7	2.6	1.9	<	.	5.4
GW-683	EXP-A	01/18/10	BJC		5.41	1.28	0.837	5.59	1.34	1.66
		08/13/10	BJC		3.54	1.8	2.31	<	.	3.98
GW-684	EXP-A	01/18/10	BJC		6.95	1.7	1.39	11	2.35	2.46
		08/06/10	BJC		3.45	1.85	2.64	14.7	3.42	3.65
GW-703	EXP-B	09/08/10	GWPP		8.7	4.7	6.9	49	6.8	8.2
			GWPP	Dup	6.3	4.2	5.5	37	6.7	10
GW-704	EXP-B	01/18/10	BJC		7.19	1.78	1.26	22.6	4.15	2.84
		08/06/10	BJC		<	.	2.22	21.4	4.4	3.58
GW-706	EXP-B	01/18/10	BJC		18.6	3.72	1.56	37	6.42	3.17
		08/06/10	BJC		13.4	3.33	2.51	33.7	6.26	4.26
GW-712	EXP-W	01/05/10	BJC		<	.	2.37	<	.	3.49
		07/21/10	BJC		<	.	2.62	<	.	4.43
GW-713	EXP-W	01/04/10	BJC		<	.	2.22	<	.	3.7
			BJC	Dup	<	.	3.03	<	.	3.87
		07/19/10	BJC		<	.	1.17	2.69	1.23	2.16
			BJC	Dup	1.29	0.76	1.21	6.22	1.77	2.58
GW-714	EXP-W	01/05/10	BJC		<	.	2.29	<	.	3.7
		07/19/10	BJC		5.99	1.66	1.51	6.8	1.93	2.8
GW-738	EXP-C	09/09/10	GWPP		4.5	4.1	4.2	120	9.9	8.2
SS-4	EXP-SW	01/20/10	GWPP		26	4.7	2.7	24	5.2	7.9
			GWPP	Dup	23	4.1	2.4	20	4.6	6.4
SS-6	EXP-SW	01/06/10	BJC		<	.	3.2	<	.	3.87
		07/22/10	BJC		2.41	1.43	2.21	4.23	1.81	3.25

Sampling Point	GW-046						GW-058			GW-085		
Functional Area	BG						BG			OLF		
Date Sampled	01/04/10			07/21/10			10/19/10			08/30/10		
Program	BJC			BJC			GWPP			GWPP		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	3.59	<MDA	.	2.81	9	4.8	6.7	<MDA	.	4.8
Gross Beta	<MDA	.	4.17	<MDA	.	4.87	15	5.2	8.9	15	5.2	9.1
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	9.77	<MDA	.	10.8	17	8.4	13	37 Q	9.1	14
Uranium-234	<MDA	.	0.443	<MDA	.	0.322	5	1	1.1	.	.	.
Uranium-235	<MDA	.	0.218	<MDA	.	0.273	0.51	0.31	0.48	.	.	.
Uranium-238	<MDA	.	0.218	<MDA	.	0.322	7.8	1.7	2.8	.	.	.

Sampling Point	GW-246			GW-276						GW-526		
Functional Area	S3			S3						S3		
Date Sampled	04/20/10			01/04/10			07/15/10			09/22/10		
Program	GWPP			BJC			BJC			GWPP		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	180	54	37	112	19.7	3.1	115	19.3	2.82	<MDA	.	160
Gross Beta	12,000	270	78	120	20.2	6.04	164	26.6	4.5	<MDA	.	170
Americium-241	.	.	.	<MDA	.	0.165	<MDA	.	0.106	.	.	.
Neptunium-237	.	.	.	5.2	2.09	0.209	5.45	2.3	0.329	.	.	.
Total Radium Alpha	.	.	.	0.59	0.284	0.289	0.35	0.23	0.313	.	.	.
Strontium-89/90	38	5.1	6	<MDA	.	2.25	<MDA	.	2.35	.	.	.
Technetium-99	27,000	440	270	135	23.2	9.46	132	23.3	11.5	<MDA	.	13
Uranium-234	73	7.7	0.96	52.5	8.99	0.27	58.3	9.83	0.257	.	.	.
Uranium-235	4.7	0.092	0.33	4.7	1.11	0.257	5.66	1.32	0.318	.	.	.
Uranium-238	170	18	0.31	114	19	0.227	128	21	0.257	.	.	.

Sampling Point	GW-537			GW-683						GW-684		
Functional Area	OLF			EXP-A						EXP-A		
Date Sampled	02/08/10			01/18/10			08/13/10			01/18/10		
Program	GWPP			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	3.3	5.41	1.28	0.837	3.54	1.8	2.31	6.95	1.7	1.39
Gross Beta	180	11	7	5.59	1.34	1.66	<MDA	.	3.98	11	2.35	2.46
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	0.39	0.024	0.029	<MDA	.	10.2	<MDA	.	6.78	<MDA	.	10.3
Uranium-234	.	.	.	2.42	0.879	0.469	1.9	0.664	0.347	3.13	1.02	0.381
Uranium-235	.	.	.	<MDA	.	0.414	0.222	0.202	0.12	<MDA	.	0.342
Uranium-238	.	.	.	3.76	1.15	0.381	1.66	0.609	0.28	5.34	1.44	0.168

Sampling Point	GW-684			GW-704						GW-706		
Functional Area	EXP-A			EXP-B						EXP-B		
Date Sampled	08/06/10			01/18/10			08/06/10			01/18/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	3.45	1.85	2.64	7.19	1.78	1.26	<MDA	.	2.22	18.6	3.72	1.56
Gross Beta	14.7	3.42	3.65	22.6	4.15	2.84	21.4	4.4	3.58	37	6.42	3.17
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	11.5	32.7	8.72	10.2	<MDA	.	11.2	44.9	10.4	10.6
Uranium-234	3.51	0.981	0.356	3.82	1.13	0.32	1.5	0.614	0.394	10.5	2.51	0.431
Uranium-235	0.383	0.283	0.288	0.466	0.338	0.158	<MDA	.	0.359	1.2	0.659	0.521
Uranium-238	4.73	1.2	0.24	5.79	1.49	0.357	1.52	0.614	0.359	19.7	4.08	0.558

Sampling Point	GW-706			GW-712						GW-713		
Functional Area	EXP-B			EXP-W						EXP-W		
Date Sampled	08/06/10			01/05/10			07/21/10			01/04/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	13.4	3.33	2.51	<MDA	.	2.37	<MDA	.	2.62	<MDA	.	2.22
Gross Beta	33.7	6.26	4.26	<MDA	.	3.49	<MDA	.	4.43	<MDA	.	3.7
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	50.3	11.5	11.5	<MDA	.	10.1	<MDA	.	11.7	<MDA	.	9.73
Uranium-234	13	2.52	0.413	<MDA	.	0.464	<MDA	.	0.374	<MDA	.	0.585
Uranium-235	1.16	0.496	0.393	<MDA	.	0.441	<MDA	.	0.358	<MDA	.	0.191
Uranium-238	19.1	3.49	0.296	<MDA	.	0.389	<MDA	.	0.323	<MDA	.	0.388

Sampling Point	GW-713									GW-714		
Functional Area	EXP-W									EXP-W		
Date Sampled	01/04/10			07/19/10						01/05/10		
Program	BJC			BJC						BJC		
Sample Type	Dup						Dup					
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	3.03	<MDA	.	1.17	1.29	0.76	1.21	<MDA	.	2.29
Gross Beta	<MDA	.	3.87	2.69	1.23	2.16	6.22	1.77	2.58	<MDA	.	3.7
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	10.2	<MDA	.	11.8	<MDA	.	10.8	<MDA	.	9.36
Uranium-234	0.577	0.547	0.561	<MDA	.	0.41	<MDA	.	0.445	1.53	0.683	0.452
Uranium-235	<MDA	.	0.325	<MDA	.	0.332	<MDA	.	0.357	<MDA	.	0.452
Uranium-238	<MDA	.	0.659	<MDA	.	0.429	<MDA	.	0.445	0.682	0.457	0.503

APPENDIX D.3: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	GW-714			BCK-03.30								
Functional Area	EXP-W			EXP-SW								
Date Sampled	07/19/10			03/09/10			06/28/10			08/30/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	5.99	1.66	1.51	.	.	.	.	.	.	.	.	.
Gross Beta	6.8	1.93	2.8	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	11.4	<MDA	.	10.2	<MDA	.	12	<MDA	.	10.7
Uranium-234	0.996	0.491	0.392	2.71	0.97	0.448	2.23	0.848	0.881	3.05	0.925	0.355
Uranium-235	<MDA	.	0.423	<MDA	.	0.508	<MDA	.	0.533	0.389	0.312	0.389
Uranium-238	0.689	0.393	0.264	.	.	.	3.98	1.12	0.461	5.04	1.28	0.135

Sampling Point	BCK-04.55									BCK-07.87		
Functional Area	EXP-SW									EXP-SW		
Date Sampled	03/09/10			06/28/10			08/30/10			03/09/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	10.1	<MDA	.	11.8	<MDA	.	10.6	22	7.43	9.95
Uranium-234	2.52	0.878	0.364	1.52	0.674	0.917	3.26	0.935	0.493	7.53	1.87	0.403
Uranium-235	<MDA	.	0.326	<MDA	.	0.207	<MDA	.	0.315	0.533	0.407	0.468
Uranium-238	6.15	1.56	0.327	4.03	1.03	0.353	7.37	1.63	0.232	15.6	3.24	0.522

Sampling Point	BCK-07.87						BCK-09.20					
Functional Area	EXP-SW						EXP-SW					
Date Sampled	06/28/10			08/30/10			03/09/10			06/28/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	36.2	9.94	11.9	28.3	8.52	10.7	29.6	8.15	9.74	26.3	8.57	11.3
Uranium-234	8.88	1.83	0.435	8.52	1.82	0.493	.	.	.	.	.	.
Uranium-235	0.721	0.37	0.328	0.743	0.383	0.27	.	.	.	.	.	.
Uranium-238	15.3	2.85	0.278	17.2	3.21	0.359	.	.	.	.	.	.

APPENDIX D.3: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	BCK-09.20			BCK-11.54								
Functional Area	EXP-SW			EXP-SW								
Date Sampled	08/30/10			03/09/10			06/28/10			08/30/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	25.3	7.86	10	91.3	16.7	9.87	179	30.6	11.2	210	35.1	9.78
Uranium-234	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-235	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	BCK-11.84									BCK-12.34		
Functional Area	EXP-SW									EXP-SW		
Date Sampled	03/09/10			06/28/10			08/30/10			03/09/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	172	29.1	10.1	269	44.5	10.7	287	47.3	9.72	325	53.4	11.1
Uranium-234	16.5	3.41	0.449	26.4	4.61	0.278	28.7	4.97	0.305	.	.	.
Uranium-235	0.921	0.528	0.371	3.06	0.845	0.247	2.27	0.7	0.279	.	.	.
Uranium-238	26	4.98	0.316	53.3	8.85	0.305	60.4	9.96	0.206	.	.	.

Sampling Point	BCK-12.34						NT-01					
Functional Area	EXP-SW						EXP-SW					
Date Sampled	06/28/10			08/30/10			03/09/10			06/28/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	547	88.6	11.5	419	68.2	10.1	551	89.1	10.2	3,440	551	28.6
Uranium-234	.	.	.	.	.	.	4.36	1.31	0.585	29.1	5.03	0.394
Uranium-235	.	.	.	.	.	.	<MDA	.	0.415	1.31	0.496	0.24
Uranium-238	.	.	.	.	.	.	3.46	1.13	0.483	32	5.48	0.297

Sampling Point	NT-01			NT-03								
Functional Area	EXP-SW			EXP-SW								
Date Sampled	08/30/10			03/09/10			06/28/10			08/30/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	3,740	599	17.5	<MDA	.	9.87	<MDA	.	11.3	<MDA	.	10.1
Uranium-234	26.3	4.61	0.21	.	.	.	.	.	.	.	.	.
Uranium-235	1.53	0.556	0.252	.	.	.	.	.	.	.	.	.
Uranium-238	27.8	4.85	0.252	.	.	.	.	.	.	.	.	.

Sampling Point	NT-07									NT-08		
Functional Area	EXP-SW									EXP-SW		
Date Sampled	02/03/10			07/21/10						03/09/10		
Program	BJC			BJC						BJC		
Sample Type							Dup					
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	.	.	.	.	.	.	.	.	.	<MDA	.	9.77
Uranium-234	5.12	1.19	0.2	4.62	1.12	0.33	4.22	1.07	0.343	.	.	.
Uranium-235	0.396	0.262	0.24	0.578	0.319	0.207	0.779	0.387	0.29	.	.	.
Uranium-238	5.92	1.33	0.2	5.65	1.3	0.307	6.28	1.42	0.29	.	.	.

Sampling Point	NT-08											
Functional Area	EXP-SW											
Date Sampled	03/09/10			06/28/10						08/30/10		
Program	BJC			BJC						BJC		
Sample Type	Dup						Dup					
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	10.2	<MDA	.	12.2	<MDA	.	11.5	24.4	7.98	10.4
Uranium-234	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-235	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	NT-08			S07								
Functional Area	EXP-SW			EXP-SW								
Date Sampled	08/30/10			03/09/10			06/28/10			08/30/10		
Program	BJC			BJC			BJC			BJC		
Sample Type	Dup											
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	19.5	7.33	10.1	.	.	.	.	.	.	.	.	.
Uranium-234	.	.	.	<MDA	.	0.517	0.455	0.291	0.301	1.01	0.443	0.332
Uranium-235	.	.	.	<MDA	.	0.321	<MDA	.	0.203	<MDA	.	0.332
Uranium-238	.	.	.	<MDA	.	0.42	0.505	0.302	0.275	0.556	0.321	0.281

Sampling Point	SS-5									SS-6		
Functional Area	EXP-SW									EXP-SW		
Date Sampled	03/09/10			06/28/10			08/30/10			01/06/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	<MDA	.	3.2
Gross Beta	.	.	.	.	.	.	.	.	.	<MDA	.	3.87
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	12.9	6.4	9.55	19.1	7.69	10.9	27.5	8.23	10.3	<MDA	.	9.57
Uranium-234	.	.	.	.	.	.	.	.	.	<MDA	.	0.663
Uranium-235	.	.	.	.	.	.	.	.	.	<MDA	.	0.472
Uranium-238	.	.	.	.	.	.	.	.	.	0.911	0.526	0.519

Sampling Point	SS-6			SS-6.6								
Functional Area	EXP-SW			EXP-SW								
Date Sampled	07/22/10			03/09/10			06/28/10			08/30/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	2.41	1.43	2.21	.	.	.	.	.	.	.	.	.
Gross Beta	4.23	1.81	3.25	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	11.1	<MDA	.	9.68	14.2	7.42	11.2	<MDA	.	10.1
Uranium-234	1.47	0.543	0.329	<MDA	.	0.809	5.52	1.34	0.411	1.56	0.574	0.365
Uranium-235	<MDA	.	0.306	0.786	0.528	0.628	0.533	0.363	0.456	<MDA	.	0.422
Uranium-238	2.64	0.773	0.329	1.58	0.722	0.43	10.3	2.13	0.411	2.64	0.784	0.318

APPENDIX D.3: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	SS-7									SS-8		
Functional Area	EXP-SW									EXP-SW		
Date Sampled	03/09/10			06/28/10			08/30/10			03/09/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	10.1	<MDA	.	11.9	<MDA	.	10.6	<MDA	.	10.1
Uranium-234	0.791	0.507	0.535	1.06	0.46	0.337	1.16	0.504	0.35	<MDA	.	0.534
Uranium-235	<MDA	.	0.316	<MDA	.	0.313	0.346	0.261	0.236	<MDA	.	0.217
Uranium-238	0.785	0.486	0.371	1.34	0.515	0.253	1.81	0.644	0.283	<MDA	.	0.492

Sampling Point	SS-8											
Functional Area	EXP-SW											
Date Sampled	03/09/10			06/28/10						08/30/10		
Program	BJC			BJC						BJC		
Sample Type	Dup						Dup					
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Gross Beta	.	.	.	.	.	.	.	.	.	.	.	.
Americium-241	.	.	.	.	.	.	.	.	.	.	.	.
Neptunium-237	.	.	.	.	.	.	.	.	.	.	.	.
Total Radium Alpha	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	.	.	.	.	.	.	.	.	.	.	.	.
Technetium-99	<MDA	.	9.47	<MDA	.	11.3	<MDA	.	11.2	<MDA	.	10.3
Uranium-234	<MDA	.	0.466	0.581	0.326	0.315	0.7	0.393	0.379	<MDA	.	0.492
Uranium-235	<MDA	.	0.499	<MDA	.	0.293	<MDA	.	0.352	<MDA	.	0.423
Uranium-238	<MDA	.	0.581	0.367	0.259	0.293	<MDA	.	0.379	<MDA	.	0.304

Sampling Point	SS-8		
Functional Area	EXP-SW		
Date Sampled	08/30/10		
Program	BJC		
Sample Type	Dup		
Result (pCi/L)	Activity	TPU	MDA
Gross Alpha	.	.	.
Gross Beta	.	.	.
Americium-241	.	.	.
Neptunium-237	.	.	.
Total Radium Alpha	.	.	.
Strontium-89/90	.	.	.
Technetium-99	<MDA	.	9.75
Uranium-234	0.566	0.34	0.406
Uranium-235	<MDA	.	0.269
Uranium-238	<MDA	.	0.374

APPENDIX D.4

MONITORING DATA FOR THE EMWMF

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-363				GW-639				GW-916	
Date Sampled	02/09/10*	04/21/10*	08/17/10*	11/17/10*	02/09/10*	04/20/10*	08/17/10*	11/18/10*	02/17/10	04/22/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type										
Field Measurements										
Time Sampled	10:00	10:40	10:30	10:30	9:00	15:30	9:20	14:50	10:10	11:30
Measuring Point Elev. (ft)	957.91	957.91	957.91	957.91	940.95	940.95	940.95	940.95	1,002.85	1,002.85
Depth to Water (ft)	3.73	4.69	4.77	4.85	9.05	10.28	11.35	10.55	4.68	5.00
Groundwater Elevation (ft)	954.18	953.22	953.14	953.06	931.90	930.67	929.60	930.40	998.17	997.85
Conductivity (μmho/cm)	520	598	687	365	979	1,181	1,286	717	288	346
Dissolved Oxygen (ppm)	4.12	2.68	1.31	3.12	1.65	1.97	1.01	1.19	2.21	3.1
Oxidation/Reduction (mV)	75	43	34	121	85	64	35	144	-60	-34
Temperature (degrees C)	14.7	15.8	19.3	15.64	12.7	20.2	17	16	11.7	13.3
Turbidity (NTU)	8	101	4	3	3	5	3	8	3	1
pH	9.02	8.54	8.66	9.2	9.07	9.15	8.95	9.34	7.41	7.39
Major Ions (mg/L)										
Calcium	1.2	1.22	1.25	1.19	0.892	0.826	0.903	0.928	41.4	38.2
Magnesium	0.488	0.484	0.497	0.453	0.27	0.246	0.27	0.263	6.5	5.88
Potassium	1.21	1.31	1.26	1.32	1.58	1.6	1.58	1.65	3.28	3.24
Sodium	123	114	114	113	224	206	215	205	26.6	26
Chloride										
Sulfate										
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	0.364	<
Antimony	<	<	<	<	<	<	<	<	<	<
Barium	0.0491	0.0484	0.0494	0.045	0.0686	0.0614	0.0654	0.063	0.13	0.119
Boron	0.332	0.317	0.308	0.313	0.624	0.572	0.571	0.573	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	0.236	0.415	0.128	0.0634	0.476	0.0998	0.503	0.742	0.376	0.177
Lead	0.0024	<	<	<	0.00493	<	0.00453	0.00258	<	<
Lithium	0.0391	0.0389	0.0392	0.0396	0.0862	0.0809	0.0836	0.082	0.0587	0.056
Manganese	<	<	<	<	0.00526	<	0.00608	0.00749	0.0806	0.124
Mercury	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.0724	0.0704	0.0714	0.0676	0.096	0.0902	0.0928	0.0881	1.16	1.14
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	<	<
Vanadium	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-916		GW-917					GW-918			
Date Sampled	08/12/10*	11/10/10*	02/16/10		04/14/10	08/09/10	11/09/10	02/10/10	04/14/10	08/11/10	11/10/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type				Dup							
Field Measurements											
Time Sampled	10:30	14:00	14:30	.	14:20	11:15	14:30	9:20	9:45	9:29	10:20
Measuring Point Elev. (ft)	1,002.85	1,002.85	997.10	.	997.10	997.10	997.10	1,067.96	1,067.96	1,067.96	1,067.96
Depth to Water (ft)	6.32	5.21	17.66	.	18.74	21.90	23.05	5.04	5.35	5.72	5.85
Groundwater Elevation (ft)	996.53	997.64	979.44	.	978.36	975.20	974.05	1,062.92	1,062.61	1,062.24	1,062.11
Conductivity (μmho/cm)	448	321	355	.	416	661	467	121	96	133	94
Dissolved Oxygen (ppm)	1.79	2.11	1.49	.	1.06	1.49	1.37	6.38	6.31	6.05	5.88
Oxidation/Reduction (mV)	-74	-44	-17	.	127	-54	-32	115	238	124	-1
Temperature (degrees C)	17.1	16.3	15	.	16.9	17.9	16	12.4	15.1	15.9	15.2
Turbidity (NTU)	2	2	4	.	1	4	10	20	28	35	14
pH	7.71	7.93	7.62	.	6.94	7.1	7.15	6.56	6.13	6.51	6.36
Major Ions (mg/L)											
Calcium	40.6	40.8	69.7	68.9	72.5	91.6	94.1	10.5	10	10.7	10.1
Magnesium	6.38	6.43	9.09	8.96	9.1	10.8	11.3	4.36	4.13	4.59	4.24
Potassium	3.44	3.56	1.26	1.26	1.39	1.46	1.51	1.95	2.16	2.44	2
Sodium	27.4	27.9	10.1	10.2	10.4	12.1	11.9	4.61	4.46	4.52	4.58
Chloride											
Sulfate											
Trace Metals (mg/L)											
Aluminum	<	<	<	<	0.357	0.604	0.504	0.856	1.42	3.36	0.606
Antimony	<	<	<	<	<	<	<	<	<	<	<
Barium	0.134	0.123	0.181	0.18	0.202	0.249	0.233	0.122	0.118	0.135	0.111
Boron	<	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<	<
Iron	0.338	0.153	0.159	0.146	2.36	1.34	1.06	0.544	0.64	1.56	0.414
Lead	0.00219	<	<	<	<	0.00231	<	<	<	0.00512	<
Lithium	0.0628	0.0616	0.0177	0.0173	0.017	0.0226	0.021	0.0117	<	0.0168	0.0126
Manganese	0.234	0.0665	0.0334	0.0329	0.0719	0.069	0.0654	0.0115	0.0114	0.0284	0.009
Mercury	<	<	<	<	<	<	<	<	<	<	0.000077 Q
Nickel	<	<	<	<	<	<	<	<	<	<	<
Strontium	1.21	1.17	0.143	0.143	0.152	0.198	0.18	0.0471	0.0457	0.0485	0.0442
Thallium	<	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	<	<	<
Vanadium	<	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)											
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-920					GW-921			
Date Sampled	02/08/10	04/13/10		08/16/10	11/09/10*	02/09/10	04/19/10	08/10/10	11/15/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type			Dup						
Field Measurements									
Time Sampled	15:20	10:40	.	9:25	11:00	15:40	10:50	9:54	10:15
Measuring Point Elev. (ft)	967.43	967.43	.	967.43	967.43	971.29	971.29	971.29	971.29
Depth to Water (ft)	5.70	7.40	.	8.28	8.05	5.08	10.80	6.95	6.81
Groundwater Elevation (ft)	961.73	960.03	.	959.15	959.38	966.21	960.49	964.34	964.48
Conductivity (μmho/cm)	271	316	.	408	286	346	382	387	332
Dissolved Oxygen (ppm)	1.26	1.21	.	1.06	1.29	4.11	1.12	0.91	0.66
Oxidation/Reduction (mV)	-36	-61	.	-113	-11	137	150	-64	6
Temperature (degrees C)	14.3	16.1	.	16.6	16.3	14.7	15.5	18	15.4
Turbidity (NTU)	1	2	.	3	5	2	1	1	1
pH	7.27	7.33	.	7.66	8.07	7.41	7.31	6.92	7.56
Major Ions (mg/L)									
Calcium	26.7	50.8	50.9	47.5	49.5	48.5	44.8	43.9	45
Magnesium	4.15	7.9	7.98	7.46	7.96	12.7	12.2	11.7	12.4
Potassium	0.714	1.66	1.65	1.55	1.66	2.8	2.78	2.59	2.76
Sodium	2.93	5.8	5.88	5.76	5.98	24.8	25.2	24.3	24.7
Chloride									
Sulfate									
Trace Metals (mg/L)									
Aluminum	<	<	<	<	<	<	<	<	<
Antimony	<	<	<	<	<	<	<	<	<
Barium	0.126	0.256	0.256	0.266	0.271	0.272	0.28	0.314	0.315
Boron	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<
Iron	0.207	0.834	0.588	0.196	0.514	0.0503	<	<	0.0682
Lead	<	<	<	<	<	<	<	<	<
Lithium	<	<	<	0.0106	0.0114	0.0239	0.0227	0.0251	0.0261
Manganese	0.0291	0.0773	0.0642	0.0468	0.0562	0.00986	0.0078	0.00958	0.0103
Mercury	<	<	<	<	<	<	<	<	0.00008 Q
Nickel	<	<	<	<	<	<	<	<	<
Strontium	0.218	0.444	0.448	0.468	0.464	1.23	1.24	1.35	1.29
Thallium	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	<
Vanadium	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)									
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-922					GW-923					
Date Sampled	**02/08/10**	**04/12/10**	**08/10/10**		**11/09/10***	**02/09/10***		**04/14/10***		**08/10/10***	
Program	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**
Sample Type				**Dup**			**F**		**F**		**F**
Field Measurements											
Time Sampled	14:20	15:30	11:25	.	9:40	10:10	.	9:50	.	10:15	.
Measuring Point Elev. (ft)	956.91	956.91	956.91	.	956.91	1,016.73	.	1,016.73	.	1,016.73	.
Depth to Water (ft)	4.89	5.03	5.24	.	5.20	23.61	.	28.47	.	33.66	.
Groundwater Elevation (ft)	952.02	951.88	951.67	.	951.71	993.12	.	988.26	.	983.07	.
Conductivity (μmho/cm)	257	308	389	.	285	175	.	258	.	409	.
Dissolved Oxygen (ppm)	1.08	1.52	1.21	.	2.92	5.91	.	4.69	.	2.58	.
Oxidation/Reduction (mV)	-32	-45	-69	.	7	150	.	131	.	22	.
Temperature (degrees C)	13.6	16.3	17.6	.	15.6	12.5	.	18	.	17.7	.
Turbidity (NTU)	1	2	3	.	1	54	.	1000	.	341	.
pH	7.47	7.6	7.88	.	7.44	6.45	.	6.92	.	7.35	.
Major Ions (mg/L)											
Calcium	45.9	44.4	45.6	44.2	42.1	32.3	32.2	37.1	34.9	43.3	42.9
Magnesium	9.96	9.48	10	9.68	9.47	11.8	11	14.5	11.1	13.1	10.8
Potassium	2.91	2.78	2.83	2.74	2.88	3.52	1.59	6.05	1.79	4.44	1.88
Sodium	9.6	8.96	8.96	8.7	8.96	3.67	3.7	4.01	3.94	4.06	4.32
Chloride						1.4		2		2.5	
Sulfate						8.6		14		8.8	
Trace Metals (mg/L)											
Aluminum	<	<	<	<	0.243	7.19	<	20.3	<	11.8	<
Antimony	<	<	<	<	<	<	<	<	<	<	<
Barium	0.742	0.702	0.72	0.7	0.702	0.21	0.137	0.391	0.133	0.266	0.123
Boron	<	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	0.0127	<	0.0424	<	0.0273	<
Copper	<	<	<	<	<	<	<	0.0235	<	<	<
Iron	0.171	0.0858	0.227	0.22	0.331	4.27	<	13.8	<	7.97	<
Lead	<	<	0.00251	0.00236	<	0.00445	<	0.0132	<	0.0112	<
Lithium	0.0132	0.0115	0.0142	0.0139	0.0136	<	<	0.0211	<	0.0178	<
Manganese	0.0196	0.0186	0.0246	0.0247	0.0195	0.0808	<	0.281	0.0245	0.138	0.0205
Mercury	<	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	0.0123	<	0.0323	<	0.0203	<
Strontium	0.836	0.777	0.804	0.78	0.807	0.0776	0.0729	0.0926	0.0747	0.0852	0.0762
Thallium	<	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<		<		<	
Vanadium	<	<	<	<	<	<	<	0.0284	<	0.0213	<
Zinc	<	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)											
cis-1,2-Dichloroethene	<	<	<	<	<	<		<		<	
Acetone	<	<	<	<	<	<		<		3.36 J	
Methylene chloride	<	<	<	<	<	<		<		<	
Toluene	<	<	<	<	<	<		<		<	

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-923		GW-924				GW-925			
Date Sampled	11/10/10*		02/10/10	04/19/10	08/10/10	11/09/10	02/10/10*	04/21/10*	08/11/10*	11/16/10*
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type		F								
Field Measurements										
Time Sampled	15:45	.	10:10	16:00	13:52	14:30	11:00	9:30	9:00	9:50
Measuring Point Elev. (ft)	1,016.73	.	968.90	968.90	968.90	968.90	971.14	971.14	971.14	971.14
Depth to Water (ft)	31.21	.	7.38	10.62	9.40	9.72	3.30	4.17	4.62	5.00
Groundwater Elevation (ft)	985.52	.	961.52	958.28	959.50	959.18	967.84	966.97	966.52	966.14
Conductivity (μmho/cm)	267	.	258	311	293	275	725	591	626	562
Dissolved Oxygen (ppm)	10.4	.	2.15	1.04	0.89	1.25	2.89	1.81	1.58	2.07
Oxidation/Reduction (mV)	177	.	49	29	-96	64	75	122	-102	171
Temperature (degrees C)	15.14	.	13.2	16.4	16.9	16.91	12.8	14.6	18.8	14.1
Turbidity (NTU)	165	.	2	1	3	2	6	2	2	3
pH	7.01	.	7.43	7.32	7.7	7.6	9.6	9.6	9.23	9.67
Major Ions (mg/L)										
Calcium	45.9	40.7	55.8	54.9	51.8	55.9	4.1	2.32	2.19	3.03
Magnesium	15.5	11.6	4.5	4.56	4.18	4.56	1.46	1.03	1.07	1.16
Potassium	6.6	2.2	0.747	0.824	0.748	0.84	1.95	1.87	1.62	1.8
Sodium	4.64	4.62	5.37	5.48	5.16	5.22	150	150	137	146
Chloride										
Sulfate										
Trace Metals (mg/L)										
Aluminum	22.2	<	<	<	<	<	1.46	0.777	0.648	1.01
Antimony	<	<	<	<	<	<	<	<	<	<
Barium	0.377	0.12	0.307	0.297	0.29	0.295	0.195	0.153	0.154	0.17
Boron	<	<	<	<	<	<	0.212	0.235	0.193	0.255
Chromium	0.0417	<	<	<	<	<	<	<	<	<
Copper	0.0265	<	<	<	<	<	<	<	<	<
Iron	15.5	<	0.101	0.0864	0.0788	0.373	1.15	0.363	0.302	0.591
Lead	0.0158	<	<	<	<	<	<	<	<	0.00293
Lithium	0.0311	<	0.0104	0.0102	0.0107	0.012	0.0538	0.054	0.0504	0.0504
Manganese	0.242	0.0332	0.0257	0.0323	0.0321	0.0458	0.0312	0.00746	0.00622	0.0155
Mercury	0.000128 Q	0.000104 Q	<	<	<	0.000115 Q	<	<	<	<
Nickel	0.0322	<	<	<	<	<	<	<	<	<
Strontium	0.0962	0.0742	0.099	0.106	0.102	0.0924	0.228	0.211	0.205	0.22
Thallium	<	<	<	<	<	<	<	<	<	<
Uranium	<		<	<	<	<	<	<	<	<
Vanadium	0.0314	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
cis-1,2-Dichloroethene	<		<	<	<	<	<	<	<	<
Acetone	<		<	<	<	<	<	<	<	<
Methylene chloride	<		<	<	<	<	<	<	<	<
Toluene	<		<	<	<	<	<	<	<	1.18 Q

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME

Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	**GW-926**				**GW-927**				
Date Sampled	**02/10/10**	**04/21/10**	**08/11/10***	**11/11/10***	**02/16/10**	**04/14/10**	**08/09/10**	**11/09/10**	
Program	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**
Sample Type									**Dup**
Field Measurements									
Time Sampled	14:20	14:40	10:10	10:30	14:45	15:30	10:35	15:30	.
Measuring Point Elev. (ft)	968.94	968.94	968.94	968.94	997.19	997.19	997.19	997.19	.
Depth to Water (ft)	6.45	8.49	8.65	8.90	13.21	15.16	19.34	20.19	.
Groundwater Elevation (ft)	962.49	960.45	960.29	960.04	983.98	982.03	977.85	977.00	.
Conductivity (μmho/cm)	275	420	305	340	348	389	549	372	.
Dissolved Oxygen (ppm)	0.94	1.04	0.89	0.99	1.64	3.1	1.34	0.95	.
Oxidation/Reduction (mV)	46	64	-149	-46	-79	-56	-134	-94	.
Temperature (degrees C)	13.1	16.4	17.4	16.6	14.3	16.5	18.1	15.4	.
Turbidity (NTU)	4	2	6	1	2	1	2	2	.
pH	6.84	6.67	7.54	7.9	7.74	6.87	7.77	8.11	.
Major Ions (mg/L)									
Calcium	43.6	42.1	43	43.7	73	70.9	68.5	73.7	74.6
Magnesium	10.7	10.6	10.3	10.2	7.31	7.04	6.76	7.5	7.6
Potassium	2.08	2.07	1.96	1.98	0.866	0.918	0.868	0.926	0.966
Sodium	10.3	10.4	9.79	9.62	8.24	7.91	7.94	8.22	8.27
Chloride									
Sulfate									
Trace Metals (mg/L)									
Aluminum	<	<	<	<	<	<	<	<	<
Antimony	<	<	<	<	<	<	<	<	<
Barium	0.225	0.228	0.216	0.205	0.219	0.211	0.213	0.204	0.206
Boron	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<
Iron	0.168	0.137	0.113	0.136	0.166	0.149	0.17	0.135	0.153
Lead	<	<	0.00246	<	<	<	<	<	<
Lithium	0.0122	0.0145	0.0121	0.0126	0.018	0.016	0.0175	0.0178	0.0172
Manganese	0.0167	0.0199	0.0183	0.0168	0.0282	0.0406	0.0345	0.0259	0.0245
Mercury	<	<	<	<	<	<	<	0.000082 Q	<
Nickel	<	<	<	<	<	<	<	<	<
Strontium	0.749	0.768	0.672	0.632	0.128	0.126	0.127	0.122	0.122
Thallium	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	<
Vanadium	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)									
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	GW-961							
Date Sampled	02/17/10		04/22/10		08/11/10		11/10/10*	
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type		F		F		F		F
Field Measurements								
Time Sampled	9:30	.	10:20	.	10:30	.	14:05	.
Measuring Point Elev. (ft)	963.57	.	963.57	.	963.57	.	963.57	.
Depth to Water (ft)	12.10	.	12.64	.	13.40	.	13.30	.
Groundwater Elevation (ft)	951.47	.	950.93	.	950.17	.	950.27	.
Conductivity (μmho/cm)	244	.	217	.	278	.	235	.
Dissolved Oxygen (ppm)	2.11	.	1.9	.	2.9	.	0.99	.
Oxidation/Reduction (mV)	141	.	189	.	-2	.	3	.
Temperature (degrees C)	13.8	.	14	.	16.9	.	17.1	.
Turbidity (NTU)	120	.	68	.	194	.	9	.
pH	5.28	.	5.61	.	6.05	.	6.4	.
Major Ions (mg/L)								
Calcium	41.9	44	35.9	37.2	38.2	45.9	24.7	38.5
Magnesium	6.34	5.73	5.54	5.34	6.4	6.16	3.98	5.78
Potassium	1.9	0.768	1.41	0.72	1.89	0.872	0.802	0.832
Sodium	7.9	8.09	7.64	8	7.63	7.72	8.11	8.1
Chloride								
Sulfate								
Trace Metals (mg/L)								
Aluminum	4.03	<	2.39	<	3.7	<	0.276	<
Antimony	<	<	<	<	<	<	<	<
Barium	0.147	0.126	0.12	0.108	0.167	0.129	0.085	0.119
Boron	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<
Iron	3.17	<	1.78	<	3.68	<	0.226	<
Lead	0.00495	<	0.00313	<	0.011	<	<	<
Lithium	0.0118	<	<	0.0107	0.0144	0.0113	<	0.0112
Manganese	0.264	0.135	0.178	0.101	0.455	0.152	0.0638	0.0513
Mercury	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<
Strontium	0.0824	0.0854	0.0736	0.0743	0.0727	0.0842	0.0508	0.0734
Thallium	<	<	<	<	<	<	<	<
Uranium	<		<		<		<	
Vanadium	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)								
cis-1,2-Dichloroethene	<		<		<		<	
Acetone	<		<		<		<	
Methylene chloride	<		<		<		<	
Toluene	<		<		<		<	

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	EMWNT-03A				EMWNT-05				EMW-VWEIR	
Date Sampled	02/08/10	04/12/10	08/12/10	11/09/10	02/08/10	04/12/10	08/09/10	11/09/10	02/08/10	04/12/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type										
Field Measurements										
Time Sampled	10:45	11:20	13:30	11:10	10:10	10:45	12:20	10:30	9:00	9:30
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)										
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	96	130	444	309	114	180	459	289	446	313
Dissolved Oxygen (ppm)	12.43	6.11	5.5	10.8	14.08	7.85	4.53	7.3	13.18	11.89
Oxidation/Reduction (mV)	90.9	-11.3	213.2	-4.2	79.8	-55.3	192.3	-53.9	155	212.1
Temperature (degrees C)	5.18	16.31	28.16	10.61	4.99	15.98	28.44	10.83	4	15.66
Turbidity (NTU)	11	29	10	5	19.6	32	59	23	44.2	14
pH	7.15	7.04	7.29	8.59	7.47	7.48	8.39	8.31	7.54	7.78
Major Ions (mg/L)										
Calcium	16.6	15.8	45.7	63.5	10.7	21.6	49.1	49.1	66.3	36.2
Magnesium	3.89	4.01	9.53	12.7	4.18	7.19	14.3	13.6	7.52	7.69
Potassium	1.32	1.36	2.01	1.64	1.69	1.98	2.59	1.99	3.54	2.05
Sodium	2	2.92	4.08	5.17	2.12	3.69	6.48	6.65	7.32	6.99
Chloride										
Sulfate										
Trace Metals (mg/L)										
Aluminum	0.757	0.801	0.399	<	0.731	1.48	2.44	<	2.92	0.764
Antimony	0.00312 J	<	<	<	<	<	0.00425 J	<	<	<
Barium	0.0352	0.046	0.0826	0.0574	0.0442	0.0716	0.125	0.0917	0.0717	0.0446
Boron	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	0.964	2.26	0.93	0.0787	0.905	2.83	7.59	3.04	1.66	0.518
Lead	0.00207 J	<	<	0.00256 J	0.00249 J	<	0.0034	<	<	<
Lithium	<	<	<	<	<	<	<	<	<	<
Manganese	0.206	0.583	0.49	0.00881	0.217	0.814	1.41	1.81	0.142	0.0988
Mercury	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.0576	0.0426	0.0907	0.111	0.0287	0.0555	0.117	0.116	0.186	0.126
Thallium	<	0.00163 J	<	<	<	0.00131 J	<	0.00318	<	<
Uranium	0.0257 Q	<	<	0.00707	<	<	<	<	0.00583	<
Vanadium	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	0.0532
Chloroethenes (μg/L)										
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Field Measurements, Major Cations, Trace Metals, and Organics

Sampling Point	EMW-VWEIR		EMW-VWUNDER				NT-04			
Date Sampled	**08/09/10**	**11/09/10**	**02/08/10**	**04/21/10**	**08/11/10**	**11/15/10**	**02/08/10**	**04/12/10**	**08/09/10**	**11/09/10**
Program	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**	**BJC**
Sample Type										
Field Measurements										
Time Sampled	11:15	9:10	15:30	15:20	14:00	15:10	9:45	10:20	11:35	9:45
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.	.
Depth to Water (ft)										
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	.	237	399	436	491	419	544	594	675	485
Dissolved Oxygen (ppm)	.	5.7	4.33	2.59	1.27	2.78	11.13	9.71	6.85	5.6
Oxidation/Reduction (mV)	.	105.4	188	191	32	285	104	10.8	172.3	81.6
Temperature (degrees C)	.	11.31	16.3	17.5	22.8	16.1	4.55	14.25	26.22	10.99
Turbidity (NTU)	.	54	6	5	9	12	17.8	2	9	3
pH	.	7.4	6.37	6.2	6.28	6.48	6.95	6.96	7.78	6.49
Major Ions (mg/L)										
Calcium	45.5	32.3	76.2	65.2	63.8	66.8	90.6	106	92.9	106
Magnesium	8.96	7.68	12.8	9.06	8.72	9.85	18.6	18.2	16.3	19.6
Potassium	3.91	4.1	2.19	2.02	1.82	2.19	2.41	1.64	1.73	2.1
Sodium	9.6	3.51	10.1	8.98	8.46	9.24	7.43	8.99	8.44	8.17
Chloride										
Sulfate										
Trace Metals (mg/L)										
Aluminum	1.04	3.68	<	<	<	<	2.15 Q	<	0.426	<
Antimony	<	<	<	<	<	<	<	<	<	<
Barium	0.127	0.0797	0.0969	0.0928	0.101	0.0874	0.321	0.409	0.445	0.461
Boron	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	0.866	2.56	<	<	<	0.114	2.14	0.673	0.855	0.228
Lead	<	0.00337	<	<	<	<	0.00349	<	<	<
Lithium	<	<	<	<	<	<	<	<	<	<
Manganese	0.34	0.0696	<	<	0.783	0.00998	0.563	0.947	0.372	0.269
Mercury	<	0.000096 J	<	<	<	<	<	<	<	0.000061 J
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.169	0.0728	0.229	0.19	0.176	0.183	0.217	0.268	0.262	0.263
Thallium	<	<	<	<	<	<	<	0.00165 J	<	<
Uranium	<	<	<	<	<	<	<	<	<	<
Vanadium	<	<	<	<	<	<	<	<	<	<
Zinc	0.0579	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
cis-1,2-Dichloroethene	<	<	<	<	<	<	2.47 J	3.5 J	<	<
Acetone	<	<	<	<	<	<	31.2	<	<	<
Methylene chloride	<	<	<	<	<	<	<	2.2 J	<	<
Toluene	<	<	<	<	<	<	<	<	<	<

Monitoring Data for the EMWMF: Radiological Analytes

Sampling Point	Date Sampled	Isotope	Result (pCi/L) Activity	TPU	MDA
GW-363	08/17/10	Curium-245	0.34	0.29	0.32
GW-363	02/09/10	Radium-226	0.3	0.22	0.18
GW-363	11/17/10	Radium-226	0.13	0.11	0.1
GW-363	11/17/10	Thorium-227	0.25	0.18	0.16
GW-363	02/09/10	Thorium-230	0.4	0.25	0.23
GW-363	11/17/10	Thorium-230	0.17	0.14	0.13
GW-363	02/09/10	Uranium-233/234	0.16	0.13	0.13
GW-363	04/21/10	Uranium-233/234	0.21	0.16	0.08
GW-363	08/17/10	Uranium-233/234	0.12	0.11	0.11
GW-363	11/17/10	Uranium-233/234	0.17	0.13	0.14
GW-363	08/17/10	Uranium-238	0.12	0.11	0.06
GW-639	02/09/10	Americium-243	0.77 Q	0.34	0.15
GW-639	02/09/10	Curium-245	0.87 Q	0.36	0.18
GW-639	02/09/10	Radium-226	0.21	0.16	0.08
GW-639	02/09/10	Radium-228	1.16	0.47	1.01
GW-639	04/20/10	Thorium-230	0.28	0.21	0.09
GW-639	11/18/10	Thorium-230	0.17	0.14	0.07
GW-639	02/09/10	Uranium-233/234	0.62	0.29	0.17
GW-639	04/20/10	Uranium-233/234	0.33	0.2	0.2
GW-639	08/17/10	Uranium-233/234	0.64	0.27	0.14
GW-639	11/18/10	Uranium-233/234	0.33	0.17	0.12
GW-639	11/18/10	Uranium-238	0.13	0.11	0.13
GW-916	08/12/10	Radium-226	0.29	0.19	0.24
GW-916	08/12/10	Radium-228	0.96	0.49	0.94
GW-916	04/22/10	Thorium-230	0.2	0.18	0.11
GW-916	11/10/10	Thorium-230	0.2	0.17	0.09
GW-916	04/22/10	Uranium-233/234	0.37	0.25	0.24
GW-916	08/12/10	Uranium-233/234	0.17	0.14	0.14
GW-916	11/10/10	Uranium-233/234	0.16	0.13	0.06
GW-916	02/17/10	Uranium-238	0.16	0.13	0.12
GW-916	11/10/10	Uranium-238	0.21	0.14	0.06
GW-917	08/09/10	Americium-243	0.19	0.17	0.1
GW-917	04/14/10	Curium-245	0.25	0.23	0.13
GW-917	08/09/10	Curium-245	0.19	0.18	0.1
GW-917 D	02/16/10	Radium-226	0.32	0.21	0.21
GW-917	11/09/10	Radium-226	0.21	0.15	0.11
GW-917	04/14/10	Strontium-90	1.46	0.67	1.26
GW-917	04/14/10	Thorium-230	0.2	0.18	0.1
GW-917	08/09/10	Thorium-230	0.19	0.15	0.15
GW-917	02/16/10	Uranium-233/234	0.14	0.12	0.11
GW-918	02/10/10	Americium-243	0.19	0.17	0.18
GW-918	02/10/10	Curium-245	0.27	0.21	0.23
GW-918	02/10/10	Iodine-129	2.2	1.15	2.17
GW-918	04/14/10	Thorium-230	0.17	0.14	0.08
GW-918	08/11/10	Thorium-230	0.17	0.16	0.16
GW-918	11/10/10	Thorium-230	0.22	0.18	0.18
GW-918	08/11/10	Uranium-233/234	0.16	0.12	0.05
GW-918	11/10/10	Uranium-233/234	0.15	0.13	0.12
GW-920	04/13/10	Chlorine-36	5.73 Q	2.29	2.84
GW-920 D	04/13/10	Curium-242	0.23	0.19	0.09
GW-920	02/08/10	Curium-245	0.15	0.14	0.14
GW-920	04/13/10	Radium-226	0.27	0.19	0.09
GW-920	11/09/10	Radium-226	0.11	0.11	0.11
GW-920 D	04/13/10	Thorium-230	0.25	0.19	0.09
GW-920	11/09/10	Uranium-233/234	0.12	0.11	0.07
GW-920	11/09/10	Uranium-238	0.14	0.12	0.11

APPENDIX D.4: CY 2010 MONITORING DATA FOR THE BEAR CREEK HYDROGEOLOGIC REGIME
Monitoring Data for the EMWMF: Radiological Analytes

Sampling Point	Date Sampled	Isotope	Result (pCi/L) Activity	TPU	MDA
GW-921	08/10/10	Curium-245	0.21	0.2	0.2
GW-921	08/10/10	Radium-226	0.2	0.15	0.19
GW-921	11/15/10	Radium-226	0.26	0.18	0.07
GW-921	11/15/10	Thorium-227	0.4	0.26	0.18
GW-921	04/19/10	Uranium-232	0.1	0.09	0.08
GW-921	11/15/10	Uranium-238	0.25	0.15	0.06
GW-922 D	08/10/10	Americium-243	0.19	0.17	0.1
GW-922 D	08/10/10	Curium-245	0.25	0.21	0.2
GW-922	08/10/10	Strontium-90	2.44	0.74	1.3
GW-922	02/08/10	Thorium-230	0.57	0.41	0.36
GW-922	04/12/10	Thorium-230	0.3	0.22	0.21
GW-922 D	08/10/10	Thorium-230	0.21	0.16	0.19
GW-922	11/09/10	Tritium	480	139.91	219
GW-922	02/08/10	Uranium-233/234	0.25	0.19	0.2
GW-922	11/09/10	Uranium-233/234	0.56	0.26	0.12
GW-922	11/09/10	Uranium-235/236	0.22	0.17	0.15
GW-922	02/08/10	Uranium-238	0.17	0.15	0.16
GW-922	11/09/10	Uranium-238	0.18	0.14	0.12
GW-923	11/11/10	Curium-245	0.25	0.24	0.24
GW-923	02/09/10	Radium-226	0.62	0.31	0.32
GW-923	04/15/10	Radium-226	0.46	0.28	0.38
GW-923	08/12/10	Radium-226	0.19	0.16	0.18
GW-923	11/11/10	Radium-226	0.51	0.23	0.05
GW-923	08/12/10	Strontium-90	26.1 Q	1.48	1.25
GW-923	02/09/10	Technetium-99	2.92	1.54	2.53
GW-923	02/09/10	Thorium-228	0.55	0.3	0.23
GW-923	04/15/10	Thorium-228	0.9	0.41	0.27
GW-923	08/12/10	Thorium-228	0.31	0.2	0.07
GW-923	11/11/10	Thorium-228	0.38	0.26	0.25
GW-923	04/15/10	Thorium-229	0.28	0.21	0.11
GW-923	02/09/10	Thorium-230	0.76	0.36	0.23
GW-923	04/15/10	Thorium-230	0.98	0.42	0.27
GW-923	08/12/10	Thorium-230	0.17	0.14	0.07
GW-923	11/11/10	Thorium-230	0.64	0.34	0.17
GW-923	02/09/10	Thorium-232	0.91	0.39	0.15
GW-923	04/15/10	Thorium-232	0.9	0.4	0.22
GW-923	08/12/10	Thorium-232	0.19	0.15	0.15
GW-923	11/11/10	Thorium-232	0.54	0.31	0.1
GW-923	08/12/10	Tritium	331	137.5	215
GW-923	02/09/10	Uranium-233/234	0.59	0.29	0.23
GW-923	04/15/10	Uranium-233/234	0.75	0.34	0.26
GW-923	11/11/10	Uranium-233/234	0.62	0.3	0.2
GW-923	02/09/10	Uranium-238	0.54	0.26	0.13
GW-923	04/15/10	Uranium-238	0.86	0.36	0.21
GW-923	11/11/10	Uranium-238	0.31	0.2	0.18
GW-924	02/10/10	Radium-226	0.2	0.17	0.18
GW-924	02/10/10	Thorium-229	0.76	0.63	0.09
GW-924	02/10/10	Thorium-230	0.17	0.14	0.14
GW-924	04/19/10	Thorium-230	0.16	0.15	0.09
GW-924	04/19/10	Thorium-232	0.16	0.15	0.08
GW-924	08/10/10	Tritium	334	138.6	217
GW-924	02/10/10	Uranium-233/234	0.22	0.16	0.15
GW-924	04/19/10	Uranium-233/234	0.16	0.13	0.07
GW-924	02/10/10	Uranium-235/236	0.18	0.16	0.14

Monitoring Data for the EMWMF: Radiological Analytes

Sampling Point	Date Sampled	Isotope	Result (pCi/L) Activity	TPU	MDA
GW-925	08/11/10	Curium-245	0.26	0.22	0.12
GW-925	08/11/10	Neptunium-237	0.16	0.12	0.13
GW-925	11/16/10	Plutonium-238	0.29	0.22	0.2
GW-925	11/16/10	Plutonium-239/240	0.22	0.19	0.2
GW-925	11/16/10	Potassium-40	39	27.82	33
GW-925	02/10/10	Radium-226	0.4	0.25	0.24
GW-925	11/16/10	Radium-226	0.12	0.11	0.09
GW-925	02/10/10	Thorium-230	0.37	0.22	0.08
GW-925	02/10/10	Uranium-233/234	0.36	0.2	0.14
GW-925	04/21/10	Uranium-233/234	0.27	0.19	0.19
GW-925	08/11/10	Uranium-233/234	0.32	0.17	0.09
GW-925	11/16/10	Uranium-233/234	0.2	0.15	0.17
GW-925	02/10/10	Uranium-238	0.24	0.17	0.17
GW-925	04/21/10	Uranium-238	0.29	0.19	0.08
GW-925	11/16/10	Uranium-238	0.12	0.11	0.11
GW-926	02/10/10	Iodine-129	2.14	1.03	2.02
GW-926	04/21/10	Thorium-230	0.31	0.23	0.1
GW-926	08/11/10	Thorium-230	0.25	0.18	0.13
GW-926	11/11/10	Uranium-233/234	0.12	0.11	0.11
GW-927	02/16/10	Curium-245	0.15	0.14	0.14
GW-927 D	11/09/10	Potassium-40	41.6	28.13	26.7
GW-927	04/14/10	Radium-226	0.18	0.16	0.1
GW-927	08/09/10	Radium-226	0.25	0.18	0.25
GW-927 D	11/09/10	Radium-226	0.21	0.15	0.06
GW-927	04/14/10	Thorium-227	0.28	0.21	0.09
GW-927	04/14/10	Thorium-228	0.21	0.18	0.09
GW-927	04/14/10	Thorium-230	0.29	0.22	0.23
GW-927	11/09/10	Thorium-230	0.15	0.14	0.08
GW-927 D	11/09/10	Thorium-230	0.13	0.12	0.12
GW-927	02/16/10	Uranium-233/234	0.25	0.18	0.08
GW-927	04/14/10	Uranium-233/234	0.17	0.14	0.07
GW-927	08/09/10	Uranium-233/234	0.12	0.11	0.06
GW-927	11/09/10	Uranium-233/234	0.14	0.12	0.06
GW-961	08/11/10	Americium-241	0.29	0.21	0.26
GW-961	02/17/10	Curium-245	0.27	0.21	0.18
GW-961	11/10/10	Curium-247	0.32	0.3	0.17
GW-961	02/17/10	Radium-226	0.16	0.14	0.14
GW-961	08/11/10	Radium-226	0.21	0.15	0.12
GW-961	11/10/10	Radium-226	0.21	0.14	0.13
GW-961	11/10/10	Thorium-227	0.2	0.17	0.19
GW-961	02/17/10	Thorium-228	0.35	0.22	0.21
GW-961	08/11/10	Thorium-228	0.16	0.15	0.08
GW-961	02/17/10	Thorium-230	0.32	0.19	0.14
GW-961	08/11/10	Thorium-230	0.24	0.19	0.19
GW-961	02/17/10	Thorium-232	0.17	0.14	0.14
GW-961	11/10/10	Thorium-232	0.14	0.12	0.07
GW-961	02/17/10	Uranium-233/234	0.27	0.19	0.21
GW-961	08/11/10	Uranium-233/234	0.15	0.12	0.06
GW-961	11/10/10	Uranium-233/234	0.17	0.13	0.13

Monitoring Data for the EMWMF: Radiological Analytes

Sampling Point	Date Sampled	Isotope	Result (pCi/L)		
			Activity	TPU	MDA
EMWNT-03A	04/12/10	Americium-241	0.19	0.16	0.08
EMWNT-03A	02/08/10	Americium-243	0.35	0.23	0.22
EMWNT-03A	02/08/10	Curium-245	0.42	0.26	0.26
EMWNT-03A	08/12/10	Radium-226	0.6	0.44	0.41
EMWNT-03A	11/09/10	Radium-228	2.64	0.76	1.36
EMWNT-03A	08/12/10	Strontium-90	1.44	0.74	1.42
EMWNT-03A	11/09/10	Strontium-90	1.31	0.56	1.02
EMWNT-03A	04/12/10	Thorium-230	0.14	0.13	0.07
EMWNT-03A	08/12/10	Thorium-230	0.15	0.13	0.12
EMWNT-03A	02/08/10	Uranium-233/234	13.7 Q	2.65	0.25
EMWNT-03A	04/12/10	Uranium-233/234	0.39	0.32	0.35
EMWNT-03A	11/09/10	Uranium-233/234	3.17 Q	0.92	0.26
EMWNT-03A	02/08/10	Uranium-235/236	0.59	0.41	0.31
EMWNT-03A	02/08/10	Uranium-238	10.2 Q	2.12	0.25
EMWNT-03A	08/12/10	Uranium-238	0.62	0.4	0.35
EMWNT-03A	11/09/10	Uranium-238	3.86 Q	1.03	0.13
NT-04	02/08/10	Americium-243	0.5	0.27	0.19
NT-04	02/08/10	Curium-245	0.49	0.28	0.29
NT-04	08/09/10	Curium-245	0.23	0.19	0.18
NT-04	11/09/10	Plutonium-242	0.47	0.42	0.1
NT-04	11/09/10	Radium-226	0.39	0.36	0.36
NT-04	08/09/10	Thorium-227	0.28	0.2	0.18
NT-04	04/12/10	Thorium-228	0.21	0.19	0.21
NT-04	08/09/10	Thorium-228	0.15	0.13	0.08
NT-04	04/12/10	Thorium-230	0.4	0.25	0.21
NT-04	08/09/10	Thorium-230	0.75	0.33	0.13
NT-04	11/09/10	Thorium-230	0.17	0.15	0.16
NT-04	02/08/10	Uranium-233/234	0.52	0.33	0.14
NT-04	04/12/10	Uranium-233/234	1.14	0.55	0.37
NT-04	08/09/10	Uranium-233/234	0.75	0.42	0.25
NT-04	11/09/10	Uranium-233/234	0.99	0.48	0.28
NT-04	02/08/10	Uranium-238	0.81	0.43	0.23
NT-04	04/12/10	Uranium-238	1.35	0.6	0.37
NT-04	08/09/10	Uranium-238	0.49	0.33	0.14
NT-04	11/09/10	Uranium-238	0.73	0.41	0.24
EMWNT-05	11/09/10	Americium-241	0.33	0.25	0.32
EMWNT-05	02/08/10	Americium-243	0.2	0.16	0.16
EMWNT-05	02/08/10	Curium-245	0.22	0.18	0.2
EMWNT-05	11/09/10	Radium-228	0.73	0.32	0.6
EMWNT-05	04/12/10	Thorium-230	0.17	0.14	0.07
EMWNT-05	08/09/10	Thorium-230	0.18	0.17	0.17
EMWNT-05	04/12/10	Uranium-233/234	0.32	0.24	0.12
EMWNT-05	08/09/10	Uranium-233/234	0.35	0.26	0.21
EMWNT-05	11/09/10	Uranium-233/234	0.6	0.37	0.28
EMWNT-05	08/09/10	Uranium-235/236	0.33	0.28	0.15
EMWNT-05	08/09/10	Uranium-238	0.44	0.29	0.21
EMWNT-05	11/09/10	Uranium-238	0.85	0.44	0.27

Monitoring Data for the EMWMF: Radiological Analytes

Sampling Point	Date Sampled	Isotope	Result (pCi/L)		
			Activity	TPU	MDA
EMW-VWEIR	04/12/10	Americium-243	0.21	0.17	0.09
EMW-VWEIR	04/12/10	Curium-245	0.21	0.18	0.09
EMW-VWEIR	11/09/10	Nickel-63	19.6	11.77	19.1
EMW-VWEIR	11/09/10	Plutonium-242	0.16	0.14	0.09
EMW-VWEIR	04/12/10	Radium-226	0.45	0.37	0.2
EMW-VWEIR	11/09/10	Radium-228	2.7	0.58	0.97
EMW-VWEIR	11/09/10	Radium-228	1.08	0.38	0.68
EMW-VWEIR	02/08/10	Strontium-90	4.48	0.9	1.45
EMW-VWEIR	04/12/10	Strontium-90	6.3	1.22	1.99
EMW-VWEIR	08/09/10	Strontium-90	3.32	0.9	1.62
EMW-VWEIR	11/09/10	Strontium-90	2.04	0.74	1.35
EMW-VWEIR	11/09/10	Strontium-90	1.88	0.77	1.44
EMW-VWEIR	02/08/10	Technetium-99	18.8	3.13	4.68
EMW-VWEIR	11/09/10	Thorium-228	0.2	0.19	0.19
EMW-VWEIR	11/09/10	Thorium-232	0.2	0.19	0.11
EMW-VWEIR	02/08/10	Tritium	750	157.87	205
EMW-VWEIR	04/12/10	Tritium	445	128.64	190
EMW-VWEIR	08/09/10	Tritium	1300	210.7	222
EMW-VWEIR	02/08/10	Uranium-233/234	30.8	5.2	0.15
EMW-VWEIR	04/12/10	Uranium-233/234	6.48	1.58	0.38
EMW-VWEIR	08/09/10	Uranium-233/234	8.79	1.84	0.13
EMW-VWEIR	11/09/10	Uranium-233/234	1.71	0.61	0.12
EMW-VWEIR	11/09/10	Uranium-233/234	2.13	0.73	0.13
EMW-VWEIR	02/08/10	Uranium-235/236	1.48	0.67	0.31
EMW-VWEIR	04/12/10	Uranium-235/236	0.43	0.36	0.19
EMW-VWEIR	11/09/10	Uranium-235/236	0.31	0.28	0.17
EMW-VWEIR	02/08/10	Uranium-238	2.06	0.74	0.29
EMW-VWEIR	04/12/10	Uranium-238	0.81	0.45	0.15
EMW-VWEIR	08/09/10	Uranium-238	0.4	0.29	0.13
EMW-VWEIR	11/09/10	Uranium-238	0.35	0.27	0.25
EMW-VWEIR	11/09/10	Uranium-238	0.49	0.33	0.27
EMW-VWUNDER	02/08/10	Americium-243	0.31	0.21	0.23
EMW-VWUNDER	02/08/10	Curium-245	0.31	0.22	0.26
EMW-VWUNDER	02/08/10	Technetium-99	2.93	1.55	2.54
EMW-VWUNDER	04/21/10	Thorium-230	0.29	0.22	0.23
EMW-VWUNDER	02/08/10	Uranium-233/234	0.34	0.21	0.19
EMW-VWUNDER	04/21/10	Uranium-233/234	0.35	0.22	0.08
EMW-VWUNDER	11/15/10	Uranium-233/234	0.26	0.16	0.14
EMW-VWUNDER	02/08/10	Uranium-238	0.25	0.17	0.13
EMW-VWUNDER	11/15/10	Uranium-238	0.17	0.13	0.16

APPENDIX E

CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME

EXPLANATION

Sampling Point:

200A6	-	Surface water location in storm drain near the outfall to Upper East Fork Poplar Creek
GHK	-	Gum Hollow Branch Kilometer (surface water sampling location)
GW	-	Groundwater monitoring well (also hyphenated numbers [e.g., 55-3A])
NPR	-	North of Pine Ridge near the Scarboro Community (surface water sampling location)
SCR	-	Spring sampling location in Union Valley
SP	-	Spring sampling location in the Y-12 Complex
STATION	-	Surface water sampling location in Upper East Fork Poplar Creek

Location:

B8110	-	Building 81-10
B9201-2	-	Building 9201-2
B9201-5	-	Building 9201-5
CPT	-	Coal Pile Trench
EXP-E	-	Exit Pathway Picket E
EXP-I	-	Exit Pathway Picket I
EXP-J	-	Exit Pathway Picket J
EXP-SR	-	Along Scarboro Road in the gap through Pine Ridge
EXP-SW	-	Surface water or spring sampling station
EXP-UV	-	East of the Oak Ridge Reservation boundary in Union Valley
FF	-	Fuel Facility (Building 9754-2)
FTF	-	Fire Training Facility
GRID	-	Comprehensive Groundwater Monitoring Plan Grid Location (MMES 1990b)
NHP	-	New Hope Pond
RG	-	Rust Garage Area
S2	-	S-2 Site
S3	-	S-3 Site
SY	-	Y-12 Salvage Yard
T0134	-	Tank 0134-U
T2331	-	Tank 2331-U
WCPA	-	Waste Coolant Processing Area
Y-12	-	Y-12 Complex

Monitoring Program:

BJC	-	managed by Bechtel Jacobs Company LLC
GWPP	-	managed by the Y-12 Groundwater Protection Program

Sample Type:

Dup	-	field duplicate sample
NP	-	sample collected without purging the well (no purge method)
PDB	-	passive diffusion bag sample

EXPLANATION (continued)

Units:

ft	-	feet (elevations are above mean sea level and depths are below grade)
µg/L	-	micrograms per liter
mg/L	-	milligrams per liter
mV	-	millivolts
µmho/cm	-	micromhos per centimeter
NTU	-	nephelometric turbidity units
pCi/L	-	picoCuries per liter
ppm	-	parts per million

Only analytes detected above reporting limits in at least one sample are included in this appendix. Additionally, results that are below the reporting limits are replaced with missing values (e.g., " < ") to emphasize the detected results. The following sections describe the analytes, reporting limits, and data qualifiers for each subappendix. A comprehensive list of the GWPP analytes, analytical methods, and reporting limits is provided in Appendix B, Table B.5.

E.1 Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals:

Results for all of the field measurements, miscellaneous analytes, and major ions are included in this appendix. The reporting limits for the major ions are shown in the following summary.

Analyte	Reporting Limit (mg/L)		Analyte	Reporting Limit (mg/L)	
	GWPP	BJC		GWPP	BJC
Cations			**Anions**		
Calcium	0.2	0.01	Bicarbonate	1.0	NS
Magnesium	0.2	0.05	Carbonate	1.0	NS
Potassium	2.0	0.025	Chloride	0.2	0.1
Sodium	0.2	0.01	Fluoride	0.1	0.05
			Nitrate (as Nitrogen)	0.05	0.1
			Sulfate	0.25	0.1
Note: "NS" = not specified.					

The major ion results for the samples collected from well GW-170 and three of the samples from well GW-929 are qualitative because the ion charge balance errors (percent) exceeds 20%. The geochemistry of samples from well GW-170 has reflected potential grout contamination since CY 2000, as shown by the elevated pH (typically > 10). Well GW-929 was recently installed and historical data are not available to identify the suspected cause of the charge balance errors.

The Y-12 GWPP SAP (B&W Y-12 2009) specifies analytical methods and reporting limits for trace metals that are appropriate for DOE Order monitoring. The laboratories subcontracted for the monitoring programs managed by BJC may use reporting limits (sometimes reporting estimated values) that are lower than the GWPP reporting limits for the metals. For this report, the analytical methods for metals used by BJC monitoring programs (EPA-7470, SW846-6010B, SW846-6020, and ASTM-D5174-M) are considered to be functionally equivalent to the methods used by the GWPP (Table B.5). To retain the highest quality data for DOE Order monitoring purposes and to standardize reporting limits for trace metal results obtained from all sources, the GWPP reporting limits were given precedence over the BJC reporting

EXPLANATION (continued)

limits (BJC 2009a) shown below. The trace metals shown in bold typeface below were detected in at least one sample collected during CY 2010 and are presented in Appendix E.1.

Analyte	Reporting Limit (mg/L)		Analyte	Reporting Limit (mg/L)	
	GWPP	BJC		GWPP	BJC
Aluminum	0.2	0.05*	**Lithium**	0.01	0.01
Antimony	0.0025	0.003	**Manganese**	0.005	0.005
Arsenic	0.005	0.005	**Mercury**	0.00005	0.0002
Barium	0.004	0.005	Molybdenum	0.05	NS
Beryllium	0.0005	0.001	**Nickel**	0.005	0.01
Boron	0.1	0.01*	Selenium	0.01	0.0025*
Cadmium	0.0025	0.00013*	Silver	0.02	0.0015*
Chromium	0.01**	0.005*	**Strontium**	0.005	0.005
Cobalt	0.02	0.005*	**Thallium**	0.0005	0.001
Copper	0.02	0.005*	Thorium	0.2	NS
Iron	0.05	0.01*	**Uranium**	0.0005	0.004
Lead	0.0005	0.002	Vanadium	0.02	0.01*
			Zinc	0.05	0.01*
Note: * - the GWPP reporting limit is used instead of the BJC reporting limit; "NS" - not specified.					

The following symbols and qualifiers are used in Appendix E.1:

. - Not analyzed or not applicable
< - Analyzed but not detected at the project reporting level
J - Positively identified; estimated concentration
Q - Result is inconsistent with historical measurements for the location
R - Result does not meet data quality objectives

EXPLANATION (continued)

E.2 Volatile Organic Compounds:

The Y-12 GWPP reporting limits for volatile organic compounds (Table B.5) and those used for monitoring programs managed by BJC are contract-required quantitation limits. Results below the quantitation limit and above the instrument detection limit are reported as estimated quantities. Therefore, non-detected results are assumed to equal zero for all compounds.

As summarized below, 26 compounds were detected in the CY 2010 groundwater samples collected in the East Fork Regime. Results for these compounds are grouped by similar chemical composition (e.g., chloroethenes) in Appendix E.2.

Compound	No. Detected	Maximum (μg/L)	Compound	No. Detected	Maximum (μg/L)
Tetrachloroethene	91	60,000	Total Xylene	5	8,300
Trichloroethene	78	7,400	Toluene	5	2,400
cis-1,2-Dichloroethene	69	2,500	1,1,1-Trichloroethane	5	40
Chloroform	48	1,900	Bromoform	4	6
Carbon tetrachloride	45	4,100	1,1,1,2-Tetrachloroethane	2	1.5
1,1-Dichloroethene	41	200	Ethylbenzene	1	570
Vinyl chloride	26	260 J	1,2-Dichloroethane	1	480
trans-1,2-Dichloroethene	26	67	Acetone	1	19
1,1-Dichloroethane	24	51	Chloromethane	1	5
1,1,2-Trichloro-1,2,2-trifluoroethane	19	2,600	cis-1,3-Dichloropropene	1	3 J
Benzene	13	7,800	Styrene	1	2 J
Methylene chloride	12	57	Chlorobenzene	1	1.1
Trichlorofluoromethane	9	25	Chloroethane	1	1 J

Also presented in Appendix E.2 are results for volatile organic gases (ethane, ethylene, and methane) as natural attenuation indicators for groundwater samples collected from nine wells in the East Fork Regime.

The following symbols and data qualifiers are used in Appendix E.2.

- . - Not analyzed
- < - Analyzed but not detected
- J - Positively identified, estimated concentration below the contract-required quantitation limit
- Q - Result is inconsistent with historical measurements for the location

EXPLANATION (continued)

E.3 Radiological Analytes:

Reporting limits for radiological analytes are sample-specific and analyte-specific minimum detectable activities that are reported with each result. The following summary shows the radiological analytes reported for at least one groundwater sample collected during CY 2010 in the East Fork Regime.

Analyte	No. of Results	No. Detected	Analyte	No. of Results	No. Detected
Gross Alpha	109	29	Uranium-234*	13	12
Gross Beta	109	38	Uranium-235*	13	7
Technetium-99	24	6	Uranium-238	13	11

Note: * = Reported by BJC laboratories in Appendix E.3 as equivalent GWPP analytes: U-233/234 = U-234; U-235/236 = U-235.

Results for gross alpha and gross beta are presented in the first four pages of Appendix E.3, followed by the results for the isotopes. The following notes and qualifiers apply to Appendix E.3:

- Result - Activity in picoCuries per liter (pCi/L)
- TPU - Total propagated uncertainty (two standard deviations); calculation includes the counting error (instrument uncertainty) as reported previously, plus other sources of uncertainty (e.g., volumetric, chemical yield)
- MDA - Minimum detectable activity
- . - Not analyzed or not applicable (TPU is not presented when the result is <MDA)
- < - Analyzed but less than the MDA (not detected)

APPENDIX E.1

FIELD MEASUREMENTS, MISCELLANEOUS ANALYTES, MAJOR IONS, AND TRACE METALS

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	55-2B	55-2C		55-3A		55-3B		55-3C		56-1A	56-1C
Functional Area	GRIDB3	GRIDB3		B9201-5		B9201-5		B9201-5		Y12	Y12
Date Sampled	04/19/10	04/19/10		03/01/10	08/05/10	03/01/10	08/05/10	03/01/10	08/05/10	03/04/10	03/04/10
Program	GWPP	GWPP		GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type			Dup								
Field Measurements											
Time Sampled	9:10	14:30	14:30	9:10	8:25	10:15	10:05	11:15	11:15	9:25	13:40
Measuring Point Elev. (ft)	977.42	977.02	977.02	972.46	972.46	973.32	973.32	974.34	974.34	969.25	969.49
Depth to Water (ft)	8.10	8.01	8.01	12.00	12.00	13.00	13.00	13.00	13.00	8.00	7.00
Groundwater Elevation (ft)	969.32	969.01	969.01	960.46	960.46	960.32	960.32	961.34	961.34	961.25	962.49
Conductivity (μmho/cm)	2,560	2,470	2,470	760	715	438	443	438	509	630	411
Dissolved Oxygen (ppm)	0.32	0.5	0.5	5.02	0.94	2.96	0.18	1.68	1.44	5.13	1.9
Iron (++)	.	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	134	96	96	154	123	123	32	87	93	142	70
Temperature (degrees C)	17.2	18.8	18.8	12	22.2	14.1	21	10.8	25	9.2	11.6
Turbidity (NTU)	.	.	.	.	.	.	.	.	.	.	.
pH	6.48	6.94	6.94	6.98	7	7.35	7.52	7.38	7.48	7.93	7.92
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	.	218	449	137	246	254	331	405	275
Suspended Solids (mg/L)	.	.	.	2	6	<	8	<	3	<	<
Major Ions (mg/L)											
Calcium	.	.	.	103	111	57.7	63.6	53.5	70.1	75.3	27.1
Magnesium	.	.	.	16.3	14.9	12.1	12.1	12.1	15.3	13.2	7.83
Potassium	.	.	.	3.36	3.5	4.67	4.33	6.48	7.03	2.72	3.6
Sodium	.	.	.	9.31	9.25	3.63	3.98	8.86	11	19.5	47.4
Bicarbonate	.	.	.	153	171	144	156	170	182	128	200
Carbonate	.	.	.	<	<	<	<	<	<	<	<
Chloride	16.2	15.1	14.9	13.8	14.1	30.2	28.5	18.8	18.3	67.9	5.27
Fluoride	.	.	.	<	<	<	<	<	<	0.393	0.038
Nitrate as N	317	283	278	1.53	1.31	<	<	<	0.243	0.484	<
Sulfate	20.2	16.5	16.3	182	150	26.2	31.6	27.9	62.6	74.9	11.5
Charge balance error (%)	.	.	.	-2.6	1.6	-1.5	-1.4	-3.4	-0.6	-2.8	-2.8
Trace Metals (mg/L)											
Aluminum	.	.	.	<	<	<	<	<	<	<	<
Arsenic	.	.	.	<	<	<	<	<	<	<	<
Barium	.	.	.	0.0366	0.0405	0.262	0.246	0.155	0.165	0.0663	0.264
Beryllium	.	.	.	<	<	<	<	<	<	<	<
Boron	.	.	.	0.136	0.132	<	<	0.113	<	<	0.138
Cadmium	.	.	.	<	<	<	<	<	<	<	<
Chromium	.	.	.	0.00717	0.0151	<	0.00932	<	0.0114	0.0138	<
Cobalt	.	.	.	<	<	<	<	<	<	<	<
Copper	.	.	.	<	<	<	<	<	<	<	<
Iron	.	.	.	0.0997	<	<	0.0636	<	<	<	<
Lead	.	.	.	<	<	<	<	0.00114	<	<	0.0382 Q
Lithium	.	.	.	<	<	0.0163	0.0169	0.0194	0.0194	0.0149	0.0247
Manganese	.	.	.	0.00948	0.00838	0.0123	0.0753	0.0203	0.0278	<	0.0855
Mercury	.	.	.	<	<	<	<	<	<	<	<
Nickel	.	.	.	0.0159	0.0175	<	<	<	<	0.0253	<
Silver	.	.	.	<	<	<	<	<	<	<	<
Strontium	.	.	.	0.277	0.292	0.733	0.704	1.2	1.53	0.456	0.86
Thallium	.	.	.	<	<	<	<	<	<	<	<
Thorium	.	.	.	<	<	<	<	<	<	<	<
Uranium	.	.	.	0.00085	0.00072	<	<	<	<	0.00282	<
Zinc	.	.	.	<	0.2	<	0.172	<	0.211	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	56-3A	56-3B	56-3C	56-4A	56-6A	60-1A	GW-106	GW-108		GW-109
Functional Area	Y12	Y12	Y12	Y12	Y12	Y12	S3	S3		S3
Date Sampled	03/03/10	03/03/10	03/03/10	03/01/10	10/18/10	04/13/10	10/19/10	01/06/10	08/04/10	10/21/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	BJC	BJC	GWPP
Sample Type				NP						
Field Measurements										
Time Sampled	9:40	10:50	15:00	15:00	15:00	10:05	10:15	14:10	10:20	10:20
Measuring Point Elev. (ft)	963.03	964.33	962.86	962.07	960.28	929.66	1,016.92	999.00	999.00	997.82
Depth to Water (ft)	11.00	11.00	10.00	10.00	12.00	12.39	6.00	6.94	6.29	7.00
Groundwater Elevation (ft)	952.03	953.33	952.86	952.07	948.28	917.27	1,010.92	992.06	992.71	990.82
Conductivity (μmho/cm)	537	556	567	181	682	678	5,200	48,723	54,462	47,400
Dissolved Oxygen (ppm)	3.42	0.9	0.44	6.56	0.72	0.28	0.62	1.12	1.03	0.3
Iron (++)	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	171	133	105	113	2	-35	154	287	37	209
Temperature (degrees C)	11.8	15.1	14	11.5	24.1	17.1	19.7	16.8	22.9	19.8
Turbidity (NTU)	.	.	.	.	.	.	.	4	5	.
pH	7.53	7.3	7.33	7.64	7.27	7.47	6.85	5.59	5.71	5.56
Miscellaneous Analytes										
Dissolved Solids (mg/L)	373	395	451	124	426	747,000Q	3,600	.	.	51,900
Suspended Solids (mg/L)	<	<	<	4	<	<	<	.	.	11
Major Ions (mg/L)										
Calcium	93.3	106	103	18.3	80.1	97.2	708	10,000	9,400	10,200
Magnesium	7.17	4.47	6.5	2.61	35.5	12.1	166	910	880	1,470
Potassium	<	<	2.13	<	<	<	12.4	33	35	105
Sodium	3.57	5.31	9.12	5.59	18.7	12.3	31.4	430	470	426
Bicarbonate	213	203	182	63.7	353	200	123	790	770	359
Carbonate	<	<	<	<	<	<	<	<	<	<
Chloride	15.5	15	14.9	2.63	11.5	20.8	11.7	160	180	89.4
Fluoride	<	<	<	<	<	<	<	<	<	6.54
Nitrate as N	0.27	0.456	0.873	1.2	<	<	634	6,500	7,600	8620
Sulfate	47.8	58.6	105	14.1	7	105	20.3	<	<	1.36
Charge balance error (%)	-2.8	1.3	-1.5	-11.5	1.4	-3.0	2.2	10.1	0.0	2.0
Trace Metals (mg/L)										
Aluminum	<	<	<	0.661	<	<	<	<	<	3.29
Arsenic	<	<	<	<	<	<	<	0.0055	<	<
Barium	0.0975	0.105	0.0697	0.0324	0.251	0.122	2.66	63	60	76.3
Beryllium	<	<	<	<	<	<	<	0.0014	0.0013	<
Boron	<	0.107	<	<	<	<	0.135	<	<	<
Cadmium	<	<	<	<	<	<	0.000585	<	<	1.03
Chromium	0.00603	0.00254	0.0048	0.0206	<	<	0.0037	0.018	0.012	<
Cobalt	<	<	<	<	<	<	<	<	0.15	0.285
Copper	<	<	<	<	<	<	<	<	<	<
Iron	<	<	0.0709	0.351	0.362	0.292	<	<	<	<
Lead	<	0.0353 Q	0.0551 Q	0.00172	<	<	<	0.0081	0.005	0.00597
Lithium	<	<	0.0118	<	<	0.839	0.0685	0.34	0.34	0.928
Manganese	<	<	<	0.00747	0.464	0.588	0.0684	140	71	62.1
Mercury	<	<	<	<	<	<	<	<	<	0.00194
Nickel	0.0123	<	<	0.0118	0.0134	<	0.0106	0.12	0.11	1.17
Silver	<	<	<	<	<	<	<	14	13	<
Strontium	0.15	0.147	0.197	0.0355	0.324	0.297	19.7	<	<	62.6
Thallium	<	<	<	<	<	<	<	28	24	0.0017
Thorium	<	<	<	<	<	<	<	0.0012	<	<
Uranium	0.00073	0.000585	<	<	<	<	0.00254	0.015	0.013	0.0119
Zinc	<	<	<	<	<	<	<	<	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-148		GW-151		GW-154		GW-169		GW-170	
Functional Area	NHP		NHP		NHP		EXP-UV		EXP-UV	
Date Sampled	03/08/10		01/28/10	08/16/10	02/02/10	08/18/10	01/27/10	08/19/10	01/27/10	
Program	GWPP		BJC	BJC	BJC	BJC	BJC	BJC	BJC	
Sample Type		Dup								Dup
Field Measurements										
Time Sampled	14:10	14:10	14:30	14:40	10:35	15:00	15:20	15:00	14:20	.
Measuring Point Elev. (ft)	907.76	907.76	916.17	916.17	911.70	911.70	932.12	932.12	932.64	.
Depth to Water (ft)	8.00	8.00	14.33	15.28	7.40	9.06	20.10	29.70	30.87	.
Groundwater Elevation (ft)	899.76	899.76	901.84	900.89	904.30	902.64	912.02	902.42	901.77	.
Conductivity (μmho/cm)	988	988	484	687	614	1,089	215	474	1,015	.
Dissolved Oxygen (ppm)	4.33	4.33	0.82	0.78	4.02	2.44	6.46	4.2	0.48	.
Iron (++)	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	120	120	137	-98	201	-103	178	-68	-40	.
Temperature (degrees C)	15	15	15.7	17.9	11.2	22.1	13.7	15.9	13.5	.
Turbidity (NTU)	.	.	2	1	5	15	11	11	1	.
pH	7.24	7.24	7.16	7.24	6.47	6.85	6.74	7.45	11.98	.
Miscellaneous Analytes										
Dissolved Solids (mg/L)	721	740	310	330	410	460	140	190	260	260
Suspended Solids (mg/L)	<	<	<	<	7.2	<	9.8	<	15	17
Major Ions (mg/L)										
Calcium	156	157	65	61	140	130	46	70	94	92
Magnesium	11.4	11.8	28	27	17	19	2.4	3.8	4.8	4.4
Potassium	2.23	2.4	1.9	2	4.8	6.3	1.4	1.6	13	13
Sodium	40.9	42	7.2 J	8.4	7.6	9.5	0.6	0.97	6.2	6.2
Bicarbonate	323	321	240	230	.	.	140	190	<	<
Carbonate	<	<	<	<	.	.	<	<	79	92
Chloride	148	149	21	22	.	.	1.7	1.6	5.2	5
Fluoride	<	<	<	<	.	.	<	<	<	<
Nitrate as N	<	<	0.82	0.77	.	.	0.96	0.83	0.34	0.33
Sulfate	17.6	17.6	24	23	.	.	4.7	5.9	8.2	7.9
Charge balance error (%)	-2.0	-1.3	-0.3	-0.6	.	.	-8.2	-1.7	-33.7 R	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	0.32	<	0.47	<	0.59	0.55
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.27	0.28	0.2	0.21	0.1	0.073	0.023	0.029	0.13	0.13
Beryllium	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	<	<	0.11	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	0.0026	<	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	<	<	<	<	0.45	<	0.76	<	1.2	0.93
Lead	< R	0.0135 R	<	<	<	<	<	<	<	<
Lithium	<	<	<	<	<	<	<	<	0.035	0.034
Manganese	0.0221	0.0248	<	<	0.8	0.2	0.024	<	0.0088	0.0075
Mercury	<	<	.	.	.	.	.	.	.	.
Nickel	0.00534	<	<	<	<	<	<	<	<	<
Silver	<	<	5.7	6.2	4.5	5.8	4.2	3.9	1.1	1
Strontium	0.588	0.609	<	<	<	<	<	<	<	<
Thallium	<	<	0.6	0.6	0.4	0.41	0.056	0.082	0.65	0.65
Thorium	<	<	<	<	<	<	<	<	<	<
Uranium	0.00112	0.00112	<	<	0.4	0.39	.	.	.	.
Zinc	<	<	<	<	<	<	<	<	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-170		GW-171	GW-172	GW-193		GW-204	GW-220	GW-223		GW-230
Functional Area	EXP-UV		EXP-UV	EXP-UV	T2331		T0134	NHP	NHP		EXP-UV
Date Sampled	08/19/10		08/04/10	08/04/10	01/06/10	08/12/10	10/28/10	08/03/10	01/28/10	08/17/10	08/04/10
Program	BJC		BJC	BJC	BJC	BJC	GWPP	GWPP	BJC	BJC	BJC
Sample Type		Dup									
Field Measurements											
Time Sampled	14:10	.	14:40	14:30	.	.	9:20	8:50	16:00	15:20	10:30
Measuring Point Elev. (ft)	932.64	.	920.72	926.69	934.17	934.17	958.74	915.64	911.62	911.62	923.11
Depth to Water (ft)	34.05	.	4.78	15.15	9.04	9.49	8.00	16.00	8.27	9.52	.
Groundwater Elevation (ft)	898.59	.	915.94	911.54	925.13	924.68	950.74	899.64	903.35	902.10	.
Conductivity (μmho/cm)	2,200	.	510	831	520	877	274	539	554	1,041	.
Dissolved Oxygen (ppm)	0.49	.	1.74	0.53	12.86	1.92	4.72	1.98	0.54	0.87	.
Iron (++)	.	.	0.01	0.32	.	.	.	.	.	.	0.85
Manganese (++)	.	.	6.1	0.9	.	.	.	.	.	.	0.7
Oxidation/Reduction (mV)	-247	.	-82	-85	101	-241	202	127	-45	-141	.
Temperature (degrees C)	16.3	.	18.8	20.29	9.8	24.8	21.6	18.5	16.5	19.4	.
Turbidity (NTU)	7	.	12	2	1	6	.	.	1	2	.
pH	11.25	.	6.6	6.93	7.92	7.32	7.43	7.51	7.04	6.71	.
Miscellaneous Analytes											
Dissolved Solids (mg/L)	390	360	220	360	.	.	.	.	360	500	570
Suspended Solids (mg/L)	11	11	29	<	.	.	.	.	<	<	<
Major Ions (mg/L)											
Calcium	150	150	.	.	.	.	.	.	91	110	.
Magnesium	1.9	2	.	.	.	.	.	.	12	14	.
Potassium	14	14	.	.	.	.	.	.	1.5	2.1	.
Sodium	6.9	7	.	.	.	.	.	.	17	31	.
Bicarbonate	<	<	.	.	.	.	.	.	220	230	.
Carbonate	62	58	.	.	.	.	.	.	<	<	.
Chloride	7.6	5.3	.	.	.	.	.	.	41	110	.
Fluoride	<	<	.	.	.	.	.	.	<	<	.
Nitrate as N	0.22	0.22	.	.	.	.	.	.	<	<	.
Sulfate	3	7.1	.	.	.	.	.	.	48	39	.
Charge balance error (%)	43 R	.	.	.	.	.	.	.	-1.9	-2.8	.
Trace Metals (mg/L)											
Aluminum	0.6	0.62	.	.	.	.	.	.	<	<	.
Arsenic	<	<	.	.	.	.	<	.	<	<	.
Barium	0.17	0.17	.	.	.	.	.	.	0.28	0.33	.
Beryllium	<	<	.	.	.	.	.	.	<	<	.
Boron	<	<	.	.	.	.	.	.	<	<	.
Cadmium	<	<	.	.	.	.	<	.	<	<	.
Chromium	<	<	.	.	.	.	0.00469	.	<	<	.
Cobalt	<	<	.	.	.	.	.	.	<	<	.
Copper	<	<	.	.	.	.	.	.	<	<	.
Iron	0.35	0.41	.	.	.	.	.	.	0.25	0.38	.
Lead	<	<	.	.	.	.	<	.	<	<	.
Lithium	0.038	0.038	.	.	.	.	.	.	<	<	.
Manganese	<	<	.	.	.	.	.	.	0.44	0.61	.
Mercury	.	.	.	.	.	.	.	.	.	.	.
Nickel	<	<	.	.	.	.	<	.	<	<	.
Silver	0.95	0.93	.	.	.	.	.	.	4.3	5	.
Strontium	<	<	.	.	.	.	.	.	<	<	.
Thallium	0.73	0.73	.	.	.	.	<	.	0.23	0.27	.
Thorium	<	<	.	.	.	.	.	.	<	<	.
Uranium	.	.	.	.	.	.	0.0272	.	0.046	0.038	.
Zinc	<	<	.	.	.	.	.	.	<	<	.

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-251		GW-253	GW-274	GW-275	GW-281	GW-337	GW-380		GW-382	
Functional Area	S2		S2	SY	SY	FF	WC	NHP		NHP	
Date Sampled	10/20/10		01/27/10	12/09/10	12/09/10	05/24/10	10/26/10	01/28/10	08/18/10	02/03/10	08/18/10
Program	GWPP		BJC	GWPP	GWPP	BJC	GWPP	BJC	BJC	BJC	BJC
Sample Type		Dup									
Field Measurements											
Time Sampled	10:40	10:40	15:10	11:55	13:10	13:45	10:50	14:55	14:10	10:40	15:35
Measuring Point Elev. (ft)	1,003.80	1,003.80	1,004.24	995.60	995.53	946.10	987.48	913.55	913.55	913.17	913.17
Depth to Water (ft)	24.00	24.00	4.91	4.00	4.00	4.80	11.00	8.65	11.38	9.65	10.65
Groundwater Elevation (ft)	979.80	979.80	999.33	991.60	991.53	941.30	976.48	904.90	902.17	903.52	902.52
Conductivity (μmho/cm)	631	631	5,277	11,140	47,200	779	808	624	668	670	1,095
Dissolved Oxygen (ppm)	0.82	0.82	1.35	0.17	0.42	2.5	0.25	2.18	2.31	1.55	2.75
Iron (++)	.	.	0.01	.	.	.	.	.	.	.	.
Manganese (++)	.	.	10.4	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	184	184	319	179	148	-4	111	253	-48	119	-146
Temperature (degrees C)	16.9	16.9	12.8	12.6	10.9	16.4	21	13	23.3	8.4	25.1
Turbidity (NTU)	.	.	10	.	.	25	.	4	34	18	1
pH	6.62	6.62	4.62	5.71	6.58	6.77	6.66	5.93	6.36	5.07	6.84
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	3,300	8,520	47,600	.	.	310	250	380	420
Suspended Solids (mg/L)	.	.	4.8	1	5	.	.	8.2	36	<	<
Major Ions (mg/L)											
Calcium	.	.	470	1,580	10,000	.	.	48	45	89	86
Magnesium	.	.	100	236	1,400	.	.	20	18	25	24
Potassium	.	.	9.2	<	35.2	.	.	1.5	1.6	3.3	3.5
Sodium	.	.	98	183	124	.	.	33	15	18	23
Bicarbonate	.	.	70	614	54.4	.	.	190	170	280	260
Carbonate	.	.	<	<	<	.	.	<	<	<	<
Chloride	4.48	4.6	95	45.2	49.2	.	21.1	71	18	67	74
Fluoride	.	.	4	<	<	.	.	<	<	<	<
Nitrate as N	28.8	28.8	580	1,319	8,850	.	1.48	3.9	1.8	0.32	0.22
Sulfate	10.3	10.4	80	3.79	2.79	.	17.9	8.7	23	4.7	5.1
Charge balance error (%)	.	.	-13.4	-0.7	-1.1	.	.	-6.3	-1.0	-1.6	-0.3
Trace Metals (mg/L)											
Aluminum	.	.	2.7	<	<	.	.	<	<	<	<
Arsenic	.	.	0.0051	<	<	.	.	<	<	<	<
Barium	.	.	0.2	8.88	151	.	.	0.039	0.04	0.55	0.53
Beryllium	.	.	0.0099	<	<	.	.	<	<	<	<
Boron	.	.	0.32	<	<	.	.	<	<	<	<
Cadmium	.	.	3.1	<	<	.	.	<	<	<	<
Chromium	.	.	0.011	0.0256	<	.	.	0.17	0.082	<	<
Cobalt	.	.	0.19	<	<	.	.	<	<	<	<
Copper	.	.	38	<	<	.	.	<	<	<	<
Iron	.	.	0.37	<	<	.	.	0.71	0.54	2.2	<
Lead	.	.	0.018	<	<	.	.	<	<	<	<
Lithium	.	.	0.055	<	0.364	.	.	<	<	<	<
Manganese	.	.	37	42.1	1.81	.	.	0.017	0.035	0.029	0.025
Mercury	.	.	.	0.00021	<	.	.	.	.	.	.
Nickel	.	.	1.6	0.147	0.369	.	.	0.037	0.13	<	<
Silver	.	.	7.3	<	<	.	.	3.1	3.7	5	5
Strontium	.	.	<	4.49	74.6	.	.	<	<	<	<
Thallium	.	.	0.76	<	<	.	.	0.058	0.055	0.3	0.3
Thorium	.	.	0.0096	<	<	.	.	<	<	<	<
Uranium	.	.	0.0041	0.00839	<	.	.	<	<	<	<
Zinc	.	.	4.2	1.08	<	.	.	<	<	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-605				GW-606		GW-618	GW-633	GW-656	GW-658	GW-686
Functional Area	EXP-I				EXP-I		EXP-E	RG	T0134	FF	CPT
Date Sampled	01/05/10		07/21/10		01/05/10	07/21/10	02/22/10	11/22/10	10/28/10	05/24/10	11/03/10
Program	BJC		BJC		BJC	BJC	BJC	GWPP	GWPP	BJC	GWPP
Sample Type		Dup		Dup							
Field Measurements											
Time Sampled	10:10	.	13:40	.	11:10	15:20	13:55	16:10	14:00	15:20	13:35
Measuring Point Elev. (ft)	919.06	.	919.06	.	919.59	919.59	985.14	996.43	954.79	944.81	963.76
Depth to Water (ft)	11.44	.	11.41	.	13.21	13.90	12.43	3.00	10.00	11.63	13.00
Groundwater Elevation (ft)	907.62	.	907.65	.	906.38	905.69	972.71	993.43	944.79	933.18	950.76
Conductivity (μmho/cm)	867	.	698	.	612	811	497	6,300	615	429	1,202
Dissolved Oxygen (ppm)	1.55	.	0.35	.	1.1	1.29	0.38	0.37	0.23	0.98	0.49
Iron (++)	.	.	.	.	.	.	0.06	.	.	.	.
Manganese (++)	.	.	.	.	.	.	0.7	.	.	.	.
Oxidation/Reduction (mV)	162	.	38	.	155	40	-24	218	-4	-58	111
Temperature (degrees C)	14.8	.	18.6	.	12.4	21.33	17.7	21.8	22.4	20.6	19
Turbidity (NTU)	1	.	3	.	1	1	1	.	.	1	.
pH	6.95	.	7.06	.	7.22	7.33	6.98	5.31	6.63	6.07	6.46
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	.	.	.	.	320	4,900	188	.	.
Suspended Solids (mg/L)	.	.	.	.	.	.	<	<	1	.	.
Major Ions (mg/L)											
Calcium	100	98	120	110	97	100	100	911	106	.	.
Magnesium	21	21	24	23	43	43	8.4	104	5.1	.	.
Potassium	2	2	2.5	2.4	3.1	3.6	3.7	7.78	2.1	.	.
Sodium	18	18	24	24	6.8	7.6	12	93.3	13.7	.	.
Bicarbonate	310	310	300	300	330	330	310	306	208	.	.
Carbonate	<	<	<	<	<	<	<	<	<	.	.
Chloride	33	33	68	69	23	21	9.3	40.9	32.7	.	17.9
Fluoride	<	<	<	<	<	<	<	<	<	.	.
Nitrate as N	0.12	0.11	0.11	0.11	10	11	0.065	760	<	.	0.399
Sulfate	33	33	34	34	66	73	19	1.22	48.3	.	281
Charge balance error (%)	-1.8	.	2.5	.	-3.2	-2.9	-4.3	-2.7	2.2	.	.
Trace Metals (mg/L)											
Aluminum	<	<	<	<	<	<	<	<	<	.	.
Arsenic	<	<	<	<	<	<	<	<	<	.	.
Barium	0.051	0.049	0.051	0.051	0.17	0.16	0.031	4.39	0.149	.	.
Beryllium	<	<	<	<	<	<	<	<	<	.	.
Boron	<	<	<	<	<	<	<	<	<	.	.
Cadmium	<	<	<	<	<	<	<	0.00102	<	.	.
Chromium	<	<	<	<	<	<	<	0.0137	0.00255	.	.
Cobalt	<	<	<	<	<	<	<	<	<	.	.
Copper	<	<	<	<	<	<	<	<	<	.	.
Iron	<	<	<	<	<	<	0.38	<	0.987	.	.
Lead	<	<	<	<	<	<	<	<	0.00935	.	.
Lithium	<	<	<	<	<	<	<	0.15	<	.	.
Manganese	0.29	0.25	0.18	0.2	0.013	0.011	1.1	4.75	0.886	.	.
Mercury	.	.	.	.	.	.	.	<	<	.	<
Nickel	<	<	<	<	<	<	<	0.195	0.0374	.	.
Silver	4.1	4.1	4.4	4.4	4.7	4.9	2.5	<	<	.	.
Strontium	<	<	<	<	<	<	<	2.38	0.184	.	.
Thallium	0.2	0.19	0.2	0.19	0.64	0.62	0.2	<	<	.	.
Thorium	<	<	<	<	<	<	<	<	<	.	.
Uranium	0.11	0.11	0.11	0.11	0.0054	0.0052	<	0.00081	<	.	.
Zinc	<	<	<	<	<	<	<	0.697	<	.	.

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-690	GW-691		GW-692		GW-698		GW-722-14		GW-722-17	
Functional Area	CPT	CPT		CPT		B8110		EXP-J		EXP-J	
Date Sampled	11/03/10	04/14/10	11/02/10	11/02/10		04/13/10	11/03/10	02/18/10	07/29/10	02/18/10	07/29/10
Program	GWPP	GWPP	GWPP	GWPP		GWPP	GWPP	BJC	GWPP	BJC	GWPP
Sample Type					Dup						
Field Measurements											
Time Sampled	15:05	9:50	9:35	11:00	11:00	14:00	10:25	13:50	8:42	14:20	10:59
Measuring Point Elev. (ft)	967.36	968.59	968.59	964.38	964.38	970.09	970.09	953.71	953.71	953.71	953.71
Depth to Water (ft)	11.00	11.56	12.00	9.00	9.00	33.36	39.00	.	.	.	.
Groundwater Elevation (ft)	956.36	957.03	956.59	955.38	955.38	936.73	931.09	.	.	.	.
Conductivity (μmho/cm)	1,378	1,470	1,011	1,147	1,147	1,260	1,707	468	538	608	557
Dissolved Oxygen (ppm)	1.43	0.42	2.08	0.16	0.16	0.27	0.17	7.56	.	8.87	.
Iron (++)	.	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	129	108	197	-155	-155	50	125	43	.	22	.
Temperature (degrees C)	18	16	17.2	20.2	20.2	18.8	17.5	13.69	18.6	14.1	20.7
Turbidity (NTU)	.	.	.	.	.	.	.	2	.	4	.
pH	6.73	6.5	6.32	7.06	7.06	6.96	6.89	6.54	7.12	6.78	7.36
Miscellaneous Analytes											
Dissolved Solids (mg/L)	.	.	.	.	.	.	.	.	250	.	243
Suspended Solids (mg/L)	.	.	.	.	.	.	.	.	<	.	<
Major Ions (mg/L)											
Calcium	.	.	.	.	.	.	.	.	64.1	.	48.2
Magnesium	.	.	.	.	.	.	.	.	27.6	.	26.8
Potassium	.	.	.	.	.	.	.	.	<	.	2.27
Sodium	.	.	.	.	.	.	.	.	14.6	.	32.5
Bicarbonate	.	.	.	.	.	.	.	.	282	.	227
Carbonate	.	.	.	.	.	.	.	.	<	.	<
Chloride	79.3	22.7	14.8	26.6	27.4	17.5	21.5	.	8.79	.	30.3
Fluoride	.	.	.	.	.	.	.	.	0.185	.	0.636
Nitrate as N	3.39	0.461	3.92	<	<	99.4	143	.	0.345	.	0.068
Sulfate	444	707	365	392	394	60.7	63.2	.	16.9	.	29.8
Charge balance error (%)	.	.	.	.	.	.	.	.	-1.3	.	0.3
Trace Metals (mg/L)											
Aluminum	.	.	.	.	.	.	.	.	<	.	<
Arsenic	.	.	.	.	.	.	.	.	<	.	<
Barium	.	.	.	.	.	.	.	.	0.113	.	0.113
Beryllium	.	.	.	.	.	.	.	.	<	.	<
Boron	.	.	.	.	.	.	.	.	0.124	.	0.152
Cadmium	.	.	.	.	.	.	.	.	<	.	<
Chromium	.	.	.	.	.	.	.	.	0.00621	.	<
Cobalt	.	.	.	.	.	.	.	.	<	.	<
Copper	.	.	.	.	.	.	.	.	<	.	<
Iron	.	.	.	.	.	.	.	.	0.0687	.	<
Lead	.	.	.	.	.	.	.	.	<	.	<
Lithium	.	.	.	.	.	.	.	.	0.0165	.	0.0289
Manganese	.	.	.	.	.	.	.	.	<	.	<
Mercury	<	<	<	0.0002	0.00022	0.00051	0.00022	.	<	.	<
Nickel	.	.	.	.	.	.	.	.	0.00564	.	<
Silver	.	.	.	.	.	.	.	.	<	.	<
Strontium	.	.	.	.	.	.	.	.	0.731	.	1.21
Thallium	.	.	.	.	.	.	.	.	<	.	<
Thorium	.	.	.	.	.	.	.	.	<	.	<
Uranium	.	.	.	.	.	.	.	.	<	.	<
Zinc	.	.	.	.	.	.	.	.	0.0685	.	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-722-20		GW-722-22		GW-722-33		GW-733		GW-744	GW-747
Functional Area	EXP-J		EXP-J		EXP-J		EXP-J		GRIDK1	GRIDK2
Date Sampled	02/18/10	08/02/10	02/18/10	08/02/10	02/18/10	08/04/10	01/05/10	07/21/10	08/03/10	08/04/10
Program	BJC	GWPP	BJC	GWPP	BJC	GWPP	BJC	BJC	GWPP	GWPP
Sample Type										
Field Measurements										
Time Sampled	14:25	8:30	14:30	9:48	14:35	8:32	14:20	9:45	10:45	10:20
Measuring Point Elev. (ft)	953.71	953.71	953.71	953.71	953.71	953.71	959.84	959.84	907.43	911.06
Depth to Water (ft)	.	.	.	.	.	.	58.06	58.70	7.00	5.00
Groundwater Elevation (ft)	.	.	.	.	.	.	901.78	901.14	900.43	906.06
Conductivity (μmho/cm)	512	515	454	519	238	472	283	365	484	422
Dissolved Oxygen (ppm)	4.84	.	8.28	.	7.62	.	1.79	1.43	1.48	0.74
Iron (++)	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	26	.	32	.	78	.	130	51	-177	-50
Temperature (degrees C)	13.73	19.5	13.44	20.2	14	20.3	12.3	22.52	22.9	24.3
Turbidity (NTU)	12	.	5	.	6	.	2	2	.	.
pH	6.76	7.2	6.5	7.42	6.2	7.03	7.57	7.35	7.7	7.46
Miscellaneous Analytes										
Dissolved Solids (mg/L)	.	213	.	210	.	277	.	.	312	246
Suspended Solids (mg/L)	.	<	.	1	.	2	.	.	1	5
Major Ions (mg/L)										
Calcium	.	54.1	.	58.2	.	82.4	.	.	51.5	41.6
Magnesium	.	28.9	.	27.6	.	11.6	.	.	11.5	10.5
Potassium	.	<	.	<	.	<	.	.	3.64	2.55
Sodium	.	15.1	.	12.3	.	2.73	.	.	36	32
Bicarbonate	.	268	.	276	.	251	.	.	238	216
Carbonate	.	<	.	<	.	<	.	.	<	<
Chloride	.	8.17	.	5.44	.	3.08	.	.	7.17	2.33
Fluoride	.	0.314	.	0.227	.	<	.	.	<	0.207
Nitrate as N	.	0.109	.	0.245	.	0.613	.	.	<	<
Sulfate	.	20.1	.	17	.	11.9	.	.	16.1	13
Charge balance error (%)	.	-2.5	.	-2.9	.	-2.0	.	.	-1.1	-3.0
Trace Metals (mg/L)										
Aluminum	.	<	.	<	.	<	.	.	<	<
Arsenic	.	<	.	<	.	<	.	.	<	<
Barium	.	0.0955	.	0.102	.	0.0306	.	.	0.304	0.175
Beryllium	.	<	.	<	.	<	.	.	<	<
Boron	.	0.118	.	0.109	.	<	.	.	<	<
Cadmium	.	<	.	<	.	<	.	.	<	<
Chromium	.	<	.	<	.	<	.	.	0.00786	<
Cobalt	.	<	.	<	.	<	.	.	<	<
Copper	.	<	.	<	.	<	.	.	<	<
Iron	.	<	.	<	.	<	.	.	<	0.236
Lead	.	<	.	<	.	0.000735	.	.	<	0.00061
Lithium	.	0.0169	.	0.016	.	<	.	.	0.0275	0.0174
Manganese	.	<	.	<	.	<	.	.	0.0129	0.0156
Mercury	.	<	.	<	.	<	.	.	<	<
Nickel	.	<	.	<	.	<	.	.	<	<
Silver	.	<	.	<	.	<	.	.	<	<
Strontium	.	0.695	.	0.676	.	0.0749	.	.	1.41	0.787
Thallium	.	<	.	<	.	<	.	.	<	<
Thorium	.	<	.	<	.	<	.	.	<	<
Uranium	.	<	.	<	.	<	.	.	<	<
Zinc	.	<	.	0.107	.	<	.	.	0.147	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-748		GW-762				GW-781	GW-782	GW-792	GW-802	GW-816
Functional Area	GRIDK2		GRIDJ3				GRIDE3	GRIDE3	GRIDD2	FF	EXP-SR
Date Sampled	08/10/10		02/02/10		08/19/10		03/10/10	03/10/10	02/17/10	05/24/10	02/24/10
Program	GWPP		BJC		BJC		GWPP	GWPP	GWPP	BJC	GWPP
Sample Type		Dup		Dup		Dup					
Field Measurements											
Time Sampled	7:35	7:35	10:05	.	9:40	.	8:45	13:30	14:05	14:15	11:10
Measuring Point Elev. (ft)	911.19	911.19	915.56	.	915.56	.	947.89	947.73	992.74	941.83	898.42
Depth to Water (ft)	7.00	7.00	12.84	.	13.45	.	8.00	.	24.00	5.85	11.00
Groundwater Elevation (ft)	904.19	904.19	902.72	.	902.11	.	939.89	.	968.74	935.98	887.42
Conductivity (μmho/cm)	556	556	745	.	845	.	435	.	419	716	497
Dissolved Oxygen (ppm)	1.79	1.79	0.71	.	0.5	.	3.02	.	1.64	1.46	0.58
Iron (++)	.	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	48	48	210	.	-78	.	147	.	165	28	-35
Temperature (degrees C)	22.8	22.8	14.9	.	19.9	.	13.5	.	12.8	20.9	12.4
Turbidity (NTU)	.	.	0	.	7	.	.	.	.	4	.
pH	7.24	7.24	6.81	.	7.56	.	8.6		5.88	6.98	6.35
Miscellaneous Analytes											
Dissolved Solids (mg/L)	268	282	360	350	380	350	278	341	235	.	303
Suspended Solids (mg/L)	<	<	<	<	<	<	2	2	<	.	32
Major Ions (mg/L)											
Calcium	92.1	90.4	83	86	84	83	8.09	93.1	54.8	.	55.5
Magnesium	8.87	8.82	24	24	24	24	2.92	13.7	5.53	.	14.5
Potassium	2.2	2.13	4	4.1	3.8	3.7	4.97	4.18	<	.	4.43
Sodium	12.5	12.3	13	13	13 J	13	81	9.59	10.6	.	6.35
Bicarbonate	214	212	270	280	270	270	207	259	107	.	180
Carbonate	<	<	<	<	<	<	<	<	<	.	<
Chloride	33.2	33.1	38	39	39	39	6.68	17.3	27.7	.	23.4
Fluoride	0.112	0.115	<	<	<	<	<	<	0.102	.	0.1
Nitrate as N	<	<	0.0046 J	0.016	0.021	0.019	0.109	0.184	3.52	.	<
Sulfate	32.4	32.6	14	14	14	14	9.51	17.4	35.5	.	15.3
Charge balance error (%)	0.3	-0.3	0.2	.	0.3	.	-2.7	2.1	-3.5	.	-2.6
Trace Metals (mg/L)											
Aluminum	<	<	<	<	<	<	<	<	<	.	<
Arsenic	<	<	<	<	<	<	<	<	<	.	<
Barium	0.167	0.165	0.52	0.52	0.51	0.52	0.25	0.432	0.109	.	0.109
Beryllium	<	<	<	<	<	<	<	<	<	.	<
Boron	<	<	<	<	<	<	0.537	0.103	<	.	<
Cadmium	<	<	<	<	<	<	<	<	<	.	<
Chromium	<	<	<	<	<	<	0.00794	0.0212	0.0178	.	<
Cobalt	<	<	<	<	<	<	<	<	<	.	<
Copper	<	<	<	<	<	<	<	<	<	.	<
Iron	0.369	0.372	<	<	<	<	0.0589	0.376	0.172	.	15.8
Lead	<	<	<	<	<	<	<	<	0.0504 Q	.	<
Lithium	<	<	0.014	0.014	0.015	0.015	0.0595	0.017	<	.	<
Manganese	0.685	0.682	0.051	0.051	0.045	0.044	<	0.00527	0.00703	.	0.885
Mercury	<	<	.	.	.	.	<	<	<	.	<
Nickel	0.02	0.0206	<	<	<	<	0.0059	0.0524	0.00892	.	<
Silver	<	<	7.2	7.4	7.9	7.9	<	<	<	.	<
Strontium	0.232	0.23	<	<	<	<	0.481	0.84	0.107	.	0.0825
Thallium	<	<	0.73	0.74	0.72	0.73	<	<	<	.	<
Thorium	<	<	<	<	<	<	<	<	<	.	<
Uranium	0.00052	0.00054	<	<	<	<	<	0.00057	<	.	<
Zinc	0.34	0.331	<	<	<	<	<	<	0.163	.	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-832		GW-928				GW-929			
Functional Area	NHP		Y12				Y12			
Date Sampled	01/28/10	08/16/10	03/08/10	04/21/10	08/18/10	11/09/10	03/08/10	04/21/10	08/18/10	11/10/10
Program	BJC	BJC	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type										
Field Measurements										
Time Sampled	14:00	16:00	10:40	9:20	8:45	13:55	9:00	15:15	11:15	8:55
Measuring Point Elev. (ft)	906.18	906.18	1,049.23	1,049.23	1,049.23	1,049.23	1,050.28	1,050.28	1,050.28	1,050.28
Depth to Water (ft)	7.02	6.70	11.00	11.00	12.00	12.00	14.00	13.94	15.00	15.00
Groundwater Elevation (ft)	899.16	899.48	1,038.23	1,038.23	1,037.23	1,037.23	1,036.28	1,036.34	1,035.28	1,035.28
Conductivity (μmho/cm)	521	591	243	539	279	276	46	46	37	36
Dissolved Oxygen (ppm)	3	3.84	4.43	2.2	0.96	0.83	1.74	1.5	1.3	3.74
Iron (++)	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	314	-79	3	116	19	-42	290	208	218	238
Temperature (degrees C)	12.5	21.4	14.8	12.7	22	19	12.8	17	22.2	14.4
Turbidity (NTU)	3	21	.	.	.	.	.	.	.	.
pH	5.83	7.42	7.12	7.18	6.97	6.64	5.17	5.22	5	4.61
Miscellaneous Analytes										
Dissolved Solids (mg/L)	270	250	181	194	171	164	67	65	32	<
Suspended Solids (mg/L)	140	<	<	<	6	2	<	<	<	<
Major Ions (mg/L)										
Calcium	110	58	32.9	33.7	38	36.3	1.22	1.03	0.797	0.783
Magnesium	17	12	5.01	5.16	5.96	5.78	1.42	1.19	0.929	0.928
Potassium	1.7	1.8	2.62	2.34	2.41	2.42	<	<	<	<
Sodium	4.9	11	9.04	8.61	8.43	8.81	3.15	2.81	2.56	2.71
Bicarbonate	230	170	122	121	139	119	22	<Q	18.2	7.53
Carbonate	<	<	<	<	<	<	<	<	<	<
Chloride	8.5	16	1.03	1.04	1.01	1.01	0.95	0.923	0.891	0.969
Fluoride	<	<	0.214	0.205	0.219	0.195	<	<	<	<
Nitrate as N	1.3	1.6	<	<	<	<	<	<	<	<
Sulfate	19	24	11.4	10.9	11.2	11.2	6.2	5.96	4.77	5.39
Charge balance error (%)	14.6	-0.6	-3.9	-2.8	-4.0	1.5	-29.9 R	29.8 R	-34.5 R	-5.9
Trace Metals (mg/L)										
Aluminum	0.98	<	<	<	<	<	0.512	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.07	0.057	0.123	0.107	0.133	0.137	0.034	0.0307	0.0304	0.027
Beryllium	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	0.0101	<	<	0.007	<	0.0116
Cobalt	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	1.8	<	1.25	0.62	1.06	1.26	0.142	<	<	<
Lead	0.0054	<	<	<	<	0.00101	<	<	<	0.00118
Lithium	0.01	<	0.039	0.037	0.0384	0.0399	0.0173	0.0147	0.0131	0.0122
Manganese	0.036	<	0.657	0.666	0.742	0.803	0.185	0.124	0.0642	0.066
Mercury	.	.	<	<	<	<	<	<	<	<
Nickel	<	<	0.0161	0.0109	0.0119	<	0.00784	0.00642	0.0116	0.00641
Silver	4.8	3.4	<	<	<	<	<	<	<	<
Strontium	<	<	0.13	0.125	0.154	0.149	0.00722	0.00628	0.00509	0.00507
Thallium	0.17	0.12	<	<	<	<	<	<	<	<
Thorium	<	<	<	<	<	<	<	<	<	<
Uranium	0.015	0.0051	<	<	<	<	<	<	<	<
Zinc	0.074	<	<	<	0.147	<	<	0.131	<	0.463

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-930				GW-931				GW-934-01	GW-934-02
Functional Area	Y12				Y12				NHP	NHP
Date Sampled	03/09/10	04/22/10	08/19/10	11/09/10	03/09/10	04/22/10	08/19/10	11/08/10	08/10/10	08/11/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type										
Field Measurements										
Time Sampled	9:30	9:30	8:50	9:30	13:50	13:20	13:45	13:45	13:17	8:21
Measuring Point Elev. (ft)	1,005.62	1,005.62	1,005.62	1,005.62	1,006.96	1,006.96	1,006.96	1,006.96	.	.
Depth to Water (ft)	11.00	10.85	10.00	11.00	11.00	10.51	9.00	11.00	.	.
Groundwater Elevation (ft)	994.62	994.77	995.62	994.62	995.96	996.45	997.96	995.96	.	.
Conductivity (μmho/cm)	327	328	333	325	166	152	212	176	608	542
Dissolved Oxygen (ppm)	0.16	0.09	0.1	0.18	1.05	0.66	0.16	0.29	.	.
Iron (++)	.	.	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	-74	3	-192	-206	279	232	168	248	.	.
Temperature (degrees C)	15	15.5	19.9	17.4	11.8	14.7	24.4	20.1	21.1	19.8
Turbidity (NTU)	.	.	.	.	.	.	.	.	.	.
pH	7.95	8.49	8.8	8.62	5.34	5.31	5.53	4.96	7.13	7.25
Miscellaneous Analytes										
Dissolved Solids (mg/L)	252	213	155	199	115	113	122	107	326	353
Suspended Solids (mg/L)	1	<	1	<	<	<	<	<	<	<
Major Ions (mg/L)										
Calcium	34.1	31.9	33.2	31.5	11.1	9.87	24.7	11.6	58.4	53.6
Magnesium	6.58	6.93	6.73	6.3	3.67	3.24	4.51	3.57	32.4	31.4
Potassium	3.23	3.23	3.08	2.91	<	<	2.1	2.02	<	<
Sodium	23.1	26.6	28.5	28.6	9.67	9.87	7.78	10.7	18.2	11.6
Bicarbonate	145	153	187	141	29.8	20.8	69.5	26.4	226	238
Carbonate	<	<	<	21.2	<	<	<	<	<	<
Chloride	4.07	3.38	2.66	2.64	21.6	17.9	6.78	16.6	25.3	22.4
Fluoride	0.272	0.224	0.275	0.227	<	<	<	<	0.218	0.515
Nitrate as N	<	<	<	<	0.295	0.415	0.5	0.335	13.2	4.64
Sulfate	13.9	12.4	7.62	8.6	16.9	18.1	24	21.8	20.4	21.9
Charge balance error (%)	0.2	-0.4	-6.2	-1.5	-10.4	-5.3	-2.8	-2.5	-1.8	-3.7
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.158	0.161	0.164	0.157	0.0422	0.0406	0.0414	0.0486	0.102	0.0529
Beryllium	<	<	<	<	<	<	<	<	<	<
Boron	<	<	<	<	<	<	<	<	0.133	0.197
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	0.00748	<	0.00402	<	<	0.0124	0.00366	<	0.00423	<
Cobalt	<	<	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<	<	<
Iron	0.256	0.0752	0.0859	0.0662	<	<	<	<	<	<
Lead	0.0116	<	0.00061	<	0.0029	<	<	<	<	<
Lithium	0.0208	0.0226	0.0199	0.0204	<	<	<	<	0.0147	0.0127
Manganese	0.535	0.416	0.24	0.198	0.176	0.162	0.229	0.252	<	<
Mercury	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Silver	<	<	<	<	<	<	<	<	<	<
Strontium	0.383	0.442	0.448	0.428	0.0286	0.026	0.0467	0.0298	0.481	0.652
Thallium	<	<	<	<	<	<	<	<	<	<
Thorium	<	<	<	<	<	<	<	<	<	<
Uranium	<	<	<	<	<	<	<	<	0.00066	0.00053
Zinc	0.151	<	<	<	<	0.219	<	<	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	GW-934-04	GW-934-05	GW-934-07	GW-934-09	GW-934-11	GW-934-12	GHK2.51WSW	
Functional Area	NHP	NHP	NHP	NHP	NHP	NHP	EXP-SW	
Date Sampled	08/11/10	08/11/10	08/11/10	08/12/10	08/17/10	08/16/10	08/09/10	
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	
Sample Type								Dup
Field Measurements								
Time Sampled	9:31	10:38	13:56	8:40	13:38	7:56	10:20	10:20
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	490	538	583	574	546	1,356	310	310
Dissolved Oxygen (ppm)	.	.	.	.	.	.	5.42	5.42
Iron (++)	.	.	.	.	.	.	.	.
Manganese (++)	.	.	.	.	.	.	.	.
Oxidation/Reduction (mV)	.	.	.	.	.	.	197	197
Temperature (degrees C)	19.6	21.3	22.7	19.4	21.3	20	19.9	19.9
Turbidity (NTU)	.	.	.	.	.	.	.	.
pH	7.11	7.28	7.17	6.95	7.34	6.92	7.07	7.07
Miscellaneous Analytes								
Dissolved Solids (mg/L)	311	284	292	419	315	792	130	153
Suspended Solids (mg/L)	2	1	1	4	<	<	<	<
Major Ions (mg/L)								
Calcium	48.8	52.1	59.9	57.9	53.2	93.5	39.3	40.5
Magnesium	29.3	33.3	32.2	31.6	31.2	28.8	11.9	12.4
Potassium	<	2.32	<	<	3.59	<	2.55	2.59
Sodium	5.62	8.39	9.33	9.11	9.52	138	2.84	2.96
Bicarbonate	225	232	218	216	235	236	131	128
Carbonate	<	<	<	<	<	<	<	<
Chloride	19.4	23.3	21.8	21.8	29	290	0.743	0.72
Fluoride	0.58	1.46	0.179	0.173	1.2	<	<	<
Nitrate as N	3.08	0.692	12.4	12.2	<	1.39	0.069	0.07
Sulfate	21.9	29.1	19.2	18.7	26.2	7.7	35.5	35.1
Charge balance error (%)	-6.1	-2.2	-1.8	-2.6	-3.3	-0.5	-3.9	-1.2
Trace Metals (mg/L)								
Aluminum	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<
Barium	0.032	0.0415	0.102	0.099	0.0453	0.127	0.0692	0.0712
Beryllium	<	<	<	<	<	<	<	<
Boron	0.102	0.161	<	<	0.169	<	<	<
Cadmium	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<
Cobalt	<	<	<	<	<	<	<	<
Copper	<	<	<	<	<	<	<	<
Iron	0.194	<	<	<	<	<	0.132	0.125
Lead	<	<	<	<	0.05	<	<	<
Lithium	<	0.0126	<	<	0.015	<	<	<
Manganese	<	<	<	<	<	<	0.0324	0.0311
Mercury	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	0.00568	<	<	<
Silver	<	<	<	<	<	<	<	<
Strontium	0.652	1.26	0.496	0.486	1.86	0.148	0.142	0.146
Thallium	<	<	<	<	<	<	<	<
Thorium	<	<	<	<	<	<	<	<
Uranium	<	0.00065	0.000685	0.000705	0.0012	0.00064	<	<
Zinc	<	<	<	<	<	<	<	<

APPENDIX E.1: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, and Trace Metals

Sampling Point	NPR12.0SW	NPR23.0SW	SCR7.1SP	SCR7.8SP	200A6			
Functional Area	EXP-SW	EXP-SW	EXP-SW	EXP-SW	EXP-SW			
Date Sampled	08/09/10	08/09/10	02/17/10	02/17/10	01/21/10	03/11/10	07/13/10	08/04/10
Program	GWPP	GWPP	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type								
Field Measurements								
Time Sampled	11:10	10:45	15:05	15:25	14:50	9:49	9:20	11:02
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.	.	.	.	.
Conductivity (μmho/cm)	183	253	468	327	365	221	417	474
Dissolved Oxygen (ppm)	4.84	4.43	9.25	9.64	8.64	12.16	6.33	5.43
Iron (++)	.	.	0.01	0	.	.	.	.
Manganese (++)	.	.	0.2	0	.	.	.	.
Oxidation/Reduction (mV)	186	192	243	71	66.3	185	238.2	185.5
Temperature (degrees C)	23.2	18.9	13.21	10.97	16.04	11.2	24.57	28.3
Turbidity (NTU)	.	.	6.55	4	12.2	5	21	7
pH	7.41	7.57	6.14	6.31	8.15	8.07	7.99	8.28
Miscellaneous Analytes								
Dissolved Solids (mg/L)	66	116	260	220	220	150	260	260
Suspended Solids (mg/L)	9	<	6.8	<	<	<	8.8	4.6
Major Ions (mg/L)								
Calcium	17.2	34.5	.	.	49	38	53	54
Magnesium	8.81	9.22	.	.	9.1	10	9.6	14
Potassium	4.36	2.72	.	.	1.4	1.3	2.8	2.5
Sodium	4.87	4.27	.	.	11	5.5	14	11
Bicarbonate	94.2	131	.	.	.	.	.	.
Carbonate	<	<	.	.	.	.	.	.
Chloride	0.933	0.628	.	.	.	.	.	.
Fluoride	<	<	.	.	.	.	.	.
Nitrate as N	<	<	.	.	.	.	.	.
Sulfate	7.43	9.75	.	.	.	.	.	.
Charge balance error (%)	-4.0	-1.9	.	.	.	.	.	.
Trace Metals (mg/L)								
Aluminum	1.36	<	.	.	0.22	<	0.45	<
Arsenic	<	<	.	.	<	<	<	<
Barium	0.114	0.0729	.	.	0.05	0.032	0.067	0.052
Beryllium	<	<	.	.	<	<	<	<
Boron	<	<	.	.	0.15	<	0.25	<
Cadmium	<	<	.	.	<	<	<	<
Chromium	0.00274	<	.	.	<	<	<	<
Cobalt	<	<	.	.	<	<	<	<
Copper	<	<	.	.	<	<	<	<
Iron	2.45	0.0898	.	.	0.32	0.12	0.41	<
Lead	0.00224	<	.	.	<	<	<	<
Lithium	<	<	.	.	0.058	<	0.095	0.015
Manganese	0.365	0.00865	.	.	0.047	0.046	0.06	0.028
Mercury	<	<	.	.	.	.	.	.
Nickel	0.00512	<	.	.	<	<	<	<
Silver	<	<	.	.	2.2	2	3.1	3.3
Strontium	0.0845	0.069	.	.	<	<	<	<
Thallium	<	<	.	.	0.13	0.098	0.14	0.16
Thorium	<	<	.	.	<	<	<	<
Uranium	<	<	.	.	0.09	<	0.1	0.01
Zinc	<	<	.	.	<	<	<	<

Sampling Point	STATION 8			
Functional Area	EXP-SW			
Date Sampled	01/21/10	03/11/10	07/13/10	08/04/10
Program	BJC	BJC	BJC	BJC
Sample Type				
Field Measurements				
Time Sampled	14:30	9:59	9:00	11:18
Measuring Point Elev. (ft)	.	.	.	.
Depth to Water (ft)	.	.	.	.
Groundwater Elevation (ft)	.	.	.	.
Conductivity (μmho/cm)	344	221	371	329
Dissolved Oxygen (ppm)	8.87	11.92	8.11	6.59
Iron (++)	.	.	.	.
Manganese (++)	.	.	.	.
Oxidation/Reduction (mV)	66.5	175	246.3	164
Temperature (degrees C)	14.36	12.29	21.36	22.7
Turbidity (NTU)	8.84	5	16	11
pH	8.09	8.26	7.91	7.2
Miscellaneous Analytes				
Dissolved Solids (mg/L)	200	150	200	220
Suspended Solids (mg/L)	<	<	9	5.6
Major Ions (mg/L)				
Calcium	43	39	43	46
Magnesium	9.7	10	9	12
Potassium	1.3	1.3	1.5	1.8
Sodium	10	6.3	7.8	9
Bicarbonate	.	.	.	.
Carbonate	.	.	.	.
Chloride	.	.	.	.
Fluoride	.	.	.	.
Nitrate as N	.	.	.	.
Sulfate	.	.	.	.
Charge balance error (%)	.	.	.	.
Trace Metals (mg/L)				
Aluminum	<	<	0.3	<
Arsenic	<	<	<	<
Barium	0.042	0.035	0.046	0.041
Beryllium	<	<	<	<
Boron	<	<	0.13	<
Cadmium	<	<	<	<
Chromium	<	<	<	<
Cobalt	<	<	<	<
Copper	<	<	<	<
Iron	0.26	0.15	0.26	<
Lead	<	<	<	<
Lithium	0.022	0.01	0.061	<
Manganese	0.043	0.039	0.057	0.043
Mercury	.	.	.	.
Nickel	<	<	<	<
Silver	2	2	2.7	2.9
Strontium	<	<	<	<
Thallium	0.13	0.1	0.12	0.13
Thorium	<	<	<	<
Uranium	0.036	0.0062	0.047	0.0042
Zinc	<	<	<	<

APPENDIX E.2

VOLATILE ORGANIC COMPOUNDS

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	55-2B	55-2C		55-3A		55-3B		55-3C		56-1A
Functional Area	GRIDB3	GRIDB3		B9201-5		B9201-5		B9201-5		Y12
Date Sampled	04/19/10	04/19/10		03/01/10	08/05/10	03/01/10	08/05/10	03/01/10	08/05/10	03/04/10
Program	GWPP	GWPP		GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type			Dup							
Chloroethenes (µg/L)										
Tetrachloroethene	380	260	240	14,000	19,000	47,000	60,000	6,500	14,000	<
Trichloroethene	200	170	180	1,000	1,800	4,500	7,400	1,100	1,500	<
cis-1,2-Dichloroethene	430	480	410	880	1,500	1,000	1,800	970	1,600	<
trans-1,2-Dichloroethene	6	7	7	15	28	37	67	15	24	<
1,1-Dichloroethene	13	15	16	20	40	110	200	31	34	<
Vinyl chloride	12	12	11	41	62	87	260 J	100	120	<
Chloroethanes (µg/L)										
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	<	<
1,1,1-Trichloroethane	2 J	<	1 J	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	11	16	15	4 J	6	26	34	6	4 J	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	3 J
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	1 J	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	2 J	2 J	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	<	<
Miscellaneous (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	300	190	170	16	26	<	<	3 J	15	<
Trichlorofluoromethane	2 J	<	1 J	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (µg/L)										
Ethane	.	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	**56-1C**	**56-2A**	**56-2B**	**56-2C**	**56-3A**	**56-3B**	**56-3C**	**56-4A**	**56-6A**	**60-1A**
Functional Area	**Y12**	**GRIDC3**	**GRIDC3**	**GRIDC3**	**Y12**	**Y12**	**Y12**	**Y12**	**Y12**	**Y12**
Date Sampled	**03/04/10**	**02/16/10**	**02/16/10**	**02/16/10**	**03/03/10**	**03/03/10**	**03/03/10**	**03/01/10**	**10/18/10**	**04/13/10**
Program	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**
Sample Type		**PDB**	**PDB**	**PDB**				**NP**		
Chloroethenes (μg/L)										
Tetrachloroethene	<	18	630	53	32	110	460	2 J	<	<
Trichloroethene	<	3 J	48	87	3 J	8	32	<	<	<
cis-1,2-Dichloroethene	<	3 J	60	1,000	5 J	12	63	<	<	<
trans-1,2-Dichloroethene	<	<	1 J	9	<	<	1 J	<	<	<
1,1-Dichloroethene	<	<	1 J	13	<	<	1 J	<	<	<
Vinyl chloride	<	<	<	53	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1,2-Tetrachloroethane	<	.	.	.	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Styrene	<	.	.	.	<	<	<	<	<	<
Miscellaneous (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	2 J	<	<	<	<	<	<	<
Trichlorofluoromethane	<	<	<	<	<	<	<	<	<	<
Acetone	<	.	.	.	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)										
Ethane	.	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-106	GW-108		GW-109	GW-148		GW-151		GW-153	GW-154	
Functional Area	S3	S3		S3	NHP		NHP		NHP	NHP	
Date Sampled	10/19/10	01/06/10	08/04/10	10/21/10	03/08/10		01/28/10	08/16/10	04/14/10	02/02/10	08/18/10
Program	GWPP	BJC	BJC	GWPP	GWPP		BJC	BJC	GWPP	BJC	BJC
Sample Type						Dup			PDB		
Chloroethenes (µg/L)											
Tetrachloroethene	<	8	7	78	<	<	760	780	<	<	<
Trichloroethene	<	4	3.8	2 J	<	<	130	130	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	19	19	72	70	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	1.2	1.4	<	<	<	2.1	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)											
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	.	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)											
Carbon tetrachloride	<	<	<	<	<	<	1,100	1,200	71	<	<
Chloroform	<	32	34	4 J	<	<	63	65	4 J	<	<
Methylene chloride	<	56	55	12	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)											
Benzene	<	1.2	1.5	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	.	<	<
Miscellaneous (µg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	<	.	.	<	<	<	.	.	<	.	.
Trichlorofluoromethane	<	.	.	<	<	<	.	.	<	.	.
Acetone	<	<	<	<	<	<	<	<	.	<	<
Bromoform	<	3.9	3.8	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (µg/L)											
Ethane	.	.	.	.	.	.	<	<	.	<	<
Ethylene	.	.	.	.	.	.	<	<	.	<	<
Methane	.	.	.	.	.	.	72	76	.	5.8	23

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-169		GW-170				GW-171	GW-172	GW-220	GW-223	
Functional Area	**EXP-UV**		**EXP-UV**				**EXP-UV**	**EXP-UV**	**NHP**	**NHP**	
Date Sampled	**01/27/10**	**08/19/10**	**01/27/10**		**08/19/10**		**08/04/10**	**08/04/10**	**08/03/10**	**01/28/10**	**08/17/10**
Program	**BJC**	**BJC**	**BJC**		**BJC**		**BJC**	**BJC**	**GWPP**	**BJC**	**BJC**
Sample Type				**Dup**		**Dup**					
Chloroethenes (µg/L)											
Tetrachloroethene	2	2	1	1	<	<	<	<	520	32	45
Trichloroethene	<	<	1.5	1.5	1.3	1.3	<	<	100	15	17
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	55	44	33
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	2 J	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	6.1	2.6
Chloroethanes (µg/L)											
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)											
Carbon tetrachloride	<	<	3.6	3.5	1	1.2	<	<	920	<	<
Chloroform	<	<	1.3	1.2	<	<	<	<	62	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)											
Benzene	<	<	1	<	1.1	1.2	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	<	<	<
Miscellaneous (µg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	<	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	<	.	.
Acetone	<	<	<	<	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (µg/L)											
Ethane	.	.	.	.	.	.	.	.	.	<	<
Ethylene	.	.	.	.	.	.	.	.	.	<	<
Methane	.	.	.	.	.	.	.	.	.	54	120

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-230	GW-240	GW-251		GW-253	GW-269	GW-274	GW-275	GW-281	GW-332	GW-337
Functional Area	**EXP-UV**	**NHP**	**S2**		**S2**	**SY**	**SY**	**SY**	**FF**	**WC**	**WC**
Date Sampled	**08/04/10**	**04/14/10**	**10/20/10**		**01/27/10**	**12/09/10**	**12/09/10**	**12/09/10**	**05/24/10**	**11/16/10**	**10/26/10**
Program	**BJC**	**GWPP**	**GWPP**		**BJC**	**GWPP**	**GWPP**	**GWPP**	**BJC**	**GWPP**	**GWPP**
Sample Type		**PDB**		**Dup**		**PDB**				**PDB**	
Chloroethenes (μg/L)											
Tetrachloroethene	<	1 J	85	84	600	8	1,300	<	<	380	490
Trichloroethene	<	<	30	31	420	3 J	10	<	<	140	460
cis-1,2-Dichloroethene	7	<	1 J	1 J	230	43	43	<	<	450	1,800
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	8	25
1,1-Dichloroethene	<	<	<	<	5.1	96	1 J	<	<	21	74
Vinyl chloride	1.5	<	<	<	85	<	4	<	<	9	22
Chloroethanes (μg/L)											
1,1,1,2-Tetrachloroethane	<	.	<	<	<	.	<	<	<	.	<
1,1,1-Trichloroethane	<	<	<	<	<	5	<	<	<	4 J	40
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	2 J	<	<	<	16	51
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)											
Carbon tetrachloride	<	2 J	<	<	20	<	<	<	<	<	<
Chloroform	<	<	4 J	4 J	28	1 J	11	<	<	<	<
Methylene chloride	<	<	<	<	<	<	23	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)											
Benzene	<	<	<	<	<	<	200	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	<	.	<	<	<	.	<	<	<	.	<
Miscellaneous (μg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	.	<	<	<	.	14	<	<	.	2,600	1,100
Trichlorofluoromethane	.	<	<	<	.	<	<	<	.	7	<
Acetone	<	.	<	<	<	.	<	<	<	.	<
Bromoform	<	<	<	<	<	<	6	<	<	<	<
Chlorobenzene	1.1	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)											
Ethane	.	.	.	.	1.4 J	.	.	.	.	.	.
Ethylene	.	.	.	.	<	.	.	.	.	.	.
Methane	.	.	.	.	9.4	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
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Sampling Point	GW-380		GW-381	GW-382		GW-383	GW-605			
Functional Area	NHP		NHP	NHP		NHP	EXP-I			
Date Sampled	01/28/10	08/18/10	04/14/10	02/03/10	08/18/10	04/14/10	01/05/10		07/21/10	
Program	BJC	BJC	GWPP	BJC	BJC	GWPP	BJC	BJC	BJC	BJC
Sample Type			PDB			PDB		Dup		Dup
Chloroethenes (µg/L)										
Tetrachloroethene	<	<	3 J	34	20	220	110	120	130	130
Trichloroethene	<	<	<	5.9	<	160	100	110	150	140
cis-1,2-Dichloroethene	<	<	7	7	<	180	160	160	210	210
trans-1,2-Dichloroethene	<	<	<	<	<	2 J	1.1	1.1	1.7	1.8
1,1-Dichloroethene	<	<	<	<	<	4 J	1.2	1.2	1.7	1.6
Vinyl chloride	<	<	<	<	<	3	1.3	1.4	1.8	1.8
Chloroethanes (µg/L)										
1,1,1,2-Tetrachloroethane	<	<	.	<	<	.	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	1 J	<	<	<	<
Chloromethanes (µg/L)										
Carbon tetrachloride	<	<	3,900	400	460	<	74	78	93	93
Chloroform	<	<	1,900	96	110	<	13	13	18	18
Methylene chloride	<	<	7	2.9	57	<	<	<	<	<
Chloromethane	<	<	5	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	.	<	<	.	<	<	<	<
Miscellaneous (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	<	.	.	<	.	.	.	.
Trichlorofluoromethane	.	.	<	.	.	<	.	.	.	.
Acetone	<	<	.	<	<	.	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	3 J	<	<	<	<
Natural Attenuation (µg/L)										
Ethane	<	<	.	<	<	.	.	.	.	.
Ethylene	<	<	.	<	<	.	.	.	.	.
Methane	<	<	.	720	870	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-606		GW-618	GW-619		GW-620	GW-633	GW-656	GW-658	GW-686
Functional Area	**EXP-I**		**EXP-E**	**FTF**		**FTF**	**RG**	**T0134**	**FF**	**CPT**
Date Sampled	**01/05/10**	**07/21/10**	**02/22/10**	**04/15/10**		**04/15/10**	**11/22/10**	**10/28/10**	**05/24/10**	**11/03/10**
Program	**BJC**	**BJC**	**BJC**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**GWPP**	**BJC**	**GWPP**
Sample Type				**PDB**	**Dup**	**PDB**				
Chloroethenes (μg/L)										
Tetrachloroethene	6	4	3	2 J	2 J	<	190 J	22	<	<
Trichloroethene	<	<	5.4	2 J	3 J	<	5 J	1,900	<	<
cis-1,2-Dichloroethene	<	<	8	3 J	3 J	<	9	120	<	11
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	18	<	<
1,1-Dichloroethene	<	<	<	<	<	<	2 J	150	<	<
Vinyl chloride	<	<	<	<	<	<	<	5	<	<
Chloroethanes (μg/L)										
1,1,1,2-Tetrachloroethane	<	<	<	.	.	.	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	480	<
1,1-Dichloroethane	<	<	<	<	<	<	<	10	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	24	29	<	<	<	<	<	<	<	<
Chloroform	31	40	<	<	<	<	10	<	<	<
Methylene chloride	<	<	<	<	<	<	14	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	2,000	<	7,800	<
Ethylbenzene	<	<	<	<	<	<	<	<	570	<
Toluene	<	<	<	<	<	<	<	<	2,400	<
Total Xylene	<	<	<	<	<	<	24	<	8,300	<
Styrene	<	<	<	.	.	.	<	<	<	<
Miscellaneous (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	<	<	<	<	<	.	<
Trichlorofluoromethane	.	.	.	<	<	<	<	<	.	<
Acetone	<	<	<	.	.	.	<	<	<	<
Bromoform	<	<	<	<	<	<	2 J	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)										
Ethane	.	.	<	.	.	.	.	.	.	.
Ethylene	.	.	<	.	.	.	.	.	.	.
Methane	.	.	29	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-690	GW-691		GW-692		GW-698		GW-700		GW-722-14	
Functional Area	CPT	CPT		CPT		B8110		B8110		EXP-J	
Date Sampled	11/03/10	04/14/10	11/02/10	11/02/10		04/13/10	11/03/10	02/16/10		02/18/10	07/29/10
Program	GWPP	GWPP	GWPP	GWPP		GWPP	GWPP	GWPP	GWPP	BJC	GWPP
Sample Type					Dup			PDB	Dup		
Chloroethenes (µg/L)											
Tetrachloroethene	50	290	15	3 J	3 J	90	140	17	16	2.2	<
Trichloroethene	3 J	2 J	<	12	13	270	480	8	7	1.1	<
cis-1,2-Dichloroethene	4 J	2 J	<	29	32	30	43	190	180	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	2 J	2 J	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)											
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	.	.	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	2 J	2 J	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)											
Carbon tetrachloride	<	<	<	<	<	2 J	3 J	<	<	15	8
Chloroform	<	<	<	<	<	8	11	<	<	1.5	1 J
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)											
Benzene	<	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	.	.	<	<
Miscellaneous (µg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	<	15	40	<	<	.	<
Trichlorofluoromethane	<	<	<	<	<	<	<	<	<	.	<
Acetone	<	<	<	<	<	<	<	.	.	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (µg/L)											
Ethane	.	.	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-722-17		GW-722-20		GW-722-22		GW-722-33		GW-733	
Functional Area	**EXP-J**		**EXP-J**		**EXP-J**		**EXP-J**		**EXP-J**	
Date Sampled	**02/18/10**	**07/29/10**	**02/18/10**	**08/02/10**	**02/18/10**	**08/02/10**	**02/18/10**	**08/04/10**	**01/05/10**	**07/21/10**
Program	**BJC**	**GWPP**	**BJC**	**GWPP**	**BJC**	**GWPP**	**BJC**	**GWPP**	**BJC**	**BJC**
Sample Type										
Chloroethenes (μg/L)										
Tetrachloroethene	4.7	2 J	11	3 J	4.7	2 J	<	<	<	<
Trichloroethene	1.2	<	2.4	<	1.6	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	24	19	37	22	12	9	<	<	5.4	3.5
Chloroform	5.4	5 J	9.3	6	1.3	1 J	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	<	<
Miscellaneous (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	<	.	<	.	<	.	<	.	.
Trichlorofluoromethane	.	<	.	<	.	<	.	<	.	.
Acetone	19	<	<	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)										
Ethane	.	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-744	GW-747	GW-748		GW-762				GW-763	GW-769	
Functional Area	GRIDK1	GRIDK2	GRIDK2		GRIDJ3				GRIDJ3	GRIDG3	
Date Sampled	08/03/10	08/04/10	08/10/10		02/02/10		08/19/10		04/14/10	04/14/10	11/16/10
Program	GWPP	GWPP	GWPP	GWPP	BJC	BJC	BJC	BJC	GWPP	GWPP	GWPP
Sample Type				Dup		Dup		Dup	PDB	PDB	PDB
Chloroethenes (μg/L)											
Tetrachloroethene	<	<	<	<	2,600	2,500	2,300	2,900	<	11	19
Trichloroethene	<	<	<	<	210	210	210	270	<	4 J	5 J
cis-1,2-Dichloroethene	<	<	<	<	74	72	<	85	<	4 J	3 J
trans-1,2-Dichloroethene	<	<	<	<	4.2	4.1	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	63	63	<	69	<	1 J	2 J
Vinyl chloride	<	<	<	<	5.7	5.7	<	<	<	<	<
Chloroethanes (μg/L)											
1,1,1,2-Tetrachloroethane	<	<	<	<	1.5	1.4	<	<	.	.	.
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	14	14	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)											
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	100	170
Chloroform	<	<	<	<	<	<	<	<	<	5 J	5
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)											
Benzene	<	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	.	.	.
Miscellaneous (μg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	.	.	.	.	<	<	2 J
Trichlorofluoromethane	<	<	<	<	.	.	.	.	<	<	<
Acetone	<	<	<	<	<	<	<	<	.	.	.
Bromoform	<	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)											
Ethane	.	.	.	.	<	<	<	<	.	.	.
Ethylene	.	.	.	.	<	<	<	<	.	.	.
Methane	.	.	.	.	22	23	24	22	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-770	GW-781	GW-782	GW-783	GW-791	GW-792	GW-802	GW-816	GW-820	GW-832	
Functional Area	GRIDG3	GRIDE3	GRIDE3	GRIDE3	GRIDD2	GRIDD2	FF	EXP-SR	B9201-2	NHP	
Date Sampled	04/14/10	03/10/10	03/10/10	03/03/10	02/16/10	02/17/10	05/24/10	02/24/10	11/16/10	01/28/10	08/16/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	BJC	GWPP	GWPP	BJC	BJC
Sample Type	PDB			PDB	PDB				PDB		
Chloroethenes (µg/L)											
Tetrachloroethene	<	<	34	3 J	360	4 J	<	<	490	9.3	6.4
Trichloroethene	<	<	20	1 J	17	<	<	<	420	1.9	1.1
cis-1,2-Dichloroethene	<	<	11	1 J	6	<	<	<	2,500	1.3	<
trans-1,2-Dichloroethene	<	<	3 J	<	<	<	<	<	16	<	<
1,1-Dichloroethene	<	<	4 J	<	<	<	<	<	13	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	73	<	<
Chloroethanes (µg/L)											
1,1,1,2-Tetrachloroethane	.	<	<	.	.	<	<	<	.	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	16	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<	<
Chloromethanes (µg/L)											
Carbon tetrachloride	35	<	<	<	<	<	<	<	<	11	7.6
Chloroform	3 J	<	<	<	<	<	<	<	<	1.1	1.5
Methylene chloride	<	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)											
Benzene	<	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<	<
Styrene	.	<	<	.	.	<	<	<	.	<	<
Miscellaneous (µg/L)											
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	<	<	.	<	23	.	.
Trichlorofluoromethane	<	<	<	<	<	<	.	<	<	.	.
Acetone	.	<	<	.	.	<	<	<	.	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (µg/L)											
Ethane	.	.	.	.	.	.	.	.	.	1.1 J	<
Ethylene	.	.	.	.	.	.	.	.	.	<	<
Methane	.	.	.	.	.	.	.	.	.	9.5	<

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-928				GW-929				GW-930	
Functional Area	Y12				Y12				Y12	
Date Sampled	03/08/10	04/21/10	08/18/10	11/09/10	03/08/10	04/21/10	08/18/10	11/10/10	03/09/10	04/22/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type										
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	<	3 Q
Trichloroethene	<	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)										
Carbon tetrachloride	<	<	<	<	<	<	<	<	<	8 Q
Chloroform	<	<	<	<	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)										
Benzene	<	<	<	<	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<	<	<	<
Miscellaneous (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	<	<	<	<	<	2 Q
Trichlorofluoromethane	<	<	<	<	<	<	<	<	<	<
Acetone	<	<	<	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)										
Ethane	.	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-930		GW-931				GW-934-01	GW-934-02	GW-934-04
Functional Area	Y12		Y12				NHP	NHP	NHP
Date Sampled	08/19/10	11/09/10	03/09/10	04/22/10	08/19/10	11/08/10	08/10/10	08/11/10	08/11/10
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type									
Chloroethenes (μg/L)									
Tetrachloroethene	<	<	<	<	<	<	2,600	69	17
Trichloroethene	<	<	<	<	<	<	67	13	7
cis-1,2-Dichloroethene	<	<	<	<	<	<	58	14	6
trans-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	12	4 J	1 J
Vinyl chloride	<	<	<	<	<	<	<	<	<
Chloroethanes (μg/L)									
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	8	3 J	<
Chloroethane	<	<	<	<	<	<	<	<	<
Chloromethanes (μg/L)									
Carbon tetrachloride	<	<	<	<	<	<	2,500	760	380
Chloroform	<	<	<	<	<	<	190 J	350	140
Methylene chloride	<	<	<	<	<	<	<	10	3 J
Chloromethane	<	<	<	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)									
Benzene	<	<	<	<	<	<	<	6	1 J
Ethylbenzene	<	<	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<	4 J	4 J
Total Xylene	<	<	<	<	<	<	<	2 J	2 J
Styrene	<	<	<	<	<	<	<	2 J	<
Miscellaneous (μg/L)									
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	<	<	2 J	<	<
Trichlorofluoromethane	<	<	<	<	<	<	16	8	2 J
Acetone	<	<	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<	<	<
Natural Attenuation (μg/L)									
Ethane	.	.	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	GW-934-05	GW-934-07	GW-934-09	GW-934-11	GW-934-12	GHK2.51WSW	
Functional Area	NHP	NHP	NHP	NHP	NHP	EXP-SW	
Date Sampled	08/11/10	08/11/10	08/12/10	08/17/10	08/16/10	08/09/10	
Program	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP	GWPP
Sample Type							Dup
Chloroethenes (µg/L)							
Tetrachloroethene	25	630	330	11	4 J	<	<
Trichloroethene	8	64	56	4 J	2 J	<	<
cis-1,2-Dichloroethene	10	46	44	8	5	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<	<
1,1-Dichloroethene	2 J	13	11	<	<	<	<
Vinyl chloride	<	<	<	<	<	<	<
Chloroethanes (µg/L)							
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<	<
1,1-Dichloroethane	2 J	7	6	2 J	<	<	<
Chloroethane	<	<	<	<	<	<	<
Chloromethanes (µg/L)							
Carbon tetrachloride	350	4,100	2,700	190	600	<	<
Chloroform	150	240	190	140	63	<	<
Methylene chloride	4 J	<	<	3 J	<	<	<
Chloromethane	<	<	<	<	<	<	<
Petrol. Hydrocarb. (µg/L)							
Benzene	2 J	<	<	2 J	<	<	<
Ethylbenzene	<	<	<	<	<	<	<
Toluene	<	<	<	<	<	<	<
Total Xylene	2 J	<	<	<	<	<	<
Styrene	<	<	<	<	<	<	<
Miscellaneous (µg/L)							
1,1,2-Trichloro-1,2,2-trifluoroethane	<	4 J	2 J	<	<	<	<
Trichlorofluoromethane	3 J	25	16	<	<	<	<
Acetone	<	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<	<
Natural Attenuation (µg/L)							
Ethane	.	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.	.
Methane	.	.	.	.	.	.	.

APPENDIX E.2: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Volatile Organic Compounds

Sampling Point	NPR12.0SW		NPR23.0SW		SCR7.1SP	SCR7.8SP
Functional Area	EXP-SW		EXP-SW		EXP-SW	EXP-SW
Date Sampled	08/09/10	11/04/10	08/09/10	11/04/10	02/17/10	02/17/10
Program	GWPP	GWPP	GWPP	GWPP	BJC	BJC
Sample Type						
Chloroethenes (μg/L)						
Tetrachloroethene	2 Q	<	8 Q	<	<	<
Trichloroethene	<	<	<	<	1	<
cis-1,2-Dichloroethene	<	<	<	<	<	<
trans-1,2-Dichloroethene	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<
Vinyl chloride	<	<	<	<	<	<
Chloroethanes (μg/L)						
1,1,1,2-Tetrachloroethane	<	<	<	<	<	<
1,1,1-Trichloroethane	<	<	<	<	<	<
1,2-Dichloroethane	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<
Chloroethane	<	<	<	<	<	<
Chloromethanes (μg/L)						
Carbon tetrachloride	<	<	<	<	<	<
Chloroform	<	<	<	<	<	<
Methylene chloride	<	<	<	<	<	<
Chloromethane	<	<	<	<	<	<
Petrol. Hydrocarb. (μg/L)						
Benzene	<	<	<	<	<	<
Ethylbenzene	<	<	<	<	<	<
Toluene	<	<	<	<	<	<
Total Xylene	<	<	<	<	<	<
Styrene	<	<	<	<	<	<
Miscellaneous (μg/L)						
1,1,2-Trichloro-1,2,2-trifluoroethane	<	<	<	<	.	.
Trichlorofluoromethane	<	<	<	<	.	.
Acetone	<	<	<	<	<	<
Bromoform	<	<	<	<	<	<
Chlorobenzene	<	<	<	<	<	<
cis-1,3-Dichloropropene	<	<	<	<	<	<
Natural Attenuation (μg/L)						
Ethane	.	.	.	.	.	.
Ethylene	.	.	.	.	.	.
Methane	.	.	.	.	.	.

APPENDIX E.3

RADIOLOGICAL ANALYTES

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Activity	TPU	MDA	Activity	TPU	MDA
55-3A	B9201-5	03/01/10	GWPP		<	.	3.6	9.8	4.1	7.4
		08/05/10	GWPP		<	.	5.5	8.3	4.3	7.5
55-3B	B9201-5	03/01/10	GWPP		<	.	2.7	<	.	6.2
		08/05/10	GWPP		<	.	4.3	<	.	8.9
55-3C	B9201-5	03/01/10	GWPP		<	.	2.8	<	.	6.2
		08/05/10	GWPP		4.6	3.8	3.9	9	4.3	7.5
56-1A	Y12	03/04/10	GWPP		2.8	2.7	2.7	<	.	7.2
56-1C	Y12	03/04/10	GWPP		<	.	2.8	<	.	7.2
56-3A	Y12	03/03/10	GWPP		<	.	2.5	<	.	6.2
56-3B	Y12	03/03/10	GWPP		<	.	2.6	<	.	5.8
56-3C	Y12	03/03/10	GWPP		<	.	2.5	<	.	6.7
56-4A	Y12	03/01/10	GWPP	NP	<	.	2.6	<	.	5.9
56-6A	Y12	10/18/10	GWPP		7.1	4.2	3.8	<	.	7.9
60-1A	Y12	04/13/10	GWPP		<	.	3.3	<	.	7.3
GW-106	S3	10/19/10	GWPP		<	.	2.2	<	.	8.2
GW-108	S3	01/06/10	BJC		262	69.2	66.5	14,800	2,370	98.7
		08/04/10	BJC		89.2	42.9	60.7	6,320	1,020	104
GW-109	S3	10/21/10	GWPP		<	.	450	<	.	810
GW-148	NHP	03/08/10	GWPP		3.1	3.1	2.9	<	.	7.3
			GWPP	Dup	<	.	3.6	<	.	6.5
GW-151	NHP	01/28/10	BJC		<	.	1.84	<	.	3.26
		08/16/10	BJC		1.95	0.934	1.39	6	1.68	2.5
GW-154	NHP	02/02/10	BJC		455	73.4	2.26	125	20.7	6.96
		08/18/10	BJC		277	45.4	1.73	50.3	9.25	6.28
GW-169	EXP-UV	01/27/10	BJC		<	.	3.15	<	.	3.59
		08/19/10	BJC		<	.	2.18	<	.	3.27
GW-170	EXP-UV	01/27/10	BJC		<	.	3.6	11	3.21	4.65
			BJC	Dup	<	.	2.63	12	2.98	3.76
		08/19/10	BJC		<	.	1.53	15	2.91	2.59
			BJC	Dup	<	.	2.14	13	3	3
GW-204	T0134	10/28/10	GWPP		26	5	3.2	<	.	8
GW-223	NHP	01/28/10	BJC		15	3.89	2.6	10	3	4
		08/17/10	BJC		11.8	3.33	2.7	10.6	3.2	4.85
GW-253	S2	01/27/10	BJC		23.9	5.05	3.68	19.1	4.64	5.33
GW-274	SY	12/09/10	GWPP		<	.	33	1,300	95	72
GW-275	SY	12/09/10	GWPP		<	.	160	<	.	180
GW-337	WC	10/26/10	GWPP		<	.	2.7	8	4.20	7.4
GW-380	NHP	01/28/10	BJC		<	.	2.38	<	.	4.35
		08/18/10	BJC		4.73	2.43	2.86	6	2.52	4.19
GW-382	NHP	02/03/10	BJC		<	.	3.38	<	.	4.6
		08/18/10	BJC		<	.	3.37	<	.	4.42
GW-605	EXP-I	01/05/10	BJC		43.4	8.31	2.36	13.1	3.45	4.53
			BJC	Dup	43.5	8.39	2.87	15.1	3.72	4.6
		07/21/10	BJC		37.5	7.69	2.9	27.1	5.49	4.74
			BJC	Dup	40.5	8.33	3.31	23.5	5.11	5.49
GW-606	EXP-I	01/05/10	BJC		7.47	2.59	2.9	6.89	2.52	4.21
		07/21/10	BJC		4.08	2.28	3.41	<	.	4.32

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Activity	TPU	MDA	Activity	TPU	MDA
GW-618	EXP-E	02/22/10	BJC		<	.	3.1	11.6	3.18	4.27
GW-633	RG	11/22/10	GWPP		64	57	53	1,600	110	90
GW-656	T0134	10/28/10	GWPP		<	.	4.9	<	.	8
GW-686	CPT	11/03/10	GWPP		<	.	8.3	<	.	8.4
GW-690	CPT	11/03/10	GWPP		<	.	5.5	<	.	7.8
GW-691	CPT	11/02/10	GWPP		<	.	6.3	<	.	8.9
GW-692	CPT		GWPP		7.1	6	5.2	8.3	4.4	7.7
		11/02/10	GWPP	Dup	<	.	9.7	<	.	8.9
GW-698	B8110	11/03/10	GWPP		<	.	7.9	<	.	9
GW-722-14	EXP-J	07/29/10	GWPP		<	.	4	<	.	6.7
GW-722-17	EXP-J	07/29/10	GWPP		<	.	4	<	.	6.9
GW-722-20	EXP-J	08/02/10	GWPP		<	.	3.4	<	.	7.6
GW-722-22	EXP-J	08/02/10	GWPP		7.3	3.7	2.6	<	.	7.6
GW-722-33	EXP-J	08/04/10	GWPP		<	.	4.1	<	.	8.8
GW-733	EXP-J	01/05/10	BJC		<	.	2.49	<	.	3.93
		07/21/10	BJC		<	.	1.74	<	.	3.38
GW-744	GRIDK1	08/03/10	GWPP		<	.	5	<	.	8.7
GW-747	GRIDK2	08/04/10	GWPP		<	.	3.4	<	.	6.8
GW-748	GRIDK2		GWPP		<	.	4.8	<	.	7.7
		08/10/10	GWPP	Dup	<	.	4.3	<	.	7.2
GW-762	GRIDJ3		BJC		<	.	2.32	9	2.35	2.94
		02/02/10	BJC	Dup	<	.	2.54	<	.	4.1
			BJC		<	.	1.71	5.24	1.77	2.88
		08/19/10	BJC	Dup	<	.	2.73	4.37	2.06	3.77
GW-781	GRIDE3	03/10/10	GWPP		<	.	2.5	<	.	6.7
GW-782	GRIDE3	03/10/10	GWPP		13	3.6	2.9	<	.	7.2
GW-792	GRIDD2	02/17/10	GWPP		2.9	2.5	1.3	<	.	6
GW-816	EXP-SR	02/24/10	GWPP		<	.	2.5	<	.	5.7
GW-832	NHP	01/28/10	BJC		4.89	2	2.8	7.67	2.29	3.47
		08/16/10	BJC		<	.	1.28	4.46	1.37	2.1
GW-928	Y12	03/08/10	GWPP		<	.	2.6	<	.	7.2
		04/21/10	GWPP		<	.	2.8	<	.	7.1
		08/18/10	GWPP		<	.	3.2	<	.	8.6
		11/09/10	GWPP		<	.	2.9	<	.	7.5
GW-929	Y12	03/08/10	GWPP		<	.	2.4	<	.	7
		04/21/10	GWPP		<	.	2.1	<	.	6.5
		08/18/10	GWPP		<	.	4.3	<	.	8.7
		11/10/10	GWPP		<	.	3.6	<	.	8.7
GW-930	Y12	03/09/10	GWPP		<	.	2.4	<	.	6.2
		04/22/10	GWPP		<	.	2.5	9.1	4	7.1
		08/19/10	GWPP		<	.	6.4	<	.	7.9
		11/09/10	GWPP		<	.	2.6	<	.	7.5
GW-931	Y12	03/09/10	GWPP		<	.	2.3	<	.	5.7
		04/22/10	GWPP		<	.	2.3	<	.	5.7
		08/19/10	GWPP		<	.	4.4	<	.	9
		11/08/10	GWPP		<	.	3.4	<	.	7.1

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Activity	TPU	MDA	Activity	TPU	MDA
GW-934-01	NHP	08/10/10	GWPP		<	.	4.8	11	4.9	9
GW-934-02	NHP	08/11/10	GWPP		<	.	4.5	<	.	9.5
GW-934-04	NHP	08/11/10	GWPP		<	.	4.6	<	.	8.9
GW-934-05	NHP	08/11/10	GWPP		<	.	4.5	27	5.9	8.8
GW-934-07	NHP	08/11/10	GWPP		<	.	3.9	<	.	8
GW-934-09	NHP	08/12/10	GWPP		<	.	5.7	<	.	8.6
GW-934-11	NHP	08/17/10	GWPP		<	.	5	<	.	8.4
GW-934-12	NHP	08/16/10	GWPP		<	.	6.2	<	.	9.2
GHK2.51WSW	EXP-SW	08/09/10	GWPP		<	.	4.5	<	.	7.7
			GWPP	Dup	<	.	5.1	<	.	8.7
NPR12.0SW	EXP-SW	08/09/10	GWPP		<	.	4.3	<	.	9
NPR23.0SW	EXP-SW	08/09/10	GWPP		<	.	4.3	<	.	8.8
STATION 8	EXP-SW	01/21/10	BJC		8.71	3.11	2.88	6.86	2.8	4.67
		03/11/10	BJC		2.52	1.13	1.55	3.4	1.41	2.48
		07/13/10	BJC		19.7	4.55	2.48	13.8	3.15	3.4
		08/04/10	BJC		<	.	2.35	5.49	2.1	3.56

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	GW-106			GW-108						GW-109		
Functional Area	S3			S3						S3		
Date Sampled	10/19/2010			1/6/2010			8/4/2010			10/21/2010		
Program	GWPP			BJC			BJC			GWPP		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	2.2	262	69.2	66.5	89.2	42.9	60.7	<MDA	.	450
Gross Beta	<MDA	.	8.2	14800	2370	98.7	6320	1020	104	<MDA	.	810
Technetium-99	<MDA	.	14	29300	4690	362	34000	5430	109	850	19	14
Uranium-234	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-235	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	GW-151						GW-154					
Location	NHP						NHP					
Date Sampled	1/28/2010			8/16/2010			2/2/2010			8/18/2010		
Program	BJC			BJC			BJC			BJC		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	1.84	1.95	0.934	1.39	455	73.4	2.26	277	45.4	1.73
Gross Beta	<MDA	.	3.26	5.67	1.68	2.5	125	20.7	6.96	50.3	9.25	6.28
Tc-99	.	.	.	.	.	.	.	.	.	.	.	.
U-234	<MDA	.	0.587	0.68	0.366	0.354	326	50.6	0.307	273	43.6	0.221
U-235	<MDA	.	0.383	<MDA	.	0.354	20.2	3.56	0.339	20.9	3.79	0.354
U-238	<MDA	.	0.416	<MDA	.	0.456	117	18.4	0.307	137	22.2	0.328

Sampling Point	GW-193						GW-204			GW-223		
Location	T2331						T0134			NHP		
Date Sampled	1/6/2010			8/12/2010			10/28/2010			1/28/2010		
Program	BJC			BJC			GWPP			BJC		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	.	.	.	.	.	.	26	5	3.2	15	3.89	2.6
Gross Beta	.	.	.	.	.	.	<MDA	.	7.6	9.81	2.77	3.85
Tc-99	<MDA	.	9.77	<MDA	.	7.12	.	.	.	.	.	.
U-234	.	.	.	.	.	.	12	1.7	0.86	6.42	2.41	1.11
U-235	.	.	.	.	.	.	0.88	0.38	0.38	1.35	1.05	1.11
U-238	.	.	.	.	.	.	8.6	1.3	0.33	14.6	4.02	0.996

Sampling Point	GW-223			GW-274			GW-275			GW-337		
Location	NHP			SY			SY			WC		
Date Sampled	8/17/2010			12/9/2010			12/9/2010			10/26/2010		
Program	BJC			GWPP			GWPP			GWPP		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	11.8	3.33	2.7	<MDA	.	33	<MDA	.	160	<MDA	.	2.7
Gross Beta	10.6	3.2	4.85	1300	95	72	<MDA	.	180	7.7	4.2	7.4
Tc-99	.	.	.	5800	46	15	<MDA	.	16	<MDA	.	13
U-234	5.19	1.2	0.368	.	.	.	.	.	.	.	.	.
U-235	0.539	0.313	0.312	.	.	.	.	.	.	.	.	.
U-238	13.6	2.57	0.29	.	.	.	.	.	.	.	.	.

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME

Radiological Analytes: Isotopic Analyses

Sampling Point	GW-605											
Location	EXP-I											
Date Sampled	1/5/2010						7/21/2010					
Program	BJC						BJC					
Type				Dup						Dup		
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	43.4	8.31	2.36	43.5	8.39	2.87	37.5	7.69	2.9	40.5	8.33	3.31
Gross Beta	13.1	3.45	4.53	15.1	3.72	4.6	27.1	5.49	4.74	23.5	5.11	5.49
Tc-99	<MDA	.	10.1	<MDA	.	10.1	<MDA	.	12.3	<MDA	.	12.1
U-234	.	.	.	.	.	.	.	.	.	.	.	.
U-235	.	.	.	.	.	.	.	.	.	.	.	.
U-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	GW-606						GW-633			GW-686		
Location	EXP-I						RG			CPT		
Date Sampled	1/5/2010			7/21/2010			11/22/2010			11/3/2010		
Program	BJC			BJC			GWPP			GWPP		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	7.47	2.59	2.9	4.08	2.28	3.41	64	57	53	<MDA	.	8.3
Gross Beta	6.89	2.52	4.21	<MDA	.	4.32	1600	110	90	<MDA	.	8.4
Tc-99	<MDA	.	10.2	<MDA	.	11.7	4000	39	16	79	10	14
U-234	.	.	.	.	.	.	.	.	.	.	.	.
U-235	.	.	.	.	.	.	.	.	.	.	.	.
U-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	GW-690			GW-691			GW-692					
Location	CPT			CPT			CPT					
Date Sampled	11/3/2010			11/2/2010			11/2/2010					
Program	GWPP			GWPP			GWPP					
Type										Dup		
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	5.5	<MDA	.	6.3	7.1	6	5.2	<MDA	.	9.7
Gross Beta	<MDA	.	7.8	<MDA	.	8.9	8.3	4.4	7.7	<MDA	.	8.9
Tc-99	<MDA	.	16	<MDA	.	16	<MDA	.	14	<MDA	.	14
U-234	.	.	.	.	.	.	.	.	.	.	.	.
U-235	.	.	.	.	.	.	.	.	.	.	.	.
U-238	.	.	.	.	.	.	.	.	.	.	.	.

Sampling Point	GW-698			GW-733						GW-832		
Location	B8110			EXP-J						NHP		
Date Sampled	11/3/2010			1/5/2010			7/21/2010			1/28/2010		
Program	GWPP			BJC			BJC			BJC		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	7.9	<MDA	.	2.49	<MDA	.	1.74	4.89	2	2.8
Gross Beta	<MDA	.	9	<MDA	.	3.93	<MDA	.	3.38	7.67	2.29	3.47
Tc-99	<MDA	.	15	<MDA	.	9.89	<MDA	.	12.3	.	.	.
U-234	.	.	.	.	.	.	.	.	.	3.83	1.12	0.619
U-235	.	.	.	.	.	.	.	.	.	0.703	0.421	0.382
U-238	.	.	.	.	.	.	.	.	.	4	1.14	0.532

APPENDIX E.3: CY 2010 MONITORING DATA FOR THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	GW-832			STATION 8								
Location	NHP			EXP-SW								
Date Sampled	8/16/2010			1/21/2010			3/11/2010			7/13/2010		
Program	BJC			BJC			BJC			BJC		
Type												
	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<MDA	.	1.28	8.71	3.11	2.88	2.52	1.13	1.55	19.7	4.55	2.48
Gross Beta	4.46	1.37	2.1	6.86	2.8	4.67	3.4	1.41	2.48	13.8	3.15	3.4
Tc-99	.	.	.	.	.	.	.	.	.	.	.	.
U-234	1.74	0.612	0.343	4.89	1.2	0.634	1.42	0.643	0.407	13.6	2.59	0.368
U-235	<MDA	.	0.292	<MDA	.	0.381	<MDA	.	0.436	1.24	0.49	0.304
U-238	1.67	0.597	0.345	12.5	2.42	0.418	2.54	0.903	0.507	16.8	3.09	0.277

Sampling Point	STATION 8		
Location	EXP-SW		
Date Sampled	8/4/2010		
Program	BJC		
Type			
	Activity	TPU	MDA
Gross Alpha	<MDA	.	2.35
Gross Beta	5.49	2.1	3.56
Tc-99	.	.	.
U-234	1.73	0.638	0.358
U-235	<MDA	.	0.327
U-238	1.44	0.569	0.29

APPENDIX F

CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME

EXPLANATION

Sampling Point:

GW	-	Groundwater monitoring well (e.g., GW-141; one exception is 1090)
MCK	-	McCoy Branch Kilometer
S17	-	Surface water station in SCR5
SCR	-	South Chestnut Ridge (tributary prefix for spring and surface water sampling locations)

Location:

CDLVII	-	Construction/Demolition Landfill VII
CRBAWP	-	Former Chestnut Ridge Borrow Area Waste Pile
CRSDB	-	Chestnut Ridge Sediment Disposal Basin
CRSP	-	Chestnut Ridge Security Pits
ECRWP	-	East Chestnut Ridge Waste Pile
EXP-SW	-	Exit Pathway (spring or surface water sampling location)
FCAP	-	Filled Coal Ash Pond
KHQ	-	Kerr Hollow Quarry
LII	-	Industrial Landfill II
LIV	-	Industrial Landfill IV
LV	-	Industrial Landfill V
UNCS	-	United Nuclear Corporation Site

Monitoring Program:

BJC	-	monitoring program managed by Bechtel Jacobs Company LLC
GWPP	-	managed by the Y-12 Groundwater Protection Program

Sample Type:

Dup	-	field duplicate sample
PDB	-	passive diffusion bag sample

Units:

ft	-	feet (elevations are above mean sea level and depths are below grade)
µg/L	-	micrograms per liter
mg/L	-	milligrams per liter
mV	-	millivolts
µmho/cm	-	micromhos per centimeter
NTU	-	Nephelometric Turbidity Units
pCi/L	-	picoCuries per liter
ppm	-	parts per million

EXPLANATION (continued)

Only analytes detected above the program reporting limits in at least one sample are presented in this appendix. Additionally, results that are below the reporting limits are replaced with values (e.g., "<") to emphasize the detected results. The following sections describe the reporting limits and data qualifiers for each subsection of the appendix. A comprehensive list of the Y-12 GWPP analytes, analytical methods, and reporting limits is provided in Appendix B, Table B.5.

F.1 Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds:

Results for all of the field measurements, miscellaneous analytes, and major ions are included in this appendix. The reporting limits for the major ions are shown in the following summary.

Analyte	Reporting Limit (mg/L)		Analyte	Reporting Limit (mg/L)	
	GWPP	BJC		GWPP	BJC
Cations			**Anions**		
Calcium	0.2	0.01	Bicarbonate	1.0	NS
Magnesium	0.2	0.05	Carbonate	1.0	NS
Potassium	2.0	0.025	Chloride	0.2	0.1
Sodium	0.2	0.01	Fluoride	0.1	0.05
			Nitrate (as Nitrogen)	0.05	0.1
			Sulfate	0.25	0.1
Note: NS = not specified					

The Y-12 GWPP SAP (B&W Y-12 2009a) specifies analytical methods and reporting limits for trace metals that are appropriate for DOE Order monitoring. Some of the laboratories used for the monitoring programs managed by BJC report metals results (often as estimated values) that are lower than the GWPP reporting limits for the metals. For this report, the analytical methods for metals used by BJC monitoring programs (EPA-7470, SW846-6010B, SW846-6020, and ASTM-D5174-M) are considered to be functionally equivalent to the methods used by the GWPP (Table B.5). To retain the highest quality data for DOE Order monitoring purposes and to standardize reporting limits for trace metal results obtained from all sources, the GWPP reporting limits were given precedence over the BJC reporting limits (BJC 2010a) shown below. Results for the trace metals shown in bold typeface below are presented in Appendix F.1 because the metal was detected at a level above the associated reporting limit in at least one groundwater or surface water sample.

EXPLANATION (continued)

Analyte	Reporting Limit (mg/L)		Analyte	Reporting Limit (mg/L)	
	GWPP	BJC		GWPP	BJC
Aluminum	0.2	0.05*	**Lithium**	0.01	0.01
Antimony	0.0025	0.003	**Manganese**	0.005	0.005
Arsenic	0.005	0.005	Mercury	0.00005	0.0002
Barium	0.004	0.005	Molybdenum	0.05	NS
Beryllium	0.0005	0.001	**Nickel**	0.005	0.01
Boron	0.1	0.01*	Selenium	0.01	0.0025*
Cadmium	0.0025	0.00013*	Silver	0.02	0.0015*
Chromium	0.01	0.005*	**Strontium**	0.005	0.005
Cobalt	0.02	0.005*	Thallium	0.0005	0.001
Copper	0.02	0.005*	Thorium	0.2	NS
Iron	0.05	0.01*	**Uranium**	0.0005	0.004
Lead	0.0005	0.002	Vanadium	0.02	0.01*
			Zinc	0.05	0.01*
Note: * - the GWPP reporting limit is used instead of the BJC reporting limit; "NS" - not specified.					

To evaluate the lowest possible mercury concentrations in surface water in McCoy Branch downstream of the FCAP, monitoring by BJC included the following results that are not presented in Appendix F.1.

Surface Water Station	Mercury Concentration (mg/L) by Method EPA-1631	
	03/01/10	09/01/10
MCK 2.0	0.0000011	0.0000003
MCK 1.4	0.0000013	0.0000005

The following symbols and data qualifiers are used in Appendix F.1:

. - Not analyzed or not applicable
< - Analyzed but not detected at the project reporting level
J - Positively identified; estimated concentration (BJC results)

EXPLANATION (continued)

The reporting limits for volatile organic compounds shown in Table B.5 and those used for monitoring programs managed by BJC are contract-required quantitation limits. Results below the quantitation limit and above the instrument detection limit are reported as estimated quantities. Therefore, non-detected results are assumed to equal zero for all compounds.

As summarized below, seven compounds were detected in groundwater samples collected in the Chestnut Ridge Regime during CY 2010. Results for these compounds are grouped by similar chemical composition (e.g., chloroethenes) in Appendix F.2.

Compound	No. Detected	Maximum (µg/L)	Compound	No. Detected	Maximum (µg/L)
1,1-Dichloroethene	9	44	Tetrachloroethene	5	11
1,1-Dichloroethane	8	72	cis-1,2-Dichloroethene	2	11
1,1,1-Trichloroethane	8	16	1,1,2-Trichloro-1,2,2-trifluoroethane	2	3 J
Trichlorofluoromethane	5	42			

The following symbols and data qualifiers are used in Appendix F.2:

- . - Not analyzed
- < - Analyzed but not detected at the project reporting level
- J - Positively identified; estimated concentration
- Q - Inconsistent with historical measurements for a sampling location

EXPLANATION (continued)

F.2 Radiological Analytes

Reporting limits for radiological analytes are sample-specific and analyte-specific minimum detectable activities that are reported with each result. The following summary shows the radiological analytes reported for at least one groundwater sample collected during CY 2010 in the Chestnut Ridge Regime.

Analyte	No. of Results	No. Detected	Analyte	No. of Results	No. Detected
Gross Alpha	85	14	Strontium-89/90	8	0
Gross Beta	75	16	Technetium-99	2	0
Cesium-137	4	0	Uranium-234	8	4
Cobalt-60	4	0	Uranium-235	8	1
Potassium-40	4	2	Uranium-238	8	1

Note: * = Reported by BJC laboratories in Appendix F.3 as equivalent GWPP analytes:
U-233/234 = U-234; U-235/236 = U-235.

Results for gross alpha and gross beta are presented in the first two pages of Appendix F.3, followed by results for the isotopes. The following notes and qualifiers apply to this appendix:

Result - Activity in picoCuries per liter (pCi/L)
TPU - Total propagated uncertainty (two standard deviations); calculation includes the counting error (instrument uncertainty) plus other sources of uncertainty (e.g., volumetric, chemical yield)
MDA - Minimum detectable activity
. - Not analyzed or not applicable (TPU is not presented when the result is <MDA)
< - Analyzed but less than the MDA

APPENDIX F.1

FIELD MEASUREMENTS, MISCELLANEOUS ANALYTES, MAJOR IONS, TRACE METALS, AND VOLATILE ORGANIC COMPOUNDS

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	1090		GW-141		GW-143	GW-144	GW-145	GW-156		GW-159
Functional Area	UNCS		LIV		KHQ	KHQ	KHQ	CRSDB		CRSDB
Date Sampled	01/27/10	08/25/10	01/14/10	07/28/10	07/15/10	07/15/10	08/24/10	07/16/10		07/16/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC		BJC
Sample Type									Dup	
Field Measurements										
Time Sampled	13:30	14:00	9:45	9:50	16:00	10:15	10:50	10:00	10:00	9:50
Measuring Point Elev. (ft)	1,104.48	1,104.48	1,186.23	1,186.23	913.98	913.54	840.24	1,049.28	1,049.28	1,051.38
Depth to Water (ft)	35.27	58.16	94.90	97.78	82.67	82.80	9.08	143.09	.	117.62
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	604	466	352	355	560	344	527	691	.	329
Dissolved Oxygen (ppm)	1.31	1.73	11	6.18	0.96	4.76	2.29	4.72	.	3.4
Oxidation/Reduction (mV)	106	158	270	130	-160	57	-70	-5	.	110
Temperature (degrees C)	14.4	18	12.5	21.5	23.8	16.4	18.4	17.8	.	18
Turbidity (NTU)	2	2	2	4	4	2	3	2	.	8
pH	6.59	7.02	6.93	7.14	7.85	6.96	7.63	7.28	.	7.15
Miscellaneous Analytes										
Dissolved Solids (mg/L)	290	270	194	188	260	220	270	360	360	190
Suspended Solids (mg/L)	<	<	<	<	<	<	<	<	<	<
Major Ions (mg/L)										
Calcium	55	56	44.3	40.3	31	57	43	70	69	42
Magnesium	32	32	26.8	24.2	26	18	35	41	41	25
Potassium	<	<	<	<	17	1.1	11	18	18	0.72
Sodium	6.6	6.5	<	<	20	0.56	4.3	4.3	4.3	<
Bicarbonate	280	270	207	187	.	.	.	.	.	.
Carbonate	<	<	<	<	.	.	.	.	.	.
Chloride	15	13	<	<	.	.	.	.	.	.
Fluoride	<	<	<	<	.	.	.	.	.	.
Nitrate as N	0.77	0.75	<	<	.	.	.	.	.	.
Sulfate	4	3.5	<	<	.	.	.	.	.	.
Charge balance error (%)	-4.2	-1.5	3.3	3.4	.	.	.	.	.	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.025	0.025	0.018	0.018	0.05	0.051	0.082	0.033	0.033	0.011
Boron	<	<	<	<	0.85	<	0.22	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	0.113	<	<	<	<	<	<
Iron	<	<	<	<	0.86	<	<	<	<	<
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	<	<	.	.	0.25	0.012	0.085	<	<	<
Manganese	0.0078	<	<	<	0.008	<	<	<	<	<
Nickel	<	<	<	0.0385	<	<	<	<	<	<
Strontium	0.023	0.022	0.016	0.0142	3	0.096	6.7	0.024	0.024	0.017
Uranium	<	<	<	<	<	<	0.011	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
Tetrachloroethene	.	.	<	<	<	<	<	.	.	.
cis-1,2-Dichloroethene	.	.	<	<	<	<	<	.	.	.
1,1-Dichloroethene	.	.	<	<	<	<	<	.	.	.
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	.	.	<	<	<	<	<	.	.	.
1,1-Dichloroethane	.	.	<	<	<	<	<	.	.	.
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	<	<	.	.	.	.	.	.

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-161		GW-177		GW-203		GW-205			
Functional Area	ECRWP		CRSP		UNCS		UNCS			
Date Sampled	01/06/10	07/22/10	01/06/10	07/26/10	02/03/10	08/24/10	01/07/10	02/03/10	08/02/10	08/24/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type										
Field Measurements										
Time Sampled	16:20	9:45	10:30	9:30	14:30	15:00	10:25	15:30	13:50	16:10
Measuring Point Elev. (ft)	1,093.54	1,093.54	1,158.20	1,158.20	1,105.45	1,105.45	1,104.14	1,104.14	1,104.14	1,104.14
Depth to Water (ft)	156.91	160.86	117.40	118.62	71.15	77.26	71.41	67.73	73.75	75.32
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	288	403	316	395	352	302	341	280	442	338
Dissolved Oxygen (ppm)	12.21	0.79	1.94	1.6	5.95	4.46	4.02	3.72	3.49	2.87
Oxidation/Reduction (mV)	-69	-73	158	148	179	-88	222	80	-139	-23
Temperature (degrees C)	13.5	17.1	12.9	21.3	11.9	21.1	8.9	13.4	22.5	21
Turbidity (NTU)	44	26	4	3	1	2	0	3	4	1
pH	7.15	7.68	7.4	6.6	8.99	8.23	10.66	9.26	10.1	9.61
Miscellaneous Analytes										
Dissolved Solids (mg/L)	.	.	220	240	180	130	.	200	.	160
Suspended Solids (mg/L)	.	.	<	<	<	<	.	<	.	<
Major Ions (mg/L)										
Calcium	41	40	47	46	37	31	.	27	.	7
Magnesium	24	24	28	27	21	17	.	20	.	16
Potassium	3.3	2.9	1.9	1.7	<	0.54	.	19	.	42
Sodium	2.7	2.5	0.7	0.78	<	<	.	3.5	.	7.8
Bicarbonate	210	210	.	.	180	140	.	150	.	170
Carbonate	<	<	.	.	<	<	.	22	.	<
Chloride	2.8	2.9	.	.	2.5	1.3	.	2.6	.	2.3
Fluoride	<	<	.	.	<	<	.	<	.	<
Nitrate as N	0.019	0.056	.	.	0.55	1.1	.	0.058	.	0.19
Sulfate	<	1.6	.	.	2.1	1.1	.	5	.	4.9
Charge balance error (%)	-0.6	-1.9	.	.	-2.5	0.4	.	-0.1	.	-8.1
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	.	<	.	<
Arsenic	<	<	<	<	<	<	.	<	.	<
Barium	0.02	0.0087	0.019	0.018	0.011	0.0078	.	0.012	.	<
Boron	<	<	<	<	<	<	.	<	.	<
Cadmium	<	<	<	<	<	<	.	<	.	<
Chromium	<	<	<	<	<	<	.	<	.	<
Iron	3.6	1.5	<	<	<	<	.	<	.	<
Lead	<	<	<	<	<	<	.	<	.	0.0059
Lithium	<	<	<	<	<	<	.	0.032	.	0.083
Manganese	0.045	0.014	0.0078	<	<	<	.	<	.	<
Nickel	<	<	<	<	<	<	.	<	.	<
Strontium	0.02	0.014	0.017	0.015	0.0098	0.0086	.	0.0074	.	<
Uranium	<	<	<	<	<	<	.	<	.	<
Zinc	<	<	<	<	<	<	.	<	.	<
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	.	.	<	.	<	.
cis-1,2-Dichloroethene	<	<	<	<	.	.	<	.	<	.
1,1-Dichloroethene	<	<	4.3	2.7	.	.	<	.	<	.
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	2.8	2.1	.	.	<	.	<	.
1,1-Dichloroethane	<	<	19	13	.	.	<	.	<	.
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	<	.	<	.

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-217		GW-221		GW-231		GW-294			
Functional Area	LIV		UNCS		KHQ		ECRWP			
Date Sampled	01/07/10	07/29/10	02/03/10	08/24/10	07/13/10		01/06/10		07/23/10	
Program	BJC	BJC	BJC	BJC	BJC		BJC		BJC	
Sample Type						Dup		Dup		Dup
Field Measurements										
Time Sampled	9:20	15:30	15:45	16:00	16:15	16:15	11:30	11:30	12:00	12:00
Measuring Point Elev. (ft)	1,177.03	1,177.03	1,106.16	1,106.16	849.67	849.67	1,083.60	1,083.60	1,083.60	1,083.60
Depth to Water (ft)	106.37	114.55	73.58	78.20	18.43	.	95.99	.	100.03	.
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	327	483	337	318	314	.	314	.	461	.
Dissolved Oxygen (ppm)	10.02	5.69	3.58	5.84	4.32	.	19.56	.	7.06	.
Oxidation/Reduction (mV)	226	-67	80	-118	51	.	199	.	128	.
Temperature (degrees C)	7.5	22.6	14.7	17.9	16.58	.	8.03	.	21.38	.
Turbidity (NTU)	1	1	1	4	8	.	1	.	7	.
pH	8.98	7.95	8.99	7.61	7.69	.	6.9	.	7.07	.
Miscellaneous Analytes										
Dissolved Solids (mg/L)	178	181	170	140	210	220	.	.	.	.
Suspended Solids (mg/L)	<	<	<	<	<	<	.	.	.	.
Major Ions (mg/L)										
Calcium	37.8	38.2	31	34	42	44	51	52	54	55
Magnesium	22.8	22.5	18	20	20	21	30	31	32	32
Potassium	<	<	<	<	0.67	0.68	0.51	0.5	0.83	0.84
Sodium	8.5	4.17	<	<	<	<	3.5	3.6	5	5.1
Bicarbonate	185	188	160	170	.	.	260	250	260	260
Carbonate	9.4	<	<	<	.	.	<	<	<	<
Chloride	<	<	1.4	1.2	.	.	7.3	7.3	9.6	9.7
Fluoride	<	<	<	<	.	.	<	<	<	<
Nitrate as N	<	<	0.54	0.41	.	.	1.4	1.3	1.6	1.6
Sulfate	5	<	1.9	1.6	.	.	2.5	2.4	2.9	2.9
Charge balance error (%)	1.6	1.9	-4.7	-2.2	.	.	-3.5	.	-0.7	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	<	0.0328	0.0066	0.0075	0.064	0.067	0.011	0.01	0.011	0.011
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<	<
Iron	<	<	<	<	<	<	<	<	<	<
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	.	.	<	<	<	<	<	<	<	<
Manganese	<	<	<	<	<	<	<	<	<	<
Nickel	0.057	<	<	<	<	<	<	<	<	<
Strontium	0.029	0.0171	0.0075	0.0091	0.04	0.042	0.023	0.023	0.023	0.023
Uranium	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	.	.	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	.	.	<	<	<	<	<	<
1,1-Dichloroethene	<	<	.	.	<	<	<	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	.	.	<	<	<	<	<	<
1,1-Dichloroethane	<	<	.	.	<	<	<	<	<	<
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	.	.	.	.	.	.	.	.

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-296		GW-298		GW-301				GW-305	
Functional Area	ECRWP		ECRWP		CRBAWP				LIV	
Date Sampled	01/06/10	07/23/10	01/07/10	07/22/10	01/05/10		07/26/10		01/07/10	05/12/10
Program	BJC	BJC	BJC	BJC	BJC		BJC		BJC	BJC
Sample Type						Dup		Dup		
Field Measurements										
Time Sampled	14:45	10:00	16:20	14:50	16:10	16:10	10:40	10:40	14:55	9:45
Measuring Point Elev. (ft)	1,090.99	1,090.99	1,049.01	1,049.01	1,086.55	1,086.55	1,086.55	1,086.55	1,183.72	1,183.72
Depth to Water (ft)	117.41	118.95	106.57	109.61	127.35	.	131.21	.	117.73	118.76
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	362	476	208	407	309	.	638	.	220	312
Dissolved Oxygen (ppm)	13	7.3	21.62	1.24	6.02	.	5.52	.	8.21	5
Oxidation/Reduction (mV)	172	23	131	-74	143	.	141	.	179	59
Temperature (degrees C)	12.94	16.7	6.31	22.8	10.8	.	18.3	.	8.1	18
Turbidity (NTU)	4	2	3	1	2	.	3	.	2	1
pH	6.88	7.49	7.37	8.3	7.66	.	6.53	.	7.85	7.55
Miscellaneous Analytes										
Dissolved Solids (mg/L)	.	.	.	.	.	.	.	.	186	.
Suspended Solids (mg/L)	.	.	.	.	.	.	.	.	<	.
Major Ions (mg/L)										
Calcium	52	50	37	36	.	.	.	.	36.6	.
Magnesium	31	29	21	20	.	.	.	.	22	.
Potassium	<	<	<	0.58	.	.	.	.	<	.
Sodium	3	2.8	2	3.7	.	.	.	.	4.3	.
Bicarbonate	260	250	190	180	.	.	.	.	181	.
Carbonate	<	<	<	<	.	.	.	.	9.2	.
Chloride	4.7	4.3	0.9	0.76	.	.	.	.	<	.
Fluoride	<	<	<	<	.	.	.	.	<	.
Nitrate as N	0.19	0.18	0.059	0.068	.	.	.	.	<	.
Sulfate	1.5	1.3	4.9	7	.	.	.	.	<	.
Charge balance error (%)	-0.9	-1.5	-3.5	-2.1	.	.	.	.	0.3	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	.	.	.	.	<	.
Arsenic	<	<	<	<	.	.	.	.	<	.
Barium	0.012	0.011	0.017	0.017	.	.	.	.	0.033	.
Boron	<	<	<	<	.	.	.	.	<	.
Cadmium	<	<	<	<	.	.	.	.	<	.
Chromium	<	<	<	<	.	.	.	.	<	.
Iron	<	<	<	<	.	.	.	.	<	.
Lead	<	<	<	<	.	.	.	.	<	.
Lithium	<	<	<	<	.	.	.	.	.	.
Manganese	<	<	<	<	.	.	.	.	<	.
Nickel	<	<	<	<	.	.	.	.	<	.
Strontium	0.019	0.017	0.024	0.022	.	.	.	.	0.018	.
Uranium	<	<	<	<	.	.	.	.	<	.
Zinc	<	<	<	<	.	.	.	.	<	.
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	9	8.2
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	12	14
1,1-Dichloroethane	<	<	<	<	<	<	<	<	34	38
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	.	.	.	.	.	.	.	.	<	<

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-305		GW-322		GW-514	GW-521		GW-522	
Functional Area	LIV		CRSP		FCAP	LIV		LIV	
Date Sampled	07/26/10	11/02/10	04/21/10		04/07/10	01/07/10	07/26/10	01/07/10	
Program	BJC	BJC	GWPP		GWPP	BJC	BJC	BJC	
Sample Type				Dup					Dup
Field Measurements									
Time Sampled	15:10	10:30	13:30	13:30	13:40	9:50	11:05	10:00	10:00
Measuring Point Elev. (ft)	1,183.72	1,183.72	1,134.98	1,134.98	1,001.22	1,182.88	1,182.88	1,175.48	1,175.48
Depth to Water (ft)	125.41	126.10	146.40	146.00	15.88	81.20	85.30	94.42	.
Groundwater Elevation (ft)									
Conductivity (μmho/cm)	434	275	517	517	293	241	350	323	.
Dissolved Oxygen (ppm)	5.36	5.85	3.3	3.3	0.26	5.79	6.38	11.75	.
Oxidation/Reduction (mV)	-55	7.9	90	90	-73	158	-34	192	.
Temperature (degrees C)	21.8	14.6	19.1	19.1	20.8	13.8	19.7	13.29	.
Turbidity (NTU)	3	2				1	2	5	.
pH	8.08	170	7.22	7.22	7.65	7.98	8.02	7.03	.
Miscellaneous Analytes									
Dissolved Solids (mg/L)	177	.	.	.	197	150	159	220	215
Suspended Solids (mg/L)	<	.	.	.	10	<	<	<	<
Major Ions (mg/L)									
Calcium	30.5	.	.	.	38.5	29.8	28.1	46.9	48.1
Magnesium	20.2	.	.	.	23.6	22.1	21	28.3	28.9
Potassium	<	.	.	.	<	<	<	<	<
Sodium	4.28	.	.	.	0.515	2.9	2.43	<	<
Bicarbonate	180	.	.	.	194	167	163	223	220
Carbonate	<	.	.	.	<	5.7	<	12.2	12.5
Chloride	<	.	.	.	1.08	<	<	<	3
Fluoride	<	.	.	.	<	<	<	<	<
Nitrate as N	<	.	.	.	<	<	<	<	<
Sulfate	<	.	.	.	2.71	<	<	5	6.6
Charge balance error (%)	-3.3	.	.	.	-1	-0.3	-0.4	-1.4	.
Trace Metals (mg/L)									
Aluminum	<	.	.	.	<	0.22	<	<	<
Arsenic	<	.	.	.	<	<	<	<	<
Barium	<	.	.	.	0.0105	<	<	0.013	0.013
Boron	<	.	.	.	<	<	<	<	<
Cadmium	<	.	.	.	<	<	<	<	<
Chromium	<	.	.	.	0.0101	<	<	<	<
Iron	<	.	.	.	5.64	0.19	<	<	<
Lead	<	.	.	.	<	<	<	<	<
Lithium	.	.	.	.	<	.	.	.	.
Manganese	<	.	.	.	0.0343	<	<	<	<
Nickel	0.0174	.	.	.	<	<	<	<	<
Strontium	0.0149	.	.	.	0.0218	0.01	<	0.02	0.02
Uranium	<	.	.	.	<	<	<	<	<
Zinc	<	.	.	.	0.156	<	<	<	<
Chloroethenes (μg/L)									
Tetrachloroethene	<	<	3 J	3 J	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	5.82	7.59	42	44	<	<	<	<	<
Chloroethanes (μg/L)									
1,1,1-Trichloroethane	11.2	12.4	16	16	<	<	<	<	<
1,1-Dichloroethane	35.7	39.3	70	72	<	<	<	<	<
Freons (μg/L)									
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	3 J	3 J	<	.	.	.	.
Trichlorofluoromethane	<	<	41	42	<	<	<	<	<

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-522		GW-540		GW-557		GW-560		GW-562	
Functional Area	LIV		LII		LV		CDLVII		CDLVII	
Date Sampled	07/26/10		01/11/10	07/28/10	01/12/10	07/27/10	01/11/10	08/03/10	01/11/10	08/03/10
Program	BJC		BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type		Dup								
Field Measurements										
Time Sampled	14:30	14:30	14:00	10:00	14:20	10:40	9:00	10:30	14:00	10:20
Measuring Point Elev. (ft)	1,175.48	1,175.48	1,072.31	1,072.31	1,081.36	1,081.36	949.05	949.05	934.69	934.69
Depth to Water (ft)	105.20	.	80.77	82.95	123.20	122.85	47.37	48.65	10.89	9.35
Groundwater Elevation (ft)										
Conductivity (µmho/cm)	333	.	373	434	262	354	265	284	256	431
Dissolved Oxygen (ppm)	6.7	.	1.27	0.78	4.17	7.62	6.96	5.57	9.1	4.62
Oxidation/Reduction (mV)	66	.	172	20	114	-30	162	-11.7	155	-9
Temperature (degrees C)	17.5	.	11.8	17.6	13.7	16.16	13.7	17.22	9.1	18.1
Turbidity (NTU)	2	.	1	6	0	5	4	8	6	16
pH	6.15	.	7.71	7.94	7.58	7.6	7.2	7.72	7.15	7.55
Miscellaneous Analytes										
Dissolved Solids (mg/L)	209	206	241	252	172	186	175	179	177	204
Suspended Solids (mg/L)	<	<	<	<	<	<	<	<	<	<
Major Ions (mg/L)										
Calcium	41.7	41.3	55	49.4	35.8	34.6	42.4	41.1	38.9	41.7
Magnesium	24.5	22.5	32.4	32.1	20.8	19.3	18.1	16.4	22	23.8
Potassium	<	<	<	<	<	<	<	<	<	<
Sodium	<	<	2.5	5.88	<	<	<	<	<	<
Bicarbonate	207	208	271	269	177	173 J	205	166	196	194
Carbonate	<	<	<	<	<	<	<	<	<	<
Chloride	<	<	<	<	<	<	<	<	<	<
Fluoride	<	<	<	<	<	<	<	<	<	<
Nitrate as N	<	<	<	<	<	<	<	<	<	<
Sulfate	<	<	<	<	<	<	<	<	<	<
Charge balance error (%)	-0.5	.	0.9	-0.1	-0.6	-3.5	-6.4	1.2	-2.2	2
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	0.49	0.398
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.0114	0.0112	0.012	0.0121	0.011	<	0.25	0.249	0.013	0.0127
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	0.03	<	<	<	<	<
Iron	<	<	<	<	<	<	<	<	0.32	0.424
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.017	0.0166	0.035	0.0325	0.017	0.0157	0.027	0.0256	0.021	0.0218
Uranium	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (µg/L)										
Tetrachloroethene	<	<	<	<	<	<	<	<	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethene	<	<	<	<	<	<	<	<	<	<
Chloroethanes (µg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Freons (µg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	<	<	<	<	<	<	<	<

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-564				GW-608	GW-609	GW-709		GW-731	GW-732
Functional Area	CDLVII				CRSP	CRSP	LII		CRSDB	CRSDB
Date Sampled	01/11/10		08/02/10		04/12/10	04/12/10	01/12/10	07/28/10	08/18/10	08/18/10
Program	BJC	BJC	BJC	BJC	GWPP	GWPP	BJC	BJC	BJC	BJC
Sample Type		Dup		Dup						
Field Measurements										
Time Sampled	10:30	10:30	10:10	10:10	9:25	13:30	9:50	15:10	11:00	9:25
Measuring Point Elev. (ft)	938.07	938.07	938.07	938.07	1,075.38	1,112.31	906.81	906.81	1,049.38	1,064.29
Depth to Water (ft)	10.46	.	11.29	.	126.12	163.11	27.81	29.50	125.09	157.80
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	238	.	324	.	331	272	239	359	334	385
Dissolved Oxygen (ppm)	7.79	.	6.99	.	2.6	3.01	2.11	1.36	6.06	6.47
Oxidation/Reduction (mV)	168	.	4	.	104	65	95	-147	-79	-60
Temperature (degrees C)	13.9	.	16.9	.	15	18.7	7.9	20.3	17.5	16.3
Turbidity (NTU)	2	.	3	.			1	2	1	3
pH	6.84	.	7.36	.	7.74	7.74	7.78	8.55	8.01	7.65
Miscellaneous Analytes										
Dissolved Solids (mg/L)	145	150	160	157	203	150	183	183	130	160
Suspended Solids (mg/L)	<	<	<	<	<	<	<	<	<	<
Major Ions (mg/L)										
Calcium	35.7	36	34.6	35.5	39.6	37.1	28.4	33.7	29	34
Magnesium	15.2	15.5	15.6	15.5	22.7	23.9	28.9	32	17	21
Potassium	<	<	<	<	2.51	<	<	<	0.88	0.87
Sodium	<	<	<	<	1.27	1.37	4	2.75	0.56	<
Bicarbonate	153	155	146	145	198	209	184	201	.	.
Carbonate	<	<	<	<	<	<	6.1	<	.	.
Chloride	<	<	<	<	2.83	1.24	<	<	.	.
Fluoride	<	<	<	<	<	<	<	<	.	.
Nitrate as N	<	<	<	<	0.311	0.81	<	<	.	.
Sulfate	<	<	<	<	3.98	4.29	9.7	7.29	.	.
Charge balance error (%)	-0.4	.	1.6	.	-2.2	-5.9	-0.4	3	.	.
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.015	0.015	0.013	0.0133	0.0159	0.0118	0.67	0.713	0.0086	0.0089
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	0.0122	<	<	<	<	<
Iron	<	<	<	<	<	<	<	0.216	<	<
Lead	<	<	<	<	<	0.00073	<	<	<	<
Lithium	.	.	.	.	0.0162	<	.	.	<	<
Manganese	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.025	0.026	0.0228	0.0236	0.0589	0.0129	0.045	0.0477	0.017	0.011
Uranium	<	<	<	<	0.00077	<	<	<	<	<
Zinc	<	<	<	<	0.181	<	<	<	<	<
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	<	1 J	<	<	.	.
cis-1,2-Dichloroethene	<	<	<	<	<	<	<	<	.	.
1,1-Dichloroethene	<	<	<	<	2 J	<	<	<	.	.
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	1 J	<	<	<	.	.
1,1-Dichloroethane	<	<	<	<	5 J	<	<	<	.	.
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	<	<	.	.	.	.
Trichlorofluoromethane	<	<	<	<	1 J	<	<	<	.	.

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-757		GW-796		GW-797		GW-798		GW-799	
Functional Area	LII		LV		LV		CDLVII		LV	
Date Sampled	01/11/10	07/28/10	01/11/10	07/28/10	01/07/10	07/27/10	01/12/10	07/29/10	01/11/10	07/27/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type										
Field Measurements										
Time Sampled	10:10	14:30	11:05	10:10	14:15	15:35	11:20	10:20	9:40	10:50
Measuring Point Elev. (ft)	961.64	961.64	1,052.62	1,052.62	1,060.00	1,060.00	1,006.00	1,006.00	981.29	981.29
Depth to Water (ft)	83.66	84.55	66.41	78.20	71.88	74.75	78.49	77.61	22.17	21.80
Groundwater Elevation (ft)										
Conductivity (μmho/cm)	148	365	243	267	506	639	223	308	245	256
Dissolved Oxygen (ppm)	4.37	1.77	6.62	7.93	5.84	4.59	4.69	5.31	7.34	4.46
Oxidation/Reduction (mV)	132	-89	236	-18	253	-25	105	-22	230	66
Temperature (degrees C)	1.3	24.11	13	17.11	9.9	28.05	14.5	18.7	9.1	16.86
Turbidity (NTU)	2	2	0	10	1	4	2	3	1	6
pH	8.47	10.06	7.55	8.62	8.33	8.84	7.57	7.27	7.94	8.37
Miscellaneous Analytes										
Dissolved Solids (mg/L)	142	143	120	127	288	319	142	144	145	138
Suspended Solids (mg/L)	<	<	<	<	<	<	<	<	<	<
Major Ions (mg/L)										
Calcium	3.2	2.9	26.6	24.7	57.1	56.1	29.5	30.8	33.1	30.9
Magnesium	4.6	3.7	15.5	15.4	32.8	33.8	16.7	17.1	17.7	18.1
Potassium	18.3	17.8	<	3.97	<	<	<	<	<	<
Sodium	40.1	40.1	<	<	4.7	5.15	<	<	<	<
Bicarbonate	51.1	33.4	128	125	216	222 J	143	141	140	143 J
Carbonate	68.1	80.5	<	<	<	<	<	<	8.8	<
Chloride	<	<	<	<	6.4	6.06	<	<	<	<
Fluoride	1.3	1.25	<	<	<	<	<	<	<	<
Nitrate as N	<	<	<	<	2.5	2.5	0.59	0.645 J	0.87	0.937
Sulfate	12.3	11.7	<	<	48.4	53.5	<	<	<	<
Charge balance error (%)	0.7	-1	0.9	1.9	0.6	-1.7	-0.9	1.4	1.2	0.1
Trace Metals (mg/L)										
Aluminum	<	<	<	<	<	<	<	<	<	<
Arsenic	<	<	<	<	<	<	<	<	<	<
Barium	0.099	0.0922	<	<	0.012	0.0123	0.011	0.0107	<	<
Boron	<	<	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	0.029	0.0185
Iron	<	<	<	0.113	<	<	<	<	<	<
Lead	<	<	<	<	<	<	<	<	<	<
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	<	<	<	<	<	<	<	<	<	<
Nickel	<	<	<	<	<	<	<	<	<	<
Strontium	0.22	0.184	0.014	0.014	0.034	0.0333	0.016	0.0168	0.02	0.0179
Uranium	<	<	<	<	<	<	<	<	<	<
Zinc	<	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)										
Tetrachloroethene	<	<	<	<	<	<	11	6.02	<	<
cis-1,2-Dichloroethene	<	<	<	<	<	<	11	5.01	<	<
1,1-Dichloroethene	<	<	<	<	<	<	6.6	<	<	<
Chloroethanes (μg/L)										
1,1,1-Trichloroethane	<	<	<	<	<	<	<	<	<	<
1,1-Dichloroethane	<	<	<	<	<	<	<	<	<	<
Freons (μg/L)										
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	<	<	<	<	13	10.3	<	<

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	GW-801		GW-831		MCK 1.4		MCK 2.0	
Functional Area	LV		FCAP		EXP-SW		EXP-SW	
Date Sampled	01/11/10	07/27/10	01/06/10	07/27/10	03/01/10	09/01/10	03/01/10	09/01/10
Program	BJC	BJC	BJC	BJC	BJC	BJC	BJC	BJC
Sample Type								
Field Measurements								
Time Sampled	13:55	14:50	14:30	10:00	14:05	10:15	13:30	8:50
Measuring Point Elev. (ft)	1,097.16	1,097.16	1,091.29	1,091.29	.	.	.	.
Depth to Water (ft)	108.61	111.61	126.42	127.35	.	.	.	.
Groundwater Elevation (ft)								
Conductivity (μmho/cm)	289	319	236	329	203	289	260	343
Dissolved Oxygen (ppm)	6.88	7.31	1.93	2.08	10.63	4.58	12.96	4.68
Oxidation/Reduction (mV)	231	-50	111	158	115.9	151.6	157.1	137.9
Temperature (degrees C)	12.1	16.9	11	20.2	8.01	23.56	11.63	16.71
Turbidity (NTU)	1	4	3	7	2	2	2	2
pH	7.02	7.83	8.21	7.41	7.65	7.99	7.81	7.68
Miscellaneous Analytes								
Dissolved Solids (mg/L)	144	152	.	.	.	.	170	180
Suspended Solids (mg/L)	<	<	.	.	.	.	<	7.6
Major Ions (mg/L)								
Calcium	32.7	30	.	.	38	37	39	47
Magnesium	18.7	16.8	.	.	10	10	13	16
Potassium	<	<	.	.	1.3	1.1	3.4	3.2
Sodium	<	<	.	.	1.4	1.3	1.4	1.5
Bicarbonate	157	156 J	.	.	.	.	140	170
Carbonate	<	<	.	.	.	.	<	<
Chloride	<	<	.	.	.	.	1.5	1.2
Fluoride	<	<	.	.	.	.	<	<
Nitrate as N	<	<	.	.	.	.	.	.
Sulfate	<	<	.	.	.	.	29	21
Charge balance error (%)	0.5	-5.6	.	.	.	.	-4.3	-0.8
Trace Metals (mg/L)								
Aluminum	<	<	.	.	<	<	<	<
Arsenic	<	<	.	.	<	<	0.012	0.019
Barium	<	<	.	.	0.051	0.049	0.054	0.083
Boron	<	<	.	.	<	<	0.17	0.17
Cadmium	<	<	.	.	<	<	<	<
Chromium	<	<	.	.	<	<	<	<
Iron	<	<	.	.	<	<	0.16	0.32
Lead	<	<	.	.	<	0.0054	<	<
Lithium	.	.	.	.	0.012	0.011	0.048	0.05
Manganese	<	<	.	.	0.046	0.026	0.12	0.23
Nickel	<	<	.	.	<	<	<	<
Strontium	0.017	0.0155	.	.	0.2	0.2	0.59	0.73
Uranium	<	<	.	.	.	.	<	<
Zinc	<	<	.	.	<	<	<	<
Chloroethenes (μg/L)								
Tetrachloroethene	<	<	<	<	.	.	.	.
cis-1,2-Dichloroethene	<	<	<	<	.	.	.	.
1,1-Dichloroethene	<	<	<	<	.	.	.	.
Chloroethanes (μg/L)								
1,1,1-Trichloroethane	<	<	<	<	.	.	.	.
1,1-Dichloroethane	<	<	<	<	.	.	.	.
Freons (μg/L)								
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	.	.	.	.
Trichlorofluoromethane	<	<	.	.	.	.	.	.

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	MCK 2.05				S17	SCR1.25SP		SCR1.5SW	SCR2.1SP
Functional Area	EXP-SW				EXP-SW	EXP-SW		EXP-SW	EXP-SW
Date Sampled	03/01/10		09/01/10		04/06/10	03/01/10	09/01/10	04/06/10	04/06/10
Program	BJC	BJC	BJC	BJC	GWPP	BJC	BJC	GWPP	GWPP
Sample Type		Dup		Dup					
Field Measurements									
Time Sampled	13:50	13:50	9:20	9:20	15:00	9:00	11:40	14:25	10:15
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)									
Conductivity (μmho/cm)	265	.	319	.	533	181	329	258	233
Dissolved Oxygen (ppm)	8.11	.	5.02	.	4.3	10.76	5.11	7.97	6.49
Oxidation/Reduction (mV)	93.1	.	137.3	.	182	167.3	158.8	152	181
Temperature (degrees C)	11.91	.	15.39	.	15.2	10.34	18.72	18.4	12.2
Turbidity (NTU)	4	.	132	.		2	10		
pH	6.66	.	7.47	.	6.93	7.1	7.43	7.82	6.95
Miscellaneous Analytes									
Dissolved Solids (mg/L)	180	190	190	190	305	110	170	183	155
Suspended Solids (mg/L)	<	<	110	140	3	<	12	22	<
Major Ions (mg/L)									
Calcium	38	38	47	46	54.9	27	42	33.2	26.7
Magnesium	14	14	16	16	31.6	11	18	12.3	10.3
Potassium	3.3	3.3	3.3	3.3	<	<	<	<	<
Sodium	1.4	1.4	1.5	1.5	1.99	0.72	0.87	0.944	1.28
Bicarbonate	140	140	170	170	233	120	180	130	110
Carbonate	<	<	<	<	<	<	<	<	<
Chloride	1.5	1.4	1.3	1.3	3.55	2	2	1.72	2.24
Fluoride	<	<	<	<	<	<	<	<	<
Nitrate as N	.	.	.	.	8.06	0.079	.	<	0.067
Sulfate	26	27	21	21	5.65	7.3	5.9	6.06	4.49
Charge balance error (%)	-2.9	.	-0.8	.	-0.2	-6.7	-2.2	-1.2	-2.7
Trace Metals (mg/L)									
Aluminum	<	<	<	<	<	<	<	0.215	<
Arsenic	0.023	0.029	0.16	0.058	<	<	<	<	<
Barium	0.07	0.07	0.15	0.084	0.128	0.041	0.065	0.0425	0.0231
Boron	0.17	0.17	0.17	0.17	<	<	<	<	<
Cadmium	<	<	<	<	0.005	<	<	<	<
Chromium	<	<	<	<	<	<	<	<	<
Iron	0.61	0.8	8	2	0.117	<	<	0.144	<
Lead	<	<	<	<	<	<	<	<	<
Lithium	0.048	0.048	0.051	0.05	<	<	<	<	<
Manganese	0.65	0.66	1.7	0.57	0.0358	0.019	0.032	0.0183	<
Nickel	<	<	<	<	<	<	<	<	<
Strontium	0.59	0.59	0.75	0.73	0.0393	0.03	0.048	0.0396	0.0324
Uranium	<	<	<	<	0.0011	<	<	0.00058	0.00226
Zinc	<	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)									
Tetrachloroethene	.	.	.	.	<	<	<	<	<
cis-1,2-Dichloroethene	.	.	.	.	<	<	<	<	<
1,1-Dichloroethene	.	.	.	.	<	<	<	<	<
Chloroethanes (μg/L)									
1,1,1-Trichloroethane	.	.	.	.	<	<	<	<	<
1,1-Dichloroethane	.	.	.	.	<	<	<	<	<
Freons (μg/L)									
1,1,2-Trichloro-1,2,2-trifluoroethane	.	.	.	.	<	.	.	<	<
Trichlorofluoromethane	.	.	.	.	<	.	.	<	<

APPENDIX F.1: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Field Measurements, Miscellaneous Analytes, Major Ions, Trace Metals, and Volatile Organic Compounds

Sampling Point	SCR2.2SP	SCR3.5SP		SCR3.5SW	SCR4.3SP		UNC SW-1	
Functional Area	EXP-SW	EXP-SW		EXP-SW	EXP-SW		EXP-SW	
Date Sampled	04/06/10	03/01/10	09/01/10	04/06/10	01/11/10	07/28/10	03/01/10	08/04/10
Program	GWPP	BJC	BJC	GWPP	BJC	BJC	BJC	BJC
Sample Type								
Field Measurements								
Time Sampled	14:00	9:40	9:45	13:30	14:40	10:45	8:25	9:00
Measuring Point Elev. (ft)	.	.	.	.	.	.	.	.
Depth to Water (ft)	.	.	.	.	.	.	.	.
Groundwater Elevation (ft)								
Conductivity (μmho/cm)	330	219	365	315	100	312	91	145
Dissolved Oxygen (ppm)	6.5	13.66	4.13	7.61	8.88	5.49	10.28	5.07
Oxidation/Reduction (mV)	165	148.6	148.1	148	225	30	195.4	380.7
Temperature (degrees C)	13.9	9.79	19.08	16.7	10.2	20.4	10.42	23.54
Turbidity (NTU)		3	4		6	12	5	7
pH	7.11	7.81	7.7	7.35	6.55	7.36	5.78	6.9
Miscellaneous Analytes								
Dissolved Solids (mg/L)	182	150	190	187	147	184	.	.
Suspended Solids (mg/L)	<	23	7.4	9	<	4.27	.	.
Major Ions (mg/L)								
Calcium	52.7	38	53	42.9	34.9	41.9	10	14
Magnesium	10.3	12	16	12.5	13	13.6	2.7	4.5
Potassium	<	1.2	1.6	<	<	<	<	<
Sodium	1.51	0.78	0.96	1.11	<	3.44	1.7	2.5
Bicarbonate	158	140	190	146	125	126	32	46
Carbonate	<	<	<	<	<	<	<	<
Chloride	2.5	1.5	1.3	1.41	3	5.1	3.6	5.6
Fluoride	<	<	<	<	<	<	<	<
Nitrate as N	0.706	0.44	.	0.247	<	<	0.12	0.056
Sulfate	7.3	14	9.6	12.2	13.2	26.8	7.2	5.9
Charge balance error (%)	1.6	-3.5	0.1	-0.2	-0.8	2.1	-6.1	-1.1
Trace Metals (mg/L)								
Aluminum	<	<	<	<	0.21	0.2	<	<
Arsenic	<	<	0.0058	<	<	<	<	<
Barium	0.0274	0.062	0.075	0.0692	0.084	0.108	0.019	0.03
Boron	<	<	<	<	<	<	<	<
Cadmium	<	<	<	<	<	<	<	<
Chromium	<	<	<	<	<	<	<	<
Iron	0.135	0.18	<	0.117	0.1	0.196	0.1	<
Lead	<	<	<	<	<	<	<	<
Lithium	<	0.012	0.014	0.0136	.	.	<	<
Manganese	0.0186	0.027	0.14	0.0231	<	<	0.0061	0.083
Nickel	<	<	<	<	<	<	<	<
Strontium	0.0648	0.19	0.28	0.218	0.075	0.112	0.025	0.029
Uranium	0.00079	<	<	<	<	<	.	.
Zinc	<	<	<	<	<	<	<	<
Chloroethenes (μg/L)								
Tetrachloroethene	<	<	<	<	<	<	.	.
cis-1,2-Dichloroethene	<	<	<	<	<	<	.	.
1,1-Dichloroethene	<	<	<	<	<	<	.	.
Chloroethanes (μg/L)								
1,1,1-Trichloroethane	<	<	<	<	<	<	.	.
1,1-Dichloroethane	<	<	<	<	<	<	.	.
Freons (μg/L)								
1,1,2-Trichloro-1,2,2-trifluoroethane	<	.	.	<	.	.	.	.
Trichlorofluoromethane	<	.	.	<	<	<	.	.

APPENDIX F.2

RADIOLOGICAL ANALYTES

APPENDIX F.2: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Result	TPU	MDA	Result	TPU	MDA
1090	UNCS	01/27/10	BJC		<	.	2.57	<	.	3.53
		08/25/10	BJC		<	.	1.77	<	.	2.69
GW-141	LIV	01/14/10	BJC		0.9	0.62	0.9	<	.	2.96
		07/28/10	BJC		<	.	1.58	<	.	3.05
GW-143	KHQ	07/15/10	BJC		6.94	1.86	1.7	16.7	3.2	2.61
GW-144	KHQ	07/15/10	BJC		<	.	2.57	<	.	3.45
GW-145	KHQ	08/24/10	BJC		6.57	1.7	1.4	12.9	2.58	2.32
GW-161	ECRWP	01/06/10	BJC		<	.	3.32	.	.	.
		07/22/10	BJC		<	.	1.51	.	.	.
GW-177	CRSP	01/06/10	BJC		<	.	2.87	<	.	3.9
		07/26/10	BJC		3.04	1.45	1.77	<	.	3.37
GW-203	UNCS	02/03/10	BJC		<	.	3.23	<	.	4.47
		08/24/10	BJC		<	.	2.57	<	.	3.38
GW-205	UNCS	02/03/10	BJC		<	.	3.45	15.7	3.97	4.58
		08/24/10	BJC		<	.	2.01	50.6	8.87	3.33
GW-217	LIV	01/07/10	BJC		0.88	0.61	0.88	<	.	2.9
		07/29/10	BJC		<	.	2.4	<	.	3.47
GW-221	UNCS	02/03/10	BJC		<	.	3.53	<	.	4.46
		08/24/10	BJC		<	.	2	<	.	3.59
GW-231	KHQ	07/13/10	BJC		<	.	3.03	<	.	4.39
			BJC	Dup	<	.	2.75	<	.	4.43
GW-294	ECRWP	01/06/10	BJC		<	.	2.71	.	.	.
			BJC	Dup	<	.	2.71	.	.	.
		07/23/10	BJC		<	.	1.75	.	.	.
			BJC	Dup	<	.	2.08	.	.	.
GW-296	ECRWP	01/06/10	BJC		<	.	2.34	.	.	.
		07/23/10	BJC		<	.	1.52	.	.	.
GW-298	ECRWP	01/07/10	BJC		<	.	2.44	.	.	.
		07/22/10	BJC		1.85	1.09	1.61	.	.	.
GW-305	LIV	01/07/10	BJC		<	.	1.03	<	.	3.22
		07/26/10	BJC		<	.	1.6	<	.	2.98
GW-514	FCAP	04/07/10	GWPP		<	.	2.4	<	.	5.8
GW-521	LIV	01/07/10	BJC		<	.	1.45	<	.	2.89
		07/26/10	BJC		<	.	1.2	<	.	2.92
GW-522	LIV	01/07/10	BJC		<	.	2.49	<	.	2.98
			BJC	Dup	<	.	1.73	<	.	3.11
		07/26/10	BJC		<	.	2.54	<	.	3.56
			BJC	Dup	1.22	0.77	1.18	<	.	3.08
GW-540	LII	01/11/10	BJC		<	.	2.06	<	.	2.81
		07/28/10	BJC		<	.	1.65	<	.	2.72
GW-557	LV	01/12/10	BJC		<	.	1.05	<	.	2.82
		07/27/10	BJC		<	.	1.82	<	.	3.18
GW-560	CDLVII	01/11/10	BJC		<	.	1.69	<	.	3.04
		08/03/10	BJC		<	.	1.98	<	.	2.74
GW-562	CDLVII	01/11/10	BJC		1.03	0.64	0.88	<	.	3.54
		08/03/10	BJC		<	.	2.05	3.28	1.53	2.91
GW-564	CDLVII	01/11/10	BJC		<	.	0.8	<	.	2.79
			BJC	Dup	<	.	0.79	<	.	2.83
	CDLVII	08/02/10	BJC		<	.	1.67	<	.	3.31
			BJC	Dup	<	.	2	<	.	3.42
GW-608	CRSP	04/12/10	GWPP		<	.	2.4	<	.	7
GW-609	CRSP	04/12/10	GWPP		2.6	2.6	2.3	7.3	3.7	6.6

APPENDIX F.2: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Radiological Analytes: Gross Alpha and Gross Beta Activity

Sampling Point	Functional Area	Date Sampled	Program	Sample Type	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
					Result	TPU	MDA	Result	TPU	MDA
GW-709	LII	01/12/10	BJC		<	.	1.7	<	.	3.42
		07/28/10	BJC		1.23	0.73	0.98	<	.	2.9
GW-757	LII	01/11/10	BJC		<	.	1.74	13.1	2.1	3.25
		07/28/10	BJC		2.28	1.06	1.2	12.8	2.24	3.54
GW-796	LV	01/11/10	BJC		<	.	1.11	<	.	2.56
		07/28/10	BJC		<	.	1	4.75	1.49	2.64
GW-797	LV	01/07/10	BJC		<	.	1.82	<	.	2.97
		07/27/10	BJC		<	.	2.14	<	.	3.67
GW-798	CDLVII	01/12/10	BJC		<	.	1.44	<	.	2.64
		07/29/10	BJC		1.04	0.59	0.77	<	.	2.94
GW-799	LV	01/11/10	BJC		<	.	1.59	<	.	2.98
		07/27/10	BJC		<	.	1.46	<	.	3.14
GW-801	LV	01/11/10	BJC		<	.	1.08	<	.	2.84
		07/27/10	BJC		<	.	1.05	<	.	3.03
MCK 2.0	EXP-SW	03/01/10	BJC		<	.	2.97	5.15	2.01	3.42
		09/01/10	BJC		<	.	2.82	<	.	4.07
MCK 2.05	EXP-SW	03/01/10	BJC		<	.	1.83	4.05	1.82	3.28
			BJC	Dup	<	.	3.07	4.42	1.96	3.52
		09/01/10	BJC		<	.	2.3	4.4	1.98	3.59
			BJC	Dup	<	.	2.76	4.94	2.03	3.54
S17	EXP-SW	04/06/10	GWPP		<	.	2.8	<	.	5.9
SCR1.25SP	EXP-SW	03/01/10	BJC		<	.	2.83	<	.	3.63
		09/01/10	BJC		<	.	2.51	5	2.33	4.3
SCR1.5SW	EXP-SW	04/06/10	GWPP		<	.	2.6	<	.	6.1
SCR2.1SP	EXP-SW	04/06/10	GWPP		<	.	2.6	<	.	6.2
SCR2.2SP	EXP-SW	04/06/10	GWPP		<	.	2.6	<	.	7.2
SCR3.5SP	EXP-SW	03/01/10	BJC		<	.	3.11	3.62	1.86	3.48
		09/01/10	BJC		<	.	2.21	<	.	3.96
SCR3.5SW	EXP-SW	04/06/10	GWPP		5.6	3	2.6	<	.	7.1
SCR4.3SP	EXP-SW	01/11/10	BJC		<	.	1.13	<	.	2.67
		07/28/10	BJC		<	.	1.99	<	.	2.99
UNC SW-1	EXP-SW	03/01/10	BJC		<	.	2.62	<	.	3.77
		08/04/10	BJC		2.33	1.48	2.17	<	.	3.71

APPENDIX F.2: CY 2010 MONITORING DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME
Radiological Analytes: Isotopic Analyses

Sampling Point	1090						GW-203					
Functional Area	UNCS						UNCS					
Date Sampled	01/27/10			08/25/10			02/03/10			08/24/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<	.	2.57	<	.	1.77	<	.	3.23	<	.	2.57
Gross Beta	<	.	3.53	<	.	2.69	<	.	4.47	<	.	3.38
Cesium-137	.	.	.	.	.	.	.	.	.	.	.	.
Cobalt-60	.	.	.	.	.	.	.	.	.	.	.	.
Potassium-40	.	.	.	.	.	.	.	.	.	.	.	.
Strontium-89/90	<	.	2.45	<	.	1.84	<	.	1.75	<	.	2.48
Technetium-99	.	.	.	.	.	.	.	.	.	.	.	.
Uranium-234	<	.	0.41	<	.	0.993	0.515	0.301	0.243	0.269	0.218	0.211
Uranium-235	<	.	0.261	<	.	0.695	<	.	0.274	0.229	0.202	0.211
Uranium-238	<	.	0.261	<	.	0.86	<	.	0.104	<	.	0.359

Sampling Point	GW-205						GW-221					
Functional Area	UNCS						UNCS					
Date Sampled	02/03/10			08/24/10			02/03/10			08/24/10		
Program	BJC			BJC			BJC			BJC		
Sample Type												
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<	.	3.45	<	.	2.01	<	.	3.53	<	.	2
Gross Beta	15.7	3.97	4.58	50.6	8.87	3.33	<	.	4.46	<	.	3.59
Cesium-137	<	.	8.87	<	.	8.85	.	.	.	.	.	.
Cobalt-60	<	.	11.2	<	.	9.84	.	.	.	.	.	.
Potassium-40	124	70.3	104	<	.	161	.	.	.	.	.	.
Strontium-89/90	<	.	1.93	<	.	2.42	<	.	1.97	<	.	2.36
Technetium-99	<	.	9.84	<	.	10.5	.	.	.	.	.	.
Uranium-234	<	.	0.381	<	.	0.364	0.514	0.395	0.452	0.301	0.231	0.265
Uranium-235	<	.	0.323	<	.	0.274	<	.	0.4	<	.	0.265
Uranium-238	<	.	0.323	<	.	0.274	<	.	0.4	0.212	0.186	0.195

Sampling Point	UNC SW-1					
Functional Area	UNCS					
Date Sampled	03/01/10			08/04/10		
Program	BJC			BJC		
Sample Type						
Result (pCi/L)	Activity	TPU	MDA	Activity	TPU	MDA
Gross Alpha	<	.	2.62	2.33	1.48	2.17
Gross Beta	<	.	3.77	<	.	3.71
Cesium-137	<	.	8.59	<	.	9.26
Cobalt-60	<	.	8.23	<	.	10.3
Potassium-40	<	.	136	260	88.4	108
Strontium-89/90	.	.	.	.	.	.
Technetium-99	.	.	.	.	.	.
Uranium-234	.	.	.	.	.	.
Uranium-235	.	.	.	.	.	.
Uranium-238	.	.	.	.	.	.

APPENDIX G

CY 2010 QUALITY ASSURANCE/QUALITY CONTROL DATA

EXPLANATION

Sampling Point:

- BCK - Bear Creek Kilometer
- GHK - Gum Hollow Branch Kilometer
- GW - Monitoring Well (also locations beginning with a number; e.g., 55-3A)
- NPR - North of Pine Ridge near the Scarboro Community (surface water sampling location)
- NT - Northern Tributary to Bear Creek
- S17 - Surface water station
- SCR - South Chestnut Ridge (tributary prefix for spring or surface water sampling location)
- SS - Spring (Bear Creek Regime)
- D - Field Duplicate Sample

Hydrogeologic Regime:

- BC - Bear Creek Hydrogeologic Regime
- CR - Chestnut Ridge Hydrogeologic Regime
- EF - Upper East Fork Poplar Creek Hydrogeologic Regime

Notes:
Appendix G shows the method (laboratory) blank and trip blank samples associated with each groundwater and surface water sample collected under management of the GWPP during CY 2010. Each method and trip blank was analyzed for volatile organic compounds (VOCs). None of the method blank samples contained VOCs. However, as shown in the following table, methylene chloride and 1,4-Dichloro-2-butene were each detected in one trip blank sample.

Sampling Point	Date Collected	Trip Blank Sample No.	Compound	Result (µg/L)	
				Trip Blank	Assoc. Sample
SS-4	01/20/10	A100190259	Methylene chloride	3 J	ND
SS-4 D	01/20/10	A100190259	Methylene chloride	3 J	ND
GW-101	09/16/10	A102240370	1,4-Dichloro-2-butene	5	ND

Note: D – duplicate sample; J - estimated concentration; ND – not detected.

Neither of the VOCs were detected in the associated sample.

Two field blank samples were collected and analyzed for VOCs during CY 2010. These samples were collected at well GW-322 (04/21/10) in the Chestnut Ridge Regime and well GW-332 (11/16/10) in the East Fork Regime. The field blank samples were analyzed for VOCs and none were detected in either sample.

Equipment rinsate samples were collected during CY 2010 at wells GW-929 (first quarter) and GW-722 (third quarter) located in the East Fork Regime. The rinsate samples were analyzed for the same parameters as the groundwater sample, and only the analytes shown below were detected.

Well-Port	Sample Number	Date Sampled	Analyte	Result	Units
GW-929	A101650551	03/08/10	Bicarbonate Dissolved Solids Lead Gross Beta	12.2 36 0.00138 4.6 ± 3.5	mg/L mg/L mg/L pCi/L
GW-722-17	A101650551	07/29/10	2-Butanone 2-Hexanone Acetone Ethanol	91 26 120 260	µg/L µg/L µg/L µg/L

Only bicarbonate (22 mg/L) and dissolved solids (67 mg/L) were detected in the groundwater samples associated with these rinsate samples.

APPENDIX G: CY 2010 QUALITY ASSURANCE/QUALITY CONTROL DATA
Correlation with Associated Groundwater and Surface Water Samples

Sampling Point	Hydrogeologic Regime	Date Sampled	Sample Number	Trip Blank Sample Number	Method Blank Sample Number
55-2B	EF	04/19/10	A100620192	A100950098	Q101370051
55-2C	EF	04/19/10	A100620191	A100950098	Q101230195
55-2C D	EF	04/19/10	A100620227	A100950098	Q101370051
55-3A	EF	03/01/10	A100070055	A100190275	Q100830093
55-3A	EF	08/05/10	A101650540	A101730306	Q102380000
55-3B	EF	03/01/10	A100070074	A100190275	Q100890028
55-3B	EF	08/05/10	A101650539	A101730306	Q102380000
55-3C	EF	03/01/10	A100070073	A100190275	Q100890028
55-3C	EF	08/05/10	A101660248	A101730306	Q102380000
56-1A	EF	03/04/10	A100070072	A100190266	Q100900356
56-1C	EF	03/04/10	A100070071	A100190266	Q100900356
56-2A	EF	02/16/10	A100070070	A100190253	Q100750051
56-2B	EF	02/16/10	A100070069	A100190253	Q100750051
56-2C	EF	02/16/10	A100070068	A100190253	Q100750051
56-3A	EF	03/03/10	A100070067	A100190274	Q100900356
56-3B	EF	03/03/10	A100070066	A100190274	Q100900356
56-3C	EF	03/03/10	A100070065	A100190274	Q100900356
56-4A	EF	03/01/10	A100070084	A100190275	Q100890028
56-6A	EF	10/18/10	A102440509	A102800495	Q103190100
60-1A	EF	04/13/10	A100620201	A100950101	Q101250183
GW-006	BC	02/03/10	A100060133	A100190255	Q100630212
GW-014	BC	08/16/10	A101650261	A101730301	Q102570243
GW-058	BC	08/26/10	A102220415	A101730295	Q102590019
GW-058	BC	10/19/10	A102800418	A102450428	Q103190100
GW-065	BC	02/09/10	A100060132	A100190254	Q100690047
GW-065	BC	08/30/10	A101650260	A102240376	Q102700046
GW-068	BC	08/23/10	A101650259	A101730297	Q102580089
GW-071	BC	02/03/10	A100060131	A100190255	Q100630355
GW-071	BC	08/23/10	A101650258	A101730297	Q102580089
GW-071 D	BC	02/03/10	A100060141	A100190255	Q100630355
GW-082	BC	01/27/10	A100060130	A100190258	Q100480179
GW-098	BC	08/30/10	A102020314	A102240376	Q102700046
GW-100	BC	09/13/10	A101650255	A102240372	Q102840243
GW-101	BC	09/16/10	A101650254	A102240370	Q102860179
GW-106	EF	10/19/10	A102800494	A102450428	Q103190100
GW-109	EF	10/21/10	A102800493	A102450426	Q103210241
GW-148	EF	03/08/10	A100070083	A100190273	Q100950000
GW-148 D	EF	03/08/10	A100070266	A100190273	Q100950000
GW-153	EF	04/14/10	A100620200	A100950100	Q101330234
GW-220	EF	08/03/10	A101650554	A101730308	Q102370075
GW-225	BC	08/30/10	A101670270	A102240376	Q102700046
GW-229	BC	09/07/10	A101650214	A102240375	Q102780200
GW-240	EF	04/14/10	A100620199	A100950100	Q101330132
GW-246	BC	02/16/10	A100060129	A100190252	Q100750068
GW-251	EF	10/20/10	A102440506	A102450427	Q103210241
GW-251 D	EF	10/20/10	A102440511	A102450427	Q103210241
GW-269	EF	12/09/10	A102440505	A103120196	Q103640351

APPENDIX G: CY 2010 QUALITY ASSURANCE/QUALITY CONTROL DATA
Correlation with Associated Groundwater and Surface Water Samples

Sampling Point	Hydrogeologic Regime	Date Sampled	Sample Number	Trip Blank Sample Number	Method Blank Sample Number
GW-274	EF	12/09/10	A102800492	A103120196	Q103640351
GW-275	EF	12/09/10	A102800491	A103120196	Q103640351
GW-289	BC	01/28/10	A100070182	A100190257	Q100480179
GW-291	BC	08/24/10	A101650535	A101730296	Q102580123
GW-291 D	BC	08/24/10	A101660260	A101730296	Q102580123
GW-307	BC	09/20/10	A101650534	A102240369	Q102860179
GW-310	BC	09/21/10	A101650533	A102240368	Q102860179
GW-312	BC	09/21/10	A101650532	A102240368	Q102860179
GW-315	BC	08/16/10	A101650531	A101730301	Q102570243
GW-322	CR	04/21/10	A100620208	A100950108	Q101370099
GW-322 D	CR	04/21/10	A100620228	A100950108	Q101370099
GW-332	EF	11/16/10	A102440500	A103120194	Q103350019
GW-337	EF	10/26/10	A102870352	A102450425	Q103150145
GW-365	BC	09/07/10	A101660251	A102240375	Q102780200
GW-381	EF	04/14/10	A100620198	A100950100	Q101330234
GW-383	EF	04/14/10	A100620197	A100950100	Q101330234
GW-514	CR	04/07/10	A100620207	A100950103	Q101250172
GW-601	BC	09/07/10	A101670269	A102240375	Q102780200
GW-608	CR	04/12/10	A100620206	A100950102	Q101250183
GW-609	CR	04/12/10	A100620205	A100950102	Q101250183
GW-615	BC	09/15/10	A101650529	A102240371	Q102840243
GW-619	EF	04/15/10	A100620196	A100950099	Q101330234
GW-619 D	EF	04/15/10	A100620229	A100950099	Q101330234
GW-620	EF	04/15/10	A100620195	A100950099	Q101330234
GW-623	BC	08/26/10	A101650528	A101730295	Q102590019
GW-626	BC	02/02/10	A100070062	A100190256	Q100610098
GW-627	BC	02/03/10	A100070061	A100190255	Q100630212
GW-627	BC	08/26/10	A101650537	A101730295	Q102590019
GW-633	EF	11/22/10	A102870351	A103120195	Q103350010
GW-648	BC	02/03/10	A100070060	A100190255	Q100630212
GW-648	BC	08/16/10	A101650536	A101730301	Q102570243
GW-653	BC	08/16/10	A101650546	A101730301	Q102570243
GW-656	EF	10/28/10	A102440501	A102450424	Q103400116
GW-686	EF	11/03/10	A102870350	A102450422	Q103330141
GW-690	EF	11/03/10	A102930231	A102450422	Q103330141
GW-691	EF	04/14/10	A100620194	A100950100	Q101330132
GW-691	EF	11/02/10	A102930230	A102450423	Q103340102
GW-692	EF	11/02/10	A102870349	A102450423	Q103340102
GW-692 D	EF	11/02/10	A102870348	A102450423	Q103340102
GW-698	EF	04/13/10	A100620193	A100950101	Q101250183
GW-698	EF	11/03/10	A102870347	A102450422	Q103330141
GW-700	EF	02/16/10	A100070180	A100190253	Q100750051
GW-700 D	EF	02/16/10	A100070265	A100190253	Q100750051
GW-703	BC	09/08/10	A101650545	A102240374	Q102780200
GW-703 D	BC	09/08/10	A101670188	A102240374	Q102780200

APPENDIX G: CY 2010 QUALITY ASSURANCE/QUALITY CONTROL DATA
Correlation with Associated Groundwater and Surface Water Samples

Sampling Point	Hydrogeologic Regime	Date Sampled	Sample Number	Trip Blank Sample Number	Method Blank Sample Number
GW-722-14	EF	07/29/10	A101650553	A101730310	Q102370041
GW-722-17	EF	07/29/10	A101650552	A101730310	Q102370041
GW-722-20	EF	08/02/10	A101650550	A101730309	Q102370041
GW-722-22	EF	08/02/10	A101650549	A101730309	Q102370041
GW-722-33	EF	08/04/10	A101650548	A101730307	Q102370075
GW-724	BC	09/09/10	A101670211	A102240373	Q102720230
GW-725	BC	09/09/10	A101650543	A102240373	Q102720230
GW-738	BC	09/09/10	A101650542	A102240373	Q102720230
GW-740	BC	09/13/10	A101650541	A102240372	Q102840243
GW-744	EF	08/03/10	A101650547	A101730308	Q102370075
GW-747	EF	08/04/10	A101650563	A101730307	Q102370075
GW-748	EF	08/10/10	A101650562	A101730304	Q102380187
GW-748 D	EF	08/10/10	A101670169	A101730304	Q102420316
GW-763	EF	04/14/10	A100620204	A100950100	Q101330132
GW-769	EF	04/14/10	A100620203	A100950100	Q101330132
GW-769	EF	11/16/10	A102440491	A103120194	Q103350019
GW-770	EF	04/14/10	A100620202	A100950100	Q101330132
GW-781	EF	03/10/10	A100070080	A100190271	Q100950004
GW-782	EF	03/10/10	A100070079	A100190271	Q100950004
GW-783	EF	03/03/10	A100070078	A100190274	Q100900356
GW-791	EF	02/16/10	A100070077	A100190253	Q100750068
GW-792	EF	02/17/10	A100070076	A100190251	Q100750068
GW-816	EF	02/24/10	A100070075	A100190250	Q100830093
GW-820	EF	11/16/10	A102440490	A103120194	Q103350019
GW-928	EF	03/08/10	A100070089	A100190273	Q100950000
GW-928	EF	04/21/10	A100960167	A100950108	Q101370099
GW-928	EF	08/18/10	A101650561	A101730299	Q102580089
GW-928	EF	11/09/10	A102800419	A102450419	Q103340094
GW-929	EF	03/08/10	A100070088	A100190273	Q100950000
GW-929	EF	04/21/10	A100960168	A100950108	Q101370099
GW-929	EF	08/18/10	A101650560	A101730299	Q102580089
GW-929	EF	11/10/10	A102800420	A103120193	Q103340094
GW-930	EF	03/09/10	A100070087	A100190272	Q100950004
GW-930	EF	04/22/10	A100960169	A100950107	Q101370099
GW-930	EF	08/19/10	A101650559	A101730298	Q102580089
GW-930	EF	11/09/10	A102800421	A102450419	Q103340094
GW-931	EF	03/09/10	A100070086	A100190272	Q100950004
GW-931	EF	04/22/10	A100960170	A100950107	Q101370099
GW-931	EF	08/19/10	A101650558	A101730298	Q102580089
GW-931	EF	11/08/10	A102800422	A102450420	Q103330141
GW-934-01	EF	08/10/10	A101730294	A101730304	Q102380187
GW-934-02	EF	08/11/10	A101730293	A101730303	Q102420311
GW-934-04	EF	08/11/10	A101730292	A101730303	Q102420316
GW-934-05	EF	08/11/10	A101730291	A101730303	Q102420316
GW-934-07	EF	08/11/10	A101730290	A101730303	Q102420316
GW-934-09	EF	08/12/10	A101730289	A101730302	Q102420316
GW-934-11	EF	08/17/10	A101730288	A101730300	Q102570243
GW-934-12	EF	08/16/10	A101730287	A101730301	Q102570243

APPENDIX G: CY 2010 QUALITY ASSURANCE/QUALITY CONTROL DATA
Correlation with Associated Groundwater and Surface Water Samples

Sampling Point	Hydrogeologic Regime	Date Sampled	Sample Number	Trip Blank Sample Number	Method Blank Sample Number
Surface water and Springs					
GHK2.51WSW	EF	08/09/10	A101650557	A101730305	Q102420311
GHK2.51WSW D	EF	08/09/10	A101670174	A101730305	Q102380187
NPR12.0SW	EF	08/09/10	A101650556	A101730305	Q102380000
NPR12.0SW	EF	11/04/10	A103080136	A102450421	Q103130030
NPR23.0SW	EF	08/09/10	A101650555	A101730305	Q102380187
NPR23.0SW	EF	11/04/10	A103080137	A102450421	Q103130030
S17	CR	04/06/10	A100620216	A100950104	Q101250172
SCR1.5SW	CR	04/06/10	A100620215	A100950104	Q101250172
SCR2.1SP	CR	04/06/10	A100620214	A100950104	Q101250172
SCR2.2SP	CR	04/06/10	A100620210	A100950104	Q101250172
SCR3.5SW	CR	04/06/10	A100620209	A100950104	Q101250172
SS-4	BC	01/20/10	A100070181	A100190259	Q100480175
SS-4 D	BC	01/20/10	A100070056	A100190259	Q100480175

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