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TNX Area Operable Unit

RCRA Facility Investigation/Remedial Investigation Work Plan Addendum for the TNX Area Operable Unit Groundwater Radiological Characterization (U) WSRC-RP-2000-4114, Revision 1, December 2000

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United States Department of Energy
Savannah River Site

RCRA FACILITY INVESTIGATION/REMEDIAL INVESTIGATION WORK PLAN ADDENDUM FOR THE TNX AREA OPERABLE UNIT GROUNDWATER RADIOLOGICAL CHARACTERIZATION (U)

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EXECUTIVE SUMMARY

The TNX Area Operable Unit of the Savannah River Floodplain Swamp Watershed is listed as one entry in the FFA Appendix C, RCRA/CERCLA Units List (WSRC 1994a). The TNX Area OU consists of four waste units, the New TNX Seepage Basin (904-102G); TNX Burying Ground (643-5G); Old TNX Seepage Basin (904-076G), and TNX Groundwater (082-G), which is the groundwater beneath the units. The upper most aquifer system of the TNX Area OU is referred to as Water Table Aquifer.

Two groundwater locations with gross alpha activities above the MCL have been identified and include a "Lower Area" located at the western edge of the Inner Swamp Area just west of the TNX Outfall Delta (near well TCM-3) and an "Upper Area" just west of the TNX Burying Ground (near wells TBG-1, -3, -4). Because radiological speciation of groundwater samples was not performed during the RFI/RI/BRA, uncertainties exist concerning the nature (i.e., isotopic composition) of alpha-emitting radionuclides in the groundwater, the extent (distribution) of the contamination, and the temporal variability. To determine the nature and extent of radionuclide contamination in the TNX groundwater, a phased groundwater sampling approach has been used.

During the Core Team meeting on 6/8/2000, the conclusion was made that uranium (i.e. gross alpha) contamination in the Lower Area groundwater is not a problem warranting action, but additional monitoring is needed to address the uncertainty of contamination variability with time. Also during the Core Team meeting on 6/8/2000, the conclusion was made that gross alpha contamination in the Upper Area of the Water Table Aquifer is not a problem warranting action, but additional sampling is needed to confirm the nature and extent of the gross alpha contamination.

The purpose of this document is to present a sampling and analysis plan for the Water Table Aquifer for purposes of obtaining additional data for remedial decision-making with respect to radioactive contamination in the groundwater.

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ACRONYMS

Al	aluminum
Am	americium
ARAR	Applicable or Relevant and Appropriate Requirements
B	boron
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CCl4	carbon tetrachloride
cis12DCE	cis-1,2-dichloroethene
COC	Constituent of Concern
COPC	Constituent of Potential Concern
DOE	Department of Energy
DWPF	Defense Waste Processing Facility
ETF	Effluent Treatment Facility
Fe	iron
FFA	Federal Facility Agreement
ft	feet
FY	Fiscal Year
GA	gross alpha
GWOU	Groundwater Operable Unit
Hg	mercury
HGCA	Hybrid Groundwater Corrective Action System
I	iodine
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
IDW	Investigation Derived Waste
IROD	Interim Action Record of Decision
kg	kilogram
m	meter
MCL	Maximum Concentration Limit
mg	milligram

ACRONYMS (con't)

Mn	manganese
NO2	nitrite
NO3	nitrate
Np	neptunium
NVB	nonvolatile beta
OU	Operable Unit
Pb	lead
PCE	tetrachloroethylene
pCi/L	picoCuries/liter
PDWS	Primary Drinking Water Standard
pH	negative log of the hydrogen ion concentration
ppb	parts per billion
Pu	plutonium
Ra	radium
RA	Risk Assessment
RBA	Risk-Based Activities
RCOC	Refined Constituent of Concern
RCRA	Resource Conservation and Recovery Act
RDR/RA	Unit Remedial Design Report/Remedial Action
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFI/RI/BRA	RCRA Facility Investigation/Remedial Investigation Report with Baseline Risk Assessment
RGO	Remedial Goal Option
Rn	radon
Rad	radiological
SCDHEC	South Carolina Department of Health and Environmental Control
Sr	strontium
SRS	Savannah River Site
TAL	Target Analyte List

ACRONYMS (con't)

Tc	technetium
TCE	trichloroethylene
Tl	thallium
TNX OU	TNX Area Operable Unit
U	uranium
mg/kg	milligrams per kilogram
US EPA	United States Environmental Protection Agency
VC	vinyl chloride
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WSRC	Westinghouse Savannah River Company
3Q99	third quarter of the calendar year 1999
4Q99	fourth quarter of the calendar year 1999
1Q00	first quarter of the calendar year 2000
2Q00	second quarter of the calendar year 2000
3Q00	third quarter of the calendar year 2000
4Q00	fourth quarter of the calendar year 2000
1Q01	first quarter of the calendar year 2001

1.0 INTRODUCTION

The TNX Area Operable Unit (TNX Area OU) of the Savannah River Floodplain Swamp Watershed (see Figure 1) is listed as one entry in the FFA Appendix C, RCRA/CERCLA Units List (WSRC 1994a). The TNX Area OU consists of four waste units, the New TNX Seepage Basin (904-102G); TNX Burying Ground (643-5G); Old TNX Seepage Basin (904-076G), and TNX Groundwater (082-G), which is the groundwater beneath the units. The upper most aquifer system of the TNX Area OU is referred to as Water Table Aquifer. The purpose of this document is to present a sampling and analysis plan for the Water Table Aquifer for purposes of obtaining additional data for remedial decision-making with respect to radioactive contamination in the groundwater. Although this document is focused on radiological sampling, for completeness, other non-radiological sampling activities (i.e. VOAs, metals, inorganics) are also documented. A brief overview of the TNX Area OU and previous waste disposal practices are provided below. Previous surveys of data and conclusions from the TNX Area OU RFI/RI/BRA are also provided in Section 2.0 as a basis for the proposed sampling and analysis plan presented in Section 3.0 of this document.

1.1 TNX Area OU History

The TNX Area OU is situated in the southwestern portion of the Savannah River Site (SRS), approximately one quarter-mile east of the Savannah River. The area has served as a pilot scale testing and evaluation facility in support of chemical processes for fuel and target manufacturing areas and for the Defense Waste Processing Facility (DWPF). The following sections describe the various activities at TNX that have resulted in contamination of soil and groundwater. Additional information for the Gordon Aquifer and the other three waste units can be found in the *RFI/RI Work Plan for TNX Area Operable Unit* (WSRC 1999a) and the *RFI/RI Report with Baseline Risk Assessment for the TNX Area Operable Unit* (WSRC 1999b).

1.1.1 Old TNX Seepage Basin

The Old TNX Seepage Basin (904-076G) was an unlined liquid-waste disposal area operated from the mid 1950's until 1980 that received wastewater generated from the TNX pilot-scale test facility. The wastewaters were conveyed through a network of process sewers. Groundwater sampling data from wells in the TNX Area indicate that seepage from the unlined basin and leakage from the process sewers resulted in soil and groundwater contamination throughout the TNX Area.

In addition, the basin would overflow periodically, and the liquids would flow down the hill to the west and discharge into the Savannah River swamp. The basin was operational from the mid 1950's until 1980 and was closed in 1981. During the closure, the west wall of the basin was breached and the remaining liquids were discharged into the swamp, forming a sediment fan referred to as the TNX Outfall Delta. The list of process chemicals disposed in the basin includes various inorganic salts, low-level radionuclides, and organic solvents. Waste stream components of particular interest included natural thorium, uranyl nitrate, mercuric nitrate, several aluminum and ammonium compounds, and tributyl phosphate. The exact quantities of disposed waste are not documented. Results from outfall delta investigations indicate the presence of inorganic and low-level radioactive contamination.

1.1.2 New TNX Seepage Basin

The New TNX Seepage Basin (904-102G) is an unlined earthen basin that received wastewater generated by the TNX facility. Beginning in 1980, the basin went into operation and received process waste flows from pilot scale simulations conducted at the TNX facility in support of the DWPF and the Separations Area. The non-hazardous wastewater consisted primarily of simulated, nonradioactive material along with other wastes such as laboratory sink discharges. Prior to 1983, the basin also received simulated, nonradioactive salt supernatant. In August 1988, the basin was removed from operation, at which time the process flows from the TNX Facility were routed to the TNX Effluent Treatment Facility (ETF). Constituents detected in the basin soils include barium (133 mg/kg), sodium (18,300 mg/kg), and nitrate (2.9 mg/kg).

1.1.3 TNX Burying Ground

The TNX Burying Ground (643-5G), consisting of four trenches at 6- to 8-feet below land surface, received contaminated material (conduit, structural steel, tin, timber, drums, rags, etc.) from a 1953 explosion of an experimental evaporator containing 1300 pounds of uranyl nitrate. Most of the waste was excavated from 1982 to 1983. Five known areas and one suspect area of contamination remain. These areas contain an estimated 60 pounds of uranyl nitrate.

1.1.4 TNX Groundwater

The TNX Groundwater (082-G) is the groundwater beneath the TNX Area units described above, extending all the way to the Savannah River. Potential sources of groundwater contamination included seepage from unlined seepage basins (Old TNX Seepage Basin, New TNX Seepage

Basin), leakage from the process sewers, and leachate from other activities at the area – such as a temporary storage facility for 55-gallon drums that was maintained in the area during site construction in the 1950s, and a staging area for incoming equipment. The exact locations of these areas are unknown but they were in the vicinity of the TNX Burying Ground.

Groundwater at TNX can be divided into two main aquifer systems, a shallow and deep aquifer system. The shallow system can be further subdivided into an unconfined Water Table Aquifer (35 to 40 feet thick) and a deeper semi-confined aquifer overlain by a clayey silt aquitard. The Water Table Aquifer is about 7.6 m (25.0 ft) below ground surface throughout much of the TNX Area OU and it outcrops in the TNX Swamp. The hydraulic gradients are such that groundwater flows progressively from the deeper aquifers to the shallower aquifers and to the Savannah River (WSRC 1998).

Groundwater contamination has been detected at TNX in the Water Table Aquifer, and consistent with the groundwater flow pattern between aquifers (i.e., upward gradient), no contamination has been detected in the semi-confined or deep aquifers. VOCs (primarily TCE, and to a lesser extent PCE, and carbon tetrachloride) are the most widespread and fastest migrating groundwater constituents in the TNX Area. The confining geological formations separating the different aquifer systems and the upward gradient in groundwater flow help to contain the mobile contaminants to the upper unconfined Water Table Aquifer, resulting in a plume stretched out toward the TNX floodplain and the Savannah River. TCE has been detected at the seep line in the Savannah River Swamp where the groundwater plume outcrops. However, no constituents from the plume have been detected in the Savannah River or any offsite groundwater. Currently, no offsite risk is present from the groundwater contamination; however, an unacceptable risk to a hypothetical onsite groundwater user has been documented (WSRC 1992, WSRC 1999b).

1.2 Remedial Actions

To control and remediate the VOC source and groundwater plume, an Interim Action Record of Decision (IROD) for the TNX Groundwater Operable Unit (GWOU) was authorized by US EPA, SCDHEC, and DOE on November 16, 1994 (WSRC 1994b). The IROD mandated that an interim remedial action construction be initiated within 15 months of the signing of the IROD. The objectives of the interim action were to reduce potential risk to human health and the environment, maintain risk at acceptable levels to the onsite worker at the seepline, remove the VOC contamination in the groundwater near the plume core, stabilize the VOC plume by

inhibiting migration of elevated levels of VOCs (500 ppb TCE) to the swamp, and prevent further aquifer degradation.

The selected remedy for accomplishing the Interim Remedial Action goals was designated the Hybrid Groundwater Corrective Action (HGCA) system. The system had two components: 1) traditional pump and treat technology to treat and inhibit further migration of the 500 ppb dissolved VOC plume, and 2) an innovative in-situ technology, airlift recirculation well, located at the heart of the plume to expedite remediation. Based on testing performed in late FY 1996, it was determined that the recirculation well was not effective in removing contaminants at this location due to site specific conditions. Furthermore, it was determined that the pump and treat system would adequately meet the remedial objectives of the Interim Record of Decision. Consequently, it was decided to discontinue further operation of the recirculation well at TNX.

Other technological approaches are being considered and/or evaluated, in the event that the Interim Remedial Action does not suffice for a final remedy. These include the GeoSiphon Cell Pilot Study and the Soil Vapor Extraction Investigation.

2.0 PREVIOUS TNX AREA GROUNDWATER CHARACTERIZATION

The following sections outline findings for the TNX Area OU Water Table Aquifer from both the RFI/RI Work Plan and the RFI/RI/BRA (WSRC 1999a and WSRC 1999b). The last section addresses the need for additional groundwater sampling and analysis in certain wells within the TNX Area OU.

2.1 RFI/RI Work Plan Findings

In preparing the RFI/RI Work Plan, a survey of historical data (1988-1992) was performed for the Water Table Aquifer. From that survey, it was determined that there were six primary groundwater contaminants in the Water Table Aquifer that exceeded the Primary Drinking Water Standards (PDWS). These contaminants included chlorinated VOCs (TCE, PCE, and carbon tetrachloride), nitrate, mercury, and gross alpha. Subsequent characterization activities from the RFI/RI/BRA and quarterly groundwater monitoring have sufficiently characterized the extent of contamination for the VOCs, nitrate, and mercury.

Gross alpha was elevated in the TNX Area and did not appear to be migrating at that time. In the RFI/RI Work Plan, it was reported that gross alpha had been consistently elevated in two monitoring wells located immediately downgradient of the TNX Burying Ground. The specific alpha emitters reported being present were the naturally occurring radionuclides radium-226; thorium-228, -230, and -232; and uranium-233, -234, -235, and -238; and the transuranic radionuclides plutonium-238, -239, -240, and -242; americium-241 and -243; and curium-242, -243, -244, and -246. Of these, radium-226 was reported as the main contributor to the gross alpha in groundwater throughout the TNX Area OU. There is a degree of uncertainty in any conclusions drawn from only the older radioanalytical data as the data was incomplete (spatially and temporally).

2.2 RFI/RI/BRA Characterization

As part of RFI/RI/BRA characterization activities for the Water Table Aquifer, 43 wells were sampled between the 4th quarter of 1995 and 3rd quarter of 1996. These wells included: XSB-1A, -1B, -1D, -2D, and -4D near the Old TNX Seepage Basin; TBG-1, -3, -4, -5, -5A, -5B, -6, and -7 near the TNX Burying Ground; YSB-1A, -2A, -3A, and -4A near the New TNX Seepage Basin; and TNX-1D through -27D from throughout the general TNX Area.

Samples from these wells were analyzed for VOCs, semi-volatile organics, TAL inorganics, pesticides/PCBs, boron, nitrates, tritium, gross radionuclide indicators (gross alpha, nonvolatile beta, total alpha-emitting radium), and field indicator parameters. Based on the previous sampling and analysis described in the RFI/RI Work Plan, it was assumed that the primary alpha-emitting radionuclide was radium-226. Consequently, radiological speciation of Water Table Aquifer samples was not performed during the RFI/RI/BRA characterization. In addition to the well locations above, two hydropunch groundwater samples (TSBG-1-13; TSBG-5-13) were collected in April 1996 and background samples were collected at well P-26D.

The following conclusions were made as part of the RFI/RI/BRA: no primary sources of contamination were identified within the Water Table Aquifer, while potential secondary sources of contamination included seepage from the unlined basins, leakage from the process sewers, and leachate from other activities in the TNX Area OU. The potential exposure pathway for the Water Table Aquifer was groundwater. From a total of 11 human health COCs, seven were retained as refined COCs (RCOCs) for the Water Table Aquifer. These included boron, manganese, mercury, carbon tetrachloride, chloroform, tetrachloroethylene, and

trichloroethylene. The human health remedial goal objectives (RGOs) for these RCOCs were developed.

Although not retained as RCOCs, two constituents (gross alpha and total alpha-emitting radium) consistently exceeded MCLs in wells just west of the TNX Burying Ground (TBG-1, -3, -4) (See Figures 2 and 5). Using current RFI/RI/BRA screening protocol, these constituents should be included as RCOCs because they exceed MCLs which are considered Applicable or Relevant and Appropriate Requirements (ARARs).

2.3 Groundwater Monitoring for the RCOCs

The current revision of the TNX Effectiveness Monitoring Strategy Addendum for the TNX GWOU RDR/RA Work Plan (WSRC 1999c) specifies a "Full Operations Monitoring Scheme" for the Interim Remedial Action as detailed in Tables 1 and 2. The scheme requires annual monitoring of several RCOCs along with nitrate (as an indicator of the extent of groundwater contamination in the TNX area). TCE monitoring is quarterly. Reporting occurs on a semiannual basis.

2.4 Groundwater Monitoring for Radionuclides

As discussed above, RFI/RI/BRA characterization and quarterly groundwater monitoring activities have sufficiently characterized the source and/or extent of contamination for the RCOCs. In addition, two locations with gross alpha activities above the MCL were identified and include a "Lower Area" located at the western edge of the Inner Swamp Area just west of the TNX Outfall Delta (well TCM-3) and an "Upper Area" just west of the TNX Burying Ground (wells TBG-1, -3, -4) (see Figure 2). Because radiological speciation of groundwater samples was not performed during the RFI/RI/BRA, uncertainties exist concerning the nature (i.e., isotopic composition) of alpha-emitting radionuclides in the groundwater, the extent (distribution) of the contamination, and the temporal variability. To determine the nature, extent, and temporal variability of radionuclide contamination in the TNX groundwater, the following phased groundwater sampling approach has been used.

2.4.1 Phase 1 Monitoring

In order to investigate the nature of the elevated gross alpha activities at the Lower Area, the 3Q99 sampling event (see Table 3) included additional radiological speciation for four wells near

the Inner Swamp area (TCM-2, TCM-3, TIR-1U, and TIR-3B). TCM-3 had consistently exhibited gross alpha activities exceeding the MCL since first sampling in 1997, whereas the immediately adjacent TCM-2 well showed gross alpha activities consistently below MCL. TIR-1U and TIR-3B showed activities just below and above the MCL. Other wells in the Lower Area showed gross alpha activities below MCL. (It should be noted that TCM-3, TIR-1U, and TIR-3B are not screened like typical monitoring wells, as discussed below in Section 2.5.1.)

2.4.2 Phase 2 Monitoring

The 4Q99 sampling event (see Table 4) continued the Phase 1 additional analyses for the Lower Area. In order to investigate the extent of the radiological contamination near well TCM-3, gross alpha and nonvolatile beta sampling was added for wells near TCM-3 (TCM-1, -5, -7, TIR-1L, -1M- -1U, -2, TNX-10D, TNX-11D), along the High Ground (TNX-8D, -9D, and -26D through -37D), and in the Outer Swamp (TNX-13D, -14D, -15D, and -16D). In addition, radiological speciation for seven wells in the Upper Area (TBG-1, TBG-3, TBG-4, TNX-3D, XSB-2D, XSB-3A, and XSB-4D) and a background well (P-26D) was included. The three TBG wells have historically shown gross alpha activities above MCLs. The XSB wells are downgradient of the TBG wells as well as downgradient and/or sidegradient of the Old TNX Seepage Basin (See Figure 3). These eight wells were added to support the evaluation of the nature of the high gross alpha activities in the Upper Area. Additional Upper Area wells were added for gross alpha and nonvolatile beta sampling to evaluate the extent of groundwater contamination. This second phase of radiological monitoring continued through the 1Q00 sampling event, as detailed in Table 5.

2.4.3 Phase 3 Monitoring

For the Lower Area, the second phase of radiological monitoring continued through the third phase with addition of GA and NVB sampling for six Outer Swamp wells (TNX-17D through TNX-22D) for the purpose of providing further definition of downgradient contamination extent (See Figure 3). Evaluation of the Phase 1 and Phase 2 monitoring data indicated the need for additional speciation for the three wells with highest gross alpha activities (TBG-1, -3, and -4) as the data did not clearly indicate the entire composition of the gross alpha activities in the Upper Area. The 2Q00 sampling event (see Table 6) therefore saw the addition of speciation of additional analytes in the three TBG wells, as well as the addition of wells for speciation (TBG-6, TNX-26D, and TNX-4D) to help with defining the nature and extent of the contamination.

Additional alpha-emitter speciation for Np, Am, Pu, and Rn was added (rad suite 2) to the suite of radiological speciation for the three monitoring wells with the highest gross alpha activities (TBG-1, -3, and –4). Radiological speciation (rad suite 1) of TBG-6 and TNX-4D was added to provide groundwater data sidegradient to the highest gross alpha activity area (See Figure 3). TNX-26D speciation was added as a sidegradient well for the Lower Area. Additional general TNX area wells (YSB-1A through YSB-4A) were added for gross alpha and nonvolatile beta analysis to ensure that all potential radiological groundwater contamination areas at TNX have been identified.

2.4.4 Phase 4 Monitoring

Based on analysis of the Phase 1 through 3 monitoring data and discussions with the Core Team on 6/8/2000, it was determined that the full nature and extent of the Upper Area radiological groundwater contamination was not yet fully understood. Thus, two additional wells (XSB-1D and TRW-1) immediately downgradient of TBG-3 and TBG-4 were added for radiological speciation in the Upper Area for 3Q00 sampling (see Figure 3 and Table 7). In addition, to support risk analysis (metal toxicity), total uranium was added to the analysis suite for those wells already having radiological speciation.

2.5 Summary of Characterization

Summary figures of monitoring results for gross alpha, total uranium, and total radium activities are given in Figures 2, 4, and 5, respectively. The three figures include detect and non-detect results to convey a complete picture of historical groundwater monitoring results. For the total radium figure, most of the data presented is the reported total alpha-emitting radium (denoted as "total radium"), with radium-226 data used when the total alpha-emitting radium was not reported. In the few cases where both radium-226 and total alpha-emitting radium was reported, the higher value was used. For the total uranium figure, the data presented is the sum of the alpha-emitting uranium isotopes: uranium-234, uranium-235, and uranium-238.

To facilitate interpretation of the data, monitoring results for each well were analyzed and classified according to the historical number of samples greater than MCLs (or 15 pCi/L in the case of total uranium). The majority of radiological monitoring results have been below MCLs. Consequently, a majority of wells have never had samples greater than MCLs and these wells are represented by green symbols. The relatively few wells that consistently show results greater than MCLs have red symbols, and these wells are thought to be indications of groundwater

contaminated above MCLs. Those wells that have had a limited number of hits above MCLs (typically 3 or less), with temporal independence (i.e., no discernable correlation amongst hits above MCL), are represented by yellow symbols. These wells with limited/independent hits are not thought to be indicative of groundwater contamination above MCLs.

2.5.1 Lower Area

The recent groundwater monitoring activities in the Lower Area have measured concentrations of both gross alpha and uranium activity in well TCM-3 above MCLs. Speciation data for radiological contaminants has been limited but indicates that uranium-238 and -234 are the primary radionuclides contributing to the alpha activity and radium-226 is potentially a secondary contributor. Based on concentrations of gross alpha in nearby groundwater wells, the extent of this contamination above MCLs appears to be limited to the area near well TCM-3. Soils near the TCM wells (grid node J-1 of the Swamp High Ground Area of the TNX Outfall Delta, Lower Discharge Gully, and Swamp Operable Unit) have also exhibited elevated concentrations of gross alpha.

As part of the GeoSiphon Cell Pilot Study, wells TCM-1, -2, and -3 were installed upgradient to the cell (TGSC-1). Well TCM-3 was used to monitor average VOC concentrations in groundwater near the cell. Wells TCM-1 and TCM-3 were screened at different intervals within the Water Table Aquifer and draw groundwater from targeted stratigraphic horizons (See Figure 6). The TCM-2 screen interval is longer and encompasses the TCM-3 screen zone. The field geologic log and associated TCE profile in the soil for the TCM wells (TCM-1SB) is included in Figure 6. The upper 10 ft of the subsurface near the TCM wells consists of an upper sandy-silty region with a highly permeable gravel layer (8 to 10 ft-bls) and an iron-cemented layer (11 ft-bls) that potentially restricts the downward migration of contaminants. Concentrations of TCE in aquifer sediments are elevated in the region above the iron-cemented layer, ranging from 0.005 to 0.065 mg/kg (See TCM-1SB TCE profile). From 11 to 22 ft-bls, the sandy-silty region continues until becoming confined by a clay lamanae region (18 to 22 ft-bls). Concentrations of TCE were lower in this region (0.005 to 0.010 mg/kg). From 22 to 40 ft-bls, the aquifer geology consists of three sandy layers separated by two claylamanae regions. As expected from the upward gradient in groundwater flow (See section 1.1.4), TCE concentrations were lowest (less than 0.01 mg/kg) in this region, indicating that migration of VOC contaminated groundwater into this region is minor. Finally, at 40 ft-bls, the aquifer is confined by the Top Snapp Formation of the Crouch Branch Confining Unit.

Well TCM-1 was screened over the small interval (26 to 28 ft-bls) in the sandy layer between the two clay lens, where the TCE concentration was low. Well TCM-2 was screened at an interval

similar to the GeoSiphon Cell (3 to 23 ft-bls) over the sandy regions above and below the iron cementation formation. Well TCM-3 was screened over a small interval (10.5 to 12.5 ft-bls) above and below the iron cementation formation near the gravel layer where the permeability was the highest. TCM-2 is screened to monitor average groundwater contaminant concentrations over the entire sandy region, while TCM-3 is screened to monitor concentrations in the region of highest permeability. Consequently, contaminant concentrations in well TCM-2 may be lower compared with TCM-3, due to the effects of dilution. Groundwater monitoring results for gross alpha and uranium indicate that this may be occurring. Results for gross alpha (1997 to present), have demonstrated that activities in wells TCM-3 have varied from 10 to 60 pCi/L, while activities in well TCM-2 have varied from 3 to 15 pCi/L (i.e. a dilution of about 3 or 4). Gross alpha activities are low (less than 2 pCi/L) in well TCM-1, indicating again that migration of contaminated groundwater into the lower portion of the aquifer (20 to 40 ft-bls) is minor.

Similar to the TCM well series, the TIR well series (TIR-1U, -1M, -1L, -2, and -3B) is also screened at different intervals within the Water Table Aquifer. The TIR wells were installed as piezometers (with 2 foot screen intervals) to assess natural pathways of contaminant removal along the extended axis of the TCE plume in the TNX Swamp Area. Wells TIR-1U, -1M, and -1L were installed in a cluster, screening the upper (7.5-9.5 ft bls), middle (13-15 ft bls), and lower (32-34 ft bls) portions of the TCE plume respectively, while wells TIR-3B and TIR-2 were installed upgradient and downgradient to the cluster, respectively, screening only the middle (13-15 ft bls) portion of the TCE plume (See Figure 6). At the time of well installation, TCE concentrations in the Water Table Aquifer (soil borings TIR-PH and TIR-3B) were highest in the upper and middle portions of the plume (See Figure 6). Based on the discussion for the TCM well series, the upper and middle portions of the TCE plume correspond to the region of highest permeability. Consequently, it is likely that contaminant concentrations in upper and middle wells (TIR-1U, -1M, -2, -3B) would be significantly higher than in the lower well (TIR-1L). In addition, because the upper and middle TIR wells were screened only at 2 foot intervals, they are expected to have contaminant concentrations much higher (potentially 3 to 4 times higher) than typical monitoring wells (i.e. wells with 15 to 20 ft screen intervals) located in close proximity (i.e. wells TNX-10D, TNX-11D, TCM-4, -5, -6, -7, -8). Note that wells TCM-4, -5, -6, -7, -8 in the Lower Area were installed to monitor the hydraulic interaction between the two Geosiphon Cells, TGSC-1 and TGSC-2, and were screened (15 foot screens) in the contaminated zone (upper and middle portions of the TCE plume).

2.5.2 Upper Area

Gross alpha activities in the Upper Area wells are less than 60 pCi/L and the extent of consistent groundwater contamination above MCLs appears to be limited to an area near wells TBG-1, -3, and -4. Gross alpha activities have been consistently elevated above the MCL in TBG-1, -3, and -4 since initial monitoring in 1988. Monitoring data from TNX-3D indicates that gross alpha activities have been historically near (above and below) the MCL. Speciation data for radiological contaminants has indicated that radium-226 may be the primary contributor to the alpha activity (see Figure 5). To further define the nature, extent, and temporal variability of radiological groundwater contamination in the Upper Area, additional rounds of speciation sampling is needed.

3.0 SAMPLING AND ANALYSIS PLAN

The following sections define the sampling and analysis plan for radioactive constituents in the groundwater in the TNX area. Well sampling will be conducted in compliance with *WSRC Hydrogeologic Data Collection Procedures and Specifications (U),* Manual 3Q5 Chapter 15 (WSRC, 1997). All samples will be analyzed for sample chemistry by SCDHEC-certified laboratories. Sampling activities associated with this investigation will generate aqueous investigation-derived waste (IDW). All IDW will be managed in accordance with the *Investigative Derived Waste Management Plan* (WSRC 1994c).

Table 8 details the proposed radiological sampling for TNX area wells from the 4Q00 to 1Q01. Sampling up to the first quarter of 2001 will provide enough quarterly data to discern nature and extent of the contamination, and account for any seasonal fluctuations. TCM-3, TIR-1U, and TIR-3B are carried forward as monitoring locations receiving comprehensive radiological speciation in this Work Plan Addendum to only provide temporal intra-well comparisons due to their unique well screen intervals.

Groundwater sampling beyond 1Q01 will be based on the scheme given in Table 9. Sampling beyond 1Q01 is a reduction in groundwater radiological sampling and a return to the Interim Action Full Operations Monitoring scheme of Table 1. The primary differences between the monitoring plans given in Table 1 and Table 9 are that gross alpha analyses will be increased in frequency from annual to quarterly sampling for the Primary Group A and Recovery Wells, and

that cis12DCE and VC have been added to the quarterly sampling of the Primary Group A and Recovery Wells.

As elevated nonvolatile beta activities have not been found (WSRC, 2000), nonvolatile beta sampling has been removed from the sampling plan. The following provides specifics for the analysis and decisions for the rad contamination in the two areas.

3.1 Lower Area

During the Core Team meeting on 6/8/2000, the conclusion was made that uranium (i.e., gross alpha) contamination in the Lower Area groundwater is not a problem warranting action, but additional monitoring is needed to address the uncertainty of contamination variability with time. It was agreed that radiological speciation would continue to be performed on Lower Area samples during monitoring activities in order to better define the nature of alpha-emitting radionuclides in the groundwater. Based on monitoring results from Phase 1 through Phase 4, radiological speciation sampling will be focused around well TCM-3 along with an upgradient well (TIR-3B) and a sidegradient well (TNX-26D). The analytes targeted for speciation include the major alpha-emitting radionuclides, as well as, important transuranic fission and decay products. Speciation data will be compared against background concentrations, RBAs, and MCLs and the results will be included in an addendum to the RFI/RI/BRA for the TNX Area OU.

Implementation of this proposed monitoring plan will result in 7 consecutive quarters of radiological speciation data for three Lower Area wells (TCM-2, TCM-3, and TIR-1U), two consecutive quarters of radiological data for wells TCM-5 and TCM-7, and 6 consecutive quarters of gross alpha activities in all nearby monitoring wells. The nature, extent, and temporal variability of any groundwater contamination in the Lower Area will be discerned with this data.

3.2 Upper Area

During the Core Team meeting on 6/8/2000, the conclusion was made that gross alpha contamination in the Upper Area of the Water Table Aquifer is not a problem warranting action, but additional sampling is needed to confirm the extent of the gross alpha contamination. It was also agreed that additional radiological speciation was needed to further define the nature of alpha-emitting radionuclides. Based on monitoring results from Phase 1 through Phase 4, radiological speciation sampling will be focused around and downgradient of the TNX Burying Ground and the Old TNX Seepage Basin, along with an upgradient well (P-26D) and a sidegradient

well (TNX-4D). The analytes targeted for speciation include the major alpha-emitting radionuclides, as well as, important transuranic fission and decay products. In addition, for the highest gross alpha activity wells (TBG-1, -3, -4), alpha-emitting transuranic radionuclides were added to the sampling scheme to further define the nature of the gross alpha contamination. Speciation data will be compared against background concentrations, RBAs, and MCLs and the results will be included in an addendum to the RFI/RI/BRA for the TNX Area OU.

Implementation of this proposed monitoring plan will result in at least 4 consecutive quarters of radiological speciation data for six wells near the Upper Area/TNX Burying Ground (TBG-1, -3, -4, -6, TNX-3D, and –4D), radiological speciation data for six wells near the Upper Area/Old TNX Seepage Basin (3 quarters for XSB-1D and TRW-1; 6 quarters for XSB-2D, -3A, and -4D; and 7 quarters for TIR-3B), and 6 consecutive quarters of gross alpha activities in all nearby monitoring wells. The number of sampling events, distribution of speciation sampling locations around historically high activity areas, and the overall coverage of gross alpha activities as an indication of general contamination, will allow discernment of the nature, extent, and temporal variability of any groundwater contamination in the Upper Area.

4.0 REFERENCES

WSRC 1992. *TNX Groundwater Interim Risk Evaluation (U)*, WSRC-TR-92-573, Rev. 0, January 1994. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1994a. *Federal Facility Agreement for the Savannah River Site*, WSRC-OS-94-42, Administrative Document Number 89-05-FF. Effective Date: August 16, 1993. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1994b. Interim Action Record of Decision, Remedial Alternative Selection - TNX Groundwater Operable Unit, WSRC-TR-94-0375, Rev. 1. October 1994. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1994c. *Investigation-Derived Waste Management Plan (U)*, WSRC-RP-94-1227, Rev. 2, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 1997. Manual 3Q5, *Hydrogeologic Data Collections Procedures and Specifications Manual*, June 1997. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1998. *TNX GeoSiphon Cell (TGSC) Phase I Treatability Study Report (U)*, WSRC-TR-98-48, Rev. 0, February 1998. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1999a. *RFI/RI Work Plan Expanded Sampling Addendum for the Outfall Delta of the TNX Outfall Delta, Lower Discharge Gully, and Swamp Operable Unit (U)*, WSRC-RP-95-113, Rev. 1.8, March 1999. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1999b. *RCRA Facility Investigation/Remedial Investigation Report with Baseline Risk Assessment for the TNX Area Operable Unit (U)*, WSRC-RP-96-808, Rev. 1.2, January 1999. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 1999c. TNX *Groundwater Operable Unit Remedial Design Report/Remedial Action Work Plan*, WSRC-TR-95-284, Rev 1.5, May 1999. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC 2000. *1999 Comprehensive TNX Area Annual Groundwater and Effectiveness Monitoring Strategy Report (U)*, WSRC-RP-2000-4027, May 2000. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

Figure 1. Areal Photograph of the TNX Area

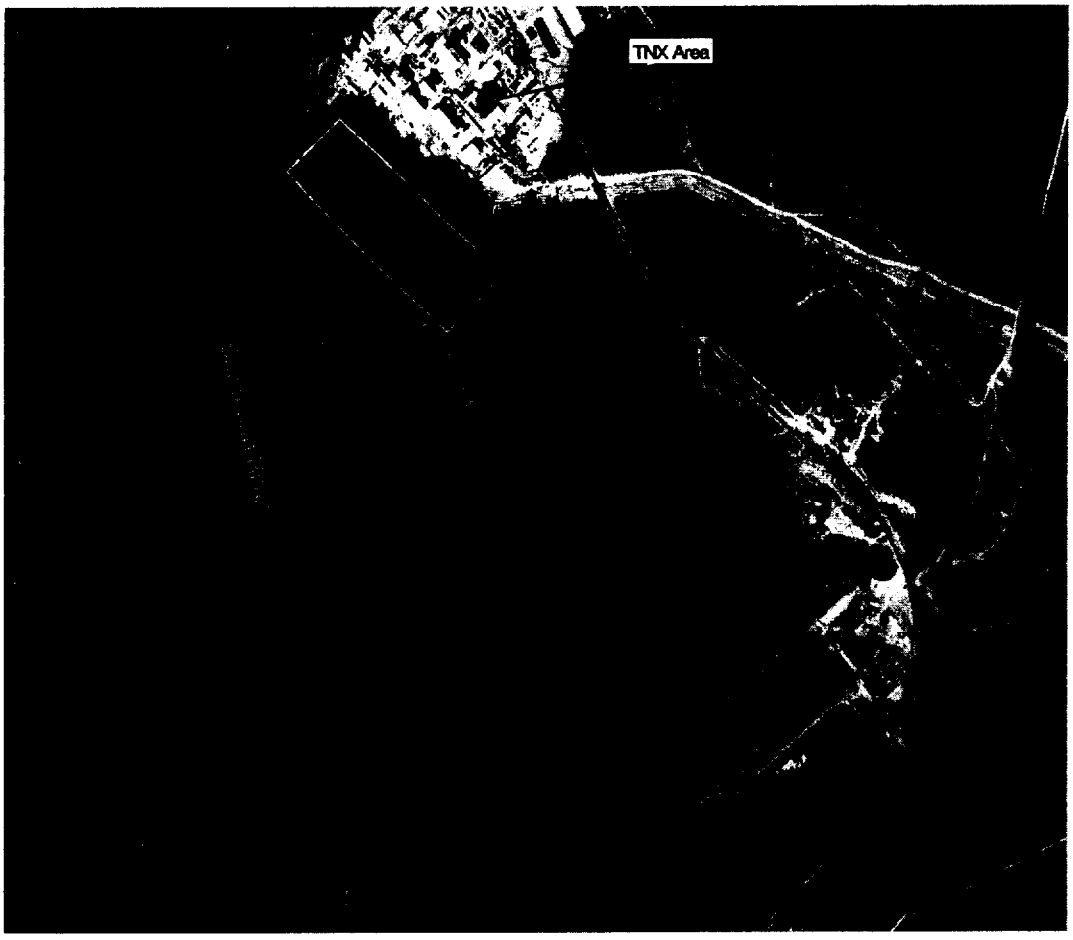
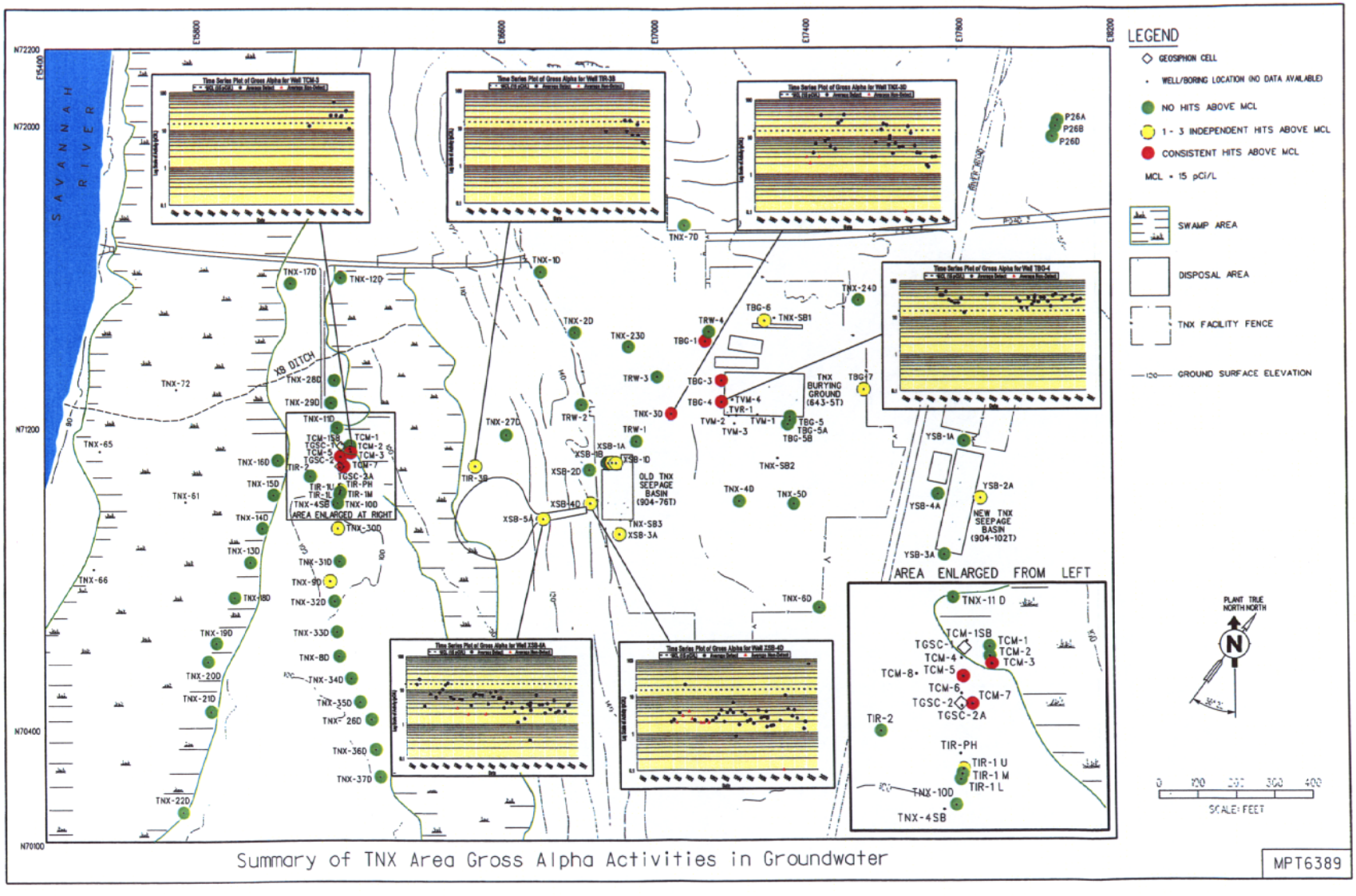


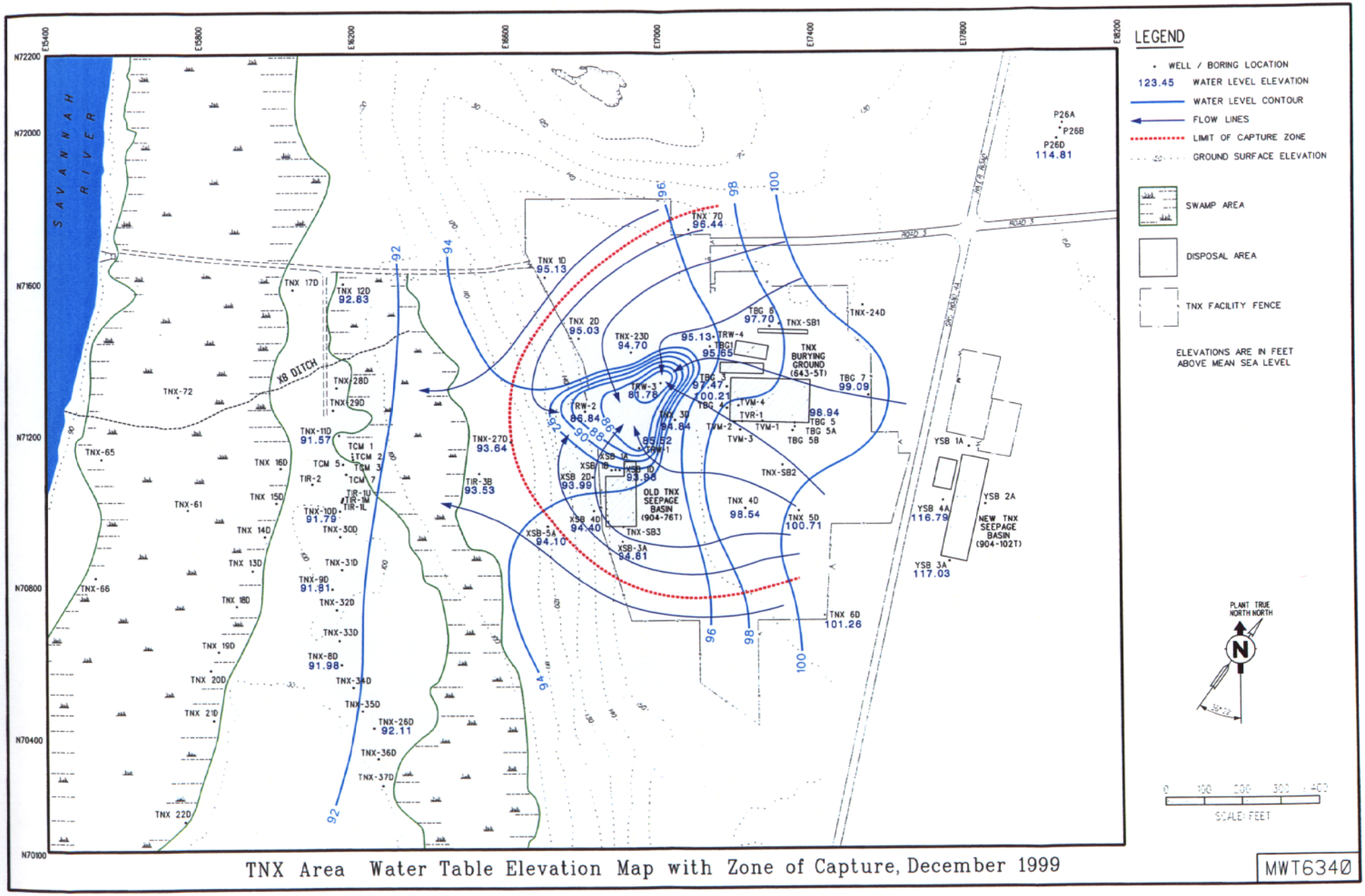
Figure 2. Summary of TNX Area Gross Alpha Activities in Groundwater



Summary of TNX Area Gross Alpha Activities in Groundwater

MPT6389

Figure 3. TNX Area Water Table Elevation Map with Zone of Capture, December 1999



TNX Area Water Table Elevation Map with Zone of Capture, December 1999

MWT6340

Figure 4. Summary of TNX Area Total Uranium Activities in Groundwater

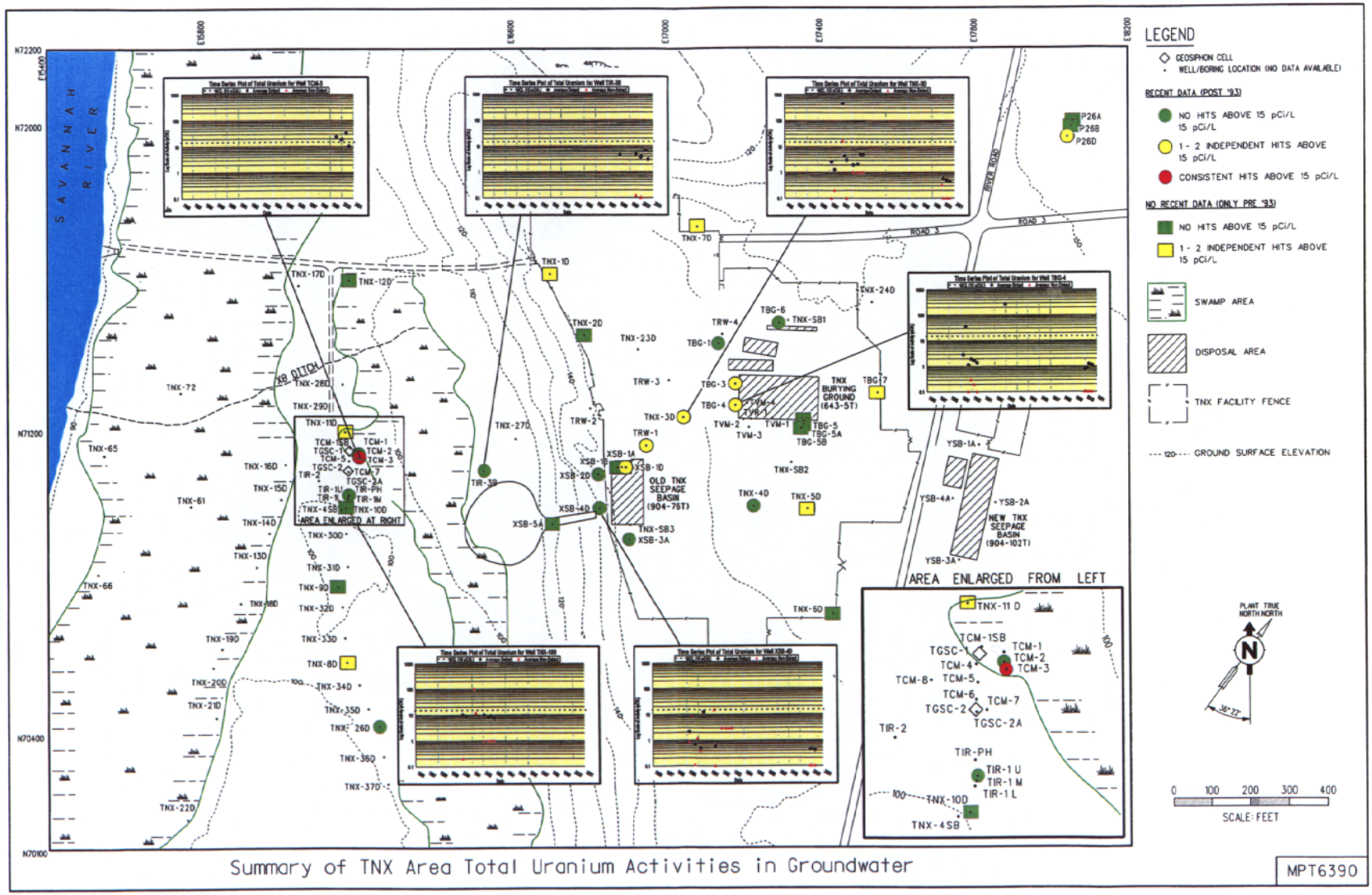
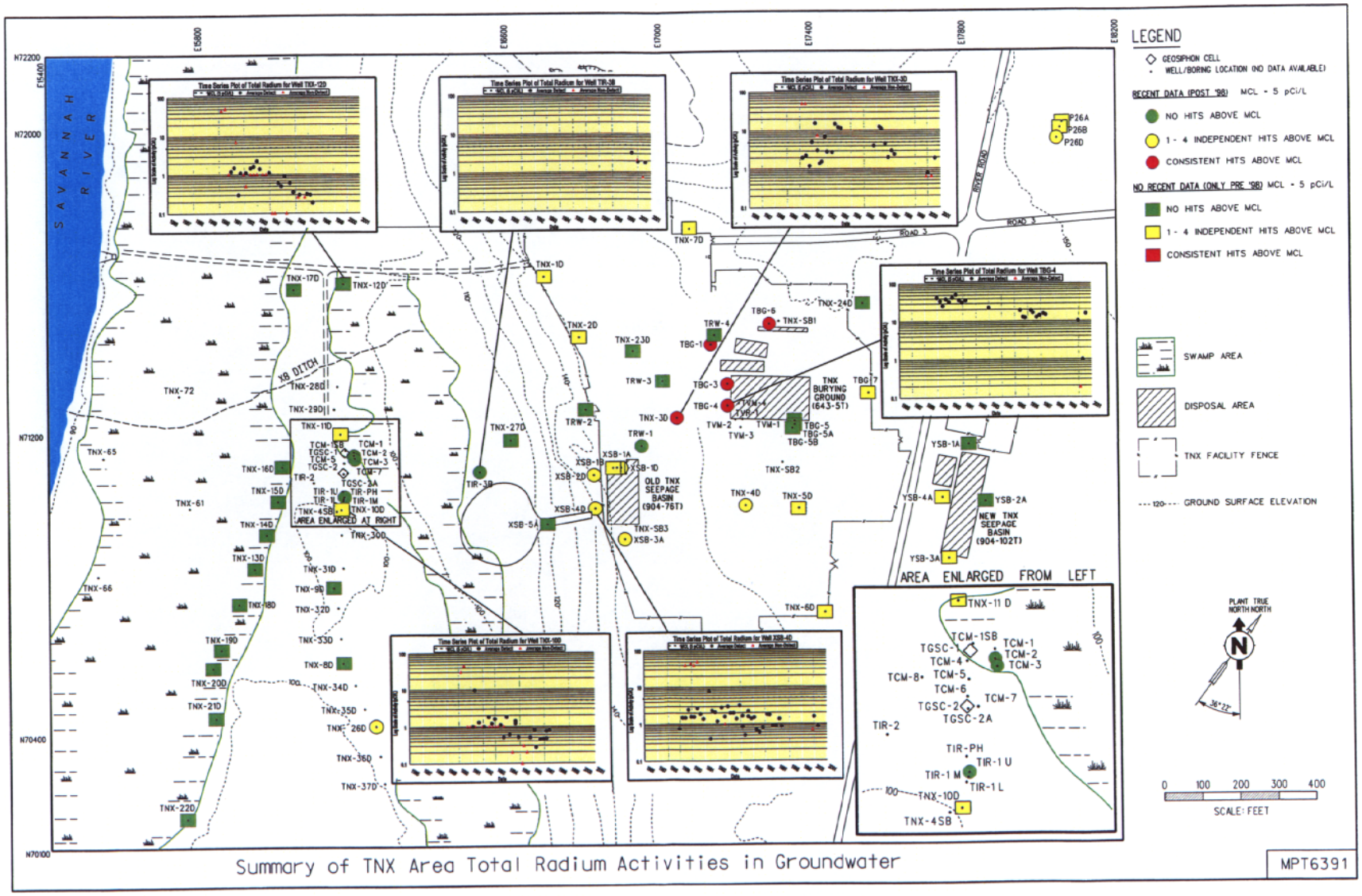
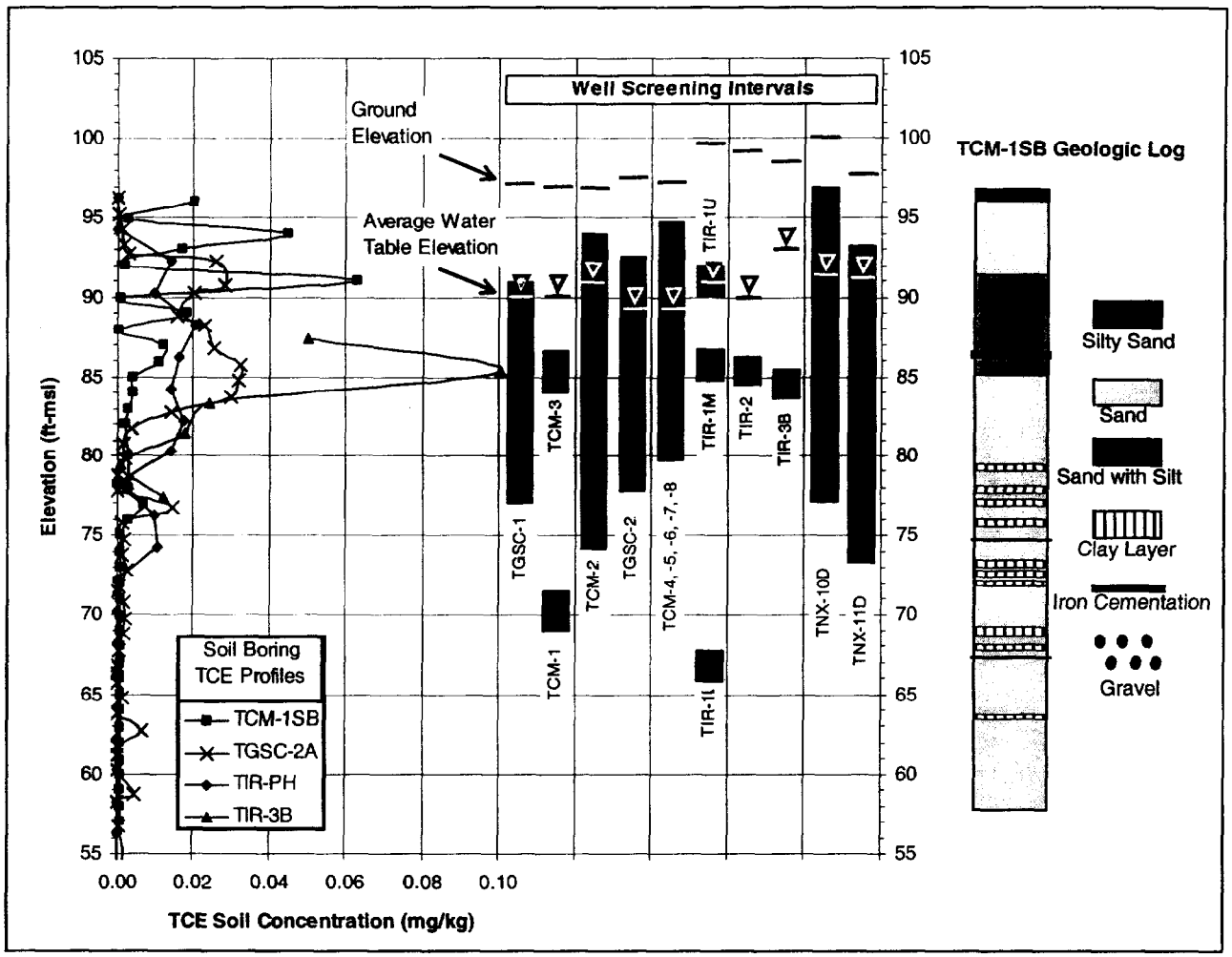

LEGEND
GEOSPHON CELL
WELL/BORING LOCATION (NO DATA AVAILABLE)
RECENT DATA (POST '93)
NO HITS ABOVE 15 pCi/L
15 pCi/L
1 - 2 INDEPENDENT HITS ABOVE
15 pCi/L
CONSISTENT HITS ABOVE 15 pCi/L
NO RECENT DATA (ONLY PRE '93)
NO HITS ABOVE 15 pCi/L
1 - 2 INDEPENDENT HITS ABOVE
15 pCi/L
SWAMP AREA
DISPOSAL AREA
TNX FACILITY FENCE
120 GROUND SURFACE ELEVATION
SAVANNAH RIVER
RB DITCH
ROAD 3
RIVER ROAD
TNX BURYING GROUND (643-5T)
OLD TNX SEEPAGE BASIN (904-76T)
NEW TNX SEEPAGE BASIN (904-102T)
AREA ENLARGED AT RIGHT
AREA ENLARGED FROM LEFT
PLANT TRUE NORTH NORTH
36° 27'
0 100 200 300 400
SCALE: FEET
Summary of TNX Area Total Uranium Activities in Groundwater
MPT6390

Figure 5. Summary of TNX Area Total Radium Activities in Groundwater



Summary of TNX Area Total Radium Activities in Groundwater

Figure 6. TCM and TIR Well Series



Note: TCM-1SB is the soil boring for the TCM wells, TGSC-2A is the soil boring for the second Geosiphon Cell TGSC-2, TIR-PH is the soil boring "Pilot Hole" for the TIR wells, and TIR-3B is the soil boring for well TIR-3B.

Table 1. TNX Interim Action Full Operations Monitoring Scheme

Monitoring Wells*	Constituents	Sampling Frequency
Primary Wells (Group A), Recovery Wells	TCE	Quarterly
Primary Wells (Group B), Background Wells	TCE	Semiannual (2Q, 4Q)
Secondary Wells	Field Parameters**	Semiannual (2Q, 4Q)
Primary Wells (Groups A and B), Recovery Wells Background Wells	VOA (PCE, CCl4, chloroform), Hg, lead, NO3-NO2, gross alpha	Annual (4Q)

* Monitoring well classification is given in Table 2.

** Field parameters (water elevation, pH, conductance, temperature, alkalinity, and turbidity) are measured routinely with every sampling event.

Acronyms: TCE = trichloroethylene, PCE = tetrachloroethylene, CCl4 = carbon tetrachloride, Hg = mercury, NO3 = nitrate, NO2 = nitrite, 2Q = second quarter of the calendar year, 4Q = fourth quarter of the calendar year

Table 2. TNX Monitoring Well Classification

Well Name	Well Classification
TBG 1	Group A
TBG 3	Group A
TBG 4	Group A
TBG 5	Group A
TBG 6	Group A
TCM 2	Group A
TIR 3B	Group A
TNX 3D	Group A
TNX 8D	Group A
TNX 10D	Group A
TNX 11D	Group A
TNX 16D	Group A
TNX 23D	Group A
TNX 26D	Group A
TNX 27D	Group A
XSB 1D	Group A
XSB 2D	Group A
XSB 3A	Group A
XSB 4D	Group A
XSB 5A / XSB 6	Group A

Well Name	Well Classification
TRW 1	Recovery
TRW 2	Recovery
TRW 3	Recovery
TRW 4	Recovery
TBG 5A	Group B
TBG 5B	Group B
TNX 2D	Group B
TNX 4D	Group B
TNX 7D	Group B
XSB 1A	Group B
XSB 1B	Group B
P 26A	Background
P 26B	Background
P 26D	Background
TBG 7	Secondary
TNX 1D	Secondary
TNX 5D	Secondary
TNX 6D	Secondary
TNX 9D	Secondary
TNX 12D	Secondary
TNX 24D	Secondary
YSB 2A	Secondary
YSB 4A	Secondary

Table 3. Phase 1: 3Q99 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background		B, Mn, Al, Fe	
P 26B	Upper Area	Background		B, Mn, Al, Fe	
P 26D	Upper Area	Background		B, Mn, Al, Fe	
TBG 1	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, NO3-NO2, VOA	
TBG 3	Upper Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TBG 4	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, Hg, NO3-NO2, VOA	
TBG 5	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, VOA	
TBG 5A	Upper Area	Group B		B, Mn, Al, Fe	
TBG 5B	Upper Area	Group B		B, Mn, Al, Fe	
TBG 6	Upper Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TBG 7	Upper Area	Secondary		B, Mn, Al, Fe, Pb, VOA	
TNX 1D	Upper Area	Secondary		B, Mn, Al, Fe	
TNX 2D	Upper Area	Group B		B, Mn, Al, Fe	
TNX 3D	Upper Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TNX 4D	Upper Area	Group B		B, Mn, Al, Fe, Pb, VOA	
TNX 5D	Upper Area	Secondary		B, Mn, Al, Fe	
TNX 6D	Upper Area	Secondary		B, Mn, Al, Fe	
TNX 7D	Upper Area	Group B		B, Mn, Al, Fe	
TNX 23D	Upper Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TNX 24D	Upper Area	Secondary		B, Mn, Al, Fe	
TRW 1	Upper Area	Recovery	TCE	B, Mn, Al, Fe, VOA	
TRW 2	Upper Area	Recovery	TCE	B, Mn, Al, Fe, VOA	
TRW 3	Upper Area	Recovery	TCE	B, Mn, Al, Fe, VOA	
TRW 4	Upper Area	Recovery	TCE	B, Mn, Al, Fe, VOA	
XSB 1A	Upper Area	Group B		B, Mn, Al, Fe	
XSB 1B	Upper Area	Group B		B, Mn, Al, Fe	
XSB 1D	Upper Area	Group A	TCE	B, Mn, Al, Fe, VOA	
XSB 2D	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, VOA	
XSB 3A	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, NO3-NO2, VOA	
XSB 4D	Upper Area	Group A	TCE	B, Mn, Al, Fe, Pb, NO3-NO2, VOA	
YSB 1A	Upper Area			B, Mn, Al, Fe	
YSB 2A	Upper Area	Secondary		B, Mn, Al, Fe, Pb, VOA	
YSB 3A	Upper Area			B, Mn, Al, Fe	
YSB 4A	Upper Area	Secondary		B, Mn, Al, Fe, Pb, VOA	

Notes:
VOA includes trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene
Acronyms: Al = aluminum, B = boron, Fe = iron, GA = gross alpha, Hg = mercury, Mn = manganese, NO3 = nitrate, NO2 = nitrite, NVB = nonvolatile beta, Pb = lead, TCE = trichloroethylene, VOA = volatile organic analysis

Table 3. (con't) Phase 1: 3Q99 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area			B, Mn, Al, Fe	
TCM 2	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, Hg, Tl, NO3-NO2, VOA	
TCM 3	Lower Area			B, Mn, Al, Fe, Pb, Hg, Tl, NO3-NO2, VOA	
TCM 5	Lower Area				
TCM 7	Lower Area				
TIR 1L	Lower Area			B, Mn, Al, Fe	
TIR 1M	Lower Area			B, Mn, Al, Fe	
TIR 1U	Lower Area			B, Mn, Al, Fe, Pb, Hg, Tl, NO3-NO2, VOA	
TIR 2	Lower Area			B, Mn, Al, Fe	
TIR 3B	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, Hg, Tl, NO3-NO2, VOA	
TNX 8D	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, VOA	
TNX 9D	Lower Area	Secondary		B, Mn, Al, Fe, Pb, VOA	
TNX 10D	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, NO3-NO2, VOA	
TNX 11D	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, VOA	
TNX 12D	Lower Area	Secondary		B, Mn, Al, Fe, Pb, VOA	
TNX 13D	Lower Area			B, Mn, Al, Fe	
TNX 14D	Lower Area			B, Mn, Al, Fe	
TNX 15D	Lower Area			B, Mn, Al, Fe	
TNX 16D	Lower Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TNX 17D	Lower Area			B, Mn, Al, Fe	
TNX 18D	Lower Area			B, Mn, Al, Fe	
TNX 19D	Lower Area			B, Mn, Al, Fe	
TNX 20D	Lower Area			B, Mn, Al, Fe	
TNX 21D	Lower Area			B, Mn, Al, Fe	
TNX 22D	Lower Area			B, Mn, Al, Fe	
TNX 26D	Lower Area	Group A	TCE	B, Mn, Al, Fe, VOA	
TNX 27D	Lower Area	Group A	TCE	B, Mn, Al, Fe, Pb, Hg, NO3-NO2, VOA	
TNX 28D	Lower Area				
TNX 29D	Lower Area				
TNX 30D	Lower Area				
TNX 31D	Lower Area				
TNX 32D	Lower Area				
TNX 33D	Lower Area				
TNX 34D	Lower Area				
TNX 35D	Lower Area				
TNX 36D	Lower Area				
TNX 37D	Lower Area				
XSB 5A	Lower Area	Group A	TCE	B, Mn, Al, Fe, VOA	

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
VOA includes trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: Al = aluminum, B = boron, Fe = iron, GA = gross alpha, Hg = mercury, Mn = manganese, NO3 = nitrate, NO2 = nitrite, NVB = nonvolatile beta, Pb = lead, TCE = trichloroethylene, Tl = thallium, VOA = volatile organic analysis

Table 4. Phase 2a: 4Q99 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	[redacted]
P 26B	Upper Area	Background	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
P 26D	Upper Area	Background	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 1	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 3	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 4	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 5	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 5A	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 5B	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 6	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TBG 7	Upper Area	Secondary	Field Parameters	B, Mn	
TNX 1D	Upper Area	Secondary	Field Parameters	B, Mn	
TNX 2D	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	[redacted]
TNX 3D	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 4D	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 5D	Upper Area	Secondary	Field Parameters	B, Mn	
TNX 6D	Upper Area	Secondary	Field Parameters	B, Mn	
TNX 7D	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 23D	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 24D	Upper Area	Secondary	Field Parameters	B, Mn	
TRW 1	Upper Area	Recovery	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TRW 2	Upper Area	Recovery	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TRW 3	Upper Area	Recovery	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TRW 4	Upper Area	Recovery	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 1A	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 1B	Upper Area	Group B	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 1D	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 2D	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 3A	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
XSB 4D	Upper Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
YSB 1A	Upper Area			B, Mn	
YSB 2A	Upper Area	Secondary	Field Parameters	B, Mn	
YSB 3A	Upper Area			B, Mn	
YSB 4A	Upper Area	Secondary	Field Parameters	B, Mn	

Notes:

Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec

VOA includes trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene

Highlighted cells are new radiological analyses as compared to the previous quarter

Acronyms: B = boron, cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, Hg = mercury, Mn = manganese, NO3 = nitrate, NO2 = nitrite, NVB = nonvolatile beta, Pb = lead, VOA = volatile organic analysis

Table 4. (con't) Phase 2a: 4Q99 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area			B, Mn, VOA, cis12DCE	
TCM 2	Lower Area	Group A	VOA, Hg, Pb, GA, NO3-NO2	B, Mn, cis12DCE	rad suite 1, NVB
TCM 3	Lower Area			B, Mn, VOA, cis12DCE	rad suite 1, GA, NVB
TCM 5	Lower Area			B, Mn, VOA, cis12DCE	
TCM 7	Lower Area			B, Mn, VOA, cis12DCE	
TIR 1L	Lower Area			B, Mn, VOA, cis12DCE	
TIR 1M	Lower Area			B, Mn, VOA, cis12DCE	
TIR 1U	Lower Area			B, Mn, VOA, cis12DCE	rad suite 1, GA, NVB
TIR 2	Lower Area			B, Mn, VOA, cis12DCE	
TIR 3B	Lower Area	Group A	VOA, Hg, Pb, GA, NO3-NO2	B, Mn, cis12DCE	rad suite 1, NVB
TNX 8D	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 9D	Lower Area	Secondary	Field Parameters	B, Mn, VOA, cis12DCE	
TNX 10D	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 11D	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 12D	Lower Area	Secondary	Field Parameters	B, Mn	
TNX 13D	Lower Area			B, Mn, VOA, cis12DCE	
TNX 14D	Lower Area			B, Mn, VOA, cis12DCE	
TNX 15D	Lower Area			B, Mn, VOA, cis12DCE	
TNX 16D	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 17D	Lower Area			B, Mn	
TNX 18D	Lower Area			B, Mn	
TNX 19D	Lower Area			B, Mn	
TNX 20D	Lower Area			B, Mn	
TNX 21D	Lower Area			B, Mn	
TNX 22D	Lower Area			B, Mn	
TNX 26D	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	
TNX 27D	Lower Area	Group A	VOA, Hg, Pb, GA, NO3-NO2	B, Mn, cis12DCE	NVB
TNX 28D	Lower Area			VOA, cis12DCE	
TNX 29D	Lower Area			VOA, cis12DCE	
TNX 30D	Lower Area			VOA, cis12DCE	
TNX 31D	Lower Area			VOA, cis12DCE	
TNX 32D	Lower Area			VOA, cis12DCE	
TNX 33D	Lower Area			VOA, cis12DCE	
TNX 34D	Lower Area			VOA, cis12DCE	
TNX 35D	Lower Area			VOA, cis12DCE	
TNX 36D	Lower Area			VOA, cis12DCE	
TNX 37D	Lower Area			VOA, cis12DCE	
XSB 5A	Lower Area	Group A	VOA, Hg, Pb, [redacted], NO3-NO2	B, Mn, cis12DCE	

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
VOA includes trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: B = boron, cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, Hg = mercury, Mn = manganese, NO3 = nitrate, NO2 = nitrite, NVB = nonvolatile beta, Pb = lead, VOA = volatile organic analysis

Table 5. Phase 2b: 1Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background			GA, NVB
P 26B	Upper Area	Background			GA, NVB
P 26D	Upper Area	Background			rad suite 1, GA, NVB
TBG 1	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TBG 3	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TBG 4	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TBG 5	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TBG 5A	Upper Area	Group B			GA, NVB
TBG 5B	Upper Area	Group B			GA, NVB
TBG 6	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TBG 7	Upper Area	Secondary			
TNX 1D	Upper Area	Secondary			
TNX 2D	Upper Area	Group B			GA, NVB
TNX 3D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TNX 4D	Upper Area	Group B			GA, NVB
TNX 5D	Upper Area	Secondary			
TNX 6D	Upper Area	Secondary			
TNX 7D	Upper Area	Group B			GA, NVB
TNX 23D	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TNX 24D	Upper Area	Secondary			
TRW 1	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 2	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 3	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 4	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
XSB 1A	Upper Area	Group B			GA, NVB
XSB 1B	Upper Area	Group B			GA, NVB
XSB 1D	Upper Area	Group A	TCE	cis12DCE	GA, NVB
XSB 2D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
XSB 3A	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
XSB 4D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
YSB 1A	Upper Area				
YSB 2A	Upper Area	Secondary			
YSB 3A	Upper Area				
YSB 4A	Upper Area	Secondary			

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene

Table 5. (con't) Phase 2b: 1Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area				GA, NVB
TCM 2	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TCM 3	Lower Area				rad suite 1, GA, NVB
TCM 5	Lower Area				GA, NVB
TCM 7	Lower Area				GA, NVB
TIR 1L	Lower Area				GA, NVB
TIR 1M	Lower Area				GA, NVB
TIR 1U	Lower Area				rad suite 1, GA, NVB
TIR 2	Lower Area				GA, NVB
TIR 3B	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TNX 8D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 9D	Lower Area	Secondary			GA, NVB
TNX 10D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 11D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 12D	Lower Area	Secondary			
TNX 13D	Lower Area				GA, NVB
TNX 14D	Lower Area				GA, NVB
TNX 15D	Lower Area				GA, NVB
TNX 16D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 17D	Lower Area				
TNX 18D	Lower Area				
TNX 19D	Lower Area				
TNX 20D	Lower Area				
TNX 21D	Lower Area				
TNX 22D	Lower Area				
TNX 26D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 27D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 28D	Lower Area				GA, NVB
TNX 29D	Lower Area				GA, NVB
TNX 30D	Lower Area				GA, NVB
TNX 31D	Lower Area				GA, NVB
TNX 32D	Lower Area				GA, NVB
TNX 33D	Lower Area				GA, NVB
TNX 34D	Lower Area				GA, NVB
TNX 35D	Lower Area				GA, NVB
TNX 36D	Lower Area				GA, NVB
TNX 37D	Lower Area				GA, NVB
XSB 5A	Lower Area	Group A	TCE	cis12DCE	GA, NVB

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene

Table 6. Phase 3: 2Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background	TCE	cis12DCE	GA, NVB
P 26B	Upper Area	Background	TCE	cis12DCE	GA, NVB
P 26D	Upper Area	Background	TCE	cis12DCE	rad suite 1, GA, NVB
TBG 1	Upper Area	Group A	TCE	cis12DCE	rad suite 1, [redacted], GA, NVB
TBG 3	Upper Area	Group A	TCE	cis12DCE	rad suite 1, [redacted], GA, NVB
TBG 4	Upper Area	Group A	TCE	cis12DCE	rad suite 1, [redacted], GA, NVB
TBG 5	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TBG 5A	Upper Area	Group B	TCE	cis12DCE	GA, NVB
TBG 5B	Upper Area	Group B	TCE	cis12DCE	GA, NVB
TBG 6	Upper Area	Group A	TCE	cis12DCE	[redacted], GA, NVB
TBG 7	Upper Area	Secondary	Field Parameters		
TNX 1D	Upper Area	Secondary	Field Parameters		
TNX 2D	Upper Area	Group B	TCE	cis12DCE	GA, NVB
TNX 3D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TNX 4D	Upper Area	Group B	TCE	cis12DCE	[redacted], GA, NVB
TNX 5D	Upper Area	Secondary	Field Parameters		[redacted]
TNX 6D	Upper Area	Secondary	Field Parameters		
TNX 7D	Upper Area	Group B	TCE	cis12DCE	GA, NVB
TNX 23D	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TNX 24D	Upper Area	Secondary	Field Parameters		
TRW 1	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 2	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 3	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 4	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
XSB 1A	Upper Area	Group B	TCE	cis12DCE	GA, NVB
XSB 1B	Upper Area	Group B	TCE	cis12DCE	GA, NVB
XSB 1D	Upper Area	Group A	TCE	cis12DCE	GA, NVB
XSB 2D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
XSB 3A	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
XSB 4D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
YSB 1A	Upper Area				[redacted]
YSB 2A	Upper Area	Secondary	Field Parameters		
YSB 3A	Upper Area				
YSB 4A	Upper Area	Secondary	Field Parameters		

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Rad Suite 2: Alpha Spec [neptunium, americium, plutonium], radon-222; and iodine-129
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene

Table 6. (con't) Phase 3: 2Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area				GA, NVB
TCM 2	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TCM 3	Lower Area				rad suite 1, GA, NVB
TCM 5	Lower Area				GA, NVB
TCM 7	Lower Area				GA, NVB
TIR 1L	Lower Area				GA, NVB
TIR 1M	Lower Area				GA, NVB
TIR 1U	Lower Area				rad suite 1, GA, NVB
TIR 2	Lower Area				GA, NVB
TIR 3B	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB
TNX 8D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 9D	Lower Area	Secondary	Field Parameters		GA, NVB
TNX 10D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 11D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 12D	Lower Area	Secondary	Field Parameters		GA, NVB
TNX 13D	Lower Area				GA, NVB
TNX 14D	Lower Area				GA, NVB
TNX 15D	Lower Area				GA, NVB
TNX 16D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 17D	Lower Area				[redacted]
TNX 18D	Lower Area				
TNX 19D	Lower Area				
TNX 20D	Lower Area				
TNX 21D	Lower Area				
TNX 22D	Lower Area				
TNX 26D	Lower Area	Group A	TCE	cis12DCE	[redacted], GA, NVB
TNX 27D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 28D	Lower Area				GA, NVB
TNX 29D	Lower Area				GA, NVB
TNX 30D	Lower Area				GA, NVB
TNX 31D	Lower Area				GA, NVB
TNX 32D	Lower Area				GA, NVB
TNX 33D	Lower Area				GA, NVB
TNX 34D	Lower Area				GA, NVB
TNX 35D	Lower Area				GA, NVB
TNX 36D	Lower Area				GA, NVB
TNX 37D	Lower Area				GA, NVB
XSB 5A	Lower Area	Group A	TCE	cis12DCE	GA, NVB

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Rad Suite 2: Alpha Spec [neptunium, americium, plutonium], radon-222; and iodine-129
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene

Table 7. Phase 4: 3Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background			GA, NVB
P 26B	Upper Area	Background			GA, NVB
P 26D	Upper Area	Background			rad suite 1, GA, NVB, [redacted]
TBG 1	Upper Area	Group A	TCE	cis12DCE	rad suite 1 & 2, GA, NVB, [redacted]
TBG 3	Upper Area	Group A	TCE	cis12DCE	rad suite 1 & 2, GA, NVB, [redacted]
TBG 4	Upper Area	Group A	TCE	cis12DCE	rad suite 1 & 2, GA, NVB, [redacted]
TBG 5	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TBG 5A	Upper Area	Group B			GA, NVB
TBG 5B	Upper Area	Group B			GA, NVB
TBG 6	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
TBG 7	Upper Area	Secondary			
TNX 1D	Upper Area	Secondary			
TNX 2D	Upper Area	Group B			GA, NVB
TNX 3D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
TNX 4D	Upper Area	Group B			rad suite 1, GA, NVB, [redacted]
TNX 5D	Upper Area	Secondary			GA, NVB
TNX 6D	Upper Area	Secondary			GA, NVB
TNX 7D	Upper Area	Group B			GA, NVB
TNX 23D	Upper Area	Group A	TCE	cis12DCE	GA, NVB
TNX 24D	Upper Area	Secondary			
TRW 1	Upper Area	Recovery	TCE	cis12DCE	[redacted], GA, NVB, [redacted]
TRW 2	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 3	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
TRW 4	Upper Area	Recovery	TCE	cis12DCE	GA, NVB
XSB 1A	Upper Area	Group B			GA, NVB
XSB 1B	Upper Area	Group B			GA, NVB
XSB 1D	Upper Area	Group A	TCE	cis12DCE	[redacted], GA, NVB, [redacted]
XSB 2D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
XSB 3A	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
XSB 4D	Upper Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
YSB 1A	Upper Area				GA, NVB
YSB 2A	Upper Area	Secondary			GA, NVB
YSB 3A	Upper Area				GA, NVB
YSB 4A	Upper Area	Secondary			GA, NVB

Notes:
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Rad Suite 2: Alpha Spec [neptunium, americium, plutonium], radon-222; and iodine-129
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene, Total U = total elemental uranium by ICP-MS

Table 7. (con't) Phase 4: 3Q00 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area				GA, NVB
TCM 2	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
TCM 3	Lower Area				rad suite 1, GA, NVB, [redacted]
TCM 5	Lower Area				GA, NVB
TCM 7	Lower Area				GA, NVB
TIR 1L	Lower Area				GA, NVB
TIR 1M	Lower Area				GA, NVB
TIR 1U	Lower Area				rad suite 1, GA, NVB, [redacted]
TIR 2	Lower Area				GA, NVB
TIR 3B	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
TNX 8D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 9D	Lower Area	Secondary			GA, NVB
TNX 10D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 11D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 12D	Lower Area	Secondary			GA, NVB
TNX 13D	Lower Area				GA, NVB
TNX 14D	Lower Area				GA, NVB
TNX 15D	Lower Area				GA, NVB
TNX 16D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 17D	Lower Area				GA, NVB
TNX 18D	Lower Area				GA, NVB
TNX 19D	Lower Area				GA, NVB
TNX 20D	Lower Area				GA, NVB
TNX 21D	Lower Area				GA, NVB
TNX 22D	Lower Area				GA, NVB
TNX 26D	Lower Area	Group A	TCE	cis12DCE	rad suite 1, GA, NVB, [redacted]
TNX 27D	Lower Area	Group A	TCE	cis12DCE	GA, NVB
TNX 28D	Lower Area				GA, NVB
TNX 29D	Lower Area				GA, NVB
TNX 30D	Lower Area				GA, NVB
TNX 31D	Lower Area				GA, NVB
TNX 32D	Lower Area				GA, NVB
TNX 33D	Lower Area				GA, NVB
TNX 34D	Lower Area				GA, NVB
TNX 35D	Lower Area				GA, NVB
TNX 36D	Lower Area				GA, NVB
TNX 37D	Lower Area				GA, NVB
[redacted]					GA, NVB

Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Highlighted cells are new radiological analyses as compared to previous quarter. Well XSB-6 is a replacement to Well XSB-5A.
Comprehensive analysis includes: aluminum, arsenic, barium, boron, cadmium, chloride, chromium, fluoride, iron, lead, lithium, calcium, magnesium, potassium, silica, manganese, mercury, nitrate/nitrite as nitrogen, selenium, silver, sodium, sulfate, total dissolved solids, total organic carbon, total organic halogens, total phosphates as phosphorous, tritium, and field parameters
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, NVB = nonvolatile beta, TCE = trichloroethylene, Total U = total elemental uranium by ICP-MS

Table 8. Phase 5: 4Q00 to 1Q01 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
P 26A	Upper Area	Background	*see note A*		GA
P 26B	Upper Area	Background	*see note A*		GA
P 26D	Upper Area	Background	*see note A*		rad suite 1, GA, Total U
TBG 1	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1 & 2, GA, Total U
TBG 3	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1 & 2, GA, Total U
TBG 4	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1 & 2, GA, Total U
TBG 5	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TBG 5A	Upper Area	Group B	*see note A*		GA
TBG 5B	Upper Area	Group B	*see note A*		GA
TBG 6	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TBG 7	Upper Area	Secondary	*see note A*		
TNX 1D	Upper Area	Secondary	*see note A*		
TNX 2D	Upper Area	Group B	*see note A*		GA
TNX 3D	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TNX 4D	Upper Area	Group B	*see note A*		rad suite 1, GA, Total U
TNX 5D	Upper Area	Secondary	*see note A*		GA
TNX 6D	Upper Area	Secondary	*see note A*		GA
TNX 7D	Upper Area	Group B	*see note A*		GA
TNX 23D	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 24D	Upper Area	Secondary	*see note A*		
TRW 1	Upper Area	Recovery	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TRW 2	Upper Area	Recovery	*see note A*	cis12DCE, [redacted]	GA
TRW 3	Upper Area	Recovery	*see note A*	cis12DCE, [redacted]	GA
TRW 4	Upper Area	Recovery	*see note A*	cis12DCE, [redacted]	GA
XSB 1A	Upper Area	Group B	*see note A*		GA
XSB 1B	Upper Area	Group B	*see note A*		GA
XSB 1D	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
XSB 2D	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
XSB 3A	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
XSB 4D	Upper Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
YSB 1A	Upper Area		*see note A*		GA
YSB 2A	Upper Area	Secondary	*see note A*		GA
YSB 3A	Upper Area		*see note A*		GA
YSB 4A	Upper Area	Secondary	*see note A*		GA

Notes:

A -- Rev. 1.5 compliance analyses will vary from quarter to quarter as per Table 1.

Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec

Rad Suite 2: Alpha Spec [neptunium, americium, plutonium], radon-222; and iodine-129

Highlighted cells are new radiological analyses as compared to the previous quarter

Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, Total U = total elemental uranium by ICP-MS, VC = vinyl chloride

Table 8. (con't) Phase 5: 4Q00 to 1Q01 TNX Monitoring

Well Name	Location	Well Classification	Rev. 1.5 Compliance Analyses	Non-Radiological Analyses	Radiological Analyses
TCM 1	Lower Area		*see note A*		GA
TCM 2	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TCM 3	Lower Area		*see note A*		rad suite 1, GA, Total U
TCM 5	Lower Area		*see note A*		[redacted], GA, [redacted]
TCM 7	Lower Area		*see note A*		[redacted], GA, [redacted]
TIR 1L	Lower Area		*see note A*		GA
TIR 1M	Lower Area		*see note A*		GA
TIR 1U	Lower Area		*see note A*		rad suite 1, GA, Total U
TIR 2	Lower Area		*see note A*		GA
TIR 3B	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TNX 8D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 9D	Lower Area	Secondary	*see note A*		GA
TNX 10D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 11D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 12D	Lower Area	Secondary	*see note A*		GA
TNX 13D	Lower Area		*see note A*		GA
TNX 14D	Lower Area		*see note A*		GA
TNX 15D	Lower Area		*see note A*		GA
TNX 16D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 17D	Lower Area		*see note A*		GA
TNX 18D	Lower Area		*see note A*		GA
TNX 19D	Lower Area		*see note A*		GA
TNX 20D	Lower Area		*see note A*		GA
TNX 21D	Lower Area		*see note A*		GA
TNX 22D	Lower Area		*see note A*		GA
TNX 26D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	rad suite 1, GA, Total U
TNX 27D	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA
TNX 28D	Lower Area		*see note A*		GA
TNX 29D	Lower Area		*see note A*		GA
TNX 30D	Lower Area		*see note A*		GA
TNX 31D	Lower Area		*see note A*		GA
TNX 32D	Lower Area		*see note A*		GA
TNX 33D	Lower Area		*see note A*		GA
TNX 34D	Lower Area		*see note A*		GA
TNX 35D	Lower Area		*see note A*		GA
TNX 36D	Lower Area		*see note A*		GA
TNX 37D	Lower Area		*see note A*		GA
XSB 6	Lower Area	Group A	*see note A*	cis12DCE, [redacted]	GA

A -- Rev. 1.5 compliance analyses will vary from quarter to quarter as per Table 1.
Rad Suite 1: radium-226, radium-228, strontium-90, technetium-99, Alpha Spec [curium, thorium, uranium], Gamma Spec
Rad Suite 2: Alpha Spec [neptunium, americium, plutonium], radon-222; and iodine-129
Highlighted cells are new radiological analyses as compared to the previous quarter
Acronyms: cis12DCE = cis-1,2-dichloroethene, GA = gross alpha, VC = vinyl chloride, Total U = total elemental uranium by ICP-MS

Table 9. TNX Monitoring Scheme: Post 1Q01

Monitoring Wells*	Constituents	Sampling Frequency
Primary Wells (Group A), Recovery Wells	TCE, cis12DCE, VC, gross alpha	Quarterly
Primary Wells (Group B), Background Wells	TCE	Semiannual (2Q, 4Q)
Secondary Wells	Field Parameters**	Semiannual (2Q, 4Q)
Primary Wells (Groups A and B), Recovery Wells Background Wells	VOA (PCE, CCl4, chloroform), Hg, lead, NO3-NO2, gross alpha	Annual (4Q)

* Monitoring well classification is given in Table 2.

** Field parameters (water elevation, pH, conductance, temperature, alkalinity, and turbidity) are measured routinely with every sampling event.

Acronyms: TCE = trichloroethylene, PCE = tetrachloroethylene, CCl4 = carbon tetrachloride, Hg = mercury, NO3 = nitrate, NO2 = nitrite, 2Q = second quarter of the calendar year, 4Q = fourth quarter of the calendar year