
1 C. Appendix C: Review of Ambient Air Monitoring and Ambient Air Sampling Studies

2 Ambient air monitoring data and ambient air sampling data are measurements of the levels of air
3 contamination that people might actually breathe. These are critical elements of this PHA,
4 because they are direct measures of exposure point concentrations and do not involve the
5 inherent uncertainties of modeling studies. ATSDR invested considerable effort in obtaining all
6 ambient air monitoring data and ambient air sampling data that might be relevant to air quality
7 issues associated with the TSCA Incinerator.

8 The main difference between ambient air monitoring and ambient air sampling is that “ambient
9 air *monitoring*” typically implies periodic measurement of air contamination levels, such as
10 measurements being made once per week; “ambient air *sampling*,” on the other hand, generally
11 refers to air quality measurements of discrete events, such as a TRV opening. Therefore,
12 *monitoring* data are most useful for characterizing routine releases from a source, while *sampling*
13 data are most useful for evaluating non-routine or episodic releases.

14 This appendix presents ATSDR’s review of all relevant ambient air sampling studies identified
15 for the TSCA Incinerator. The reviews present key information on the studies, such as number
16 and locations of sampling stations, sampling frequencies, number of samples collected,
17 pollutants measured, and comparisons of measured concentrations to health-based comparison
18 values. Sections III.D and III.E of this PHA indicate how ATSDR interpreted the ambient air
19 monitoring and ambient air sampling data when reaching conclusions for this site.

20 **Note:** Throughout this appendix, the units of measurement shown are the same as those
21 reported in the original studies. In the main body of this PHA, ATSDR converts readings for the
22 same parameters into a single set of units to allow better comparison across studies.

23 C.1 DOE Data (DOE 1991–2002)

24 For several decades, DOE has operated a routine environmental surveillance program at ORR.
25 This program has been fully functional the entire time that the TSCA Incinerator has processed
26 wastes. DOE’s ambient air monitoring and ambient air sampling follow general procedures
27 specified in the ORR site-wide environmental monitoring plan (DOE 2003c), which outlines
28 extensive quality assurance and quality control procedures. Much of DOE’s sampling activities
29 are conducted under TDEC oversight (see Appendix C.3).

30 The scope of DOE’s monitoring efforts has changed over the years. For instance, many changes
31 occurred in 1992, when DOE conducted a systematic review of the monitoring locations, siting
32 requirements, quality assurance measures, and standard operating procedures. Deficiencies
33 identified during this review were promptly corrected. While some contaminants have been
34 removed from the monitoring program over the years (typically after multiple years of data
35 demonstrate that contamination levels are safely below levels of public health concern), other
36 contaminants have been added to the program.

37 ATSDR’s review of DOE’s routine monitoring and sampling results follow, organized by groups
38 of contaminants. Refer to Section III.D.2 for a summary of DOE’s air quality measurements
39 made during TRV events.

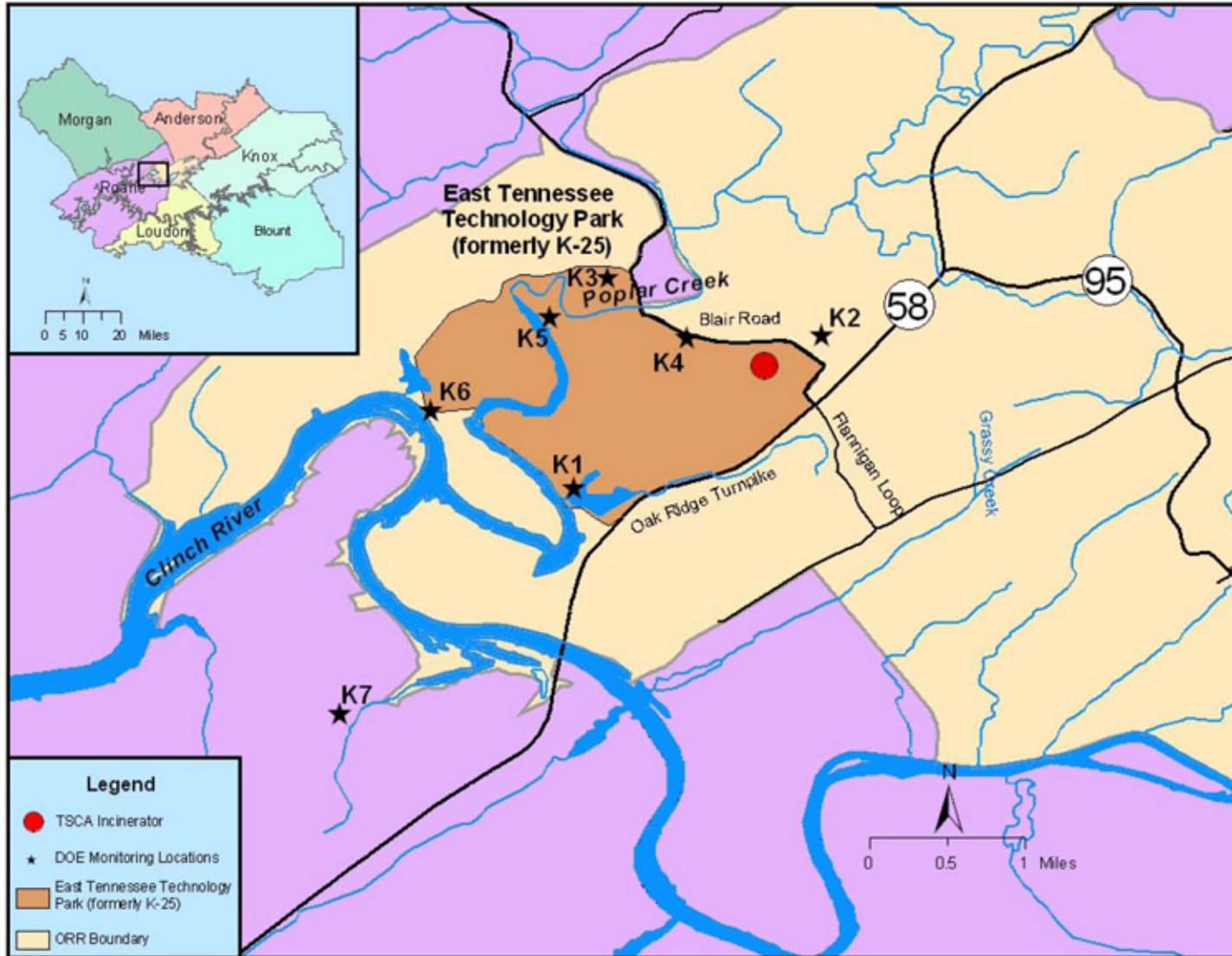
1 Particulate matter

2 From 1991 to 2000, DOE routinely monitored ambient air concentrations of two size fractions of
3 particulate matter: PM10 and TSP. All measurements were made using EPA reference method
4 devices that have been shown to measure particulate matter concentrations both accurately and
5 precisely. With few exceptions, the monitoring involved collection of 24-hour integrated samples
6 every 6 days. Such a schedule, which ensures that sampling results will be available for all 7
7 days of the week, is widely used for particulate matter monitoring applications. Data trends for
8 both sets of measurements follow.

9 From 1991 to 1995, DOE measured TSP concentrations at seven different monitoring stations.
10 Figure C-1 shows the locations of these stations, and Table C-1 reviews the monitoring results.
11 As the figure indicates, monitoring occurred at locations surrounding the incinerator, including at
12 locations where modeling results predicted elevated ground-level impacts would occur. Over this
13 5-year time frame, DOE collected more than 1,200 valid TSP samples. The data summary in
14 Table C-1 shows that none of the measurements, individually or averaged over a year, exceeded
15 EPA's health-based standards for TSP.

16 Starting in 1991, DOE included PM10 monitoring as part of its routine environmental
17 surveillance network. Figure C-2 shows where DOE installed three PM10 monitoring stations
18 between 1991 and 2000, and Table C-1 summarizes the measurement results. To date, DOE has
19 collected more than 775 samples from these three stations, not one of which has exceeded EPA's
20 health-based air quality standard. Further, the annual average concentrations of PM10 have all
21 been below EPA's corresponding annual average standard.

22 Overall, more than 2,000 particulate matter samples have been collected at or near ETTP since
23 the TSCA Incinerator began operating, and every measured concentration has been well below
24 corresponding health-based air quality standards. Further, the particulate matter levels detected at
25 these stations are little different from the nationwide average levels that EPA has recently
26 reported (EPA 2003). With 10 years of monitoring data showing particulate matter levels below
27 levels of health concern, DOE stopped conducting these measurements at the end of calendar
28 year 2000.

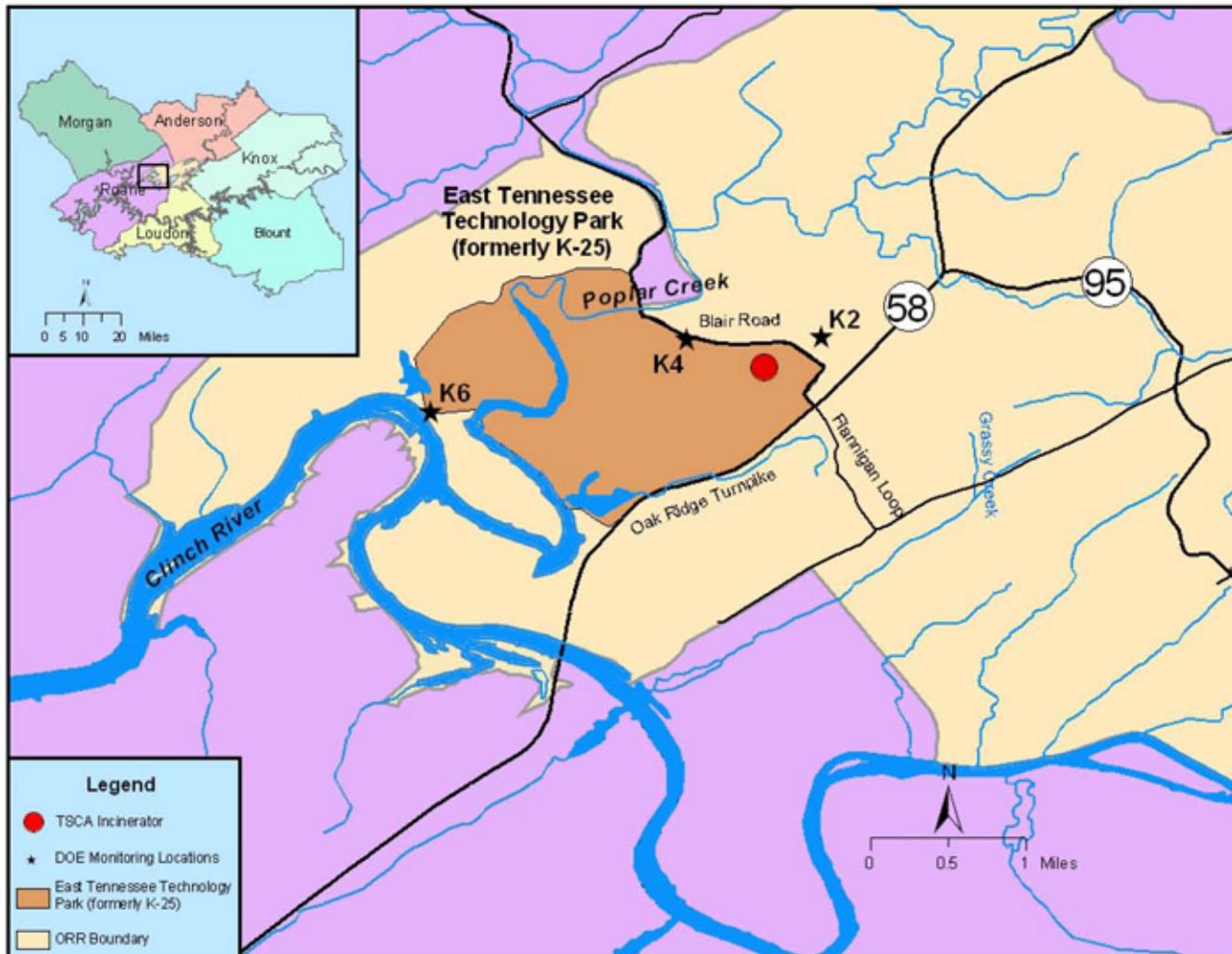


1 Figure C-1. DOE's TSP Monitoring Locations

1 **Table C-1. DOE’s Monitoring Data for Particulate Matter (1991–2000)**

<i>Station</i>	<i>Years of Operation</i>	<i>Number of Samples</i>	<i>Highest Annual Average Concentration</i> <i>(µg/m³)</i>	<i>EPA’s Annual NAAQS</i>	<i>Highest 24-Hour Average Concentration</i> <i>(µg/m³)</i>	<i>EPA’s 24-Hour NAAQS</i>
Monitoring results for TSP						
K1	1991–1995	>229	27.6	75 µg/m ³	88.4	260 µg/m ³
K2	1991–1995	>225	24.3		106.5	
K3	1991–1995	>227	26.4		86.4	
K4	1991–1995	>222	34.7		157.5	
K5	1991–1995	>222	32.4		93.8	
K6	1994–1995	59	25.2		71.9	
K7	1995	37	47.7		99.4	
Monitoring results for PM10						
K2	1999–2000	117	23.2	50 µg/m ³	69.9	150 µg/m ³
K4	1991–1998	>378	24.3		89.6	
K6	1996–2000	278	21.4		60.2	

2 Notes: Source of data: DOE 1991–2002.
 3 The numbers of samples for every station were taken from DOE’s annual site environmental reports. However, the 1993 report did not specify the numbers of
 4 samples that were collected that year. Therefore, the exact number of samples for stations that operated during 1993 is not known.
 5 The table presents EPA’s former health-based standards for TSP. The annual TSP standard was actually based on an annual geometric mean concentration, not
 6 an annual average (or arithmetic mean). This distinction has no bearing on the conclusion, given the substantial difference between the measured concentrations
 7 and the standard.
 8



1 **Figure C-2. DOE's PM10 Monitoring Locations**

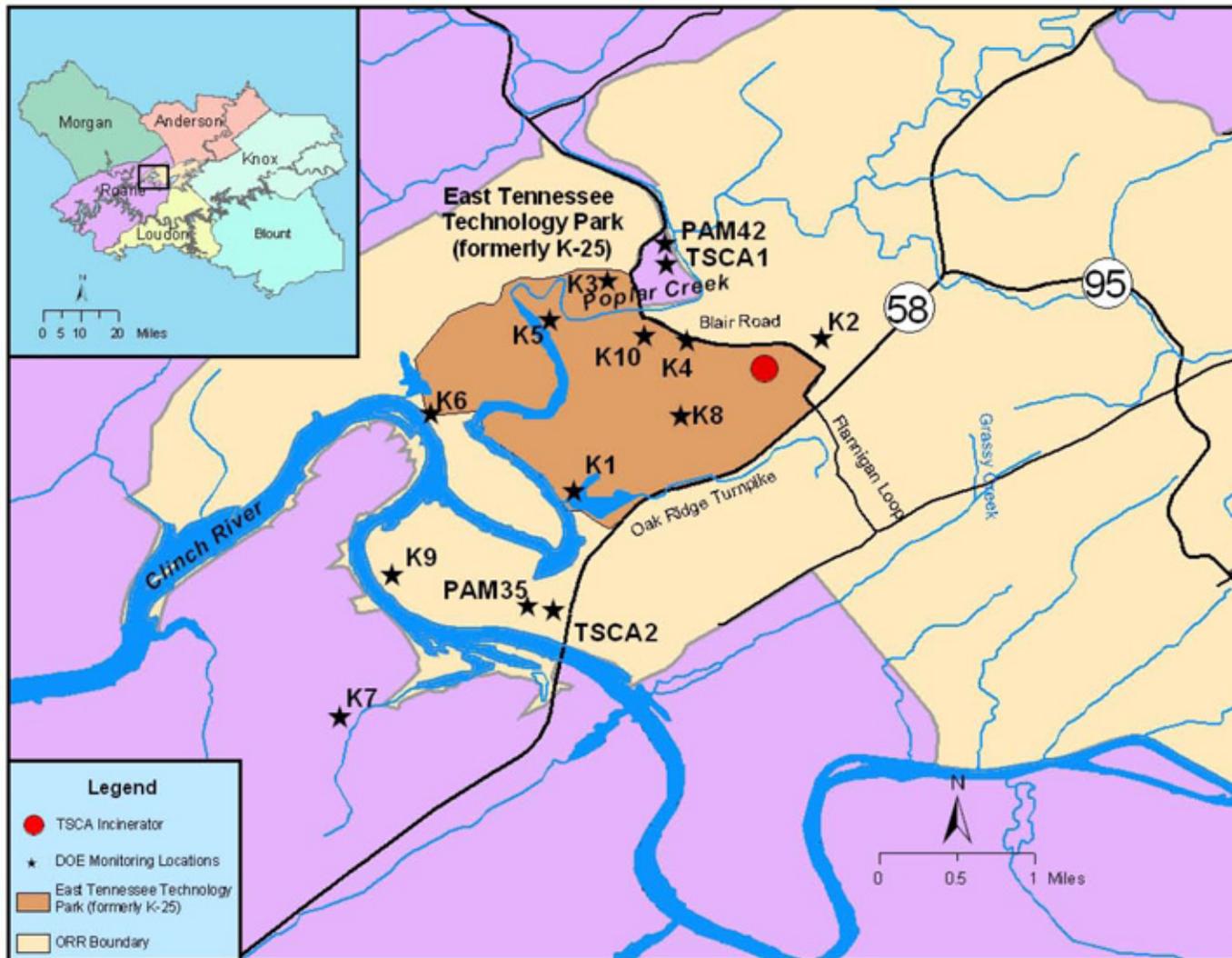
2

1 Metals

2 Since 1991, DOE has measured ambient air concentrations of metals at 14 different locations
3 within and near ETTP (see Figure C-3). The monitoring locations were chosen for various
4 reasons: to characterize maximum impacts from the TSCA Incinerator; to assess upwind-
5 downwind differences in air quality; and to evaluate air contamination at locations where winds
6 blow off ORR property. Between 1991 and 2001, DOE measured ambient air concentrations of
7 seven different metals, including four known human carcinogens.

8 DOE sent PM10 and TSP filters to an analytical laboratory to determine the composition of the
9 collected airborne particles. The laboratory created composite monthly samples for every
10 monitoring station from the individual filters that DOE collected on the 6-day rotating schedule.
11 Filter analyses were performed using inductively coupled plasma/mass spectrometry, which is
12 consistent with analytical methodologies EPA has published for such chemical speciation work.

13 Table C-2 summarizes DOE's metals monitoring data. The highest annual average air
14 concentrations of four of the metals — beryllium, lead, nickel, and uranium — did not exceed
15 their corresponding health-based comparison values. In fact, the measured concentrations were
16 considerably lower than these screening numbers. For instance, the highest annual average
17 concentration for uranium ($0.001373 \mu\text{g}/\text{m}^3$) was more than 200 times lower than uranium's
18 comparison value ($0.3 \mu\text{g}/\text{m}^3$). On the other hand, measured levels for arsenic, cadmium, and
19 chromium all exceeded their corresponding Cancer Risk Evaluation Guides (CREGs).
20 Accordingly, ATSDR selected these three metals as contaminants of concern and used more
21 detailed evaluations to understand the public health implications of inhaling them (see Section
22 IV).



1 Figure C-3. DOE's Metals Monitoring Locations

1 **Table C-2. DOE's Monitoring Data for Metals (1991–2001)**

<i>Metal</i>	<i>Time Frame of Monitoring</i>	<i>Highest Annual Average Concentration</i> ($\mu\text{g}/\text{m}^3$)	<i>Health-Based Comparison Value</i> ($\mu\text{g}/\text{m}^3$)	<i>Type of Comparison Value</i>
Arsenic	1994–2001	0.000809	0.0002	CREG
Beryllium	1994–2001	0.000024	0.0004	CREG
Cadmium	1994–2001	0.001963	0.0006	CREG
Chromium (total)	1991–2001	<0.0064	0.00008	CREG (see notes)
Lead	1991–2001	<0.0543	1.5	NAAQS
Nickel	1991–1993	<0.0104	0.09	EMEG-chronic
Uranium	1991–2001	0.001373	0.3	EMEG-chronic (see notes)

2 Notes: Source of data: DOE 1991–2002.

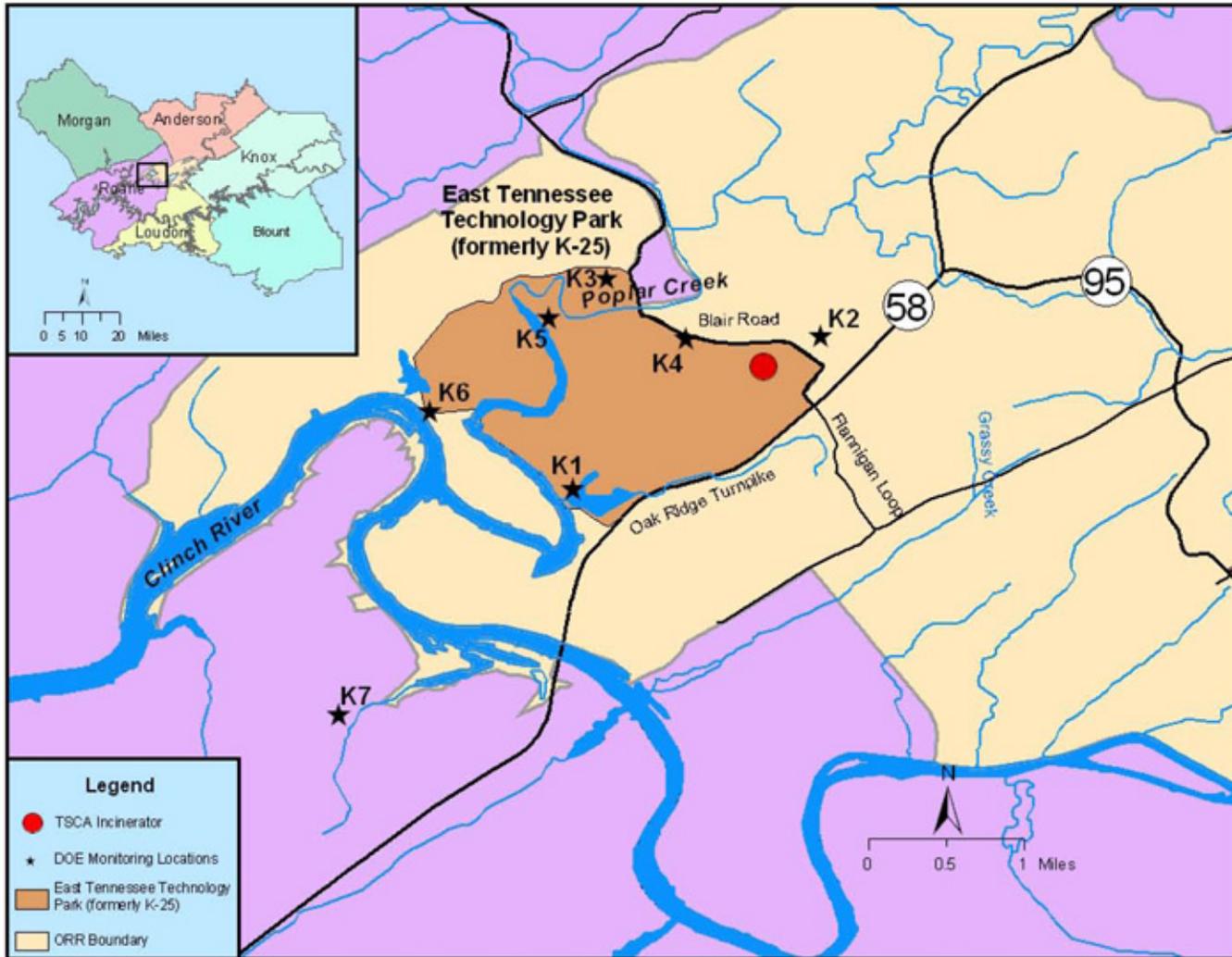
3 The highest annual average concentration is the highest average value reported for any of the monitoring stations for
4 any of the years on record. This highest value was selected as the first step in the screening process. In cases where a
5 metal was not detected in every sample, DOE used the detection limit to compute arithmetic means and reported the
6 annual average as being “less than” the computed value.

7 DOE measured ambient air concentrations of total chromium. The comparison value is for hexavalent chromium,
8 which is a subset of total chromium. Refer to Section IV.B for ATSDR's detailed evaluation of chromium
9 exposures.

10 The comparison value for uranium is ATSDR's EMEG for chronic exposure to highly soluble uranium salts. This
11 comparison value is suitable for evaluating the chemical toxicity of uranium. Refer to Tables C-3 and C-4 for
12 ATSDR's evaluation of exposures to radioactivity associated with uranium.
13

14 **Radiation and radionuclides**

15 For several years before the TSCA Incinerator first operated, DOE's environmental surveillance
16 network at ORR included external gamma radiation monitoring. This monitoring helps determine
17 whether releases from ORR facilities are causing increases in external gamma radiation above
18 background levels. The measurements are collected using external gross gamma radiation
19 monitors that are equipped with dual-range, high-pressure ion chamber sensors and digital
20 electronic count-rate meters. The external gamma readings are recorded weekly, including at
21 station PAM-42, which is in close proximity to ETTP (see Figure C-4). Between 1991 and 2002,
22 the average external gamma radiation levels at this location were 5.9 $\mu\text{R}/\text{hr}$. These levels not
23 only were consistent with measurements at designated background monitoring stations (i.e., Fort
24 Loudon Dam, Norris Dam), but also fell within the range of gamma radiation levels in urban and
25 suburban locations around the country (DOE 1991–2002).



1 Figure C-4. DOE's Radionuclide Monitoring Locations

To supplement the gamma radiation measurements, DOE also measures concentrations of radionuclides around the perimeter of the main ORR facilities. ATSDR reviewed the history of sampling results for stations PAM35 and PAM42, as documented in the annual site environmental reports (DOE 1991–2002). At both of these stations, two sampling devices operate. The first device continuously collects particulate matter on filters, which are removed biweekly and analyzed as quarterly composites.⁶ The second device collects water vapor to measure concentrations of tritium. An analytical laboratory then conducts all isotopic analyses of the sampling media. TDEC’s state radiochemistry laboratory has performed much of the filter analyses for the radionuclide samples.

Table C-3 summarizes DOE’s monitoring data for radionuclides and compares the highest annual average concentration measured to DOE’s Derived Concentration Guides (DCGs) for inhalation exposure (see Appendix D). As the table shows, all of the radionuclides documented in DOE’s annual site environmental reports were found at concentrations at least 100 times lower than their corresponding DCGs.

Table C-3. DOE’s Monitoring Data for Radionuclides (1991–2001)

<i>Radionuclide</i>	<i>Highest Annual Concentration Measured ($\mu\text{Ci/mL}$)</i>	<i>DOE’s Derived Concentration Guide ($\mu\text{Ci/mL}$)</i>	<i>Margin of Safety (See Notes)</i>
Beryllium-7	1.6×10^{-13}	4.0×10^{-8}	250,000
Cesium-137	1.6×10^{-16}	4.0×10^{-10}	2,500,000
Cobalt-60	1.5×10^{-16}	4.0×10^{-10}	2,700,000
Potassium-40	3.8×10^{-15}	9.0×10^{-10}	240,000
Thorium-228	7.0×10^{-18}	4.0×10^{-14}	5,700
Thorium-230	3.8×10^{-16}	4.0×10^{-14}	110
Thorium-232	8.3×10^{-18}	7.0×10^{-15}	840
Tritium	1.1×10^{-11}	1.0×10^{-7}	9,100
Uranium-234	7.2×10^{-17}	9.0×10^{-14}	1,300
Uranium-235	1.1×10^{-17}	1.0×10^{-13}	9,100
Uranium-238	4.6×10^{-17}	1.0×10^{-13}	2,200

Notes: Source of data: DOE 1991–2002.

Concentrations for radionuclides are the highest annual averages reported in DOE’s annual site environmental reports for the two perimeter monitoring stations at ETP. The table lists those radionuclides for which measurement data were reported in at least three annual site environmental reports.

DOE’s Derived Concentration Guides (DCGs) represent exposure levels that would deliver annual effective dose equivalents of 100 mrem/year to an individual who is continuously exposed to the measured amounts, 24 hours per day, 365 days per year.

Margin of safety in this table is calculated as the quotient of the DCG and the highest activity measured. Margins of safety greater than 1 imply that measured levels are safely below the relevant DCGs.

In summary, DOE’s environmental surveillance network offers extensive insights into the air contamination levels of particulate matter, metals, and radionuclides. These data are particularly useful due to their extensive temporal and spatial coverage: monitoring for most contaminants has occurred the entire time the TSCA Incinerator has operated, and monitoring stations are located in and near the areas expected to have the greatest air quality impacts from the

⁶ Note that the averaging time and compositing frequency for this and other sampling efforts have changed over the years.

1 incinerator's emissions. The monitoring data suggest that ambient air concentrations of many
2 pollutants do not reach levels of potential health concern; however, ambient air concentrations of
3 arsenic, cadmium, and chromium require additional evaluation (see Section IV). Section III.D.1
4 of this PHA reviews DOE's monitoring data in light of air quality measurements made by other
5 parties; that section also lists several recommendations for improving the reporting of the
6 monitoring results. Section III.D.2 summarizes ambient air concentrations DOE measured during
7 TRV events.

8 **C.2 EPA Data (EPA 1996–2003)**

9 In 1973, EPA established the Environmental Radiation Ambient Monitoring System (ERAMS)
10 to identify nationwide trends in radionuclide levels in multiple environmental media. One station
11 EPA installed (see Figure 10) is located immediately downwind from the TSCA Incinerator,
12 where the agency has continuously collected airborne particulates on sampling filters since July
13 1996. Twice weekly, the filters are removed, surveyed in the field for gross beta activity, and
14 sent to an EPA laboratory for a more accurate and precise measurement of gross beta activity.
15 Composites of the semi-weekly sampling filters are then analyzed, either quarterly or annually,
16 for activity levels of selected uranium and plutonium isotopes. The sampling and analytical
17 procedures at all monitoring stations are consistent with specifications in the ERAMS Quality
18 Assurance Project Plan. EPA publishes the sampling results in quarterly reports (EPA 1996–
19 2003) and has posted them on a project Web site (EPA 2004e). According to EPA, all ERAMS
20 data posted on the Web site have undergone thorough quality assurance and quality control
21 checks.

22 Table C-4 summarizes data trends for three ERAMS stations: the K-25 station, which is located
23 immediately downwind from the TSCA Incinerator, and stations in Knoxville and Nashville,
24 which are included for comparison purposes. The table presents average activity levels for gross
25 beta, two plutonium isotopes, and three uranium isotopes. These summary statistics indicate that
26 the annual average levels of the two plutonium isotopes at K-25 are lower than the levels
27 observed in Knoxville and Nashville, while the opposite trend exists for the three uranium
28 isotopes. More importantly, the activity levels for all five isotopes shown in Table C-4 are safely
29 below health-protective comparison values developed by EPA.

30

1 **Table C-4. EPA's ERAMS Data (1996–2000)**

Radionuclide	Monitoring Station	Highest Annual Average Air Activity	Health-Based Comparison Value or Screening Value (See Notes)
Gross Beta	K-25	0.012 pCi/m ³	1 pCi/m ³
	Knoxville	0.018 pCi/m ³	
	Nashville	0.015 pCi/m ³	
Plutonium-238	K-25	0.46 aCi/m ³	140 aCi/m ³
	Knoxville	0.83 aCi/m ³	
	Nashville	0.64 aCi/m ³	
Plutonium-239	K-25	0.37 aCi/m ³	140 aCi/m ³
	Knoxville	18.3 aCi/m ³	
	Nashville	0.21 aCi/m ³	
Uranium-234	K-25	59.1 aCi/m ³	420 aCi/m ³
	Knoxville	31.8 aCi/m ³	
	Nashville	20.7 aCi/m ³	
Uranium-235	K-25	4.23 aCi/m ³	470 aCi/m ³
	Knoxville	3.63 aCi/m ³	
	Nashville	2.58 aCi/m ³	
Uranium-238	K-25	69.7 aCi/m ³	510 aCi/m ³
	Knoxville	29.8 aCi/m ³	
	Nashville	19.6 aCi/m ³	

2 Notes: Data source: EPA 1996–2003.

3 Health-based comparison values for plutonium and uranium isotopes are taken from EPA's ERAMS Web site (EPA
4 2004e). Specifically, the values selected represent exposure levels that would present theoretical cancer risks of less
5 than 1 in 1,000,000 for the majority of the exposed population.

6 A screening value of 1 pCi/m³ is used to evaluate gross beta radiation. When levels exceeded this amount, EPA
7 performed a gamma analysis of the sampling filters. The data for gross beta are average activities from 1996 to
8 2003, not the highest annual average.

9 Data from monitoring stations in Knoxville and Nashville are presented for comparison purposes.

10 1 aCi = 10⁻¹⁸ Ci = 10⁻⁶ pCi

11

12

1 **C.3 TDEC Data (TDEC 1996–2002)**

2 To assist ATSDR with the public health assessment process, TDEC provided copies of its annual
3 Environmental Monitoring Reports from calendar years 1996 to 2002 (TDEC 1996–2002).
4 ATSDR thoroughly reviewed these documents, which present environmental sampling data for
5 multiple media throughout ORR. The following paragraphs describe TDEC’s ambient air
6 sampling efforts, as those relate most directly to the issues evaluated in this PHA.

7 **Ambient radiation monitoring using environmental dosimetry**

8 Since 1995, TDEC has operated an extensive network of thermoluminescent dosimeters (TLDs)
9 to continuously measure gamma radiation levels at numerous locations throughout ORR.
10 Currently, TDEC’s network includes nearly 65 monitoring locations, though the number and
11 placement of TLDs has changed over the years. The overwhelming majority of these monitoring
12 locations are in on-site areas that the public cannot access. Both aluminum oxide TLDs and
13 lithium fluoride TLDs are used in this network. TDEC collects the TLDs quarterly and returns
14 them to the manufacturer (Landauer, Inc.) for analysis.

15 When evaluating the gamma radiation data, ATSDR considered the monitoring locations nearest
16 ETTP where the public might have routine access. Based on these criteria, ATSDR focused its
17 evaluation on gamma radiation levels measured at the “K-25 Visitor Center,” which is located
18 along the Oak Ridge Turnpike (Route 58), just south of the main entrance to ETTP. According to
19 measurements documented in TDEC’s annual monitoring reports, annual average radiation doses
20 at this location have ranged from 8.9 to 22.5 mrem/year (above background), with an 8-year
21 average of 15.7 mrem/year (above background). These levels are considerably lower than 100
22 mrem/year, which is both ATSDR’s MRL for ionizing radiation and TDEC’s primary dose limit
23 for protecting members of the public.

24 **Monitoring for metals**

25 From 1997 to the present, TDEC conducted ambient air monitoring for metals at multiple
26 locations around ETTP, but primarily at stations where DOE also monitors metals. These
27 measurements occur at stations K2, PAM35, and PAM42 (see Figure C-3). A stated purpose of
28 the TDEC monitoring is “to provide an independent verification of monitoring results as reported
29 by the DOE” (TDEC 1996–2002). The program has focused on a core group of metals: arsenic,
30 beryllium, cadmium, chromium, lead, nickel, and uranium. In the first years this monitoring was
31 conducted, TDEC operated a single particulate sampling device at a fixed location for a set time
32 frame (roughly 1 month), after which the device would be moved to another location for a set
33 time frame, and so on. The program changed in 2002, with TDEC operating three separate
34 sampling devices at three different locations.

35 Table C-5 summarizes TDEC’s monitoring data for metals. Of the analytes considered, only
36 arsenic and chromium had at least one measured concentration greater than their health-based
37 comparison values. This finding is somewhat consistent with trends among DOE’s monitoring
38 data for metals from the same time frame. According to TDEC’s monitoring data, ambient air
39 concentrations of the remaining metals (beryllium, cadmium, lead, nickel, and uranium) did not
40 exceed health-based comparison values. Based on trends among both DOE’s and TDEC’s

1 monitoring data, ATSDR selected arsenic, cadmium, and chromium as contaminants warranting
 2 further evaluation, as documented in Section IV of this PHA. As noted elsewhere in this PHA,
 3 the detection of the metals in ambient air near ETP does not mean the metals originate from the
 4 TSCA Incinerator. Rather, multiple air emissions sources — some not associated with ORR
 5 operations (e.g., mobile sources) — contribute to the airborne levels of metals summarized
 6 below.

7 **Table C-5. TDEC's Monitoring Data for Metals (1997–2002)**

<i>Metal</i>	<i>Time Frame of Monitoring</i>	<i>Highest Average Concentration ($\mu\text{g}/\text{m}^3$)</i>	<i>Health-Based Comparison Value ($\mu\text{g}/\text{m}^3$)</i>	<i>Type of Comparison Value</i>
Arsenic	1997–2002	0.003	0.0002	CREG
Beryllium	1997–2002	0.0004	0.0004	CREG
Cadmium	1997–2002	0.0004	0.0006	CREG
Chromium (total)	1997–2002	0.002	0.00008	CREG (see notes)
Lead	1997–2002	0.05	1.5	NAAQS
Nickel	1999–2002	0.000128	0.09	EMEG-chronic
Uranium	1999–2002	<0.01	0.3	EMEG-chronic (see notes)

8 Notes: Source of data: TDEC 1996–2002.

9 The highest average concentrations are the highest values in TDEC's annual reports that did not have a "<" before
 10 the concentration. In the case of uranium, every measurement was either reported as "not detected" or as "<0.01."

11 The averaging period for the concentrations shown in this table varies, because TDEC moved its sampling
 12 equipment from location to location during the first several years this program operated.

13 TDEC measured ambient air concentrations of total chromium. The comparison value is for hexavalent chromium,
 14 which is a subset of total chromium. Refer to Section IV.B for ATSDR's detailed evaluation of chromium
 15 exposures.

16 The comparison value for uranium is ATSDR's EMEG for chronic exposure to highly soluble uranium salts. This
 17 comparison value is suitable for evaluating the chemical toxicity of uranium. Refer to Tables C-3 and C-4 for
 18 ATSDR's evaluation of exposures to radioactivity associated with uranium.

1 **Additional monitoring and sampling activities**

2 ATSDR acknowledges that TDEC conducts numerous additional activities related to
3 environmental surveillance. For instance, TDEC takes the lead in providing oversight of DOE's
4 emissions and ambient air sampling programs. The oversight activities involve observing
5 sampling efforts, reviewing equipment operation, evaluating sampling results, conducting
6 independent sampling events, and analyzing some samples collected by DOE. For instance,
7 TDEC's state radiochemistry laboratory analyzes particulate filters collected at DOE's perimeter
8 monitoring stations (see Appendix C.1). Finally, TDEC conducts many other monitoring and
9 surveillance activities aimed at characterizing releases and exposure levels within ETPP
10 property, where the public cannot access. These activities include monitoring fugitive
11 radiological emissions, real-time ambient monitoring for gamma radiation, and various special
12 studies that focus on specific issues.

13 Section III.D.1 describes how TDEC's monitoring results factored into ATSDR's analysis and
14 recommends how TDEC can improve its documentation of monitoring data in future annual
15 reports.

16 **C.4 TVA Data (EPA 2004d)**

17 Early in the Oak Ridge TSCA Incinerator public health assessment process, a community
18 member recommended that ATSDR consult with TVA to determine whether that agency
19 collected any ambient air monitoring data from locations near the TSCA Incinerator. ATSDR
20 contacted TVA and received a listing of that agency's ambient air monitoring stations, only one
21 of which is located within 5 miles of this site. As Figure 10 depicts, that TVA station is located
22 approximately 3 miles south of the site along a bend in the Clinch River, where TVA
23 continuously measured ambient air concentrations of nitrogen dioxide, ozone, and sulfur dioxide
24 for nearly 2 years, between 1999 and 2000. Measurements were made with EPA-approved
25 monitoring methodologies and were validated before submission to a centralized database of
26 monitoring results maintained by EPA. Table C-6 summarizes TVA's monitoring data from this
27 station, which are reviewed below for the three main contaminants:

28 **Nitrogen dioxide**

29 TVA collected 10,940 1-hour average observations of ambient air concentrations of nitrogen
30 dioxide. The annual average concentrations computed from these measurements were safely
31 below EPA's health-based air quality standards.

32 **Ozone**

33 Between 1999 and 2000, TVA's monitoring station south of the TSCA Incinerator collected
34 valid ozone data on approximately 380 days. A single 1-hour average measurement (0.131 ppm)
35 exceeded EPA's previous health-based standard for ozone. During this same time, 8-hour
36 average ozone concentrations exceeded EPA's current health-based standard for ozone on 22
37 days, or roughly 6% of the days on which ozone monitoring occurred. As multiple sections of
38 this PHA describe, the elevated ozone levels observed in the Knoxville metropolitan area should
39 be viewed as a regional air quality issue caused by an extremely wide range of emissions, both

1 local and distant. Air emissions from the TSCA Incinerator likely have an insignificant effect on
2 the ozone concentrations previously measured by TVA.

3 **Sulfur dioxide**

4 TVA collected 12,206 1-hour average observations of ambient air concentrations of sulfur
5 dioxide. Every 3-hour average, 24-hour average, and annual average concentration computed
6 from these values was safely below EPA's corresponding health-based air quality standards.

7 Trends from the TVA monitoring data provide very limited insights into the TSCA Incinerator's
8 potential air quality impacts, given the pollutants that were measured. Nonetheless, other
9 sections of this PHA refer to the TVA monitoring data when considering general air quality
10 issues for the Knoxville metropolitan area.

11 **Table C-6. TVA's Monitoring Data for Criteria Pollutants (1999–2000)**

<i>Pollutant</i>	<i>Averaging Time</i>	<i>Highest Concentration Measured</i>	<i>Comparison Value (See Notes)</i>
Nitrogen dioxide	Annual average	0.0084 ppm	0.053 ppm
Ozone	1-hour average	0.131 ppm	0.12 ppm
	8-hour average	0.108 ppm	0.08 ppm
Sulfur dioxide	Annual average	0.0031 ppm	0.03 ppm
	24-hour average	0.014 ppm	0.14 ppm
	3-hour average	0.049 ppm	0.5 ppm

12 Notes: Data source: EPA 2004d.

13 The comparison values are all EPA National Ambient Air Quality Standards (NAAQS). For nitrogen dioxide,
14 ozone, and the annual average and 24-hour average concentrations of sulfur dioxide, the comparison values are
15 health-based. For the 3-hour average concentration of sulfur dioxide, the comparison value is a secondary standard,
16 which is designed to protect things people value, other than their health (e.g., visibility, vegetation, building
17 surfaces).

18

19