APPENDICES

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Appendix A. ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices throughout the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency—unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health.

This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

Absorption
The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute
Occurring over a short time [compare with chronic].

Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Adverse health effect
A change in body function or cell structure that might lead to disease or health problems

Aerobic
Requiring oxygen [compare with anaerobic].

Ambient
Surrounding (for example, ambient air).

Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biota
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Cancer
Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Cancer risk evaluation guide (CREG)
Estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10-6) persons exposed over a 70-year life span. ATSDR's CREGs are calculated from EPA's cancer potency factors.

Cancer slope factor (CSF)
An estimate of possible increases in cancer cases in a population.

Carcinogen
A substance that causes cancer.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic
Occurring over a long time [compare with acute].

Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Comparison value (CV)
Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration
The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant
A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Dermal
Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact
Contact with (touching) the skin [see route of exposure].

Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOE
United States Department of Energy.

Dose (for chemicals that are not radioactive)
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media evaluation guide (EMEG)
A media-specific comparison value that is used to select contaminants of concern. Levels below the EMEG are not expected to cause adverse noncarcinogenic health effects.

EPA
United States Environmental Protection Agency.

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure
Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Half-life (t½)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25 percent of the original number of radioactive atoms remain.

Hazard
A source of potential harm from past, current, or future exposures.

Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.

Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.

Indeterminate public health hazard
The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Lowest-observed-adverse-effect level (LOAEL)
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite
Any product of metabolism.

mg/kg
Milligram per kilogram.

mg/m^3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration
Moving from one location to another.

Minimal risk level (MRL)
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Mortality
Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

MRL [see minimal risk level]

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

No apparent public health hazard
A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population
A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

ppb
Parts per billion.

ppm
Parts per million.

Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action
A list of steps to protect public health.

Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

Public health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Public meeting
A public forum with community members for communication about a site.

Radionuclide
Any radioactive isotope (form) of any element.

RCRA [see Resource Conservation and Recovery Act (1976, 1984)]

Reference dose (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Reference dose media evaluation guide (RMEG)
Lifetime exposure level at which adverse, noncarcinogenic health effects would not be expected to occur.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

Remedial investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RfD [see reference dose]

Risk
The probability that something will cause injury or harm.

Risk-based concentration (RBC)
A contaminant concentration that is not expected to cause adverse health effects over long-term exposure.

Route of exposure
The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size
The number of units chosen from a population or an environment.

Solvent
A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Special populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water
Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see public health surveillance]

Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

TEF/TEQ
The toxic equivalency factor (TEF) approach compares the relative potency of individual congeners with that of tetrachlorodibenzo-p-dioxin (TCDD), the best-studied member of this chemical class. The concentration or dose of each dioxin-like congener is multiplied by its TEF to arrive at a toxic equivalent (TEQ), and the TEQs are added to give the total toxic equivalency. The total toxic equivalency is then compared to reference exposure levels for TCDD expected to be without significant risk for producing health hazards.

Toxicological profile
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology
The study of the harmful effects of substances on humans or animals.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)
National Center for Environmental Health (CDC) (http://www.cdc.gov/nceh/dls/report/glossary.htm) National Library of Medicine (NIH) (http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)

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Appendix B. Off-site Chemicals Without Comparison Values

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Table B-1. Chemicals Detected in Off-site Soil

Substance Name	Average Concentration (ppm)	Highest Dose (mg/kg/day)	Screening Guideline	Screening Guideline Source	Does the dose/ concentration exceed the screening guideline?
Inorganics					
Thorium	28	3.4E-04	0.6–18 ppm	ATSDR/NCRP	Yes—Rad PHA
Organics					
4-Aminobiphenyl	3.4	3.4E-04	5 ppm	FDA 21CFR74	No
1-Bromo-4-phenoxy benzene	1.2	4.2E-05	10 ppm	ATSDR-benzene	No
bis(2-Chloroethoxy)methane	1.2	1.5E-05	100 ppm	PADEP	No
P-Chloro-m-cresol	0.51	1.5E-05	1,000 ppm	Anbesol Teething Gel	No
alpha-Chloronaphthalene	4.1	6.3E-06	8.0E-02 mg/kg/day	EPA RfD for beta-chloronaphthalene	No
4-Chlorophenyl phenyl ether	1.1	5.0E-05	0.8 ppm	TCEQ-TRRP for soil	Yes
Dibenz(a,j)acridine	4.1	1.4E-05	0.73	CalEPA TEF = 0.1	No
p(Dimethylamino)azobenzene	4.1	5.0E-05	1.3E-03	CalEPA—URF	No
7,12-Dimethylbenz(a)anthracene	4.1	5.0E-05	7.1E-02	CalEPA—URF	No
Endosulfan sulfate	0.022	5.0E-05	100 ppm	CEMEG (endosulfan)	No
Endrin ketone	0.022	2.7E-07	20 ppm	CEMEG (endrin)	No
Ethyl methanesulfonate	4.1	2.7E-07	100 ppm	PADEP	No
2-Fluorophenol	1.4	5.0E-05	1.6 ppm	TCEQ-TRRP for soil as 2-chlorophenol	No
Methyl methanesulfonate	4.1	1.7E-05	100 ppm	PADEP as ethyl methanesulfonate	No
3-Methylcholanthrene	4.1	5.0E-05	6.3E-03	CalEPA—URF	No
beta-Naphthylamine	6.9	5.0E-05	2.7 ppm	TCEQ—Media Specific Concentration Residential Soil	Yes

The average concentrations are rounded.
Highest doses were calculated using the following formula:

non-pica child dose = (average concentration*0.0002 kg/day*291.2 days/year*6 years)/(13 kg*(365 days/year*6 years))

CALEPA = California Environmental Protection Agency
CEMEG = chronic environmental media evaluation guide
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food and Drug Administration
mg/kg/day = milligram per kilogram per day
NCRP = National Council on Radiation Protection and Measurements
PADEP = Pennsylvania Department of Environmental Protection
TCEQ = Texas Commission on Environmental Quality
TRRP = Texas Risk Reduction Program
PHA = public health assessment
ppm = parts per million
RfD = reference dose
TEF = toxic equivalency factor
URF = unit risk factors

Table B-2. Chemicals Detected in Off-site Sediment

Substance Name	***Average Concentration (ppm)***	***Highest Dose (mg/kg/day)***	***Screening Guideline***	***Screening Guideline Source***	***Does the dose/ concentration exceed the screening guideline?***
Inorganics					
Phosphate	406	1.0E-04	FDA—generally recognized as safe		No
Silicon	410	1.0E-04	Biologically inert		No
Thorium	54	1.4E-05	0.6–18 ppm	ATSDR/NCRP	Yes—Rad PHA
Organics					
Acetic acid	0.011	2.8E-09	40,000–80,000 ppm	Vinegar	No
1-Bromo-4-phenoxy benzene	0.77	1.9E-07	0.28	TCEQ—TRRP as bromophenyl phenylether, -4	Yes
Bis(2-chloroethoxy) methane	0.77	1.9E-07	100 ppm	PADEP	No
Carbon-14	19,000	4.8E-03	ATSDR—Radiation Dose Screening PHA		
Chlorine atom	18,000	4.6E-03	32 ppm	TCEQ—TRRP for soil	Yes
p-Chloro-m-cresol	0.77	1.9E-07	20 ppm	ATSDR—EMEG 4-chlorophenol	No
4-Chlorophenyl phenyl ether	0.77	1.9E-07	0.8 ppm	TCEQ-TRRP for soil	No
Cyclotetrasiloxane	0.027	6.8E-09	NJ value	Data QA/QC	No—presumptive evidence/ estimated value
Dodacane	0.0074	1.9E-09	NJ value	Data QA/QC	No—presumptive evidence/ estimated value
Endosulfan sulfate	0.45	1.1E-07	100 ppm	CEMEG (endosulfan)	No
Endrin ketone	0.46	1.2E-07	20 ppm	CEMEG (endrin)	No
Hydrocarbon	13	3.3E-06	880 ppm	NM TPH Screening Guidelines	No
Nitrogen, kjeldahl	1,600	4.0E-04	20,000	EMEG (ammonia)	No
Total combustible organics	198,000	5.0E-02	10 ppm	EMEG (benzene)	Yes
Total petroleum hydrocarbons	150	3.8E-05	880 ppm	NM TPH Screening Guidelines	No

The average concentrations are rounded.
Highest doses were calculated using the following formula:

child dose = (average concentration*0.0001 kg/day*12 days/year*6 years)/(13 kg*(365 days/year*6 years))

CEMEG = chronic environmental media evaluation guide
EMEG = environmental media evaluation guide
FDA = U.S. Food and Drug Administration
mg/kg/day = milligram per kilogram per day
NCRP = National Council on Radiation Protection and Measurements
PADEP = Pennsylvania Department of Environmental Protection
TCEQ = Texas Commission on Environmental Quality
NM = New Mexico
PHA = public health assessment
ppm = parts per million
QA/QC = quality assurance/quality control
TPH = total petroleum hydrocarbons
TRRP = Texas Risk Reduction Program

Table B-3. Chemicals Detected in Off-site Surface Water

Substance Name	Average Concentration (ppb)	Highest Dose (mg/kg/day)	Screening Guideline	Screening Guideline Source	Does the dose/ concentration exceed the screening guideline?
Inorganics					
Bicarbonate, dissolved	180,000	2.3E-01	500,000 ppb	Alkalinity EPA—SMCL	No
Cesium	0.61	7.7E-07	1 ppb	ATSDR background	No
Chloride	119,000	5.1E-01	250,000 ppb	EPA—SMCL	No
Silicon	2,100	2.7E-03	Biologically inert		No
Sulfate	625,000	3.1E+00	250,000 ppb	EPA—SMCL	No
Sulfide	4,000	5.1E-03	500 ppb	Rotten egg odor in water	Yes, as hydrogen sulfide
Sulfur	8,200	1.0E-02	250,000 ppb	EPA—SMCL as sulfate	No
Organics					
bis(2-Chloroethoxy)methane*	10	1.3E-05	5 ppb	NYSDEC Groundwater Quality Standard	Yes
Bromide*	59	1.8E-04	300,000 ppb	Secondary MCL for chloride	No
1-Bromo-4-phenoxy benzene*	10	1.3E-05	5 ppb	Benzene MCL	Yes
4-Chlorophenyl phenyl ether*	10	1.3E-05	0.061	TCEQ TRRP residential ground water (2 liters/day)	Yes
Orthophosphate*	287	4.0E-04	Food grade chemical – added to drinking water to reduce lead leaching FDA—generally recognized as safe		No
p-Chloro-m-cresol*	10	1.3E-05	1 ppb	NYSDEC Groundwater Quality Standard	Yes
Thorium*	0.87	1.1E-06	ATSDR—Radiation Dose Screening PHA		
Tetraoxo-sulfate(1-)	21,000	2.7E-02	250,000 ppb	EPA—SMCL as sulfate	No
Total petroleum hydrocarbons	1,050	1.3E-03	1,400 ppb	New Mexico TPH Screening Guidelines	No

*Chemical was detected in less than 10% of the samples. The average concentration was estimated using 1/2 the detection limit for nondetected samples.

The average concentrations are rounded.

Highest doses were calculated using the following formula:

child dose = ((average concentration/1,000)*0.5 liters/day*12 days/year*6 years)/(13 kg*(365 days/year*6 years))

EPA = U.S. Environmental Protection Agency
FDA = U.S. Food and Drug Administration
MCL = maximum contaminant level
mg/kg/day = milligram per kilogram per day
NYSDEC = New York State Department of Environmental Conservation
ppb = parts per billion
SMCL = secondary maximum contaminant level
TCEQ = Texas Commission on Environmental Quality
TPH = total petroleum hydrocarbons
TRRP = Texas Risk Reduction Program

Table B-4. Chemicals Detected in Fish Collected Off-site

Substance Name	Location	Average Concentration (ppm)	Highest Dose (mg/kg/day)	Screening Guideline	Screening Guideline Source	Does the dose/ concentration exceed the screening guideline?
Inorganics						
Lead	Clinch River	0.44	6.8E-04	2.0 ppm	FDA 21CFR173	No
	WBR	0.32	4.9E-04	2.0 ppm	FDA 21CFR173	No
Organics						
Endosulfan sulfate	Clinch River	0.075	1.2E-04	8.1 ppm	RBC (endosulfan)	No
Endrin ketone	Clinch River	0.079	1.2E-04	0.41 ppm	RBC (endrin)	No
	WBR	0.066	1.0E-04			No
Endrin aldehyde	Clinch River	0.011	1.7E-05	0.41 ppm	RBC (endrin)	No
	WBR	0.021	3.2E-05			No
2,2',3,4',5',6-Hexachloro-1,1'-biphenyl	Clinch River	0.031	4.8E-05	2.0E-05	CMRL (PCB)	Yes for noncancer (No for cancer)
	WBR	0.019	2.9E-05			Yes for noncancer (No for cancer)
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	WBR	0.01	1.5E-05	2.0E-05	CMRL (PCB)	No for cancer and noncancer
Nonachlor, cis-	Clinch River	0.027	4.2E-05	0.0006 mg/kg/day	CMRL (chlordane)	No
	WBR	0.017	2.6E-05			No
Nonachlor, trans-	Clinch River	0.047	7.2E-05	0.0006 mg/kg/day	CMRL (chlordane)	No
	WBR	0.033	5.1E-05			No
Nonachlor, trans-	Clinch River	0.006	9.2E-06	0.0006 mg/kg/day	CMRL (chlordane)	No
	WBR	0.0092	1.4E-05			No

The average concentrations are rounded.
Highest doses were calculated using the following formula:

subsistence child dose = (average concentration*0.02 kg/day*365 days/year*6 years)/(13 kg*(365 days/year*6 years))

CMRL = chronic minimal risk level
FDA = U.S. Food and Drug Administration
mg/kg/day = milligram per kilogram per day
PCB = polychlorinated biphenyl
ppm = parts per million
RBC = risk-based concentration
WBR = Watts Bar Reservoir

Table B-5. Chemicals Detected in Off-site Game

Substance Name	*Average Concentration (ppm)*	*Highest Dose (mg/kg/day)*	*Screening Guideline*	*Screening Guideline Source*	*Does the dose/concentration exceed the screening guideline?*
Organics					
Nonachlor, cis	0.0055	4.2E-07	0.0006 mg/kg/day	CMRL (chlordane)	No
Nonachlor, trans	0.0051	3.9E-07	0.0006 mg/kg/day	CMRL (chlordane)	No

The average concentrations are rounded.
Highest doses were calculated using the following formula:
child dose = (average concentration*0.001 kg/day*365 days/year*6 years)/(13 kg*(365 days/year*6 years))
CMRL = chronic minimal risk level
mg/kg/day = milligram per kilogram per day
ppm = parts per million

Screening guidelines are available for all chemicals detected in the vegetation and air.

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APPENDIX C

Summary Briefs

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ORRHES Brief
Oak Ridge Reservation Health Effects Subcommittee

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Dose Reconstruction Feasibility Study
Oak Ridge Health Study Phase I Report

Site: Oak Ridge Reservation
Study area: Oak Ridge Area
Time period: 1942–1992
Conducted by: Tennessee Department of Health and the Oak Ridge Health Agreement Steering Panel

Purpose

The Dose Reconstruction Feasibility Study had two purposes: first, to identify past chemical and radionuclide releases from the Oak Ridge Reservation (ORR) that have the highest potential to impact the health of the people living near the ORR; and second, to determine whether sufficient information existed about these releases to estimate the exposure doses received by people living near the ORR.

Background

In July 1991, the Tennessee Department of Health initiated a Health Studies Agreement with the U.S. Department of Energy (DOE). This agreement provides funding for an independent state evaluation of adverse health effects that may have occurred in populations around the ORR. The Oak Ridge Health Agreement Steering Panel (ORHASP) was established to direct and oversee this state evaluation (hereafter called the Oak Ridge Health Studies) and to facilitate interaction and cooperation with the community. ORHASP was an independent panel of local citizens and nationally recognized scientists who provided direction, recommendations, and oversight for the Oak Ridge Health Studies. These health studies focused on the potential effects from off-site exposures to chemicals and radionuclides released at the reservation since 1942. The state conducted the Oak Ridge Health Studies in two phases. Phase 1 is the Dose Reconstruction Feasibility Study described in this summary.

Methods

The Dose Reconstruction Feasibility Study consisted of seven tasks. During Task 1, state investigators identified historical operations at the ORR that used and released chemicals and radionuclides. This involved interviewing both active and retired DOE staff members about past operations, as well as reviewing historical documents (such as purchase orders, laboratory records, and published operational reports). Task 1 documented past activities at each major facility, including routine operations, waste management practices, special projects, and accidents and incidents. Investigators then prioritized these activities for further study based on the likelihood that releases from these activities could have resulted in off-site exposures.

During Task 2, state investigators inventoried the available environmental sampling and research data that could be used to estimate the doses that local populations may have received from chemical and radionuclide releases from the ORR. This data, obtained from DOE and other federal and state agencies (such as the U.S. Environmental Protection Agency, Tennessee Valley

Authority, and the Tennessee Division of Radiological Health), was summarized by environmental media (such as surface water, sediment, air, drinking water, groundwater, and food items). As part of this task, investigators developed abstracts which summarize approximately 100 environmental monitoring and research projects that characterize the historical presence of contaminants in areas outside the ORR.

Based on the results of Tasks 1 and 2, investigators identified a number of historical facility processes and activities at ORR as having a high potential for releasing substantial quantities of contaminants to the off-site environment. These activities were recommended for further evaluation in Tasks 3 and 4.

Tasks 3 and 4 were designed to provide an initial, very rough evaluation of the large quantity of information and data identified in Tasks 1 and 2, and to determine the potential for the contaminant releases to impact the public's health. During Task 3, investigators sought to answer the question: How could contaminants released from the Oak Ridge Reservation have reached local populations? This involved identifying the exposure pathways that could have transported contaminants from the ORR site to residents.

Task 3 began with compiling a list of contaminants investigated during Task 1 and Task 2. These contaminants are listed in Table 1. The contaminants in the list were separated into four general groups: radionuclides, nonradioactive metals, acids/bases, and organic compounds. One of the first steps in Task 3 was to eliminate any chemicals on these lists that were judged unlikely to reach local populations in quantities that would pose a health concern. For example, acids and bases were not selected for further evaluation because these compounds rapidly dissociate in the environment and primarily cause acute health effects, such as irritation. Likewise, although chlorofluorocarbons (Freon) were used in significant quantities at each of the ORR facilities, they were judged unlikely to result in significant exposure because they also rapidly disassociate. Also, some other contaminants (see Table 2) were not selected for further evaluation because they were used in relatively small quantities or in processes that are not believed to be associated with significant releases. Investigators determined that only a portion of contaminants identified in Tasks 1 and 2 could have reached people in the Oak Ridge area and potentially impacted their health. These contaminants, listed in Table 3, were evaluated further in Tasks 3 and 4.

The next step in Task 3 was to determine, for each contaminant listed in Table 3, whether a complete exposure pathway existed. A complete exposure pathway means a plausible route by which the contaminant could have traveled from ORR to offsite populations. Only those contaminants with complete exposure pathways would have the potential to cause adverse health effects. In this feasibility study, an exposure pathway is considered complete if it has the following three elements:

- A source that released the contaminant into the environment;
- A transport medium (such as air, surface water, soil, or biota) or some combination of these media (e.g., air ➔ pasture ➔ livestock milk) that carried the contaminant off the site to a location where exposure could occur; and
- An exposure route (such as inhalation, ingestion, or—in the case of certain radionuclides that emit gamma or beta radiation—immersion) through which a person could come into contact with the contaminant.

In examining whether complete exposure pathways existed, investigators considered the characteristics of each contaminant and the environmental setting at the ORR. Contaminants that lacked a source, transport medium, or exposure route were eliminated from further consideration because they lacked a complete exposure pathway. Through this analysis, investigators identified a number of contaminants with complete exposure pathways.

During Task 4, investigators sought to determine qualitatively which of the contaminants with complete exposure pathways appeared to pose the greatest potential to impact off-site populations. They began by comparing the pathways for each contaminant individually. For each contaminant, they determined which pathway appeared to have the greatest potential for exposing off-site populations, and they compared the exposure potential of the contaminant's other pathways to its most significant pathway. They then divided contaminants into three categories—radionuclides, carcinogens, and noncarcinogens—and compared the contaminants within each category based on their exposure potential and on their potential to cause health effects. This analysis identified facilities, processes, contaminants, media, and exposure routes believed to have the greatest potential to impact off-site populations. The results are provided in Table 4.

The Task 4 analysis was intended to provide a preliminary framework to help focus and prioritize future quantitative studies of the potential health impacts of off-site contamination. These analyses are intended to provide an initial approach to studying an extremely complex site. However, care must be taken in attempting to make broad generalizations or draw conclusions about the potential health hazard posed by the releases from the ORR.

In Task 5, investigators described the historical locations and activities of populations most likely to have been affected by the releases identified in Task 4. During Task 6, investigators compiled a summary of the current toxicologic knowledge and hazardous properties of the key contaminants. Task 7 involved collecting, categorizing, summarizing, and indexing selected documents relevant to the feasibility study.

Study Group

A study group was not selected.

Exposures

Seven completed exposure pathways associated with air, six completed exposure pathways associated with surface water, and ten completed exposure pathways associated with soil/sediment were evaluated for radionuclides and chemical substances (metals, organic compounds, and polycyclic aromatic hydrocarbons) released at the ORR from 1942 to 1992.

Outcome Measures

No outcome measures were studied.

Conclusions

The feasibility study indicated that past releases of the following contaminants have the greatest potential to impact off-site populations.

- **Radioactive iodine**
  The largest identified releases of radioactive iodine were associated with radioactive lanthanum processing from 1944 through 1956 at the X-10 facility.

- **Radioactive cesium**
  The largest identified releases of radioactive cesium were associated with various chemical separation activities that took place from 1943 through the 1960s.

- **Mercury**
  The largest identified releases of mercury were associated with lithium separation and enrichment operations that were conducted at the Y-12 facility from 1955 through 1963.

- **Polychlorinated biphenyls**
  Concentrations of polychlorinated biphenyls (PCBs) found in fish taken from the East Fork Poplar Creek and the Clinch River have been high enough to warrant further study. These releases likely came from electrical transformers and machining operations at the K-25 and Y-12 plants.

State investigators determined that sufficient information was available to reconstruct past releases and potential off-site doses for these contaminants. The steering panel (ORHASP) recommended that dose reconstruction activities proceed for the releases of radioactive iodine, radioactive cesium, mercury, and PCBs. Specifically they recommended that the state should continue the tasks begun during the feasibility study, and should characterize the actual release history of these contaminants from the reservation; identify appropriate fate and transport models to predict historical off-site concentrations; and identify an exposure model to use in calculating doses to the exposed population.

The panel also recommended that a broader-based investigation of operations and contaminants be conducted to study the large number of ORR contaminants released that have lower potentials for off-site health effects, including the five contaminants (chromium VI; plutonium 239, 240, and 241; tritium; arsenic; and neptunium 237) that could not be qualitatively evaluated during Phase 1 due to a lack of available data. Such an investigation would help in modifying or reinforcing the recommendations for future health studies.

Additionally, the panel recommended that researchers explore opportunities to conduct epidemiologic studies investigating potential associations between exposure doses and adverse health effects in exposed populations.

TABLE 1

LIST OF CONTAMINANTS INVESTIGATED DURING TASK 1 AND TASK 2

X-10	K-25	Y-12
Radionuclides		
Americium-241 Argon-41 Barium-140 Berkelium Californium-252 Carbon-14 Cerium-144 Cesium-134,-137 Cobalt-57,-60 Curium-242,-243,-244 Einsteinium Europium-152,-154,-155 Fermium Iodine-129, -131, -133 Krypton-85 Lanthanum-140 Niobium-95 Phosphorus-32 Plutonium-238, -239, -240, -241 Protactinium-233 Ruthenium-103, -106 Selenium-75 Strontium-89, -90 Tritium Uranium-233,-234, -235, -238 Xenon-133 Zirconium-95	Neptunium-237 Plutonium-239 Technetium-99 Uranium-234, -235, -238	Neptunium-237 Plutonium-239, -239, -240, -241 Technetium-99 Thorium-232 Tritium Uranium-234, -235, -238
Nonradioactive Metals		
None Initially Identified	Beryllium Chromium, (trivalent and hexavalent) Nickel	Arsenic Beryllium Chromium, (trivalent and hexavalent) Lead Lithium Mercury
Acids/Bases		
Hydrochloric acid Hydrogen peroxide Nitric acid Sodium hydroxide Sulfuric acid	Acetic acid Chlorine trifluoride Fluorine and fluoride compounds Hydrofluoric acid Nitric acid Potassium hydroxide Sulfuric acid	Ammonium hydroxide Fluorine and various fluorides Hydrofluoric acid Nitric acid Phosgene
Organic Compounds		
None Initially Identified	Benzene Carbon tetrachloride Chloroform Chlorofluorocarbons (Freons) Methylene chloride Polychlorinated biphenyls 1,1,1-Trichloroethane Trichloroethylene	Carbon tetrachloride Chlorofluorocarbons (Freons) Methylene chloride Polychlorinated biphenyls Tetrachloroethylene 1,1,1-Trichloroethane Trichloroethylene

TABLE 2

CONTAMINANTS NOT WARRANTING FURTHER EVALUATION IN TASK 3 AND TASK 4

Radionuclides
Americium-241
Californium-252
Carbon-14
Cobalt-57
Cesium-134
Curium-242, -243, -244
Europium-152, -154, -155
Phosphorus-32
Selenium-75
Uranium-233
Berkelium
Einsteinium
Fermium
Nonradioactive Metals
Lithium
Organic Compounds
Benzene
Chlorofluorocarbons (Freons)
Chloroform
Acids/Bases
Acetic acid
Ammonium hydroxide
Chlorine trifluoride
Fluorine and various fluoride compounds
Hydrochloric acid
Hydrogen peroxide
Hydrofluoric acid
Nitric acid
Phosgene
Potassium hydroxide
Sulfuric acid
Sodium hydroxide

TABLE 3

CONTAMINANTS FURTHER EVALUATED IN TASK 3 AND TASK 4

Radionuclides	Nonradioactive Metals	Organic Compounds
Argon-41 Barium-140 Cerium-144 Cesium-137 Cobalt-60 Iodine-129, -131, -133 Krypton-85 Lanthanum-140 Neptunium-237 Niobium-95 Plutonium-238, -239, -240, -241 Protactinium-233 Ruthenium-103, -106 Strontium-89, 90 Technetium-99 Thorium-232 Tritium Uranium-234 -235, -238 Xenon-133 Zirconium-95	Arsenic Beryllium Chromium (trivalent and hexavalent) Lead Mercury Nickel	Carbon tetrachloride Methylene chloride Polychlorinated biphenyls Tetrachloroethylene 1,1,1-Trichloroethane Trichloroethylene

TABLE 4

HIGHEST PRIORITY CONTAMINANTS, SOURCES, TRANSPORT MEDIA, AND EXPOSURE ROUTES

Contaminant	Source	Transport Medium	Exposure Route
Iodine-131, -133	X-10 Radioactive lanthanon (RaLa) processing (1944-1956)	Air to vegetable to dairy cattle milk	Ingestion
Cesium-137	X-10 Various chemical separation processes (1944-1960s)	Surface water to fish Soil/sediment Soil/sediment to vegetables; livestock/game (beef); dairy cattle milk	Ingestion Ingestion Ingestion
Mercury	Y-12 Lithium separation and enrichment operations (1955-1963)	Air Air to vegetables; Livestock/game (beef); dairy cattle milk Surface water to fish Soil/sediment to livestock/game (beef); vegetables	Inhalation Ingestion Ingestion Ingestion
Polychlorinated biphenyls	K-25 and Y-12 Transformers and machining	Surface water to fish	Ingestion

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ORRHES Brief
Oak Ridge Reservation Health Effects Subcommittee

Screening-Level Evaluation of Additional Potential Materials of Concern, July 1999—Task 7

Site: Oak Ridge Reservation
Study area: Oak Ridge Area
Time period: 1942–1990
Conducted by: Tennessee Department of Health and the Oak Ridge Health Agreement Steering Panel

Purpose

The purpose of this screening-level evaluation was to determine whether additional contaminants that existed at Oak Ridge Reservation (ORR), other than the five already identified in the Oak Ridge Dose Reconstruction Feasibility Study (iodine, mercury, polychlorinated biphenyls [PCBs], radionuclides, and uranium), warrant further evaluation of their potential for causing health effects in off-site populations.

Background

In July 1991, the Tennessee Department of Health in cooperation with the U.S. Department of Energy initiated a Health Studies Agreement to evaluate the potential for exposures to chemical and radiological releases from past operations at ORR. The Oak Ridge Dose Reconstruction Feasibility Study was conducted from 1992 to 1993 to identify those operations and materials that warranted detailed evaluation based on the risks posed to off-site populations. The feasibility study recommended that dose reconstructions be conducted for radioactive iodine releases from X-10 radioactive lanthanum processing (Task 1), mercury releases from Y-12 lithium enrichment (Task 2), PCBs in the environment near Oak Ridge (Task 3), and radionuclides released from White Oak Creek to the Clinch River (Task 4). In addition, the study called for a systematic search of historical records (Task 5), an evaluation of the quality of historical uranium effluent monitoring data (Task 6), and additional screening of materials that could not be evaluated during the feasibility study (Task 7).

The Oak Ridge Health Agreement Steering Panel (ORRHES) was established to direct and oversee the Oak Ridge Health Studies and to facilitate interaction and cooperation with the community. This group is comprised of local citizens and nationally recognized scientists.

Methods

During the Task 7 Screening-Level Evaluation, three different methods (qualitative screening, the threshold quantity approach, and quantitative screening) were used to evaluate the importance of materials with respect to their potential for causing off-site health effects. Twenty-five materials or groups of materials were evaluated. Please see Table 1 for a summary of the methods used to evaluate each material/group of materials.

- Qualitative Screening—All materials used on ORR were qualitatively screened for quantities used, forms used, and/or manners of use. If it was unlikely that off-site releases were sufficient to pose an off-site health hazard, then these materials were not evaluated quantitatively. If off-site exposures were likely to have occurred at harmful levels, then the materials were evaluated quantitatively.

- Threshold Quantity Approach—When information was insufficient to conduct quantitative screening, inventories of materials used at ORR were estimated based on historical records and interviews of workers. These estimated inventories of materials were determined to be either above or below a conservatively calculated health-based threshold quantity. If the estimates for a material were below the calculated threshold quantity, then it was determined to be highly unlikely to have posed a risk to human health through off-site releases.

- Quantitative Screening—The quantitative screening used a two-level screening approach to identify those materials that could produce health risks (i.e., doses) to exposed people that are clearly below minimum levels of health concern (Level I Screen) and above minimum levels of health concern (Refined Level I Screen). Health-based decision guides were established by the Oak Ridge Health Agreement Steering Panel and represent minimum levels of health concern.

  — The Level I Screening calculates a screening index for a maximally exposed reference individual who would have received the highest exposure. This conservative (protective) screening index is not expected to underestimate exposure to any real person in the population of interest. If the estimated Level I screening index was below the ORRHES decision guide, then the hazard to essentially all members of the population, including the maximally exposed individual, would be below the minimum level of health concern. In addition, the Level I screening index would be so low that further detailed study of exposures is not warranted because the screening index is below the threshold for consideration of more extensive health effects studies. However, if during the Level I Screening, the screening index was above the ORRHES decision guide, then the contaminant was further evaluated using Refined Level I Screening.

  — The Refined Level I Screen calculates a less conservative, more realistic screening index by using more reasonable exposure parameters than the Level I Screen. In addition, depending upon the contaminant, a less conservative environmental concentration was sometimes used. However, the transfer factors and toxicity values remained the same for both screening levels. The Refined Level I Screening maintains considerable conservatism because of these conservative transfer factors and toxicity values.

  If the Refined Level I screening index was below the ORRHES decision guide, then the hazard to most members of the population would be below minimum levels of health concern. In addition, the Refined Level I screening index would be so low that further detail study of exposure is not warranted because the screening index is below the threshold for consideration of more extensive health effects studies and was given a low priority for further study. However, if during the Refined Level I Screening, the screening index was above the ORRHES decision guide, then the contaminant was determined to be of high priority for a detail evaluation.

Study Group

The screening evaluation focuses on the potential for health effects to occur in off-site residents. The Level I Screen estimates a dose for the hypothetical maximally exposed individual who would have received the highest exposure and would have been the most at-risk. The Refined Level I Screen estimates a dose for a more typically exposed individual in the targeted population. The study group for exposure from lead were children because they are particularly sensitive to the neurological effects of lead.

Exposures

Quantitative screening used mathematical equations to calculate a screening index (theoretical estimates of risk or hazard) from multiple exposure pathways, including inhalation; ground exposure (for radionuclides); ingestion of soil or sediment; and ingestion of vegetables, meat, milk, and/or fish.

Outcome Measures

No outcome measures were studied.

Results

Screening-level analyses were performed for seven carcinogens. They were evaluated according to source, resulting in 10 separate analyses. Three of the Level I Screen analyses (Np-237 from K-25, Np-237 from Y-12, and tritium from Y-12) yielded results that were below the decision guides. Refined Level I Screens were performed on the other seven carcinogenic assessments. The results of five separate analyses (beryllium from Y-12, chromium VI from ORR, nickel from K-25, technetium-99 from K-25, and technetium-99 from Y-12) were below the decision guides, and two analyses (arsenic from K-25 and arsenic from Y-12) were above the decision guides.

Arsenic was released into the air from the burning of coal at several coal-fired steam plants located on the Oak Ridge Reservation and into the soil, sediment, and surface water from coal piles and disposal of fly ash from the steam plants. Lead was likely released into soil, sediment, and surface water from the disposal of liquid waste into the Y-12 storm sewers and may have been released into the air from process stacks and the plant ventilation system.

Screening-level analyses were performed for seven noncarcinogens. These, too, were evaluated according to source, resulting in eight separate analyses. One Level I Screen analysis (beryllium from Y-12) yielded results that were below the decision guide. Refined Level I Screens were performed on the other seven noncarcinogenic assessments. Four analyses (chromium VI from ORR, copper from K-25, lithium from Y-12, and nickel from K-25) were below the decision guides and three analyses (arsenic from K-25, arsenic from Y-12, and lead from Y-12) were above the decision guides.

Three materials (niobium, zirconium, and tetramethylammoniumborohydride [TMAB]) were evaluated using the threshold quantity approach because information was insufficient to perform quantitative screening. None of the three was determined to be present in high enough quantities at the Y-12 Plant to have posed off-site health hazards.

Conclusions

Based on the qualitative and quantitative screening, the materials were separated into three classes in terms of potential off-site health hazards: not candidates for further study, potential candidates for further study, and high priority candidates for further study. (as shown in Table 2).

- Not Candidates—Five materials at the K-25 and 14 materials used at the Y-12 Plant were determined to not warrant further study. All of these chemicals were eliminated because either (1) quantitatively, they fell below Level I Screening decision guides; (2) not enough material was present to have posed an off-site health hazard according to the threshold quantity approach; or (3) qualitatively, the quantities used, forms used, and/or manners of usage were such that off-site releases would not have been sufficient to cause off-site health hazards.

- Potential Candidates—Three materials at the K-25 (copper powder, nickel, and technetium-99), three materials used at the Y-12 Plant (beryllium compounds, lithium compounds, and technetium-99), and one material used at ORR (chromium VI) were determined to be potential candidates for further study. These materials were identified as potential candidates because (1) their Level I Screening indices exceeded the decision guides and (2) their Refined Level I Screening indices did not exceed the decision guides.

- High Priority Candidates—One material used at the K-25 (arsenic) and two at the Y-12 Plant (arsenic and lead) were determined to be high priority candidates for further study. They were chosen as high priority materials because their Refined Level I Screening indices exceeded the decision guides.

Two issues remaining from the Dose Reconstruction Feasibility Study were evaluated during Task 7: the possible off-site health risks associated with asbestos and the composition of plutonium formed and released to the environment.

- Asbestos—Asbestos could not be fully evaluated during the feasibility study; therefore, it was qualitatively evaluated during this task for the potential for off-site releases and community exposure. Available information on the use and disposal of asbestos, as well as, off-site asbestos monitoring was summarized. None of the investigations performed to date have identified any asbestos-related exposure events or activities associated with community exposure, making it very unlikely that asbestos from ORR has caused any significant off-site health risks.

- Plutonium—The records that documented the rate of plutonium release did not specify the isotopic composition of the product formed. As a result, during the feasibility study, the project team made the assumption that the plutonium that was formed and released was plutonium-239. If incorrect, this assumption could have significant ramifications on the screening of past airborne plutonium releases. Therefore, the composition of the plutonium formed and released was evaluated further during this task. Plutonium inventory from X-10 was calculated, and plutonium-239 was found to comprise at least 99.9% of the plutonium present in Clinton Pile fuel slugs. This result confirmed that the assumptions made in the feasibility study did not introduce significant inaccuracy into the screening evaluation that was conducted.

TABLE 1

Summary of Screening Methods Used for Each Material

Qualitative Screening		
Material	**Source**	**Notes**
Boron carbide, boron nitride, yttrium boride, titanium boride, rubidium nitrate, triplex coating, carbon fibers, glass fibers, and four-ring polyphenyl ether	ORR	Evaluated based on quantities used, forms used, and manners of usage.
Tellurium	Y-12	Evaluated based on quantities used, forms used, and manners of usage.

Threshold Quantity Approach			
Material	**Source**	**Media**	**Threshold Values**
Niobium	Y-12 Used in production of two alloys, mulberry and binary	Air Surface Water	Evaluated using a reference dose derived from an LD50, an empirically derived dispersion factor for airborne releases from Y-12 to Scarboro, and estimated average East Fork Poplar Creek (EFPC) flow rates.
Tetramethylammoniumboro-hydride (TMAB)	Y-12 An industrial material	Air Surface Water	Evaluated based on quantities used, forms used, and manners of usage.
Zirconium	Y-12 Used in production of an alloy, mulberry	Air Surface Water	Evaluated using a reference dose derived from an ACGIH Threshold Limit Value for occupational exposure, an empirically derived dispersion factor for air released from Y-12 to Scarboro, and estimated average EFPC flow rates.

TABLE 1
Summary of Screening Methods Used for Each Material (continued)

Quantitative Screening			
Material	**Source**	**Media**	**Exposure Values**
Arsenic Level I Screen and Refined Level I Screen	K-25 Y-12 Released as a naturally occurring product in coal, which was used in coal–fired steam plants	Air	Based on coal use and dispersion modeling to Union/Lawnville (K-25) and Scarboro (Y-12).
		Surface Water	Used maximum in Poplar Creek (K-25) and the 95% upper confidence limit (UCL) on the mean concentration in McCoy Branch (Y-12).
		Soil/Sediment	Used sediment core concentration detected in Poplar Creek to represent the early 1960s (K-25) and the 95% UCL on the mean concentration in McCoy Branch (Y-12).
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.
Beryllium compounds Level I Screen and Refined Level I Screen	Y-12 Used in production	Air	Used Y-12 stack monitoring data and an empirical dispersion factor for releases to Scarboro.
		Surface Water	Used maximum concentration measured in EFPC.
		Soil	Used maximum concentration measured in EFPC.
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.
Copper Level I Screen and Refined Level I Screen	K-25 An industrial material	Air	Based on airborne concentrations measured at the most-affected on-site air sampler that were adjusted according to the ratio of dispersion model results at that sampler to those at Union/Lawnville.
		Surface Water	Used maximum concentration measured during the Clinch River Remedial Investigation.
		Soil/Sediment	Used highest mean concentration in Clinch River.
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer factor and an ATSDR bioconcentration factor.

TABLE 1
Summary of Screening Methods Used for Each Material (continued)

Quantitative Screening (continued)			
Material	**Source**	**Media**	**Exposure Values**
Hexavalent chromium (Chromium VI) Level I Screen and Refined Level I Screen	ORR Used in cooling towers to control corrosion	Air	Based on modeling of emission and drift from K-25 cooling towers to Union/Lawnville.
		Surface Water	Used maximum concentration measured in Poplar Creek before 1970.
		Soil	Used average concentration of total chromium measured during the EFPC Remedial Investigation; assumed to be 1/6 (16.7%) chromium VI.
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.
Lead EPA's Integrated Exposure Uptake Biokinetic model	Y-12 Used in production of components, in paints, and as radiation shielding	Air	Estimated from background concentrations of lead prior to mid-1970s.
		Surface Water	Used maximum concentration measured in EFPC (a higher concentration was detected near Y-12; however it was considered to be anomalous).
		Soil/Sediment	Used maximum concentration measured in the EFPC Remedial Investigation, the 95% UCL, and the 95% UCL multiplied by 3.5 for a higher past concentration.
		Food Items	Based on concentrations in air, soil, and water and biotransfer and bio-concentration factors from literature.
Lithium Level I Screen and Refined Level I Screen	Y-12 Used in lithium isotope separation, chemical, and component fabrication	Air	Used stack sampling data from two lithium processing buildings and an empirical dispersion factor for releases to Scarboro.
		Surface Water	Used highest quarterly average measured in EFPC.
		Soil/Sediment	Used maximum concentration measured in the EFPC floodplain.
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.

TABLE 1
Summary of Screening Methods Used for Each Material (continued)

Quantitative Screening (continued)			
Material	**Source**	**Media**	**Exposure Values**
Neptunium-237 Level I Screen	K-25 Y-12 Found in recycled uranium	Air	Based on levels in recycled uranium, an estimated release fraction, and dispersion modeling to Union/Lawnville (K-25) and Scarboro (Y-12).
		Surface Water	Based on reported releases to Clinch River (K-25) and EFPC (Y-12), corrected for dilution.
		Soil/Sediment	Used maximum concentrations detected in Clinch River (K-25) and EFPC (Y-12).
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.
Nickel Level I Screen and Refined Level I Screen	K-25 Used in the production of barrier material for the gaseous diffusion process	Air	Based on the 95% UCL for the year of the highest measured concentrations in on-site air samplers and dispersion modeling to Union/Lawnville.
		Surface Water	Used 95% UCL for the year of the highest concentrations in Clinch River.
		Soil/Sediment	Used highest mean concentration in Clinch River.
		Food Items	Based on concentrations in air, soil, and water and NCRP biotransfer and bioconcentration factors.
Technetium-99 Level I Screen and Refined Level I Screen	K-25 Y-12 Product of fission of uranium atoms and from neutron activation of stable molybdenum-98	Air	Used an average of concentrations modeled to Union/Lawnville (K-25) and Scarboro (Y-12).
		Surface Water	Used maximum concentration detected in Clinch River (K-25) and EFPC (Y-12).
		Soil/Sediment	Used maximum concentration from the K-25 perimeter and EFPC (Y-12).
		Food Items	Based on concentrations in air, soil, and water and biotransfer and bioconcentration factors from literature.

TABLE 1
Summary of Screening Methods Used for Each Material (continued)

Quantitative Screening (continued)			
Material	**Source**	**Media**	**Exposure Values**
Tritium Level I Screen	Y-12 Used in deuterium gas production and lithium deuteride recovery operations	Surface Water	Evaluated based on deuterium inventory differences and the peak tritium concentration in the deuterium that was processed at Y-12; the release estimate was used with the International Atomic Energy Agency method for tritium dose assessment, assuming all the tritium that escaped was released to EFPC.

TABLE 2
Categorization of Materials Based on Screening Results

Contaminant Source	Not Candidates for Further Study (Level I result was below the decision guide)	Potential Candidates for Further Study (Refined Level I result was below the decision guide)	High Priority Candidates for Further Study (Refined Level I result was above the decision guide)
K-25	Neptunium-237 (cancer) Evaluated qualitatively (quantities, forms, and manner of use were not sufficient): • Carbon fibers • Four-ring polyphenyl ether • Glass fibers • Triplex coating	• Copper powder (noncancer) • Nickel (cancer) • Nickel (noncancer) • Technetium-99 (cancer)	• Arsenic (cancer) • Arsenic (noncancer)
Y-12 Plant	• Beryllium compounds (noncancer) • Neptunium-237 (cancer) • Tritium (cancer) Evaluated using Threshold Quantity Approach (not enough material was present): • Niobium (noncancer) • TMAB • Zirconium (noncancer) Evaluated qualitatively (quantities, forms, and manner of use were not sufficient): • Boron carbide • Boron nitride • Rubidium nitrate • Rubidium bromide • Tellurium • Titanium boride • Yttrium boride • Zirconium	• Beryllium compounds (cancer) • Lithium compounds (noncancer) • Technetium-99 (cancer)	• Arsenic (cancer) • Arsenic (noncancer) • Lead (noncancer) Arsenic was released into the air from the burning of coal at several coal-fired steam plants located on the Oak Ridge Reservation and into the soil, sediment, and surface water from coal piles and disposal of fly ash from the steam plants. Lead was likely released into soil, sediment, and surface water from the disposal of liquid waste into the Y-12 storm sewers and may have been released into the air from process stacks and the plant ventilation system."
ORR (all complexes)		• Chromium VI (cancer) • Chromium VI (noncancer)	

Introduction

Fish are an important part of a healthy diet. They are a lean, low-calorie source of protein. Some sport fish caught in the nation's lakes, rivers, oceans, and estuaries, however, may contain chemicals that could pose health risks if these fish are eaten in large amounts.

The purpose of this brochure is not to discourage you from eating fish. It is intended as a guide to help you select and prepare fish that are low in chemical pollutants. By following these recommendations, you and your family can continue to enjoy the benefits of eating fish.

Fish taken from polluted waters might be hazardous to your health. Eating fish containing chemical pollutants may cause birth defects, liver damage, cancer, and other serious health problems.

Chemical pollutants in water come from many sources. They come from factories and sewage treatment plants that you can easily see. They also come from sources that you can't easily see, like chemical spills or runoff from city streets and farm fields. Pollutants are also carried long distances in the air.

Fish may be exposed to chemical pollutants in the water, and the food they eat. They may take up some of the pollutants into their bodies. The pollutants are found in the skin, fat, internal organs, and sometimes muscle tissue of the fish.

What can I do to reduce my health risks from eating fish containing chemical pollutants ?

Following these steps can reduce your health risks from eating fish containing chemical pollutants. The rest of the brochure explains these recommendations in more detail.

1. ***Call your local or state environmental health department.*** Contact them before you fish to see if any advisories are posted in areas where you want to fish.
2. ***Select certain kinds and sizes of fish for eating.*** Younger fish contain fewer pollutants than older, larger fish. Panfish feed on insects and are less likely to build up pollutants.
3. ***Clean and cook your fish properly.*** Proper cleaning and cooking techniques may reduce the levels of some chemical pollutants in the fish.

Health Note

Advisories are different from fishing restrictions or bans or limits. Advisories are issued to provide ***recommendations*** for limiting the amount of fish to be eaten due to levels of pollutants in the fish.

A Message from the Administrator

Christine Todd Whitman

I believe water is the biggest environmental issue we face in the 21st Century in terms of both quality and quantity. In the 30 years since its passage, the Clean Water Act has dramatically increased the number of waterways that are once again safe for fishing and swimming. Despite this great progress in reducing water pollution, many of the nation's waters still do not meet water quality goals. I challenge you to join with me to finish the business of restoring and protecting our nation's waters for present and future generations.

For More Information

For more information about reducing your health risks from eating fish that contain chemical pollutants, contact your local or state health or environmental protection department. You can find the telephone number in the blue section of your local telephone directory.

You may also contact:

U.S. Environmental Protection Agency
Office of Water
Fish and Wildlife Contamination Program (4305T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

web address: www.epa.gov/ost/fish

United States Environmental Protection Agency
Office of Water (4101M)
EPA 823-F-02-005 • April 2002

In celebration of the 30th anniversary of the Clean Water Act, EPA presents

A Guide to Healthy Eating of the Fish You Catch

★ 2002 ★ THE YEAR OF CLEAN WATER
Celebration & Recommitment

Developed in collaboration with the Agency for Toxic Substances and Disease Registry, U.S. Public Health Service

Catching Fish

How can I find out if the waters that I fish in are polluted?

It's almost impossible to tell if a water body is polluted simply by looking at it. However, there are ways to find out.

First, look to see if warning signs are posted along the water's edge. If there are signs, follow the advice printed on them.

Second, even if you don't see warning signs, call your local or state health or environmental protection department and ask for their advice. Ask them if there are any advisories on the kinds or sizes of fish that may be eaten from the waters where you plan to fish. You can also ask about fishing advisories at local sporting goods or bait shops where fishing licenses are sold.

If the water body has not been tested, follow these guidelines to reduce your health risks from eating fish that might contain small amounts of chemical pollutants.

Health Note

Some chemical pollutants, such as mercury and PCBs, can pose greater risks to women of childbearing age, pregnant women, nursing mothers, and young children. This group should be especially careful to greatly reduce or avoid eating fish caught from polluted waters.

Do some fish contain more pollutants than others?

Yes. You can't look at fish and tell if they contain chemical pollutants. The only way to tell if fish contain harmful levels of chemical pollutants is to have them tested in a laboratory. Follow these simple guidelines to lower the risk to your family:

- If you eat gamefish, such as lake trout, salmon, walleye, and bass, eat the smaller, younger fish (within legal limits). They are less likely to contain harmful levels of pollutants than larger, older fish.
- Eat panfish, such as bluegill, perch, stream trout, and smelt. They feed on insects and other aquatic life and are less likely to contain high levels of harmful pollutants.
- Eat fewer fatty fish, such as lake trout, or fish that feed on the bottoms of lakes and streams such as catfish and carp. These fish are more likely to contain higher levels of chemical pollutants.

Cleaning Fish

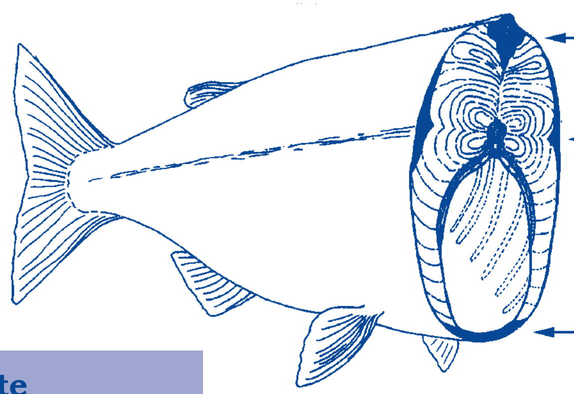
Can I clean my fish to reduce the amount of chemical pollutants that might be present?

Yes. It's always a good idea to remove the skin, fat, and internal organs (where harmful pollutants are most likely to accumulate) before you cook the fish.

As an added precaution:

- Remove and throw away the head, guts, kidneys, and the liver.

Trim away the skin and fatty tissue before cooking to reduce the level of some pollutants in the fish you eat.



Health Note

Mercury is found throughout the tissue in fish, so these cleaning and cooking techniques will not reduce the amount of mercury in a meal of fish.

- Fillet fish and cut away the fat and skin before you cook it.
- Clean and dress fish as soon as possible.

Remember that with any fresh meat, always follow proper food handling and storage techniques. To prevent the growth of bacteria or viruses, keep freshly caught fish on ice and out of direct sunlight.

Cooking Fish

Can I cook my fish to reduce my health risk from eating fish containing chemical pollutants?

Yes. The way you cook fish can make a difference in the kinds and amounts of chemical pollutants remaining in the fish. Fish should be properly prepared and grilled, baked, or broiled. By letting the fat drain away, you can remove pollutants stored in the fatty parts of the fish. Added precautions include:

- Avoid or reduce the amount of fish drippings or broth that you use to flavor the meal. These drippings may contain higher levels of pollutants.
- Eat less fried or deep fat-fried fish because frying seals any chemical pollutants that might be in the fish's fat into the portion that you will eat.
- If you like smoked fish, it is best to fillet the fish and remove the skin before the fish is smoked.

APPENDIX D

Media Maps

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Figure D-1. Number of Off-site Soil Samples Collected from Each Location

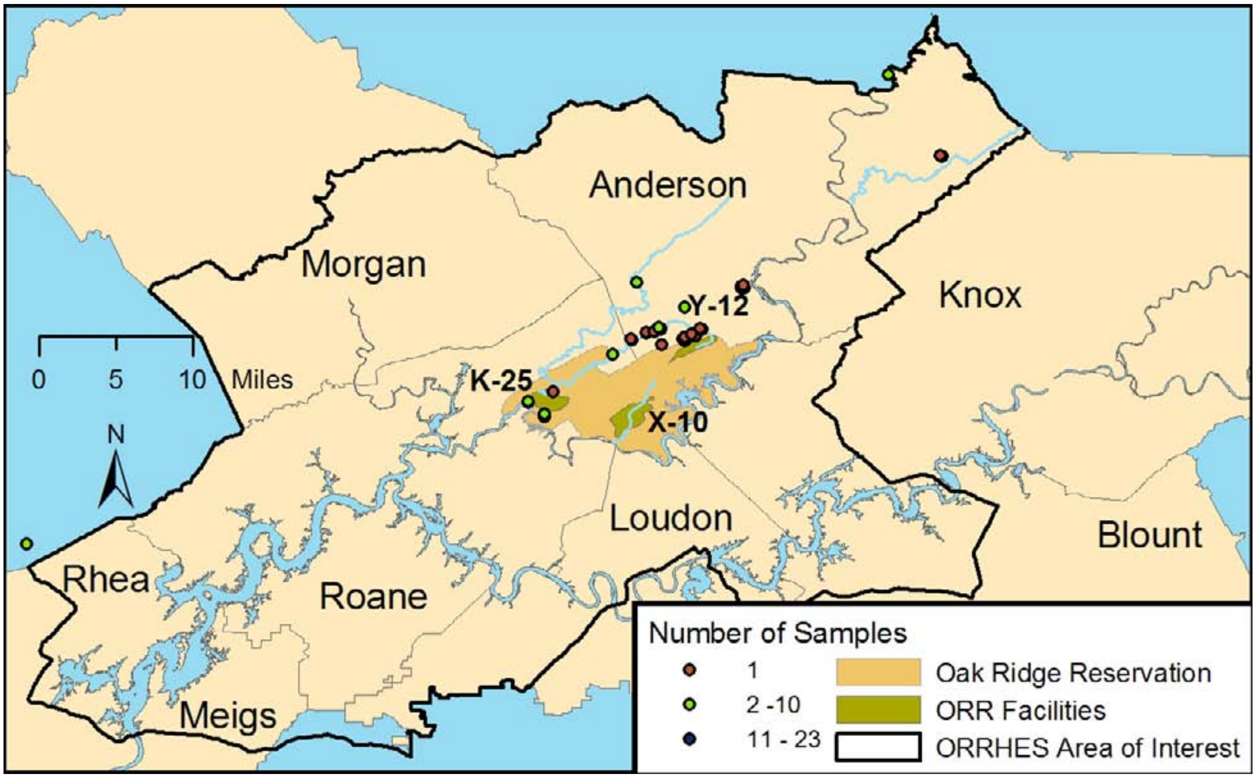


Figure D-2. Number of Chemicals Collected from Each Off-site Soil Location

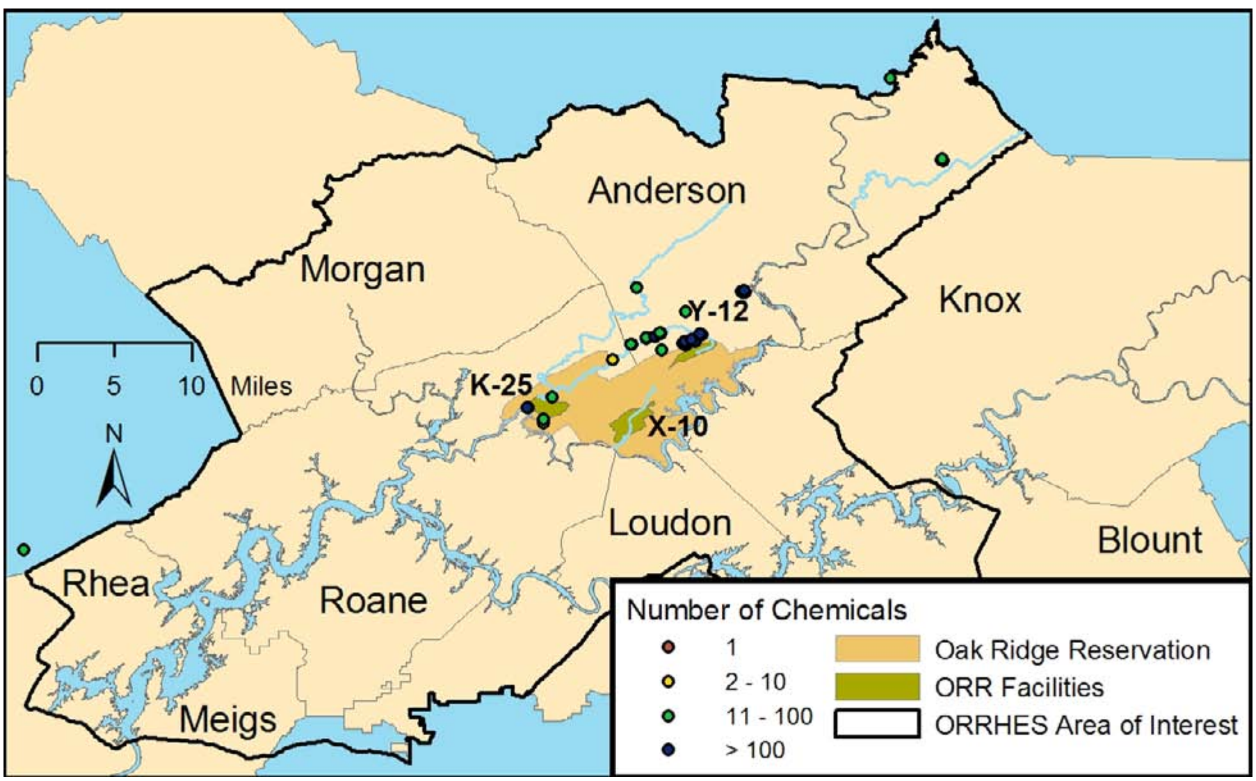


Figure D-3. Number of Off-site Sediment Samples Collected from Each Location

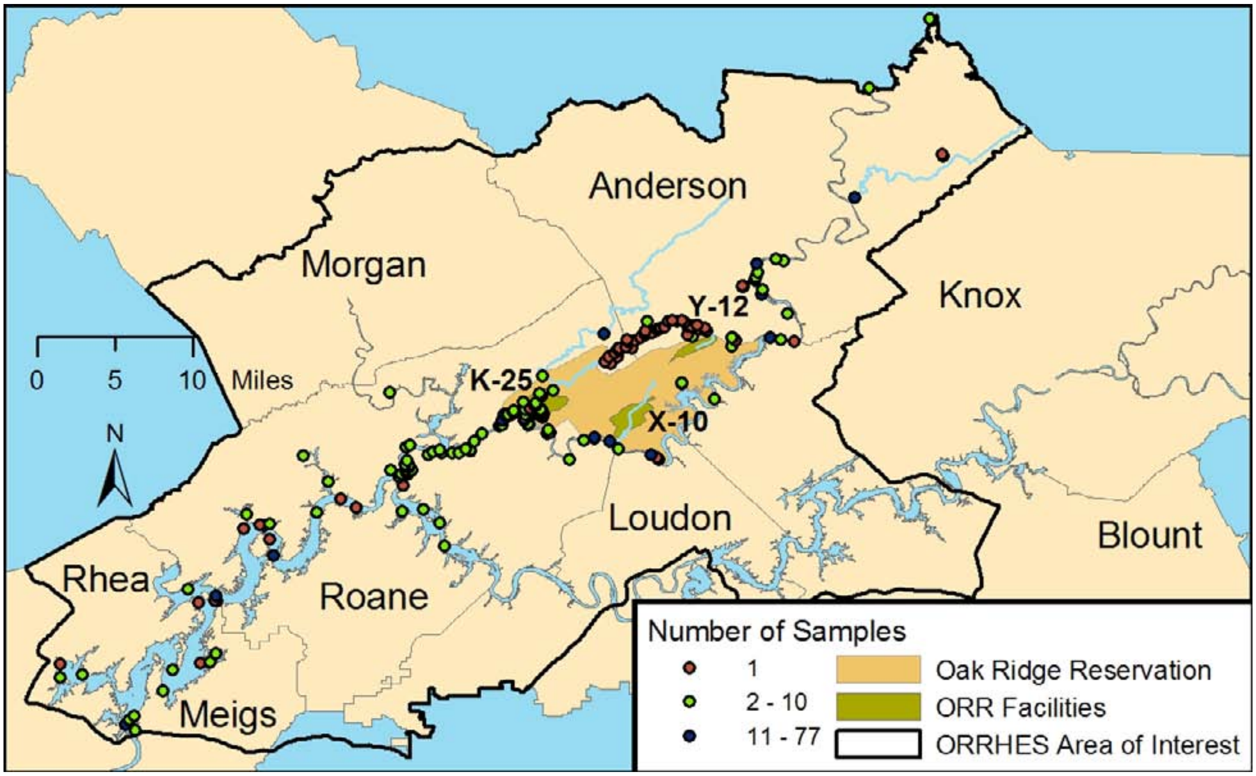


Figure D-4. Number of Chemicals Collected from Each Off-site Sediment Location

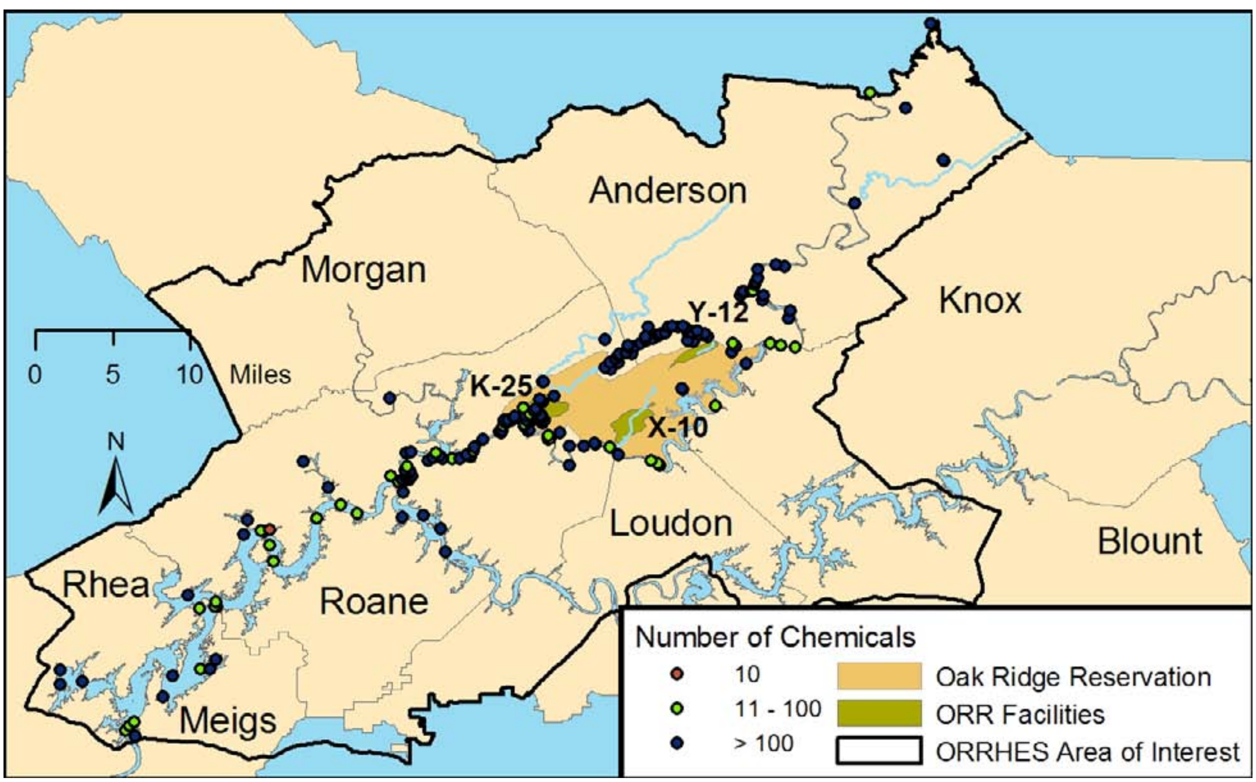


Figure D-5. Number of Off-site Surface Water Samples Collected from Each Location

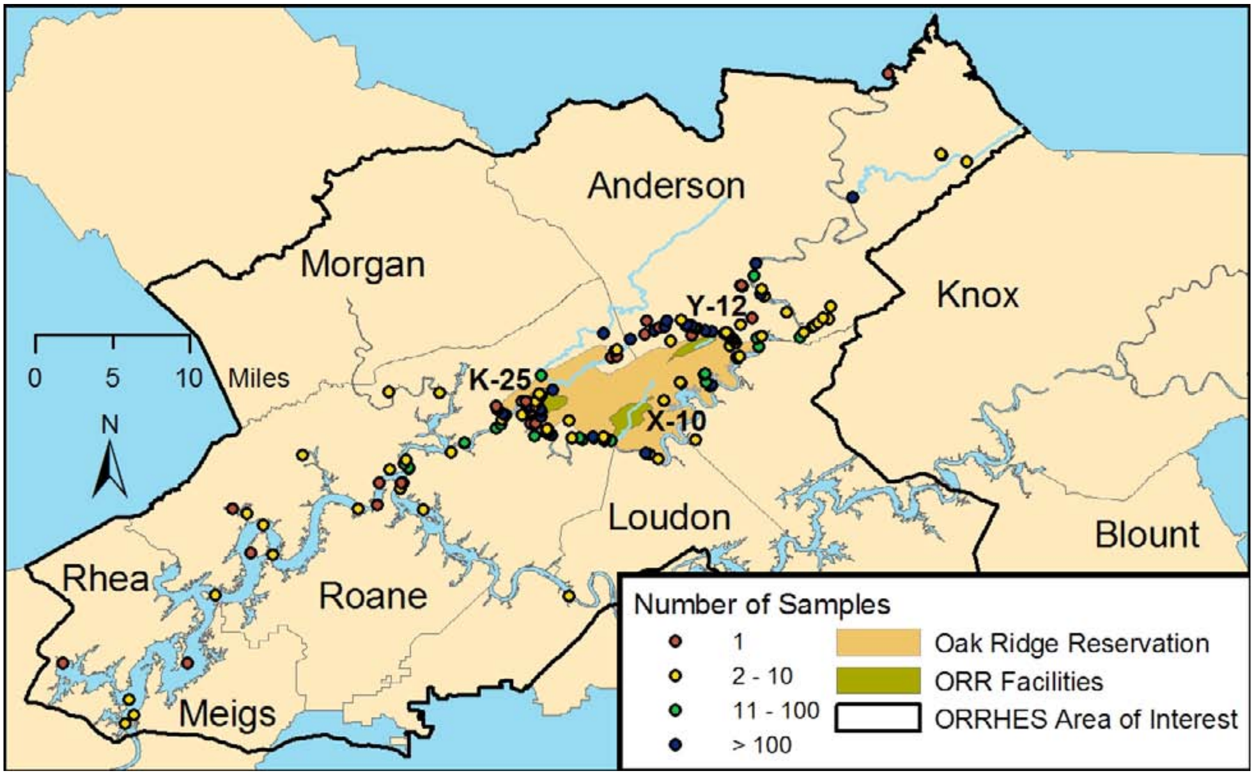


Figure D-6. Number of Chemicals Collected from Each Off-site Surface Water Location

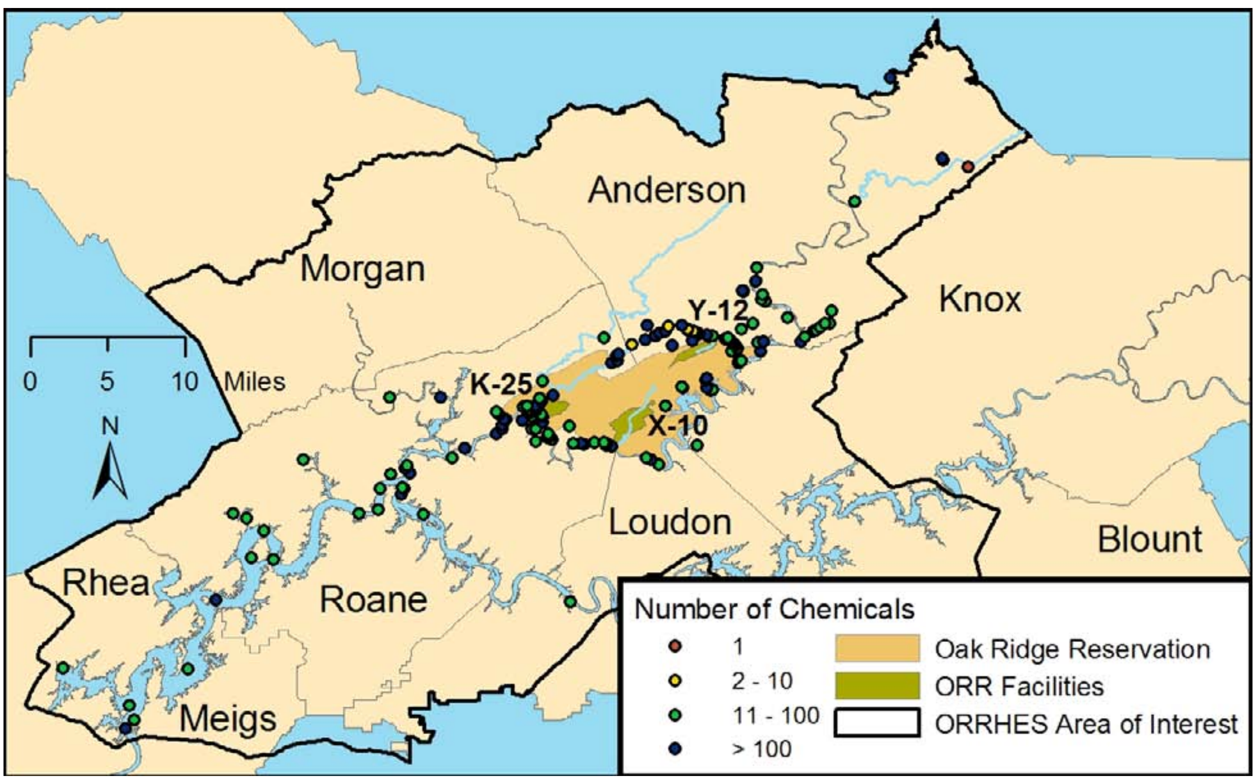


Figure D-7. Number of Off-site Fish Samples Collected from Each Location

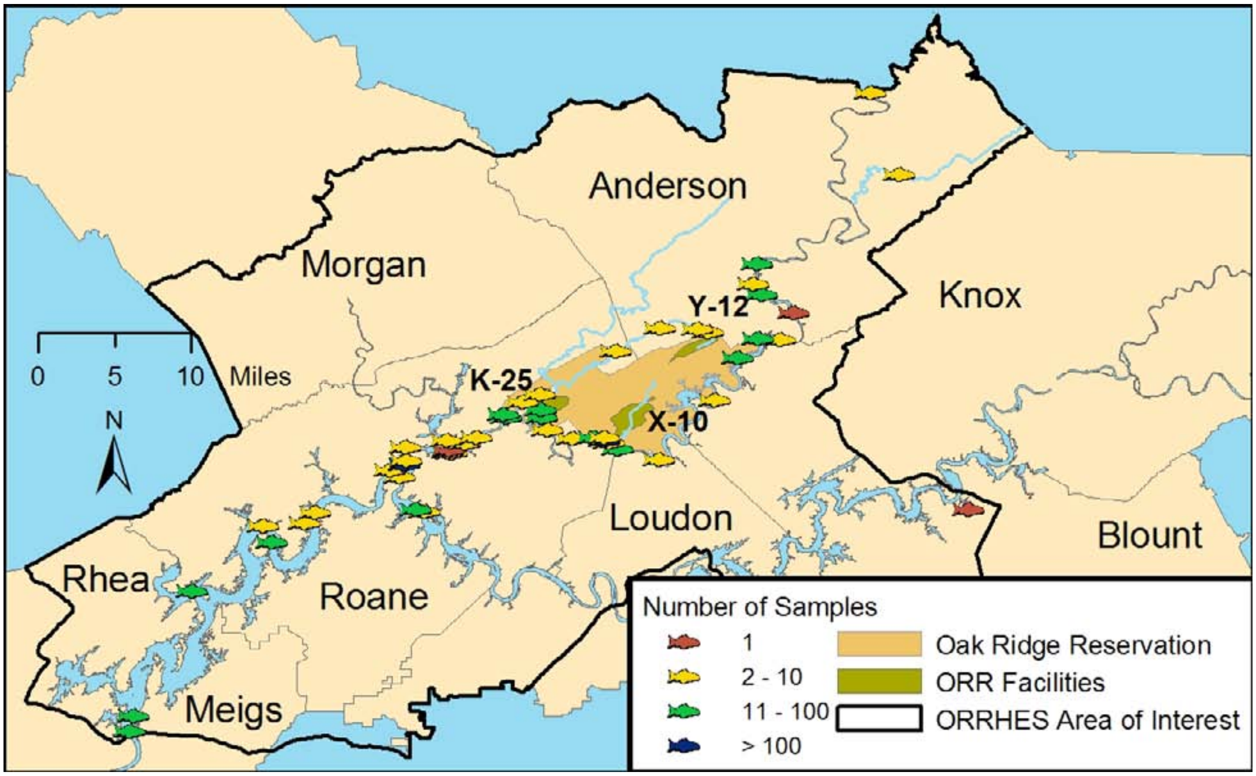


Figure D-8. Number of Chemicals Collected from Each Off-site Fish Location

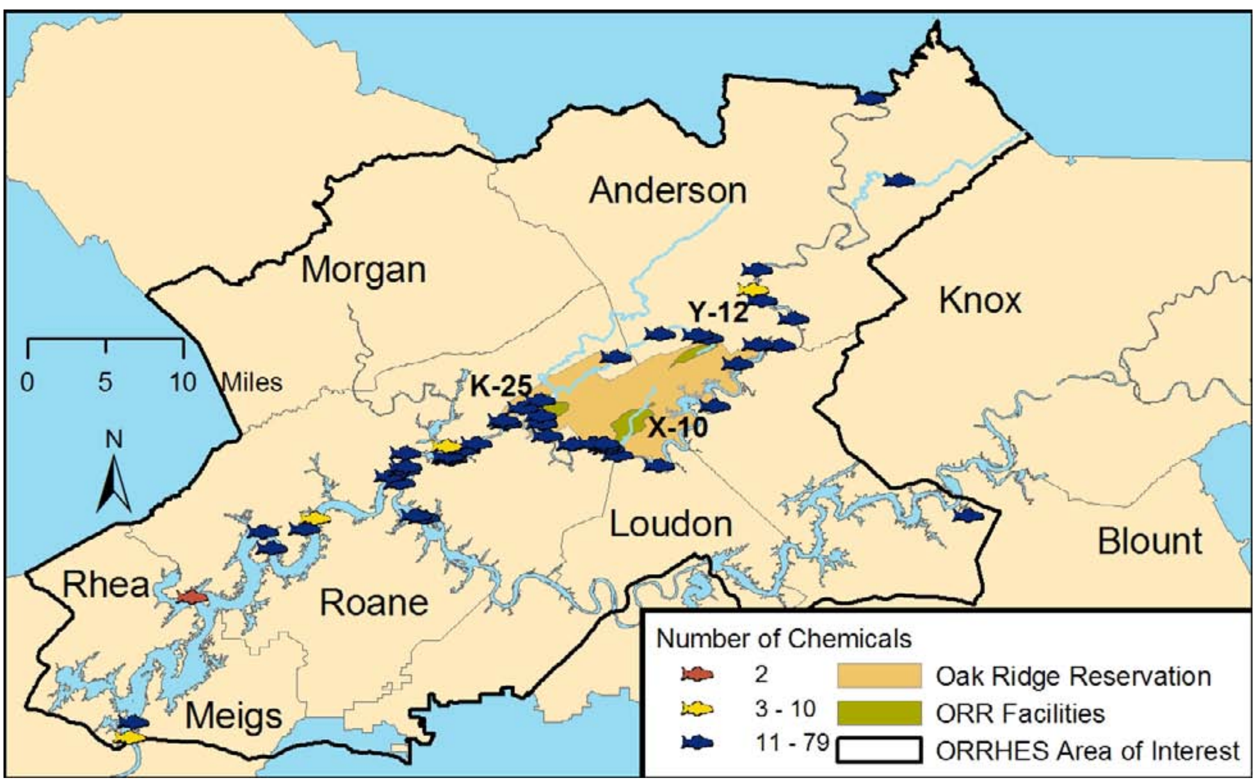


Figure D-9. Number of On-site Fish Samples Collected from Each Location

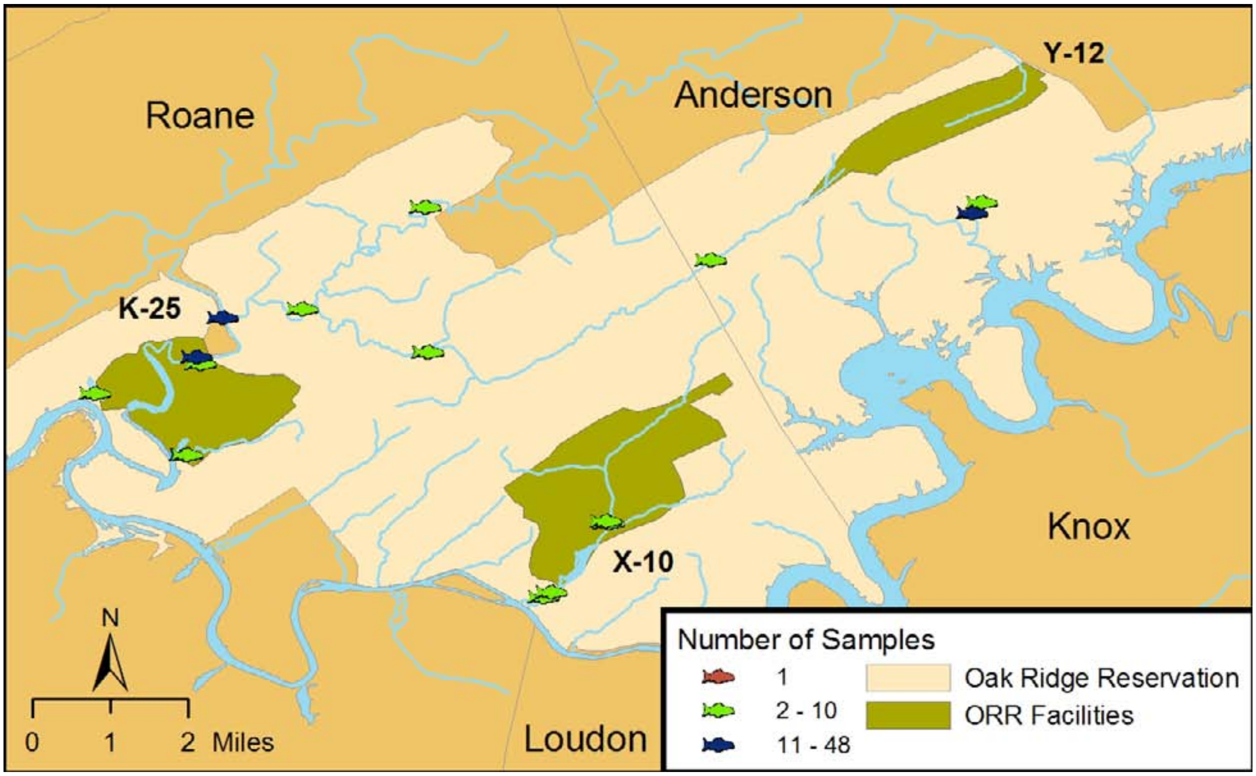


Figure D-10. Number of Chemicals Collected from Each On-site Fish Location

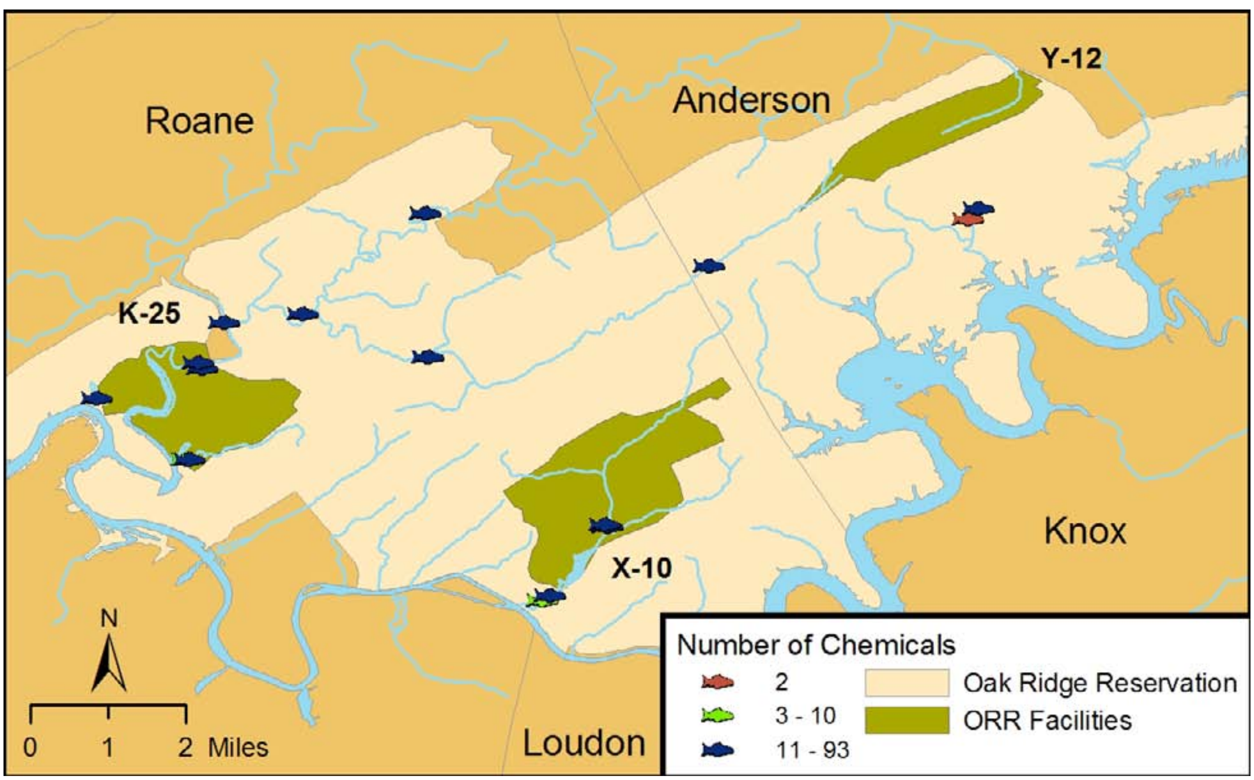


Figure D-11. Number of Off-site Game Samples Collected from Each Location

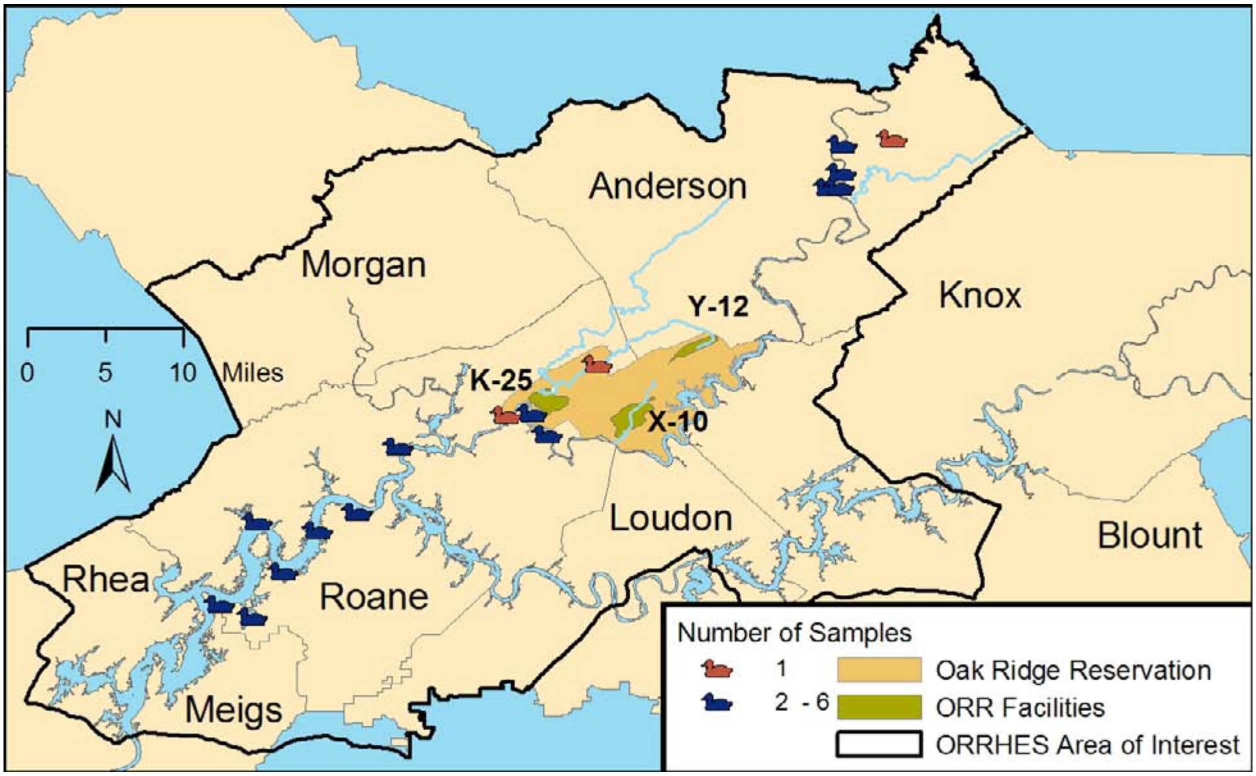


Figure D-12. Number of Chemicals Collected from Each Off-site Game Location

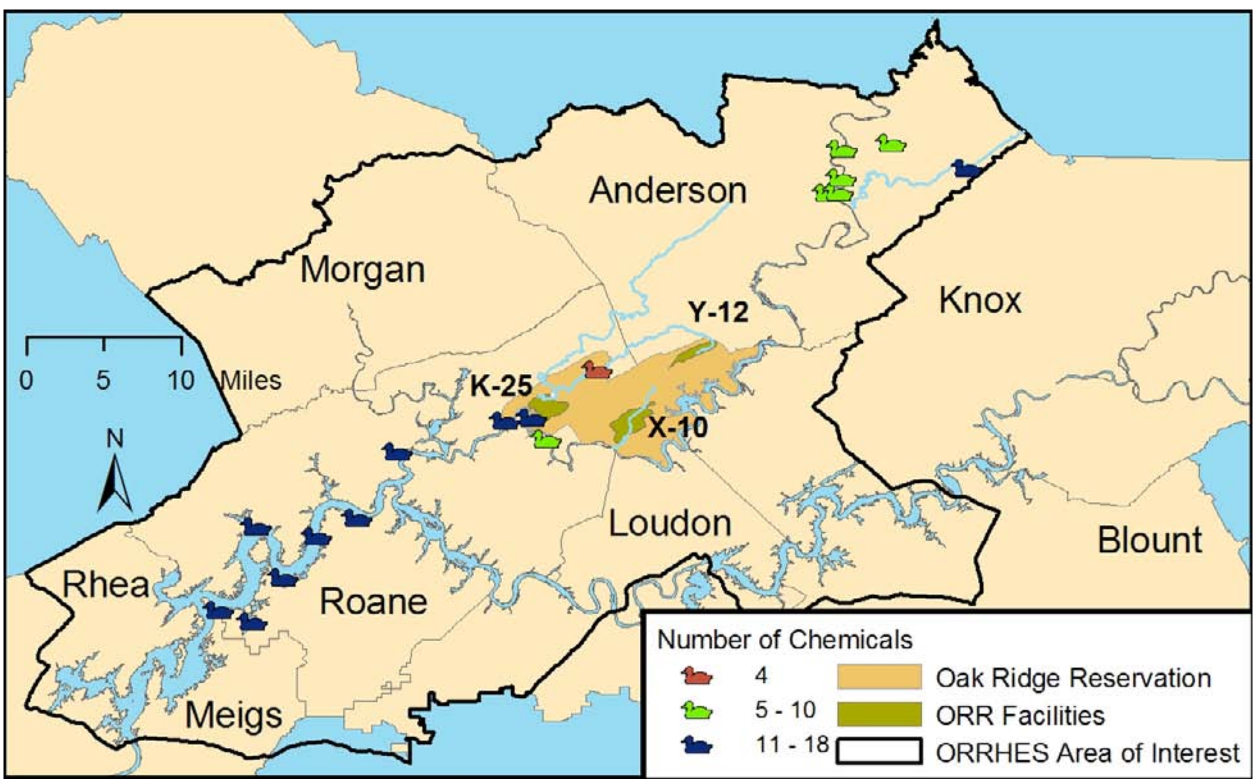


Figure D-13. Number of On-site Game Samples Collected from Each Location

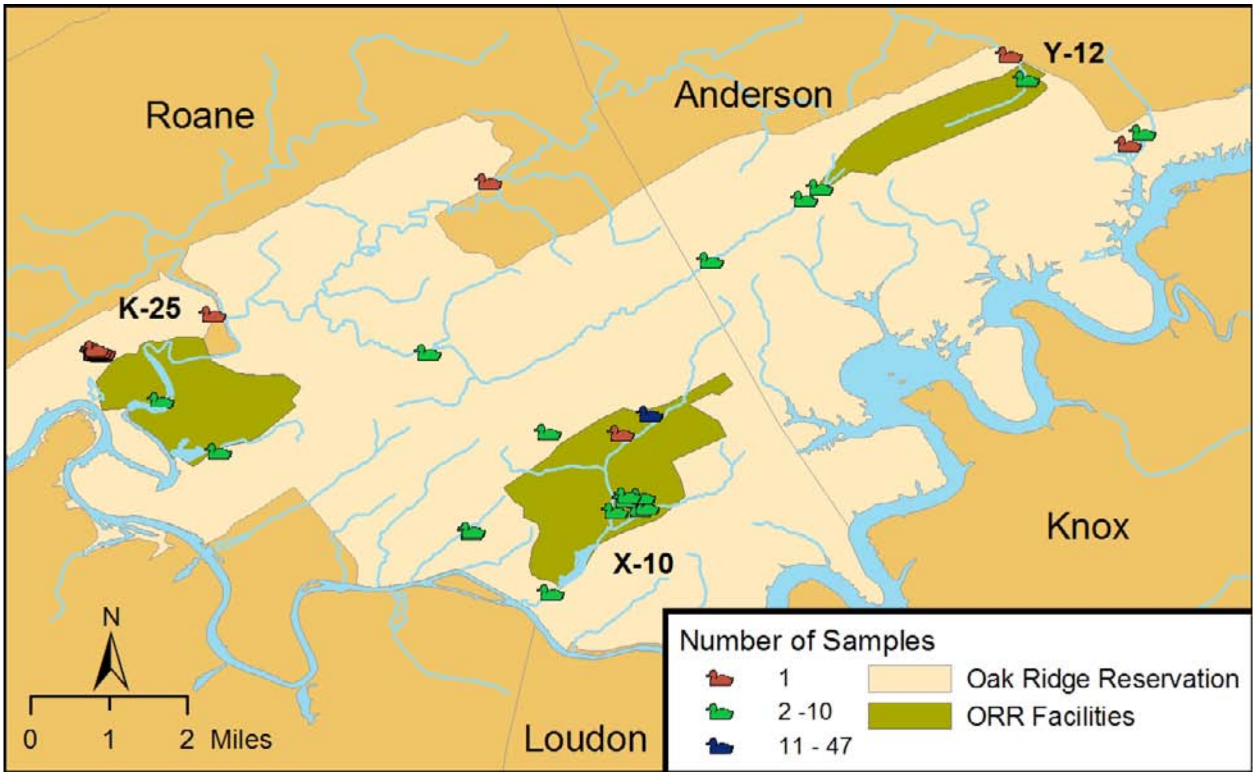


Figure D-14. Number of Chemicals Collected from Each On-site Game Location

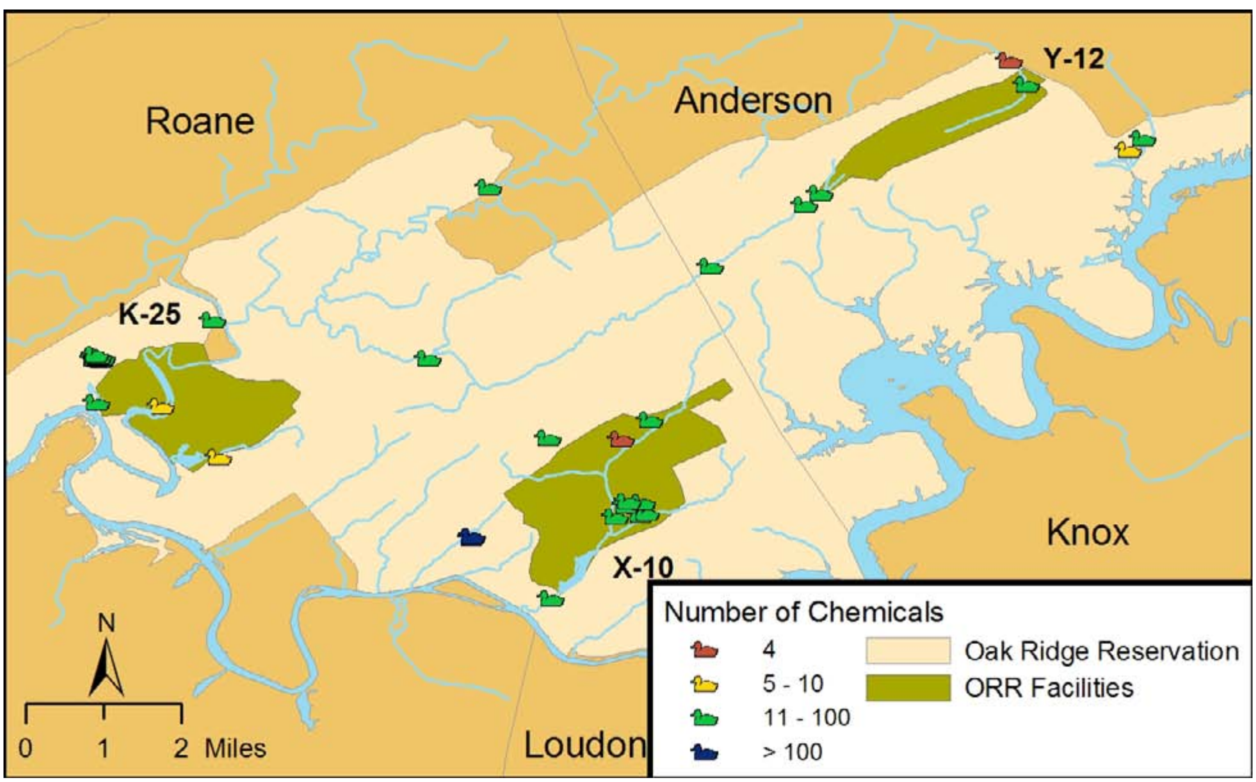


Figure D-15. Number of Off-site Vegetation Samples Collected from Each Location

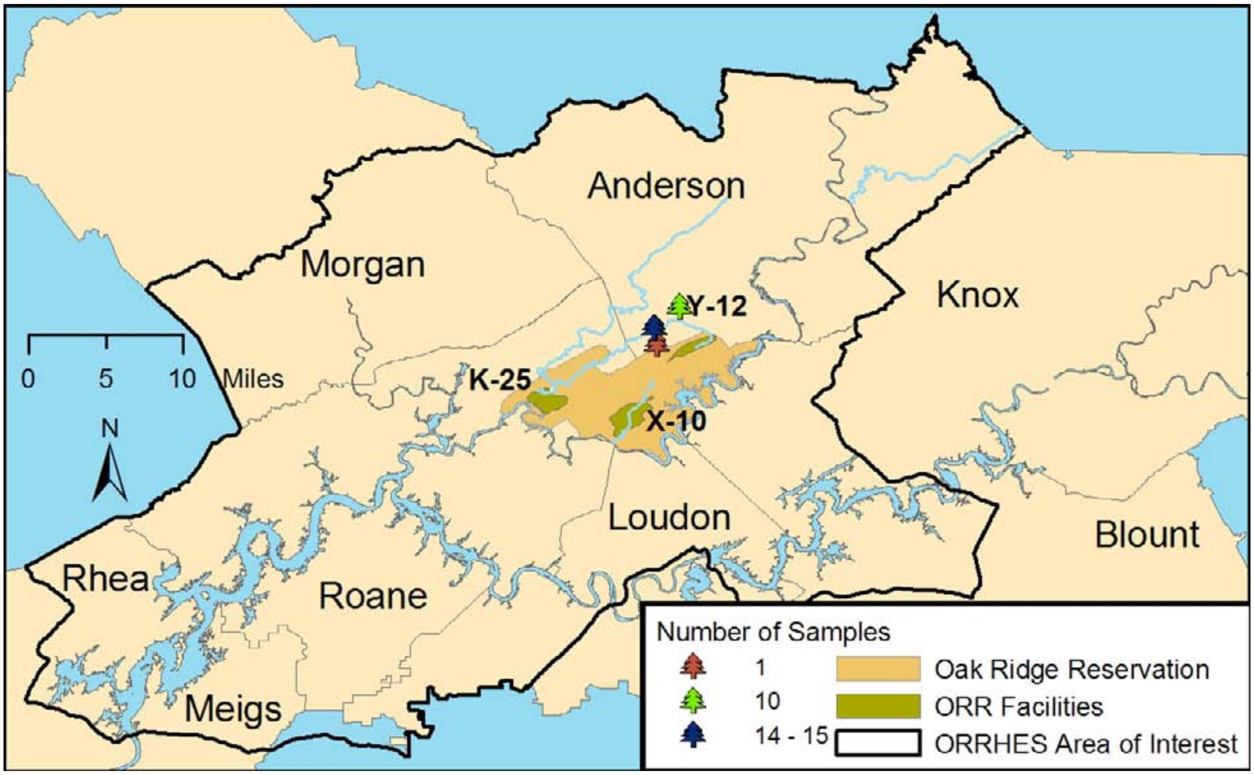


Figure D-16. Number of Chemicals Collected from Each Off-site Vegetation Location

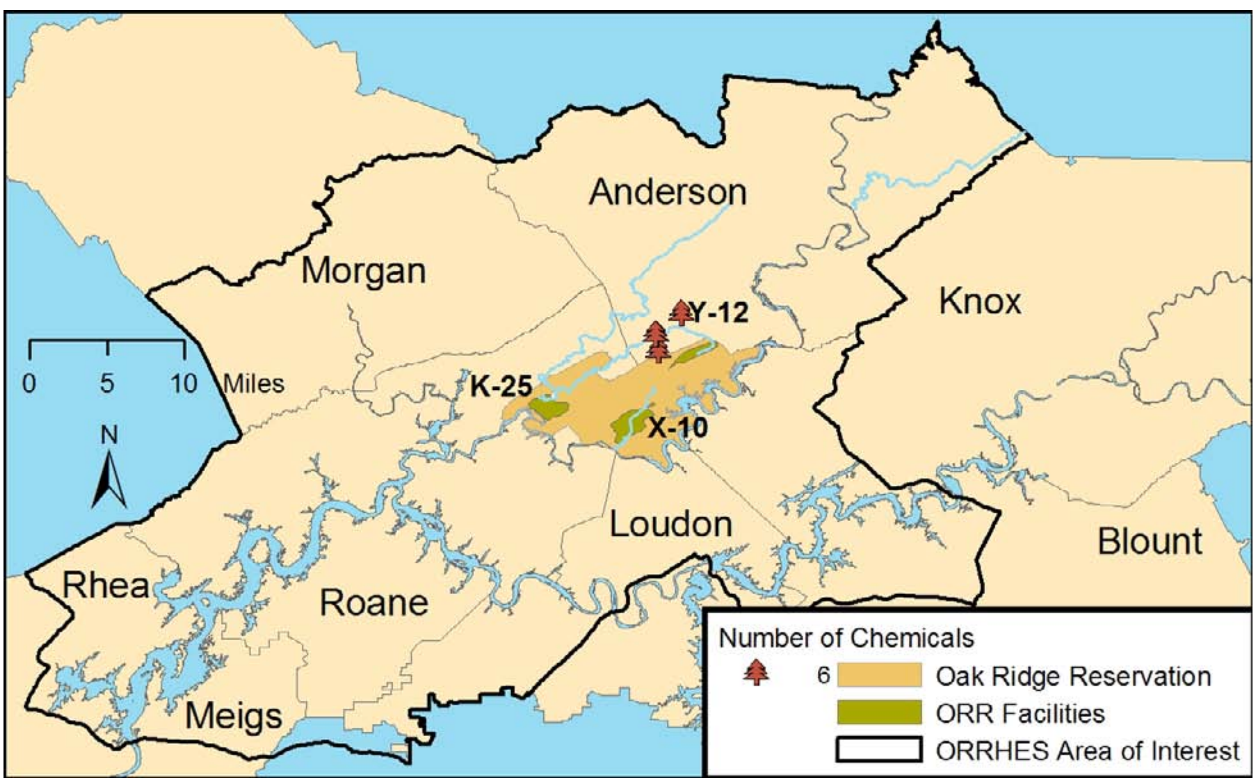


Figure D-17. Number of Air Samples Collected from Each Location

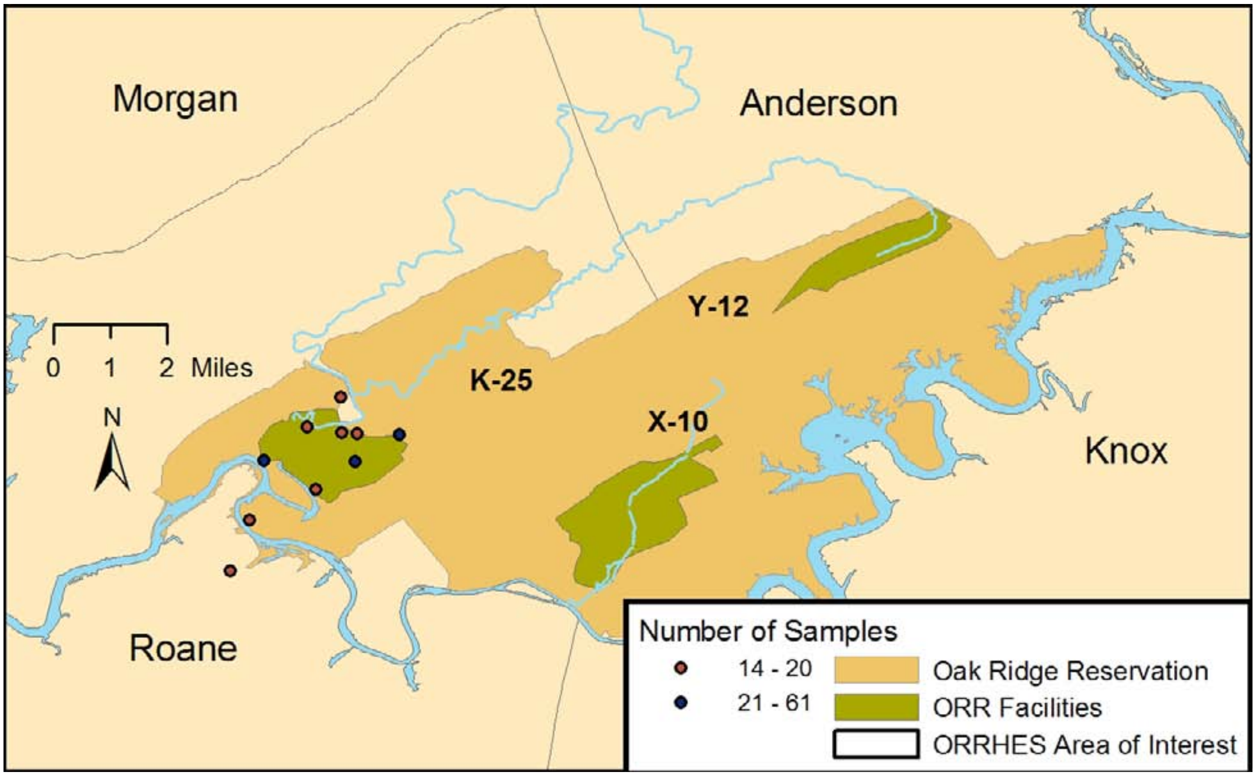
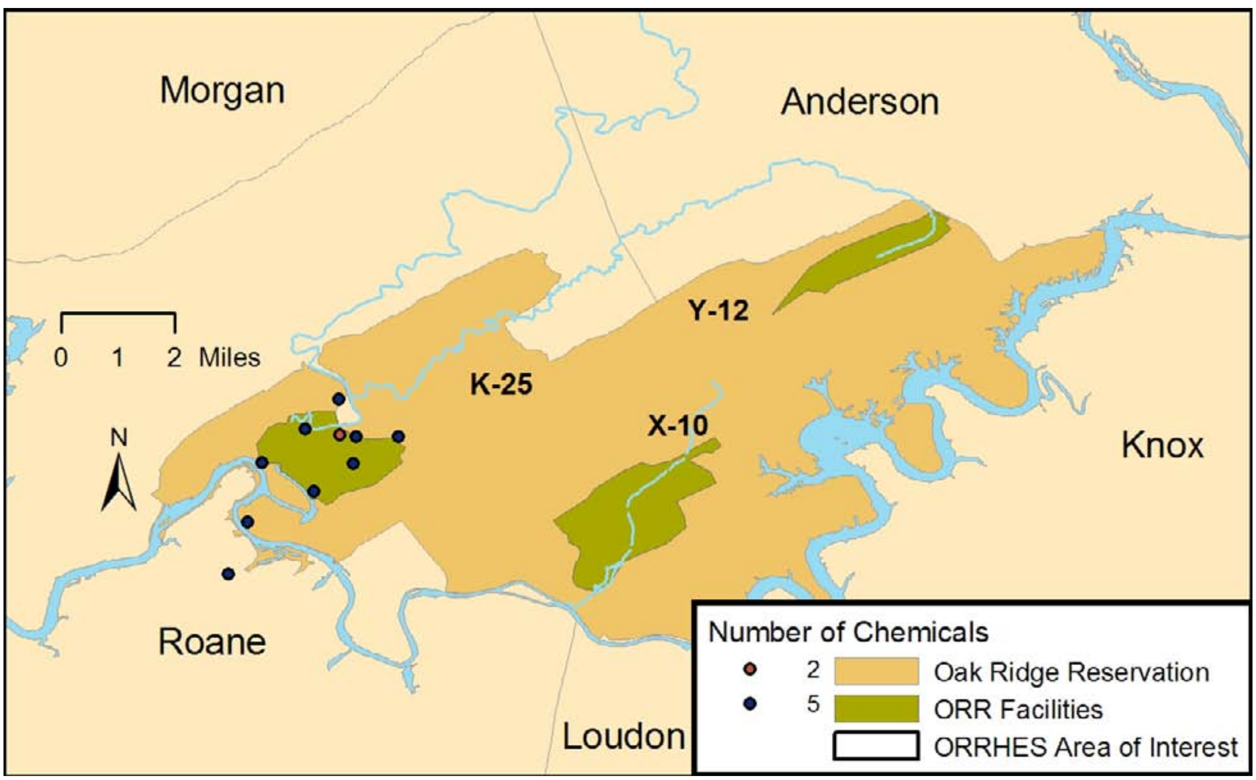


Figure D-18. Number of Chemicals Collected from Each Air Location



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APPENDIX E

Y-12 Uranium Releases PHA Community Health Concerns & Responses

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Community Health Concerns From the Oak Ridge Reservation Community Health Concerns Database

All page numbers, sections, figures, tables, and sources in this table refer to the Y-12 Uranium Releases Public Health Assessment (ATSDR 2004b).

	Summarized Concern/Issue	*ATSDR's Response*
Health Concerns/General		
1	The U 235 contamination is significant.	ATSDR evaluated past and current exposure to uranium contamination released from the Y-12 plant and determined that in every exposure pathway, the levels of uranium were too low to be of public health hazard for both radiation and chemical health effects (please see Figures 8, 9, and 12 and Table 25). ATSDR evaluated whether the levels of U 235 in the soil in Scarboro were significant by comparing the radioactivity concentrations detected in Scarboro by FAMU (FAMU 1998) and EPA (EPA 2003) to average background levels in the area around Oak Ridge and to background concentrations typically found in nature. ATSDR found that the levels of U 235 that were detected were indistinguishable from background levels when considering the uncertainty associated with the analysis of the uranium measurements. Please see the Current Soil Exposure Pathway discussion under the Current Radiation Effects section (Section III.B.2.a.) and Figures 21, 24, and 25 for more details about this evaluation. ATSDR also evaluated whether the radioactivity concentrations of uranium detected in the air in Scarboro were higher than those detected at background air monitoring stations. The data indicate that the concentrations in Scarboro are about 60% higher than the remote background locations; however, all of the air concentrations, including those from Scarboro, were well below levels of health concern. Please see the Current Inhalation Exposure Pathway discussion under the Current Chemical Effects section (Section III.B.2.b.) and Figure 27 for additional details.
2	ORR facilities were engaged in plutonium production.	A pilot-scale plutonium production plant was built at the X-10 site in 1943 and was operated until November 1963. For more details, please see Section 2.1.1. The Original Mission in the Oak Ridge Health Studies Phase 1 Report, Volume II, Part A: Dose Reconstruction Feasibility Study, Tasks 1 & 2 (ChemRisk 1993a). During Phase 1 of the Oak Ridge Health Studies, the quantity of plutonium released was estimated and determined to not warrant further health study. Plutonium was low in the preliminary ranking of potential hazards. Please see Section 5.4, Relative Importance of Releases from the ORR and Table 5-11 in the Oak Ridge Health Studies Phase 1 Report, Volume II, Part B: Dose Reconstruction Feasibility Study, Tasks 3 & 4 (ChemRisk 1993b). These reports are available at the DOE Information Center located at 475 Oak Ridge Turnpike, Oak Ridge, Tennessee. You can also obtain documents from the Information Center at http://www.oakridge.doe.gov/info_cntr/index.html or by calling 865-241-4780.

	Summarized Concern/Issue	*ATSDR's Response*
3	We would like for environmental tests to be performed on other neighborhoods in Oak Ridge so that it can be determined if the trace levels of uranium contaminants detected in our neighborhood are significantly different from Oak Ridge in general. Do you have any statistics comparing illness in Scarboro and other sections of Oak Ridge? There are no other residential data to compare to Scarboro. It is generally believed by most people who live in Tennessee and perhaps the nation that the Scarboro neighborhood in Oak Ridge, Tennessee, is contaminated with mercury.... The data showed very high levels of mercury contamination in several areas of Oak Ridge; however, the media primarily focused attention on mercury contamination in the Scarboro neighborhood (where no significant mercury was ever found). We would like for those interested in helping our neighborhood with health and contamination issues to be mindful of the psychological, sociological, and economic consequences that result whether contamination issues are real or imaginary.	During this evaluation of Y-12 uranium releases, ATSDR attempted to locate uranium soil sampling data from other areas in Oak Ridge (for example, data from the Atomic City Auto Parts remediation, the CSX Railroad remediation, and sampling data collected in the Woodland area of Oak Ridge), but as of this writing was unsuccessful. ATSDR evaluated whether the levels of uranium in the soil were significantly different in Scarboro by comparing the levels detected in Scarboro by FAMU (FAMU 1998) and EPA (EPA 2003) to the average background levels in the area around Oak Ridge and to background concentrations typically found in nature. ATSDR found that the levels of uranium that were detected were indistinguishable from background, when considering the uncertainty associated with the analysis of the uranium measurements. Please see the Current Soil Exposure Pathway discussion under Current Radiation Effects section (Section III.B.2.a.) and Figures 21, 24, and 25 for more details about this evaluation. ATSDR also evaluated whether the radioactivity concentrations of U 235 detected in the air in Scarboro were higher than those detected at background stations. The data indicate that the concentrations in Scarboro are about 60% higher than the background locations; however, all of the air concentrations, including those from Scarboro, were well below levels of health concern. Please see the Current Inhalation Exposure Pathway discussion under the Current Chemical Effects section (Section III.B.2.b.) and Figure 27 for additional details. ATSDR evaluated past and current exposure to uranium contamination released from the Y-12 plant and determined that in every exposure pathway, the levels of uranium were too low to be of public health concern for both radiation and chemical health effects. ATSDR will be conducting a public health assessment on mercury releases from Y-12, which will evaluate exposure to the mercury concentrations in Scarboro.
4	We know the soil is contaminated and want someone to prove it. (Just tell us the truth.) There must be something wrong if the government does so many studies, and the newspaper gives it so much attention. Scarboro is the most contaminated residential area.	The city of Oak Ridge is the established community where residents resided during the years of uranium releases that could have been impacted by Y-12 uranium releases. In this public health assessment, the Scarboro community was used as a reference location that represents the city of Oak Ridge. The Scarboro community was selected as the reference population after air dispersion modeling indicated that its residents were expected to have received the highest exposures (ChemRisk 1999). However, when ATSDR compared the levels of uranium in the soil in Scarboro (FAMU 1998 and EPA 2003) to levels of uranium naturally occurring in the soil and to average background levels in the Oak Ridge area, it was determined that the uranium radioactivity concentrations in Scarboro were indistinguishable from levels occurring naturally. Please see the Current Soil Exposure Pathway discussion under Current Radiation Effects section (Section III.B.2.a.) and Figures 21, 24, and 25 for more details about this evaluation.

	Summarized Concern/Issue	*ATSDR's Response*
5	The sirens in Y-12 are all nuclear alarms.	The following Web site provides information on warning sirens, the latest news, and other information in case of an emergency at the ORR: http://www.oakridge.doe.gov/emercomm/. The Web site also provides general information about the DOE Emergency Preparedness Program. If you have questions about this program, please visit the Web site or call the DOE Public Affairs Office at 865-576-0885. The sirens are tested at noon eastern time on the first Wednesday of each month. Any other tests and exercises are announced in advance through area newspapers, radio, and television.
6	The SED/AEC dumped "hot" waste from Y-12 in/near Scarboro. Scarboro is a part of ORR, is owned by the government, is leased to the residents, and can be used as a DOE dump at any time. Concerned about the locations of actual and alleged "dumps."	A municipal landfill (on Tuskegee Drive across from Scarboro) and a building material dump site (at the corner of Tuskegee Drive and Tulsa) were present in Oak Ridge in the past. Both sites are currently closed. Neither area was identified as having radioactive wastes during the aerial radiological surveys conducted in the Scarboro area in 1959, 1973, 1980, 1989, 1992, and 1997. Every flyover of Scarboro showed only natural background levels (Carden and Joseph 1998). While this does not preclude the presence of deeply buried wastes in these areas, if present, they most likely are not impacting public health in the Scarboro community because people do not have contact with deeply buried wastes. Designated landfills on the ORR were used for disposal of hazardous wastes and radioactive materials.
7	The drinking water changes color and is sometimes cloudy. Something in water; water was white; how much exposure can an individual have to the water before they are affected by it; things in the water; water not drinkable; problems with water; water quality (thick, milky appearance).	Oak Ridge is supplied with public water from a water treatment plant that draws surface water from Melton Hill Lake. The intake at the lake is located approximately one mile upstream of the ORR. Until May 2000, DOE owned and operated the water treatment plant at its Y-12 facility and sold drinking water to the city of Oak Ridge for distribution to residents and businesses. The city of Oak Ridge now owns and operates the water distribution system (City of Oak Ridge 2002). Under the Safe Drinking Water Act, EPA sets health-based standards for hundreds of substances in drinking water and specifies treatments for providing safe drinking water (EPA 1999). The public water supply for Oak Ridge is continually monitored for these regulated substances. TDEC receives a copy of the monitoring report to ensure that people are receiving clean drinking water. More information about the quality of the Oak Ridge public water supply system is available at the following Web site: http://www.cortn.org/PW-html/2001WaterQualityReport.htm. To ask specific questions related to your drinking water, please call Mr. Bruce Giles, Water and Wastewater Manager, at 865-425-1875 or call EPA's Safe Drinking Water Hotline at 800-426-4791.

	Summarized Concern/Issue	ATSDR's Response
8	If the Joint Center cannot supply Scarboro with money they should go home. The Joint Center should help Scarboro to write and find grant money. The Joint Center agreement does not require them to explain any past data before 1998. The purpose of Joint Center's Scarboro Community Environmental Study is to address community concerns about environmental monitoring in the Scarboro neighborhood.	Please contact DOE with your concerns about the Joint Center's funding as these comments are not applicable to ATSDR. More information about the Joint Center for Political and Economic Studies can be found at www.jointcenter.org or by calling 202-789-3500.
9	Who makes the official health call?	ATSDR is the principal federal public health agency charged with the responsibility of evaluating the human health effects of exposure to hazardous substances. The agency works in close collaboration with local, state, and other federal agencies, with tribal governments, and with communities and local health care providers. The goal of the agency is to help prevent or reduce harmful human health effects from exposure to hazardous substances. In 1980, the U.S. Congress created ATSDR to implement the health-related sections of the laws that protect the public from hazardous waste and environmental spills of hazardous substances. CERCLA, commonly known as the "Superfund" Act, provided a congressional mandate to clean up abandoned and inactive hazardous waste sites and to provide federal assistance in emergencies involving toxic substances. As the lead agency in the Public Health Service for implementing the health-related provisions of CERCLA, ATSDR is charged under the Superfund Act to assess the presence and nature of health hazards at specific Superfund sites, to help reduce or prevent further exposure, and to expand the knowledge base about health effects related to exposure to hazardous substances. Under this purview, ATSDR is determining whether hazardous levels of uranium from the Y-12 plant represent a public health hazard for people living near the ORR. For additional information about ATSDR, please visit our Web site at: http://www.atsdr.cdc.gov/. ORRHES was established in 1999, as a subcommittee of the Citizens Advisory Committee on Public Health Service Activities and Research at DOE Sites. The ORRHES provides advice and recommendations to ATSDR and Centers for Disease Control and Prevention (CDC) concerning public health activities and research conducted by ATSDR and CDC at the ORR.

	Summarized Concern/Issue	ATSDR's Response
10	Scarboro has a "high" background. The monitor is in the wrong place. They didn't sample the pond where the dump was. They sampled my neighbor's yard, but not my yard. The number of surface water and sediment samples taken should be increased. Our objections in the Scarboro sampling issue include: DOE's shameless refusal to investigate particular areas suggested by Scarboro residents familiar with the DOE's legacy of contamination in their neighborhood. Our objections in the Scarboro sampling issue include: The use of Y-12 as a control against which Scarboro soil was measured to compare contamination levels. Our objections in the Scarboro sampling issue include: The use of the top two inches of soil as a valid sample for soil analysis; the use of only three soil samples sets for analysis.	In 2001, EPA validated the environmental sampling conducted within the Scarboro community by FAMU in 1998 (EPA 2003; FAMU 1998). ATSDR reviewed the methods and results of the environmental sampling conducted by FAMU and EPA, and found that the procedures were adequate for making public health decisions. Both EPA's and FAMU's reports are available in the DOE Information Center located at 475 Oak Ridge Turnpike, Oak Ridge, Tennessee. You can obtain documents from the Information Center at http://www.oakridge.doe.gov/info_cntr/index.html or by calling 865-241-4780. ATSDR evaluated whether the levels of uranium in the soil were significantly different in Scarboro (FAMU 1998 and EPA 2003) by comparing the levels detected in the soil in Scarboro to levels of uranium naturally occurring in the soil and to average background levels in the Oak Ridge area. ATSDR determined that the uranium concentrations in Scarboro were indistinguishable from levels occurring naturally. Please see the Current Soil Exposure Pathway discussion under Current Radiation Effects section (Section III.B.2.a.) and Figures 21, 24, and 25 for more details about this evaluation. When conducting sampling at hazardous waste sites, ATSDR recommends that the initial evaluation of the site include an assessment of probable routes of public exposure/contaminant migration off site, and that the sampling begin at the public exposure points to determine if interim actions are needed to reduce or eliminate public exposure. Contaminated soils may expose individuals who live, play, or work near the site to contaminants at levels of health concern. Ingestion of contaminated surface soil, particularly by children, is a primary concern. Inhalation of contaminated dust and direct dermal contact with contaminated soils also can lead to adverse health effects. Generally, the public is exposed to only the top few inches of soil; therefore, ATSDR has defined surface soil as the top 3 inches. For a public health evaluation, ATSDR needs concentrations of contaminants found in surface soil reported separately from those found in subsurface soil.

	Summarized Concern/Issue	ATSDR's Response
11	Scarboro is adjacent to the "incinerator." Fly ash from Y-12 settled over my car. Contamination in air; lots of dust, air stays very smoky, smoggy. Things in air; respiratory problems; respiratory problems in children caused by air pollution from ORR; black air on mother's car after she washed it had to be from the plant; at times the air has a peculiar smell; chest pain during excitation; air pollutants building in the soils nearby; gasoline type fumes.	In 1997 and 1998, CDC, TDOH, and the Scarboro Community Environmental Justice Council conducted a study to determine whether rates of pediatric respiratory illnesses were higher in Scarboro than elsewhere in the United States and to assess whether exposure to various factors increased residents' risk for health problems. The researchers concluded the following: No unusual pattern of illnesses emerged among the children receiving medical exams. The illnesses that were detected were not more severe than would be expected in any community. The findings of the medical exams were consistent with the findings of the community survey. The reported prevalence rate of asthma among children in Scarboro (13%) was higher than the estimated national rate (7% in all children and 9% in black children). However, few studies have been conducted on communities similar to Scarboro, and without asthma prevalence information from these communities, it was not possible to determine whether the prevalence of asthma was higher than would be expected. The Scarboro rate was, however, within the range of rates reported in similar studies throughout the United States and internationally. The reported rate of wheezing among children in Scarboro (35%) was also higher than most national and international estimated rates (which range from 1.6% to 36.8%). The prevalence rates of hay fever and sinus infections in children were comparable to national estimated rates. Because the investigation was not designed to detect associations, and a relatively small group of children was studied, it was not possible to identify causes of the respiratory illnesses. Copies of the report on this study, *An Analysis of Respiratory Illnesses Among Children in the Scarboro Community,* are available in the ATSDR Oak Ridge field office at 1975 Tulane Avenue, Oak Ridge, Tennessee (telephone: 865-220-0295). This investigation is summarized in Section II.F.3. and in Appendix I.
12	What did my husband bring home from the plant? Activities at DOE plants have led to worker health problems.	Federal regulations establish requirements for a radiological protection program. Included in the law are requirements for monitoring personnel and the workplace to ensure that contaminants are not taken outside of radiological areas. A DOE Order delineates requirements to ensure worker protection in all environment, safety, and health disciplines. The Atomic Energy Commission established worker health and safety plans through a series of orders. Worker health issues at the plants are a concern to ATSDR; however, those issues are under the purview of NIOSH. For information on NIOSH's occupational energy research program see NIOSH's Web site at www.cdc.gov/niosh/2001-133.html or telephone 513-841-4400.

	Summarized Concern/Issue	ATSDR's Response
13	People have lived along Scarboro Road.	To address this comment, ATSDR reviewed available historical U.S. Geological Survey (USGS) maps from 1941, 1953, 1968, 1980, and 1990 to identify buildings located along Scarboro Road. In 1941, prior to ORR being established, eight unidentified buildings (potentially houses) were located along Scarboro Road. By 1953, all but one of these buildings (located at a Y intersection about 1,200 feet north of Bear Creek Road) were removed and one additional structure was added about 1,500 feet south of Bear Creek Road. Both were located west of Scarboro Road on DOE property. In 1968, the structure south of Bear Creek Road was removed, but the one at the Y intersection remained. In addition, a gas station was added north of the intersection of Scarboro Road and Bear Creek Road. No changes along Scarboro Road were noted from the 1968 map to the 1980 and 1990 maps. In addition, ATSDR reviewed a 1945 map of the city of Oak Ridge that shows that Scarboro Road used to run north to the Oak Ridge Turnpike prior to the construction of South Illinois Avenue. According to the USGS map from 1936, seven buildings were located on this portion of Scarboro Road that no longer exists. In 1946, an additional building is shown.
14	If DOE has contaminated Scarboro land, they must buy it back.	Please contact DOE with your concerns about buying back contaminated land in Scarboro as this comment is not applicable to ATSDR.
15	The city should cover the contaminated ditches. The springs along the north side of Pine Ridge are contaminated. Groundwater flows from the Y-12 plant to Scarboro. LEFPC flows through the Scarboro community; so does Scarboro Creek. Kids play around the EFPC, when it rains water runs from the EFPC into the yards in community; son swam in the creek as a child; mercury in creek; concerned about water that flows across property; open ditches; children play in water; test the water running through the community; more frequent testing of water; lots of creeks used for drinking water when young; water glows in dark; storm water drains from reservation onto property.	Using the surface water and sediment radioactivity concentrations estimated during Task 6 of the Oak Ridge Dose Reconstruction (ChemRisk 1999), ATSDR evaluated whether past exposure to uranium in the surface water and sediment from EFPC and the floodplain would cause harmful health effects. The estimated doses were below levels of health concern for both radiation and chemical effects. Please see the Past Surface Water Exposure Pathway and the Past Soil Exposure Pathway discussions under the Past Radiation Effects section (Section III.B.1.a.) and the Past Exposure via Ingestion discussion under the Past Chemical Effects section (Section III.B.1.b) for more details about this evaluation. In 1998 and 2001, FAMU and EPA, respectively, sampled surface water and sediment from Scarboro ditches (EPA 2003; FAMU 1998). In addition, DOE takes bi-monthly surface water samples in EFPC (DOE 1995b). ATSDR evaluated the current surface water data as it pertains to uranium contamination in the Current Surface Water Exposure Pathway and Current Soil Exposure Pathway discussions under the Current Radiation Effects section (Section III.B.2.a.) and in the Current Ingestion Exposure Pathway discussion under the Current Chemical Effects section (Section III.B.2.b.). As shown in Table 16, the mean total uranium concentrations in surface water in Scarboro and Lower EFPC are below ATSDR's EMEG and are; therefore, not of health concern. ATSDR evaluated sediment data with the soil data (see Tables 17 and 18 and Figures 21, 24, and 25). The uranium content of soils/sediment in Scarboro is indistinguishable from natural background levels and is not at a level of health concern.

	Summarized Concern/Issue	ATSDR's Response
16	Not allowed to eat fish or touch the water; like to fish; ate fish only to learn later they were contaminated. Vegetables grown in Scarboro are not safe to eat and changed color. What is in the soil? How does it get inside people's body; grass is purplish gold in color, color of flowers has changed; no information on soil testing; soil and water should be tested.	ATSDR received data on vegetable samples collected from gardens from two Scarboro residents. ATSDR calculated radiation and chemical doses following ingestion of vegetables from these gardens. As shown in Tables 21 and 24, the resulting doses are below levels of health concern—it is safe to eat vegetables from private gardens in Scarboro. Please see the Ingestion of Vegetables Grown Near the Y-12 Plants discussions in the Current Radiation Effects (Section III.B.2.a.) and Current Chemical Effects (Section III.B.2.b.) sections for more details about ATSDR's evaluation. ATSDR compared the levels of uranium detected in Scarboro soil (EPA 2003; FAMU 1998) to the average background levels in the area around Oak Ridge and to background concentrations typically found in nature. ATSDR found that the levels of uranium that were detected in Scarboro soil were indistinguishable from background and are not a health hazard. Please see the Current Soil Exposure Pathway discussion under Current Radiation Effects section (Section III.B.2.a.) and Figures 21, 24, and 25 for more details about this evaluation. Fish fillet samples collected from EFPC contain mercury and PCBs. However, it is ATSDR's understanding that EFPC is not a very productive fishing location and very few people actually eat fish from the creek. Regardless, in 1993, ATSDR evaluated eating fish from EFPC in a health consultation (ATSDR 1993b). ATSDR concluded that there is no acute health threat to people who eat the fish. However, if people frequently ingest contaminated fish from the creek over a prolonged period, there is a moderate increased risk of adverse effects to the central nervous system and kidneys, and of developing cancer. Copies of the health consultation, entitled *Y-12 Weapons Plant Chemical Releases Into East Fork Poplar Creek,* are available at the ATSDR Oak Ridge field office at 1975 Tulane Avenue, Oak Ridge, Tennessee (telephone: 865-220-0295). This investigation is summarized in Section II.F.1. and in Appendix I.
17	Check for radiation from the plant; radiation spills; radiation levels in Scarboro; should check homes for radon; a lot of people have died; skin allergy; allergies 65% have it; skin rashes on children.	DOE conducts ambient air monitoring in the environment surrounding ORR facilities, including around the Y-12 plant, to measure radiological and other parameters (DOE 1995b). One monitoring station (Station 46) is located in Scarboro, west of the Mount Zion Church on Tuskegee Drive, about 140 meters west of the Scarboro Community Center. This continuous monitoring station has been providing quarterly and annual measurements of uranium in the air since 1986 (ChemRisk 1999). The level of radiation received by Scarboro residents is not a health hazard.
18	If strontium 90 (Sr 90) were to produce health effects, how would those present themselves?	Because Sr 90 is chemically similar to calcium, it tends to deposit in bone and bone marrow (it is called a "bone seeker"). Internal exposure to Sr 90 is linked to bone cancer, cancer of the soft tissue near the bone, and leukemia (EPA 2002c). Risk of cancer increases with increased exposure to Sr 90. However, Sr 90 was not released from the Y-12 plant in high enough quantities to be a health hazard.

	Summarized Concern/Issue	ATSDR's Response
19	Uranium and mercury are the obvious contaminants to detect. What about other radionuclides such as beryllium? Wasn't it used at Y-12? Is the Y-12 nuke slow cooker at Chestnut Ridge security pits included in health effects? I also agree with attendees that the proposed surveillance, in its present proposed form, does not go far enough. Lead, thorium, beryllium, cyanide, acetonitrile, tungsten, and other materials worked at the Y-12 site have been historically "misplaced." At the meeting it was stated by someone in the audience that Strontium-90 and Cesium-137 and other relevant radionuclides should also be measured. The concentration of mercury in the air should be measured, so air samples should be taken also. The concentration of mercury in plants should be measured. Uranium, mercury, iodine, and PCBs have been detected in Scarboro.	Based on ATSDR's review and analysis of past exposures in the Phase I and Phase II screening evaluations in the State of Tennessee's Oak Ridge Health Studies, ATSDR concluded that past release of beryllium from the Y-12 plant is not a public health hazard to people living near the Y-12 plant. ATSDR will continue to evaluate contaminants and pathways of concern to the community surrounding ORR. In addition to this evaluation of uranium from the Y-12 plant, ATSDR is evaluating uranium and fluoride from the K-25 facility, iodine 131, mercury, White Oak Creek releases in the 1950s, PCBs, the TSCA incinerator, and groundwater. ATSDR will also screen data from 1990 to the present to determine whether additional contaminants of concern need to be addressed. Also, in 1998, FAMU collected soil and sediment from Scarboro and analyzed 10% of the samples for 150 organic and inorganic chemicals (FAMU 1998). ATSDR evaluated these data and determined that none of the chemicals that were detected (more than 100 chemicals were not detected) were at concentrations that would cause harmful health effects from exposure to the soil or sediment. ATSDR also evaluated the gamma spectroscopy data collected by EPA in their soil sampling effort in Scarboro (EPA 2003) and concluded that other radionuclides are not of public health concern. Uranium and thorium are naturally occurring; during their decay, they produce a number of progeny that are gamma emitters. The results indicate that the progeny of uranium 238 and thorium 232 are present in the expected concentrations based on the amount of U 238 reported by EPA and FAMU (EPA 2003; FAMU 1998). Furthermore, no cobalt 60 (Co 60) was detected, and the concentration of cesium 137 (Cs 137) detected at the sampling locations averaged less than 0.3 pCi/g. In DOE's Background Soil Characterization Project (DOE 1993), the reported concentration of Cs 137 was 2 to 3 times higher than the Scarboro value. This concentration of Cs 137 is not considered to be a public health concern as the resulting radiation dose (estimated from Federal Guidance Report 13 electronic data) following the ingestion of 100 mg of soil, is orders of magnitude below the typical background dose in the Oak Ridge area.
20	The community, via SCEJOC, should be able to identify and select a contractor to accomplish the tasks needed for the characterization of pollution in the community. Establish clearly that other affected communities in Oak Ridge are invited to sit at the table and collaborate on coordinating activities. The community needs funding to secure its own technical assistance to ensure adequate input into this project.	DOE has primary responsibility for environmental sampling at the ORR.

	Summarized Concern/Issue	ATSDR's Response
21	This community needs a Sentinel Health Event evaluation performed immediately. The community needs the data from the secret well monitoring done since the 1980s. The community needs the data from the surface and groundwater studies at Y-12 and K-25, and this data directly impacts the surrounding residents.	This public health assessment evaluates exposure to uranium released from the Y-12 plant. All of the data that ATSDR knows of that pertains to the community is included in this report. ATSDR will evaluate uranium from the K-25 facility and the groundwater pathway in the future.
22	As the aerial studies will only reveal large releases (i.e., rare events) why is DOE spending large amounts of funding on this project?	Since the 1950s, aerial radiological surveys have been conducted at DOE facilities to provide data on the total gamma radiation emission rate found on and around its facilities (Carden and Joseph 1998). Not only do these surveys allow for the relatively rapid characterization of large land areas to determine the background levels of radiation, they are also a proven method for identifying areas where the radiation levels significantly exceed background levels of radiation. Because many of the radioactive materials used at Oak Ridge are gamma-emitting elements or decay into gamma-emitting elements, the elevated levels could be associated with Cs 137, Co 60, decay products of Sr 90, and decay products of uranium isotopes. In the case of uranium isotopes, if the soil concentrations are not significantly elevated above background levels, then the aerial survey data will be inconclusive; that is, the computer-generated results would not show the presence of elevated levels of uranium. ATSDR has reviewed the existing flyover data for the Scarboro community and the soil survey data. While these aerial radiological surveys aid in identifying contaminated areas and the presence of relatively small amounts of contaminants (i.e., several Clinch River Cs 137 hot spots and natural uranium at the Chattanooga shale outcrop on East Fork Ridge), ATSDR does not find the surveys extremely useful in estimating doses or in making health decisions.

	Summarized Concern/Issue	***ATSDR's Response***
23	DOE has not done an adequate job of informing Scarboro, Oak Ridge, and surrounding communities of these meetings. Our demand is that all policy debates and decisions made on the issues of environmental contamination and its effects include citizens affected by DOE-ORO operations. Should not the result of past studies of past contaminants be more widely made available to the people of Scarboro?	ATSDR is committed to engaging the Oak Ridge community as partners in conceptualizing, planning, and implementing public health activities at ORR, in communicating and discussing results, and in determining appropriate follow-up actions. Throughout the public health assessment process, ATSDR staff have worked with the local community to identify and understand health concerns and to provide opportunities for public involvement. Please see the Summary of Public Health Activities section (specifically, Section II.F.1.) for additional information about ATSDR's community involvement activities. The Oak Ridge Reservation Health Effects Subcommittee (ORRHES) was established in 1999, by ATSDR and CDC to provide advice and recommendations concerning public health activities and research conducted at the ORR. The subcommittee consists of 21 individuals with different backgrounds, interests, and expertise, as well as liaison members from state and federal agencies. The Subcommittee meets periodically in Oak Ridge—community members are always welcome to attend the meetings. To promote collaboration between ATSDR and the communities surrounding the ORR, ATSDR opened a field office in Oak Ridge (located at 1975 Tulane Avenue) in 2001. This field office provides even more opportunities for community members to become involved in ATSDR's public health activities at the ORR. Please contact the ATSDR Oak Ridge field office at 865-220-0295 if you would like to be involved.
24	DOE MUST remember that many people don't attend these meetings because of fear of retaliation on their jobs. Scarboro residents and other Afro-Americans do not participate for fear of retaliation.	All community members are encouraged to talk to any of the ORRHES members about their concerns. Perhaps it would help to know that one of the members is a Scarboro resident and a number of other members are active in the Scarboro community. Please visit the following Web site for more information about the ORRHES and its members: http://www.atsdr.cdc.gov/HAC/oakridge/index.html. Additionally, community members can fill out an *anonymous* Community Health Concerns sheet in ATSDR's field office, located at 1975 Tulane Avenue in Oak Ridge (telephone: 865-220-0295). All concerns are entered into the ATSDR Community Health Concerns Database to ensure that all health concerns are brought to ATSDR's attention and are included in ATSDR's evaluation of potential public health impacts from exposures related to the ORR.
25	Is ozone concentration monitored? What health effects from ozone?	ATSDR is unaware of any ozone monitoring in Scarboro or the city of Oak Ridge. EPA's Clean Air Act Web site may provide some useful information: http://www.epa.gov/air/oaq_caa.html.

	Summarized Concern/Issue	ATSDR's Response
Cancer Health Effects		
26	There is a high rate of cancer deaths in Scarboro. Over 80% of people die from cancer; grandfather has spot on lung; husband passed of leukemia; cancer from the plant or the water; husband died of cancer in 1996, worked 39 years at ORR: Everybody around here dies with cancer; Did living here have anything to do with it? Cancer killed 2 brothers, mother, and husband; high rate of breast cancer; cancer possibly due to vegetable garden.	The Public Health Assessment Work Group, as part of the ORRHES, is currently evaluating cancer issues with the TDOH Cancer Registry. For more information about the work group's efforts, contact members of ORRHES or the ATSDR Oak Ridge field office (located at 1975 Tulane Avenue, Oak Ridge, Tennessee; telephone: 865-220-0295).
Noncancer Health Effects		
27	A lot of deformed and retarded babies were born in Oak Ridge.	Uranium is not known to cause these kinds of health effects. The level of exposure to uranium from the Y-12 plant is not expected to cause these problems in pregnant women. However, ATSDR will also be evaluating the effects from exposure to iodine 131, mercury, White Oak Creek releases in the 1950s, PCBs, fluorides, the TSCA incinerator, and groundwater. Please contact the TDOH with your concerns about a high rate of deformed and retarded babies being born in Oak Ridge.

	Summarized Concern/Issue	ATSDR's Response
28	Scarboro children suffer from too much asthma. Asthma; Check people with respiratory problems; 65% of residents have asthma, child up the street has trouble breathing; man had to leave Scarboro because his two boys had trouble breathing.	In 1997 and 1998, CDC, TDOH, and the Scarboro Community Environmental Justice Council conducted a study to determine whether rates of pediatric respiratory illnesses were higher in Scarboro than elsewhere in the United States, and whether exposure to various factors increased residents' risk for health problems. The researchers concluded the following: No unusual pattern of illnesses emerged among the children receiving medical exams. The illnesses that were detected were not more severe than would be expected in any community. The findings of the medical exams were consistent with the findings of the community survey. The reported prevalence rate of asthma among children in Scarboro (13%) was higher than the estimated national rate (7% in all children and 9% in black children). However, few studies have been conducted on communities similar to Scarboro, and without asthma prevalence information from these communities, it was not possible to determine whether the prevalence of asthma was higher than would be expected. The Scarboro rate was, however, within the range of rates reported in similar studies throughout the United States and internationally. The reported rate of wheezing among children in Scarboro (35%) was also higher than most national and international estimated rates (which range from 1.6% to 36.8%). The prevalence rates of hay fever and sinus infections in children were comparable to national estimated rates. Because the investigation was not designed to detect associations, and a relatively small group of children was studied, it was not possible to identify causes of the respiratory illnesses. Copies of the report on this study, *An Analysis of Respiratory Illnesses Among Children in the Scarboro Community,* are available in the ATSDR Oak Ridge field office at 1975 Tulane Avenue, Oak Ridge, Tennessee (telephone: 865-220-0295). This investigation is summarized in Section II.F.3. and in Appendix I.

	Summarized Concern/Issue	ATSDR's Response
Health Concerns/Procedural		
29	Scarboro was left out of the flyovers because it is contaminated.	DOE conducted eight aerial radiological surveys of the ORR between 1959 and 1997. Such flyovers are performed at major DOE facilities nationwide and follow specific procedures. "Broad Area" flyovers cover the entire ORR, while "Focused Area" flyovers cover the three plants and specific areas of interest due to DOE activities in the area, such as White Oak Creek remediation. Areas off the ORR that show only natural background levels of radiation are not surveyed in Focused Area flyovers. The community of Scarboro was included in five Broad Area flyovers, and because every flyover showed only background readings, it was not included in two Focused Area flyovers. About a third of the Scarboro community was included in the Focused Area flyover of White Oak Creek only because it was on the flight-path for the White Oak Creek survey. Scarboro was not included in Focused Area flyovers because it was "not contaminated." Copies of the full report summarizing all radiological flyovers, *Aerial Radiological Surveys of the Scarboro Community,* are available from the Information Center by visiting the following Web site http://www.oakridge.doe.gov/info_cntr/index.html or by calling 865-241-4780. Because of this concern, FAMU and EPA performed independent soil sampling of Scarboro. The results of both sampling campaigns confirmed that the levels of uranium would not result in harmful health effects for the people living in Scarboro. For every exposure pathway evaluated, the levels were too low to be of health concern for both radiation and chemical health effects.
30	The DOE Background Soil Study was done on contaminated soils.	During this evaluation of uranium from the Y-12 plant, ATSDR reviewed Scarboro soil data (EPA 2003; FAMU 1998), the Background Soil Characterization Project (DOE 1993), and natural background levels. As shown in Figures 21, 24, and 25, there was no significant difference between them. Please see the Current Soil Exposure Pathway discussion under Current Radiation Effects section (Section III.B.2.a.) for more details about this evaluation. Furthermore, ATSDR compared the results of the Scarboro sampling and the DOE Background Characterization Project to values typically found throughout the country and found no significant difference among the values reported.
31	The Scarboro cancer data supplied by the state is incomplete.	The Public Health Assessment Work Group, as part of ORRHES, is currently evaluating cancer data in counties surrounding the ORR. For more information about the work group's efforts, contact members of ORRHES or the ATSDR Oak Ridge field office (located at 1975 Tulane Avenue, Oak Ridge, Tennessee; telephone: 865-220-0295).

	Summarized Concern/Issue	ATSDR's Response
32	What experiments were run on us? What secrets are still being kept? Any DOE-controlled study will lack credibility.	For several decades, DOE and its predecessor agencies have conducted research and production activities at a number of sites across the country, including ORR. These activities involved development and production of nuclear weapons and materials, as well as other nuclear energy-related research. People in communities near and downwind from these sites became increasingly concerned about whether site activities might be affecting their health. In response to these concerns, DOE asked the U.S. Department of Health and Human Services (DHHS) to *independently* investigate the public health implications of its nuclear energy-related activities. DOE formally delegated responsibility for this work to DHHS in two memorandums of understanding issued in 1990. Under a memorandum of understanding between DOE and DHHS, CDC became responsible for analytic epidemiologic research concerning the potential impacts of DOE's energy-related activities. This memorandum of understanding also recognized that ATSDR would be responsible for all public health activities mandated by Superfund. These activities include conducting public health assessments at DOE sites, in addition to other follow-up activities, as appropriate. The ORRHES was established in 1999, as a subcommittee of the Citizens Advisory Committee on Public Health Service Activities and Research at DOE Sites. ORRHES provides advice and recommendations to ATSDR and CDC concerning public health activities and research conducted at ORR. The subcommittee consists of 21 individuals with different backgrounds, interests, and expertise, as well as liaison members from state and federal agencies.
33	The Scarboro community should influence the choice of the contractor that will perform the sample collections.	Because ATSDR did not perform environmental sampling in the Scarboro community, this comment is not applicable to ATSDR.
34	ORHASP has recognized that mercury speciation is still a problem, but is not going to address it. We must have independent analysis and research performed by both minority and majority universities.	ATSDR will evaluate exposures to mercury during a separate public health assessment, expected to be conducted during 2004.