Oak Ridge Reservation

Annual Site Environmental Report 2024

Cover Image

Oak Ridge National Laboratory

Design

Professional Project Services, Inc.

DOE-SC-OSO/RM-2025
September 2025

Oak Ridge Reservation
Annual Site Environmental Report
2024

US Department of Energy project manager and Oak Ridge Reservation coordinator: Michele Branton

Technical coordinators:

Y-12 National Security Complex: Paula Roddy, Walt Doty, Mason Jobe

Oak Ridge National Laboratory: Joan Hughes

East Tennessee Technology Park: Kevin Crow, Arden Lady, Roger Petrie

Project director: James J. Rochelle
Project coordinator: Kimberly L. Davis, PhD
Integrating editors: Teresa J. Thompson, Wendy L. Bennett
Technical support: Ellen J. Wald

Prepared by the following for the US Department of Energy:

UT-Battelle, LLC
under Contract DE-AC05-00OR22725

Consolidated Nuclear Security, LLC
under Contract DE-NA0001942

United Cleanup Oak Ridge LLC (UCOR)
under Contract DE-SC-0004645

Professional Project Services, Inc.
under Contract GS-00F-112CA/89243118FSC400042

This report is available online at https://doeic.science.energy.gov/ASER/

DOE contact: *If you have questions or comments about the ASER documents, or wish to provide review comments or suggestions for improvement, please complete the survey at the bottom of the web page at the link above, or contact Jayashree Jayaraj, DOE/SC, at jayashree.jayaraj@science.doe.gov.*

Disclaimer

Contents

Figures

Tables

Appendices

Acronyms and Abbreviations

A	ACM	asbestos-containing material
	AFFF	aqueous film-forming foams
	AFV	alternative fuel vehicle
	AIM	American Innovation and Manufacturing Act
	ANSI	American National Standards Institute
	AOEC	Agent Operations Eastern Command
	ASER	*Oak Ridge Reservation Annual Site Environmental Report*
	AWQC	ambient water quality criterion
B	BCG	biota concentration guide
	BCK	Bear Creek kilometer
	BFK	Brushy Fork kilometer
	BMAP	Biological Monitoring and Abatement Program
	BMP	best management practice
C	CAA	Clean Air Act
	CAP-88 PC	Clean Air Act Assessment Package-1988 (software)
	CEDS	Central Energy Data System
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
	CFR	*Code of Federal Regulations*
	CFTF	Carbon Fiber Technology Facility
	CNS	Consolidated Nuclear Security, LLC
	COVID-19	Coronavirus Disease 2019
	CRK	Clinch River kilometer
	CROET	Community Reuse Organization of East Tennessee
	CWA	Clean Water Act
	CWTS	Chromium Water Treatment System
	CX	categorical exclusion
	CY	calendar year
D	D&D	decontamination and decommissioning
	DCE	dichloroethene/dichloroethylene
	DCS	derived concentration standard
	DMRQA	Discharge Monitoring Report Quality Assurance Study
	DOD-ELAP	US Department of Defense Environmental Laboratory Accreditation Program
	DOE	US Department of Energy
	DOECAP	DOE Consolidated Audit Program

E	EC	environmental compliance
	ECM	energy conservation measure
	ED	effective dose
	EFK	East Fork Poplar Creek kilometer
	EFPC	East Fork Poplar Creek
	EIS	environmental impact statement
	EISA	Energy Independence and Security Act of 2007
	EM	DOE Office of Environmental Management
	EMDF	Environmental Disposal Facility
	EMP	Environmental Monitoring Program
	EMS	environmental management system
	EMWMF	Environmental Management Waste Management Facility
	EO	executive order
	EPA	US Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPSD	UT-Battelle Environmental Protection Services Division
	EPT	ephemeroptera, plecoptera, and trichoptera (taxa)
	e-RICE	emergency reciprocating internal combustion engine
	ES&H	environment, safety, and health
	ESH&Q	environment, safety, health, and quality
	ESPC	Energy Savings and Performance Contract
	ESS	ORNL Environmental Surveillance System
	ETTP	East Tennessee Technology Park
	EU	exposure unit
F	FCK	First Creek kilometer
	FFK	Fifth Creek kilometer
	FMD	ORNL Facilities Management Division
	FWS	US Fish and Wildlife Service
	FY	fiscal year
G	GHG	greenhouse gas
	GSA	General Services Administration
H	HAP	hazardous air pollutant
	HCK	Hinds Creek kilometer
	HFIR	High Flux Isotope Reactor
	Hg^{2+}	inorganic mercury
	Hg_T	total mercury
	HQ	hazard quotient
	HVC	ORNL Hardin Valley Campus

I	IC	inhibition concentration
	ISMS	integrated safety management system
	ISO	International Organization for Standardization
	Isotek	Isotek Systems, LLC
J	JCI	Johnson Controls Inc.
L		
	LLW	low-level radioactive waste
	LPF	Lithium Processing Facility
M	M&E	material and equipment
	M&V	measurement and verification
	MAPEP	Mixed Analyte Performance Evaluation Program
	MARSAME	*Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual*
	MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
	MBK	Mill Branch kilometer
	MCK	McCoy Branch kilometer
	MCL	maximum contaminant level
	MCL-DCs	maximum contaminant level-derived concentrations
	MEI	maximally exposed individual
	MEK	Melton Branch kilometer
	MeHg	methylmercury
	MIK	Mitchell Branch kilometer
	MOA	memorandum of agreement
	MPNHP	Manhattan Project National Historical Park
	MT	meteorological tower
N	NAAQS	National Ambient Air Quality Standards
	NELAP	National Environmental Laboratory Accreditation Program
	NEPA	National Environmental Policy Act
	NESHAPs	National Emission Standards for Hazardous Air Pollutants
	NFPA	National Fire Protection Association
	NHPA	National Historic Preservation Act
	NNSA	National Nuclear Security Administration
	NPDES	National Pollutant Discharge Elimination System
	NPO	NNSA Production Office
	NRC	US Nuclear Regulatory Commission
	NRHP	National Register of Historic Places
	NTRC	National Transportation Research Center

O	ODS	ozone-depleting substance
	ORAU	Oak Ridge Associated Universities
	OREM	DOE Oak Ridge Office of Environmental Management
	ORGDP	Oak Ridge Gaseous Diffusion Plant
	ORISE	Oak Ridge Institute for Science and Education
	ORNL	Oak Ridge National Laboratory
	ORO	DOE Oak Ridge Office
	ORR	Oak Ridge Reservation
	ORRL	Oak Ridge Reservation Landfills
	ORSSAB	Oak Ridge Site Specific Advisory Board
	OST	Office of Secure Transportation
P	PCB	polychlorinated biphenyl
	PCBADL	Polychlorinated Biphenyl Annual Document Log
	PCCR	phased construction completion report
	PCE	tetrachloroethene
	PFAS	per- and polyfluoroalkyl substances
	PFOA	perfluorooctanoic acid
	PFOS	perfluorooctane sulfonate
	PM_{10}	particulate matter with an aerodynamic diameter ≤ 10 µm
	$PM_{2.5}$	fine particulate matter with an aerodynamic diameter ≤ 2.5 µm
	PWTC	Process Waste Treatment Complex
Q	QA	quality assurance
	QC	quality control
	QMS	quality management system
R	R&D	research and development
	RA	remedial action
	Rad-NESHAPs	National Emission Standards for Hazardous Air Pollutants for Radionuclides
	RCRA	Resource Conservation and Recovery Act
	RECs	renewable energy credits
	RMAL	Radiochemical Materials Analytical Laboratory
	ROD	record of decision
S	SARA	Superfund Amendments and Reauthorization Act
	SBMS	UT-Battelle Standards-Based Management System
	SC	DOE Office of Science
	SD	storm water outfall/storm drain
	SHPO	State Historic Preservation Office
	SME	subject matter expert
	SNS	Spallation Neutron Source
	SODAR	sonic detection and ranging

	SOF	sum of fractions
	SPCC	spill prevention, control, and countermeasures
	SPMD	semipermeable membrane device
	STP	sewage treatment plant
	SWPP	storm water pollution prevention
	SWPPP	storm water pollution prevention plan
	SWSA	solid waste storage area
T	Tc	technetium
	TCA	trichloroethane
	TCE	trichloroethene/trichloroethylene
	TDEC	Tennessee Department of Environment and Conservation
	TEMA	Tennessee Emergency Management Agency
	TMDL	total maximum daily load
	TMI	Tennessee Macroinvertebrate Index
	TRI	toxic chemical release inventory
	TRO	total residue oxidant
	TRU	transuranic
	TSCA	Toxic Substances Control Act
	TSS	total suspended solids
	TVA	Tennessee Valley Authority
	TWPC	Transuranic Waste Processing Center
	TWRA	Tennessee Wildlife Resources Agency
U	UCOR	United Cleanup Oak Ridge LLC
	UEFPC	Upper East Fork Poplar Creek
	UPF	Uranium Processing Facility
	USDA	US Department of Agriculture
	UST	underground storage tank
	UT	University of Tennessee
	UT-Battelle	UT-Battelle, LLC
V	VC	vinyl chloride
	VOC	volatile organic compound
	VOHAP	volatile organic hazardous air pollutant
W	WBK	Walker Branch kilometer
	WCK	White Oak Creek kilometer
	WEPAR	West End Protected Area Reduction
	WFMP	*Oak Ridge Reservation Wildland Fire Management Plan*
	WM/WRM	weapon material/weapon-related material
	WOC	White Oak Creek
	WOCHW	White Oak Creek headwaters

	WOD	White Oak Dam
	WQC	water quality criterion
	WQPP	water quality protection plan
	WRRP	Water Resources Restoration Program
Y	Y-12 or Y-12 Complex	Y-12 National Security Complex

Units of Measure and Conversion Factors*

Units of measure and their abbreviations

acre	acre	miles per hour	mph
becquerel	Bq	millicurie	mCi
British thermal unit	Btu	milligram	mg
centimeter	cm	milliliter	mL
curie	Ci	millimeter	mm
day	d	million	M
degrees Celsius	°C	million gallons per day	MGD
degrees Fahrenheit	°F	millirad	mrad
disintegrations per minute	dpm	millirem	mrem
foot	ft	milliroentgen	mR
gallon	gal	millisievert	mSv
gallons per minute	gpm	minute	min
gram	g	nanogram	ng
gray	Gy	nephelometric turbidity unit	NTU
gross square feet	gsf	parts per billion	ppb
hectare	ha	parts per million	ppm
hour	h	parts per trillion	ppt
inch	in.	picocurie	pCi
joule	J	pound	lb
kilocurie	kCi	pound mass	lbm
kilogram	kg	pounds per square inch	psi
kilometer	km	pounds per square inch gauge	psig
kilowatt	kW	quart	qt
linear feet	LF	rad	rad
liter	L	roentgen	R
millibar	mb	roentgen equivalent man	rem
megajoule	MJ	second	S
megawatt	MW	sievert	Sv
megawatt-hour	MWh	standard unit (pH)	SU
meter	m	thousand cubic feet	mcf
metric tons	MT	ton, short (2,000 lb)	ton
metric tons of carbon	MTCO2e	wet weight	ww
microcurie	µCi	yard	yd
microgram	µg	year	Yr
micrometer	µm		

Quantitative prefixes

exa	$\times 10^{18}$	mega	$\times 10^{6}$	atto	$\times 10^{-18}$	micro	$\times 10^{-6}$
peta	$\times 10^{15}$	kilo	$\times 10^{3}$	femto	$\times 10^{-15}$	milli	$\times 10^{-3}$
tera	$\times 10^{12}$	hecto	$\times 10^{2}$	pico	$\times 10^{-12}$	center	$\times 10^{-2}$
giga	$\times 10^{9}$	deka	$\times 10^{1}$	nano	$\times 10^{-9}$	decic	$\times 10^{-1}$

**Due to differing permit reporting requirements and instrument capabilities, various units of measurement are used in this report. This list of units of measure and conversion factors is intended to help readers make approximate conversions to other units as needed for specific calculations and comparisons.*

Unit conversions

Unit	Conversion	Equivalent	Unit	Conversion	Equivalent
Length					
in.	× 2.54	cm	cm	× 0.394	in.
ft	× 0.305	m	m	× 3.28	ft
mile	× 1.61	km	km	× 0.621	mile
Area					
acre	× 0.405	ha	ha	× 2.47	acre
ft^2	× 0.093	m^2	m^2	× 10.764	ft^2
$mile^2$	× 2.59	km^2	km^2	× 0.386	$mile^2$
Volume					
ft^3	× 0.028	m^3	m^3	× 35.31	ft^3
qt	× 0.946	L	L	× 1.057	qt
gal	× 3.7854118	L	L	× 0.264172051	gal
Concentration					
ppb	× 1	µg/kg	µg/kg	× 1	ppb
ppm	× 1	mg/kg	mg/kg	× 1	ppm
ppb	× 1	µg/L	µg/L	× 1	ppb
ppm	× 1	mg/L	mg/L	× 1	ppm
Weight					
lb	× 0.4536	kg	kg	× 2.205	lb
lbm	× 0.45356	kg	kg	× 2.2046226	lbm
ton, short	× 907.1847	kg	kg	× 0.00110231131	ton, short
Temperature					
°C	°F = (9/5)°C + 32	°F	°F	°C = (5/9) (F–32)	°C
Activity					
Bq	$\times 2.7 \times 10^{-11}$	Ci	Ci	$\times 3.7 \times 10^{10}$	Bq
Bq	× 27	pCi	pCi	× 0.037	Bq
mSv	× 100	mrem	mrem	× 0.01	mSv
Sv	× 100	rem	rem	× 0.01	Sv
nCi	× 1,000	pCi	pCi	× 0.001	nCi
mCi/km^2	× 1	nCi/m^2	nCi/m^2	× 1	mCi/km^2
dpm/L	$\times 0.45 \times 10^9$	$\mu Ci/cm^3$	$\mu Ci/cm^3$	$\times 2.22 \times 10^9$	dpm/L
pCi/L	$\times 10^{-9}$	µCi/mL	µCi/mL	$\times 10^9$	pCi/L
pCi/m^3	$\times 10^{12}$	$\mu Ci/cm^3$	$\mu Ci/cm^3$	$\times 10^{12}$	pCi/m^3

Acknowledgments

The US Department of Energy (DOE) is responsible for producing this document. DOE acknowledges, with deep appreciation, the efforts of the following individuals who provided data management and technical writing support.

ETTP
Eddie Arnold
Daniel Barnes
Thomas Barton
Betsy Brucken
Brennan Burke
Kevin Crow
Emily Day
James Dunn
Ted Faust
Megan Flynn
Steve Foster
Rob Foti
Justin Frazier
Sidney Garland
Sierra Generette
Christine Gilmore
Crystal Hann
Brianna Humphrey
Kevin Ironside
Charlie Justice
Richard Ketelle
Arden Lady
Natalie Landry
Teresa Mathews
Patrick Mullen
Derek Overcash
Brad Russell
Gill Sallade
Greg Schwartz
Sarah Springer
Alison Terebush
Venita Thomas

ORNL
Karen Atchely
Caroline Barber
Gio Barton
Brenda Becker-Khaleel
Brandon Bonds
Cory Buckner
Scott Byers
Greg Byrd
Jason Case
Callie Catani
Gary Chadwick
Sara Darling
Kathy Davidson
Sharon Deane
Makayla Edwards
Katie Ertell
Jamie Evans
Rich Franco
Taylor Frye
Julie Hancock
Amber Harshman
Jamie Herold
Ryan Hodges
Joan Hughes
Trent Jett
Karen Johnson
Kathy Jones
Michael Jones
Nikki Jones
Richard Ketelle
Jessica Langstaff
Jeff Maddox
Michael Masters
Teresa Mathews
Paul Matson
William McCarter
Kitty McCracken
Susan Michaud
Amy Miller
Stacey Montgomery
Jesse Morris
Lori Muhs
Jason Newport
Todd North
Jenn Parikh
Anne Prosser
Mark Robbins
Ernest Ryan, Jr.
Denise Saunders
Marshall Schmitt
Emma Shamblin
Louise Stephenson
Searia Stephenson
Billey Thomas
Erin Trent
Steve Trotter

Y-12 COMPLEX
Chloe Ashley
Steven Brooks
Vicki Brumback
Wayne Carlton
Nickkii Cody
Kimberly Cole
Seth Cook
Daniel Craze
Christa Davis
Walt Doty
Steve Foster
Matthew Frost
Regan Frye
Leanne Hackney
Kim Hanzelka
Abigail Harmon
Amber Harshman
Catlin Hoch-Nussbaum
Mason Jobe
Steven Jones
Kris Kinder
Michelle Kunz
Daniel Lawson
Jennifer Linton
Wesley Long
Stacey Loveless
Gerald Lowe
Kenneth Lowe
William J. Lynch
Leslie Mathews
Dr. Teresa Mathews
Wayne May
T. Andrew Melton
Mary Murray
Jane Nations
C. Scott Nelson
Caitlin Newman
Aprell Patterson
Jonathan Phillips
Jeremy Price
Annette Primrose
Paula Roddy
Gene Sievers
Brad Skaggs
Johnny Skinner
Terry Slack
Adam Smith
Rae Spencer
James Stinnett
Eve Whittenburg
Jeannette Widman