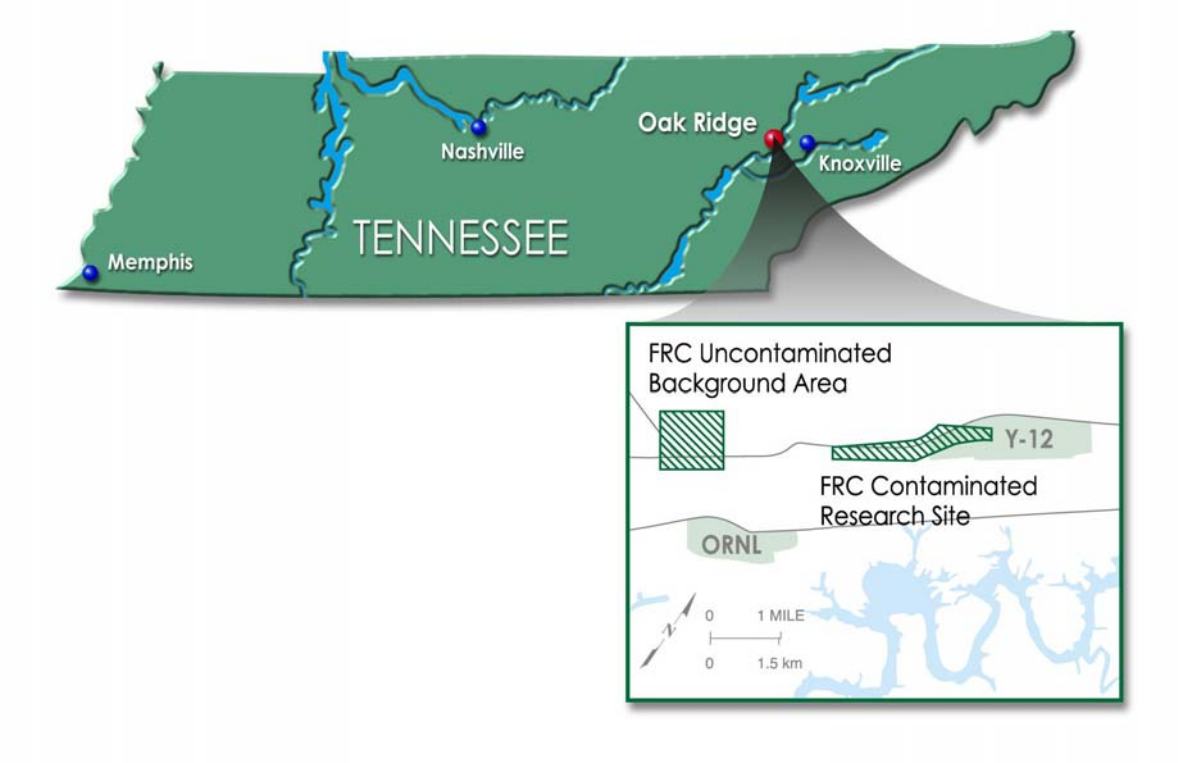
A Researcher's Guide to Using the Oak Ridge Field Research Center:

Obtaining Samples or Preparing for On-site Field Research



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Prepared for

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Office of Biological and Environmental Research (BER)
Environmental Remediation Sciences Division
By
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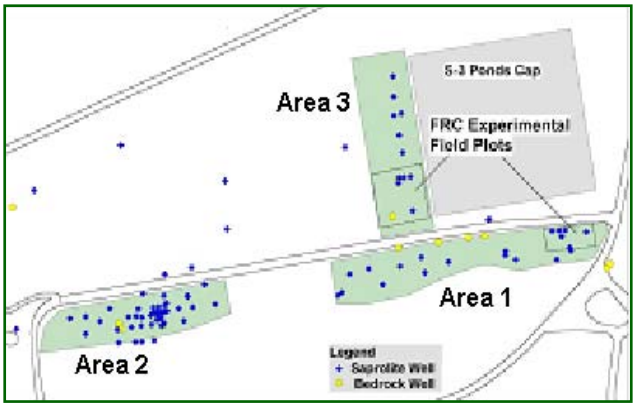
The Oak Ridge FRC...

...provides contaminated and uncontaminated field sites in which investigators can conduct research and obtain samples useful in exploring the transportation, fate, and remediation of subsurface contamination sources and plumes

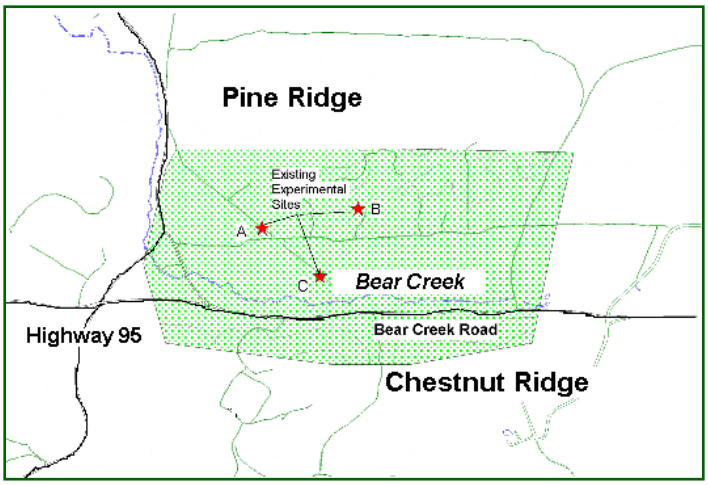
The Oak Ridge Field Research Center (FRC) contains a mixture of contaminant plumes and poorly understood hydrogeochemical conditions. For example, buried wastes in contact with a shallow water table have created large reservoirs of contamination. Rainfall patterns affect the water table level seasonally and over time. Furthermore, the hydrogeology of the area, with its fractures and karst geology, affects the movement of contaminant plumes. Plumes have migrated long distances to surface discharge points through ill-defined preferred flowpaths created by the fractures and karst conditions.

For more information about the Oak Ridge FRC, see www.esd.ornl.gov/orifc.

Contaminated Area



Uncontaminated Background Area



A Researcher's Guide to the FRC

Researchers likely will use the Oak Ridge FRC in two main ways: (a) to obtain samples of various sorts from the FRC's contaminated and background sites and (b) to conduct on-site field work.

This Researcher's Guide aims to make the process of obtaining samples and conducting field work as clear and problem-free as possible.

FRC staff wish to provide samples that meet investigators' needs as accurately and efficiently as possible. For information about the kinds of samples available and how to request those samples, see http://public.ornl.gov/orifc/frc_requestsamples.cfm. The FRC Sample Request Form (http://public.ornl.gov/orifc/samplerequestform_ERSP.xls) is the primary way to assure that researchers communicate their needs to FRC staff, reducing the possibility of either party unintentionally making assumptions about such specifics as sample preservation and shipment. FRC staff also want to assure that investigators safely and legally can receive radioactively contaminated samples to conduct laboratory experiments. This guide therefore describes institutionalized procedures regarding the shipment of certain radioactive samples.

Because FRC field experimentation sites are located on a U.S. Department of Energy Reservation, gaining access to the sites may be quite different from gaining access to other kinds of field sites. This guide should help prepare investigators, by discussing logistical details important to their visits. Additionally, the guide describes the pathway of FRC field research, from work plan preparation, to Field Research Review Panel evaluation, to field work, and post-field work activities. This pathway is designed to promote effective and productive field work, while maintaining site integrity for future researchers.

We update the Researcher's Guide periodically, so that it continues to meet researchers' needs and reflect any changes at the FRC over time. Your comments and suggestions for improving this guide are welcome.

Obtaining Oak Ridge FRC Samples

What kinds of samples are available?

- Groundwater
- Sediment cores
- Composite sediment
- Reference material
  - Humics
  - Sediment (high and low Fe sands from Abbott's Pit)

- From contaminated or uncontaminated sites
- Archived or newly collected
- Frozen, refrigerated, or dried

How do Principal Investigators (PIs) request samples?

Investigators request samples by completing and submitting a sample request form (http://public.ornl.gov/orifc/samplerequestform_ERSP.xls) to the FRC Manager (fax: 865/576-8646)

What happens after investigators request samples?

- FRC Manager works with PIs to identify the best sites for their needs and to address special needs
- PIs are informed when samples will be shipped
- Requests are logged into a database

Once the request is made, how long might it take to receive the samples?

- Timing depends on the kind of sample, whether drilling is required, and any backlog of sampling requests. For example, archived samples could be sent within a day's time. New samples that require drilling mobilization could take a month or several months to send. Among the situations that can delay sample collection or distribution are the need to resolve permitting issues or if the recipient's institution does not have the legal authority to accept particular kinds of samples.

How do samples get to investigators' institutions?

Investigators' Responsibility:

- For background site, **uncontaminated** samples, there are no special requirements
- For certain **radioactive** samples, the receiving institution needs a license. Investigators or, more likely, radiation protection officers at the institutions that will receive radioactive samples, work with the FRC Manager to determine whether the receiving institutions have, or need, such a license
- Additional formal permits and approvals may be necessary before samples are shipped outside the USA. Investigators and institutions wishing to receive samples must identify and fulfill any such requirements before samples can be shipped from the FRC. Obtaining these formal approvals may take considerable time
- The FRC's host institution, Oak Ridge National Laboratory (ORNL), must approve the FRC's ability to ship radioactive samples. Sometimes, this approval process is iterative, involving a series of communications between the FRC/ORNL and the receiving institution

FRC Responsibility:

- Collect and store samples under specified, previously agreed upon conditions
- Ship samples to receiving institutions. For radioactive samples, the FRC will ship samples after obtaining ORNL approval

To receive radioactive samples:
Radiation Protection Officers at the receiving investigators' institutions must provide the Oak Ridge FRC Manager assurance that they are permitted to receive radioactive samples.

WHO IS RESPONSIBLE FOR ANALYZING SAMPLES?

- Generally, PIs are responsible for sample analyses. However, the FRC can assist with sample analyses on a pre-arranged, case-by-case basis
- FRC site characterization analyses typically provide representative, not sample-specific, data

WHO STORES OR DISPOSES OF SAMPLES SENT TO INVESTIGATORS?

- Once samples leave the FRC, they become the responsibility of the requesting PI

Maximum Radionuclide Concentrations Detected at the FRC for Shipping, Transportation, and Waste Management Discussions
March 2004

(Note: Table based on FRC and Bear Creek Valley Risk Assessment Screening Data—Subject to Further Revision)

Contaminant	Maximum Detected—(Groundwater) Contaminated Area Shallow Unconsolidated Wells	Maximum Detected—(Soils) Contaminated Area
Pb-212	18 pCi/L	-
K-40	52 pCi/L	-
Tc-99	40,000 pCi/L	95 pCi/G
Th-228	-	3.5 pCi/G
Th-230	-	3.4 pCi/G
Tl-208	4.5 pCi/L	-
H-3	1500 pCi/L	-
U-234	303–4650 pCi/L	17 pCi/G
U-235[b]	86.2–547 pCi/L	4.39 pCi/G
U-238[b]	800–13600 pCi/L	162.10 pCi/G
Total U	0.01-62 mg/L	483 µg/g[a]

[a] Up to 730 µg detected in Area 3 Field Plots

[b] U235/U238 ratios are <0.05. Therefore the samples are depleted with respect to U235

Glove bag with air-lock capable of handling 5-foot-long core sections—available for researchers' use.

Summary checklist for obtaining samples

- ❑ **Investigators submit a sample request form to FRC Manager for each medium or sampling event**
- ❑ **Investigators specify special needs**
- ❑ **Investigators coordinate with FRC Manager to assure that samples best suit research needs**
- ❑ **Receiving institution's radiation protection officer coordinates with FRC Manager to assure that all necessary licenses to send and receive radioactive sample(s) are in place and reviewed by ORNL**
- ❑ **Receiving institutions outside of the USA identify and obtain needed country's and/or facility's formal approvals to receive samples, and provide the FRC Manager with necessary documentation**

Conducting Field Investigations at the Oak Ridge FRC

Before going to the Oak Ridge FRC…

SUBMIT A WORK PLAN

- The PI must submit a work plan for review and approval by the FRC's Field Research Review Panel (FRRP). FRRP concerns focus primarily on scientific integrity, assuring that projects do not compromise the site for future researchers, and avoiding negative environmental impacts.
- The FRC then submits the work plan to others, potentially including:
  - Regulators, if permits may be needed—note that ground penetration permits generally are handled by the FRC
  - Bechtel Jacobs Corporation (BJC), the site manager, assures that proposed efforts do not conflict with continuing or planned CERCLA cleanup activities
  - Contractors responsible for the Y-12 National Security Complex on which the FRC site is located, assure that responsible parties are informed of upcoming activities and that those activities do not conflict with contractors' responsibilities
  - ORNL's health and safety review panel, as a normal part of the Laboratory's Integrated Safety Management System

From these reviews comes a list of operational and training requirements and, possibly, alterations to the work plan.

Significant changes PIs make to approved work plans may require additional FRRP or regulatory review. If such changes are necessary, leave ample time for this review process.

Typical Training Requirements

General Employee Training (GET)

Must take at ORNL when you will be on-site for 30 or more days per year.

HAZWOPER 40-hour

Required for people who will be handling hazardous wastes. Can be taken in any location offered.

HAZWOPER 8-hour refresher

Need proof of training within the past year. Can be taken in any location offered or via internet.

Rad Worker II

Required for people who will be handling soil contaminated with radionuclides. Available at ORNL.

Storm flow

Video must be viewed by individuals who will work at the FRC sites. Available at ORNL.

ASSURE THAT TRAINING REQUIREMENTS ARE FULFILLED

- Training needs will be identified during the FRRP work plan review and through the process of obtaining a Guest Assignment Badge. The FRC Manager will certify that appropriate training has been completed, and a guest assignment badge will be provided.

Obtain a Guest Assignment Badge

- A guest assignment badge will allow you to conduct research at the FRC for a specified time period.
- If you are a foreign national, be aware that your country will be classified as "sensitive" or "nonsensitive," depending on world events. The Foreign National Office (FNO) requires a minimum of 30 days to process guest assignment badge paperwork for sensitive and nonsensitive assignments**.** If you wish to obtain a visitor's pass (short-term, e.g., for meetings or a workshop), the FNO requires at least 30 working days to process nonsensitive and sensitive visits. Contact Dianne Kosier (see last page of this guide) to obtain more information or initiate the badging process. You will need to fax a copy of your passport and visa to obtain a badge.

Communicate with the FRC Manager & Document In Writing

- If field research requires sending chemicals to the FRC, investigators must alert the FRC Manager well in advance so that the chemicals can be logged on to the ORNL chemical management system. This process typically takes approximately 2 days.
- The investigator and FRC Manager should decide explicitly who is responsible for different planned sampling activities.
- Equipment needs should be determined and agreed upon, in conjunction with the FRC Manager. Together, the investigator and FRC Manager will decide which party is responsible for taking specific pieces of equipment to field sites.
- If you wish to take a camera to FRC field sites, the FRC Manager must be notified in advance so that appropriate arrangements can be made. Normal security protocols at the Y-12 National Security Complex prohibit taking cameras on-site.

Getting to, and into, ORNL

- Because of recent increased security requirements, there have been changes in how the site is accessed. Bethel Valley Road, the main access route to ORNL from both directions, is closed to the public. Before planning a visit to ORNL, coordinate with FRC staff, who will arrange for you to proceed past entrance stations on Bethel Valley Road leading to the Laboratory's Visitors Center. It is very important, if you are not a DOE or DOE contractor employee, to arrange your visit to ORNL ahead of time.
- Once verified, you will be issued a Temporary Entry Pass, which authorizes you to travel from the entrance to ORNL Visitors Center. Follow the signs directly to Visitor Center to receive an ORNL proximity card and a visitor ID, or to the ORNL badge office for badging, as appropriate. ORNL's Visitors Center is open from Monday through Friday, from 7 a.m. until 4 p.m.
- If you arrive and are not on the list of registered visitors, FRC staff will then have to verify your visit with ORNL Security. This process could take some time if FRC staff are otherwise occupied. It is therefore very important to make arrangements ahead of time.
- ORNL Visitors Center staff can provide you with access to specific Laboratory areas based upon your needed access requirement for as long as your stay requires. Access to buildings at ORNL is controlled with a "proximity card reader" system. The ORNL proximity card you receive at the Visitors Center should provide entrance into your building simply by placing the card in front of the proximity reader, located beside the doorway. If your proximity card does not give you access to a desired building, report to the Visitors Center.

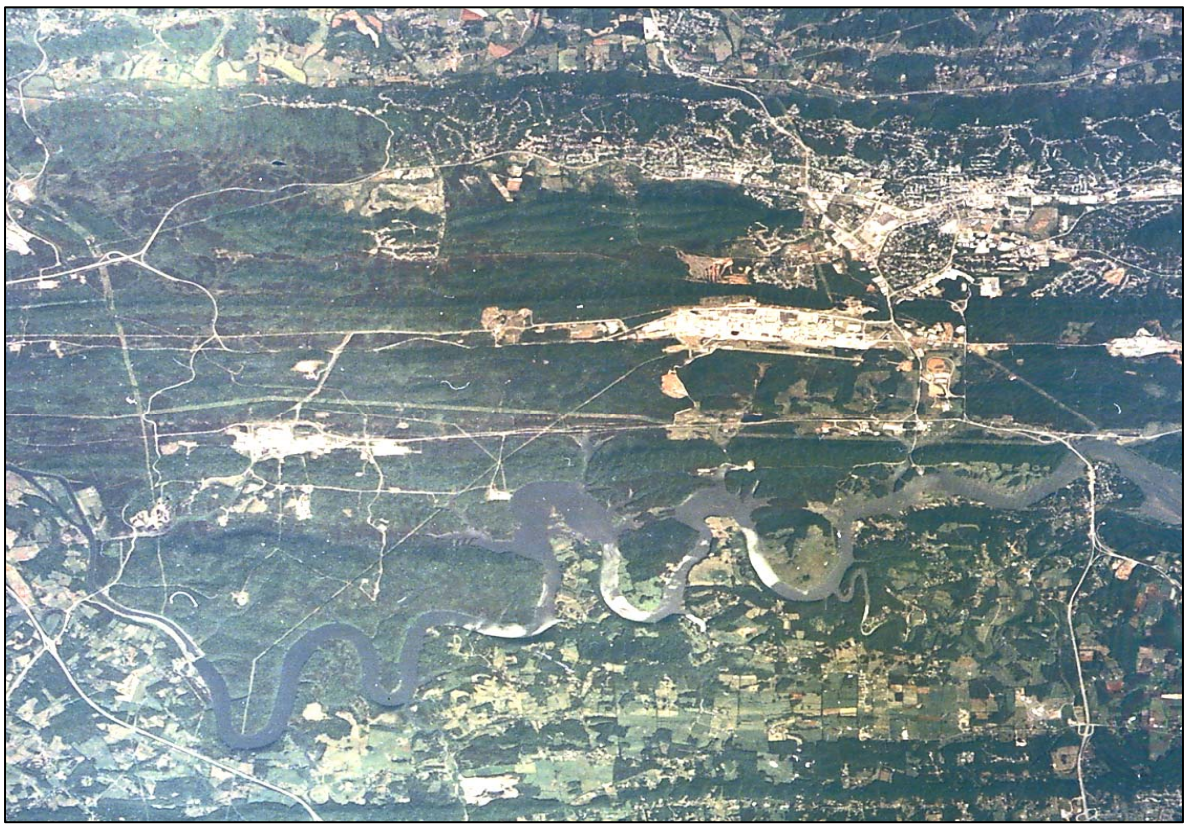
GETTING TO, AND INTO, THE FRC

- Access to the background and contaminated areas is from Bear Creek Valley Road (BCVR). Initially, visitors must go to the Y-12 Visitors Center to arrange a pass. Requests for site access for visitors should be coordinated at least five (5) business days in advance of the visit. Current hours of operation for the Visitors Center are from 6 a.m. until 4:30 p.m., Monday through Thursday. This road has limited access where motorists must pass through guard check points. The background area is accessed via a well-packed gravel road off BCVR. This gravel road is secured with a locked cross-arm gate. Investigators will be issued a key for access. The FRC site is not located in a restricted area. Solid Waste Storage areas are clearly marked. Access to the areas in a vehicle is limited to the established roadways; driving off of these roads is prohibited.

New security requirement: All US citizens (except cleared ORNL employees) and Foreign Nationals must provide proof of citizenship before gaining access to the site, ***and must bring acceptable photo ID with them to the Y-12 Visitor Center.*** Acceptable evidence of U.S. Citizenship is as follows:

- Birth Certificate (certified copy with raised and/or colored official seal);
- Certificate of Naturalization (immigration and Naturalization Services (INS) Form N-550 or N-570);
- Certificate of U.S. Citizenship (INS Form N-560 or N-561);
- Report of Birth Abroad of a citizen of the USA (Form FS-240); or
- Passport (new or expired)

- A TID (tamper-indicating device) will be applied to the ORNL badge at the Y-12 Visitor Center once proof of citizenship is verified for U.S. citizen and foreign national guest assignments. A Y-12 Security Plan will have to be submitted from the FRC manager or host for foreign national guests and visitors to gain access to the site.



Aerial view of ORNL, Y-12 National Security Complex, and the Oak Ridge FRC

While at the Oak Ridge FRC…

Investigator's Responsibilities

- Be present at the FRC when significant field work activities are underway—when sampling is initiated, or later, when a significant amount of sampling (e.g., daily) or on-site work is necessary
- Follow approved work plans unless you obtain prior approval to deviate from those plans
- Dispose of any wastes as per the approved work plan and in accordance with FRC rules and procedures. For example, permits do not allow pumping contaminated water pulled from the subsurface back into the ground
- Assure that all personnel have the proper training
- Be safe—follow required environmental, safety, health and quality procedures

Safety…

…is a crucial concern for the Department of Energy. Investigators MUST follow approved health and safety plans (located at http://public.ornl.gov/nabirfrc/other/frchsp.pdf). Failure to do so can prevent those investigators, and potentially other investigators, from using the site.

If you have an emergency while in the field…

Emergency response is handled by the Y-12 National Security Complex Emergency Response Team.

- **If you are using a Y-12 phone,** dial **911** to reach the Plant Shift Superintendent, who leads this Team.
- **If you are using your personal cell phone,** dial **865/574-7172**.

FRC Responsibilities

- Provide site briefing and tour of facilities (approximately 1–2 hours)
- Conduct routine sampling and monitoring
- Assist in on-site logistics
- Ship samples, unless investigators and the FRC Manager make other arrangements
- Assure that on-site investigators have proper training, taken either on- or off-site
- Assist in providing necessary training
- Provide all drilling services and some routine sampling support for low-frequency sampling events

When you leave the Oak Ridge FRC…

- Dismantle and remove any equipment or material that is not a part of a continuing experiment. Investigators can arrange for the FRC to store equipment and material

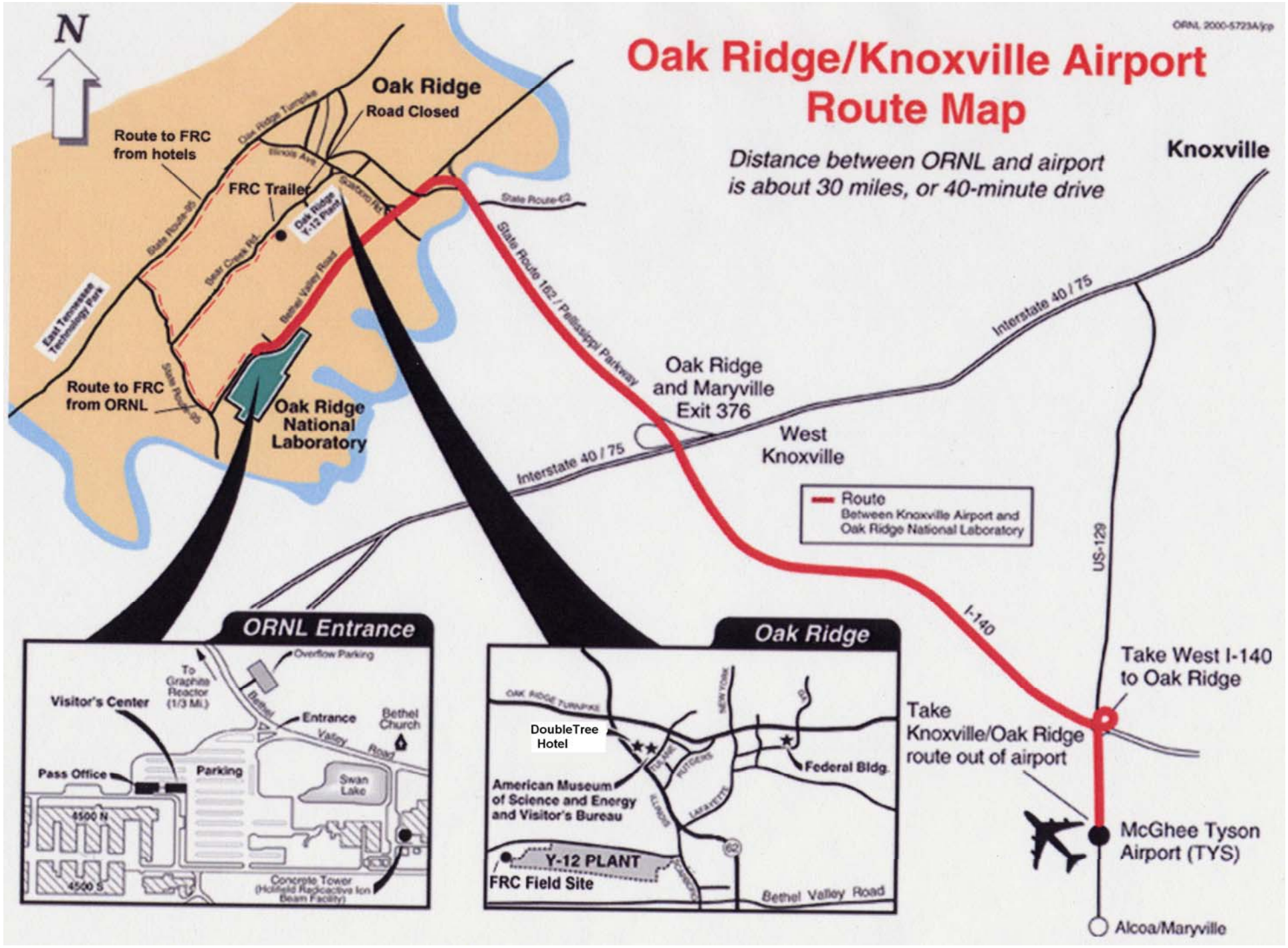
- Provide the FRC Manager with feedback about your field work experience—facilities and services—to help improve FRC operation and responsiveness

- Identify fieldwork-related obstacles and surprises (e.g., well clogging) that are important for the FRC Manager and future researchers to know

FRC Dedicated Drilling rig collecting subsurface samples in Area 2.

Summary checklist—conducting on-site field work

- ❑ **Submit work plan for review to the Field Research Review Panel (FRRP) chair, and any other necessary reviews**
- ❑ **Obtain guest assignment badge**
- ❑ **Assure that all necessary training courses are taken**
- ❑ **Make explicit agreements with FRC Manager about responsibilities for sampling, equipment, chemicals, and other needs**
- ❑ **Follow work plan and ORNL Health and Safety Plan**
- ❑ **Dispose of wastes properly**
- ❑ **Dismantle or remove any materials that are not a part of the experiment**
- ❑ **Provide feedback to the FRC Manager about your field work experience, especially identifying pieces of information that may be important to future FRC researchers**


ORNL 2000-5723A/jcp
Oak Ridge/Knoxville Airport
Route Map
Distance between ORNL and airport
is about 30 miles, or 40-minute drive
N
Oak Ridge
Road Closed
Route to FRC
from hotels
FRC Trailer
Oak Ridge
Y-12 Plant
State Route-95
East Tennessee
Technology Park
Bear Creek Rd.
Bethel Valley Road
Route to FRC
from ORNL
Oak Ridge
National
Laboratory
State Route-62
State Route 162 / Pellissippi Parkway
Knoxville
Interstate 40 / 75
Oak Ridge
and Maryville
Exit 376
West
Knoxville
Interstate 40 / 75
Route
Between Knoxville Airport and
Oak Ridge National Laboratory
US-129
I-140
Take West I-140
to Oak Ridge
Take
Knoxville/Oak Ridge
route out of airport
McGhee Tyson
Airport (TYS)
Alcoa/Maryville
ORNL Entrance
To
Graphite
Reactor
(1/3 Mi.)
Overflow Parking
Visitor's Center
Bethel
Valley
Road
Entrance
Bethel
Church
Pass Office
Parking
Swan
Lake
4500 N
4500 S
Concrete Tower
(Holifield Radioactive Ion
Beam Facility)
Oak Ridge
OAK RIDGE TURNPIKE
DoubleTree
Hotel
Federal Bldg.
American Museum
of Science and Energy
and Visitor's Bureau
Y-12 PLANT
FRC Field Site
Bethel Valley Road

A Sampling of FRC Facilities

Sample Handling and Analysis Facilities

- **Building 1505**: Laboratory and office facility housing a large portion of ORNL's Environmental Sciences Division staff. Includes radioactive material storage room, isotope counting machine rooms, sample preparation and analysis labs, computer rooms, x-ray, laser and electron microscope equipment rooms, and change rooms.

- **Building 7042**: Core Barn. 8000 ft^2 metal warehouse used to store geologic core samples and core sampling and analysis equipment such as core cutters and petrographic microscopes. The building has electrical service but no water supply. Could be used for all phases of sample handling, processing, dividing, packaging, storing, shipping, and archiving.

- **Building 0855**: Drilling and Field Equipment Storage and Shop. One story metal warehouse (40 x 60 ft) used for storage and maintenance of field equipment, most of which is used for drilling wells for environmental remediation research. The building is heated, has electrical service, and is supplied with non-potable process water. Could be used for all phases of sample handling, processing, dividing, packaging, storing, shipping, and archiving. It could also be used as a location from which to stage field sampling events and for cleaning and decontaminating equipment.

Physical Infrastructure and Heavy Equipment

- **Drilling equipment:** An Acker Drill Co. Holegator track drill is on-site for drilling operations. A Mobile Drill Co. Surveyor trailer mounted drill is available for shallow soil work. Additional equipment includes: (1) hollow-stem and flight augers; (2) a 94 mm wire-line system with soil and coring attachments; (3) split spoons up to 3.5"; (4) driven wells up to 2"; (5) micro wells of various configurations; (6) portable drilling and sampling systems for limited access areas; (7) conventional shallow soil hand-operated sampling equipment; (8) down-hole video camera; (9) a Sullair 185 trailer mounted compressor; (10) portable hot water/steam pressure washing systems; and (11) vehicles dedicated to supporting drilling activities. Earth movers, fork lifts, cranes, and other such equipment can be scheduled for use by contacting FRC staff.

- **Electrical power:**
  - (110/120 VAC)—at both trailers.
  - 220 and 240 (3-phase)—on two telephone poles located within the FRC contaminated site and a pole adjacent to the lysimeter site.
  - 6 generators, ranging from 1–7.2 kW. The 7.2 kW unit can also provide three phase 240 VAC.

- **Motor laboratory:** A single-axle, dual-wheeled vehicle (GVWR 14,100 lbs) with an electric winch is equipped with: heat and air conditioning; a 5 kW on-board generator (110/240 VAC); 600 watt inverter; triple battery system; wet lab area; refrigerator; computer workstation; on-board propane; and hand tools.

- **Office space and trailers:** Small field-office trailers are located at FRC background and contaminated areas. An enclosed 8 ft x 12 ft trailer also is available for storing large and heavy equipment.

- **Subsurface sampling and monitoring equipment:** Includes large numbers of water level sounders, data loggers, and transducers; multi-parameter down-hole continuous monitoring devices (e.g., YSI Sondes); Eh, specific conductance, pH, and dissolved oxygen meters; Hach kit field analysis equipment; drilling equipment; sampling pumps; solar panels; 12 volt batteries; and glove bag. ORNL has a supply of tracers such as bromide and dyes to conduct tracer studies.

- **Water supply:** A portable system up to 525 gal. is available for field use. Larger (up to 5,000 gal) tanks also are available. Several cascading large volume storage tanks can accommodate larger supplies.

- **Weather information:** NOAA weather information is available on local plant communication system networks, or via phone with the Y-12 Plant Shift Superintendent or the ORNL Shift Supervisor.

- **Weather station:** Recording meteorological stations are accessible at two locations on the west and east ends of the Y-12 Plant. There also is a rain gauge at the FRC background area.

Available FRC Services

FRC staff make a wide variety of services available to investigators. Generally, these services are available at no cost to investigators. However, principal investigators may need to supply staff for non-routine activities. For example, frequent sampling (e.g., daily) or sampling protocols that require many hours on-site may fall outside the realm of FRC-provided services. The best advice is to discuss your needs with the FRC Manager and clarify roles and responsibilities in writing **before** engaging in field work. Examples of services available through the FRC are listed, below.

Administration

- NEPA review
- Assistance with preparing work plans
- Interactions with DOE, regulators, and local oversight committees
- Coordination with facility operator
- Permitting (e.g., preparation of subsurface injection and penetration permits)
- Waste management
- Health & Safety training, General Employee Training, and Rad Worker II training

Project Planning

- Site selection
- Project scoping
- Project mobilization/demobilization

FRC laboratory with analytical equipment

Project Execution

- Piezometer installation (e.g., with dedicated on-site drilling rig)
- Subsurface sampling (e.g., core collection with dedicated onsite drilling rig)
- Routine groundwater and/or soil monitoring
- Injection of tracers, microbes, nutrients, chelators, etc.
- Hydraulic testing (e.g., pumping tests, slug tests, and point dilution tests)
- Meteorological data collection
- Surface and downhole geophysics
- Decontamination and/or sterilization of equipment
- Sample packing, distribution, and shipping
- Quality assurance (chain of custody)

Sample and Data Management

- Sample analysis (chemical and microbial)
- Sample archiving and storing
- Data analysis
- Data management (e.g., input to FRC database)
- Reporting
- Modeling

Key FRC Contacts

FRC Manager — David Watson

ORNL, Building 1505, room 302
watsondb@ornl.gov
phone: 865/241-4749
fax: 865/576-8646

Health and Safety

Tonia Mehlhorn (Safety training for FRC)
ORNL, Building 1505, room 208
boglema@ornl.gov
phone: 865/574-7824
fax: 865/574-8543

Debra Austin (rad contamination support)
ORNL, Building 1505, room 118
hoganda@ornl.gov
phone: 865/576-1408
pager: 865/873-6370
fax: 865/241-2779

Training Coordinator

Sylvia Porter
ORNL, Building 1505, room 114
portersy@ornl.gov
phone: 865/574-7297
fax: 865/574-4946

Webmaster

Marcella Mueller
UT-Battelle, Building 1505, room 304
muellerma@ornl.gov
phone: 865/574-7313

FRC Database

Craig Brandt
ORNL, Building 1505, room 330
brandtcc@ornl.gov
phone:865/974-1921
fax: 865/576-8646

Administrative Support

Beth Bailey
ORNL, Building 1505, Room 300
baileydb@ornl.gov
phone: 865/574-7301
fax: 865/576-8646

Badging

Diane Kosier
UT/Battelle, Building 1505, Room 301
kosiernd@ornl.gov
Phone: 865/574-7359
fax: 865/576-8646

Emergency Services

- Call **911** from any ORNL or Y-12 telephone
- If using an outside telephone (or cell phone):
  - at **ORNL**, call **865/574-6606** (Laboratory Shift Superintendent)
  - at the **FRC** field site (located at the Y-12 National Security Complex), call **865/574-7172** (Plant Shift Superintendent)

Shipping (rad license) and Sample Processing

Kenneth Lowe
ORNL, Building 1505, room 240
loweka@ornl.gov
phone: 865/576-0440
fax: 865/576-3989