



# Idaho Department of Environmental Quality

## The INL Oversight Program

When the federal government developed what is now the Idaho National Laboratory (INL) in 1949, the U.S. was engaged in the cold war. The nation was concerned with national security. This was reflected at the INL in efforts to develop nuclear energy, support the nuclear navy, and aid the development and maintenance of the nation's nuclear arsenal.

As the cold war came to a close, the impact of decades of atomic energy research, nuclear fuel reprocessing, and waste disposal at the INL Site came to light. By the late 1980s, cleaning up buried waste as well as soil and ground water contamination at the INL Site was given higher priority.

To ease public concern regarding Department of Energy (DOE) facilities such as the INL, the Secretary of Energy proposed a non-regulatory oversight role for states hosting DOE facilities. In 1989, the Idaho Legislature established a comprehensive oversight program for the INL. The following year, Idaho became the first state in the nation to negotiate an agreement with DOE for funding of independent environmental oversight and monitoring of a DOE facility. This oversight and monitoring is performed by the Idaho Department of Environmental Quality (DEQ) INL Oversight Program.

## Monitoring and Surveillance of the Idaho National Laboratory

Over the years, the DEQ INL Oversight Program has developed an effective monitoring and surveillance program to help evaluate the effects of the INL on public health and the environment. DEQ provides monitoring results to the citizens of Idaho so they can form knowledgeable opinions about DOE activities at the INL Site.

Idaho's Environmental Oversight and Monitoring Agreement with DOE allows DEQ to independently monitor the environment in and around the INL, participate in emergency preparedness and response efforts, and conduct independent assessments of the impact of DOE activities. The combination of oversight responsibilities and radiological expertise makes DEQ's Oversight Program a unique asset to the State of Idaho.

## Environmental Pathway Monitoring

Air, soil, ground water, surface water, external radiation, plants, and animals at the INL Site are routinely monitored by DOE contractors and the United States Geological Survey (USGS). This monitoring helps locate and measure historical contamination from the INL Site and detect any contamination that might come from current activities at the INL Site.

DEQ independently monitors environmental pathways (see the environmental pathways diagram on the following page) that contaminants from INL sources could take to reach people and the environment. These sources have historically included air stacks, wastewater ponds, injection wells, buried wastes, leaks, spills, or accidents. DEQ monitors select air, external radiation, water, and terrestrial locations to assess environmental conditions. DEQ's INL Oversight Program publishes its monitoring results in quarterly data reports and annual reports that are available at [www.deq.idaho.gov/inl\\_oversight/monitoring/overview.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/overview.cfm).

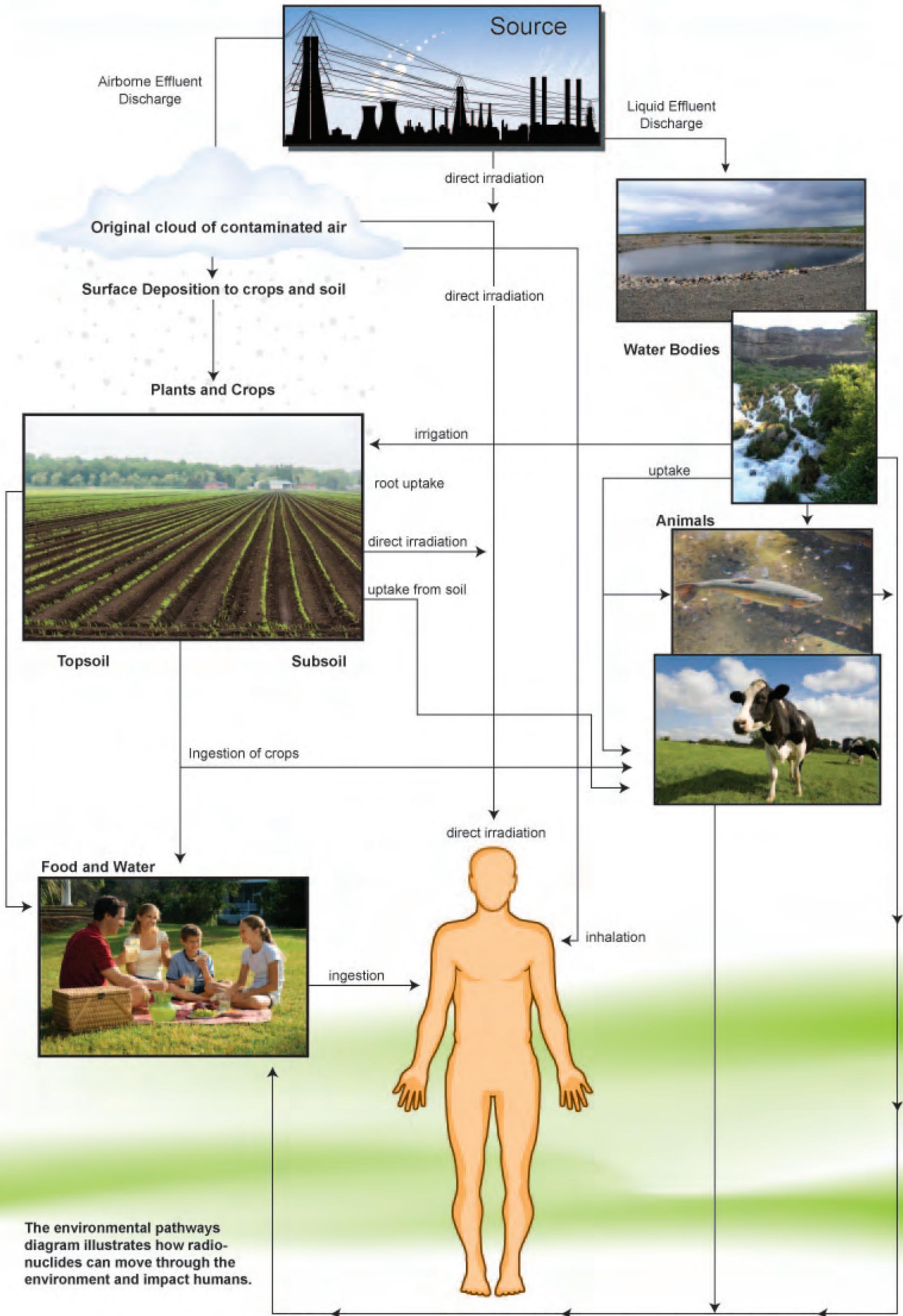
DEQ monitoring of the INL Site is designed to help understand "background" conditions, identify trends in contaminant concentrations, and report results that may indicate a risk to the public. Monitoring includes both radiological and non-radiological contaminants that may have come from the INL Site.

This routine monitoring for environmental impacts also enables DEQ to sample for environmental or human health impacts in the event of an emergency at the INL Site.

**DEQ monitors the INL Site independently of DOE. DEQ compares its own monitoring results with DOE's monitoring results to assure that DEQ results are accurate.**

**DEQ monitoring results are published in quarterly and annual reports. Quarterly reports contain detailed data and monitoring results. Annual reports look at the big picture, including summaries and trends. DEQ quarterly and annual reports are available at [www.deq.idaho.gov/inl\\_oversight/monitoring/overview.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/overview.cfm).**

# Environmental Pathways



The environmental pathways diagram illustrates how radionuclides can move through the environment and impact humans.

# Air Monitoring

Radioactive contamination can travel through the air as dust particles or as a gas. Air monitoring samples are continuously collected by drawing air through special filters that collect radioactive particles (dust and soot), radioactive gas (iodine), and atmospheric moisture. DEQ operates 10 air monitoring stations equipped with particulate air samplers, radioactive gas collectors, and water vapor collectors. Six of these air monitoring stations also include precipitation collectors, and three are part of the community monitoring stations described on page 7. Additional details about how different types of air samples are collected and analyzed are provided below.

**Radioactive Particles.** Particulate matter is collected on paper filters using a high-volume total suspended particulate (TSP) matter sampler. These filters are collected and analyzed for radioactivity (gross alpha and gross beta) every week. From these analyses, air concentrations are calculated based on the amount of radioactivity on the filter divided by the volume of air that passed through the filter. To gain more information, all TSP filters from each location are analyzed together for gamma-emitting radionuclides every three months. All filters from each location are analyzed together for radioactive strontium-90, americium-241, plutonium-238, and plutonium-239/240 at the end of each year.

**Radioactive Gas.** Radioactive iodine (radioiodine), a gas, is collected in a cartridge filled with activated charcoal, using a low-volume air pump. The activated charcoal traps radioiodine within its sponge-like pores. These cartridges are collected weekly and are analyzed together as a batch. If radioiodine (specifically, iodine-131) is detected in the batch, then each cartridge is individually analyzed.

**Atmospheric Moisture.** Atmospheric moisture is collected by drawing air through a column filled with molecular sieve beads (a moisture-absorbing material). When the column is saturated with moisture, it is taken to the lab where the beads are removed and heated, causing them to release their stored water. This water is analyzed for tritium, a radioactive isotope of hydrogen.



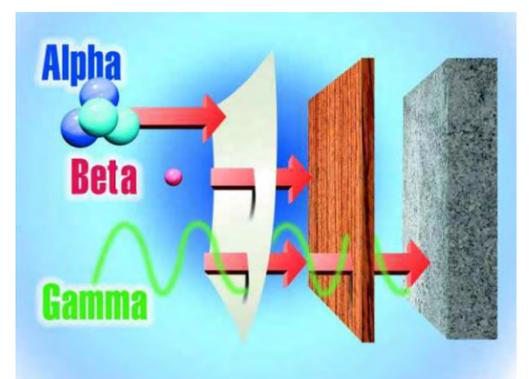
Mud Lake monitoring station co-located with National Oceanic and Atmospheric Administration (NOAA) meteorological tower

**Precipitation.** Precipitation in the form of rain or snow is collected using a 1-square-meter tray that drains into a 5-gallon container. The collection tray is kept warm during the winter months. The water sample is retrieved every three months or when the 5-gallon sample container is full. The sample is analyzed for tritium and gamma radiation-emitting nuclides that may have been washed out of the atmosphere by rain or snow.

Radiation is *energy in the form of particles or waves that are emitted through space*. There are many

## External Radiation Monitoring

types of radiation: heat, visible light, ultraviolet light, radio wave, microwave, and ionizing. Only ionizing radiation has enough energy to cause physical changes at the cellular level and is the type of radiation that most people think of when they hear the term “radiation.” There are many sources of ionizing radiation in the environment, including cosmic radiation, naturally occurring uranium and thorium, radon, and fallout from past above-ground nuclear testing. Together, these add up to the “background radiation” specific to an area. Of the three most common types of ionizing radiation (alpha, beta, and gamma), only gamma represents an external hazard because it is energetic enough to pass through the human body and ionize cells without being taken into the body through inhalation, ingestion, or cuts. DEQ uses the following two types of radiation monitoring equipment to measure external (gamma) radiation.



How easily are three common types of radiation (alpha, beta, gamma) stopped? Alpha radiation is stopped by a sheet of paper and beta radiation by a thin sheet of wood, but it takes lead or concrete to stop gamma rays.

**High Pressure Ion Chambers (HPICs).** DEQ has a network of 12 HPICs that continuously monitor gamma radiation and send the results by radio to the DEQ office in Idaho Falls every five minutes. These results can be viewed at [www.deq.idaho.gov/inl\\_oversight/monitoring/piconline.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/piconline.cfm). Ten of these HPICs are located at air monitoring stations and two are at remote locations. Measurements are made available to the public in quarterly and annual reports on DEQ’s INL Oversight Program Web site at [www.deq.idaho.gov/inl\\_oversight/monitoring/overview.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/overview.cfm).

**Electret Ionization Chambers (EICs).** DEQ also uses passive monitors for measuring radiation exposure. There are 56 EICs in locations that include air and radiation monitoring stations, INL facility boundaries, and roads inside and outside the INL Site. EICs are collected every three months and measure the total gamma radiation exposure over that time period.

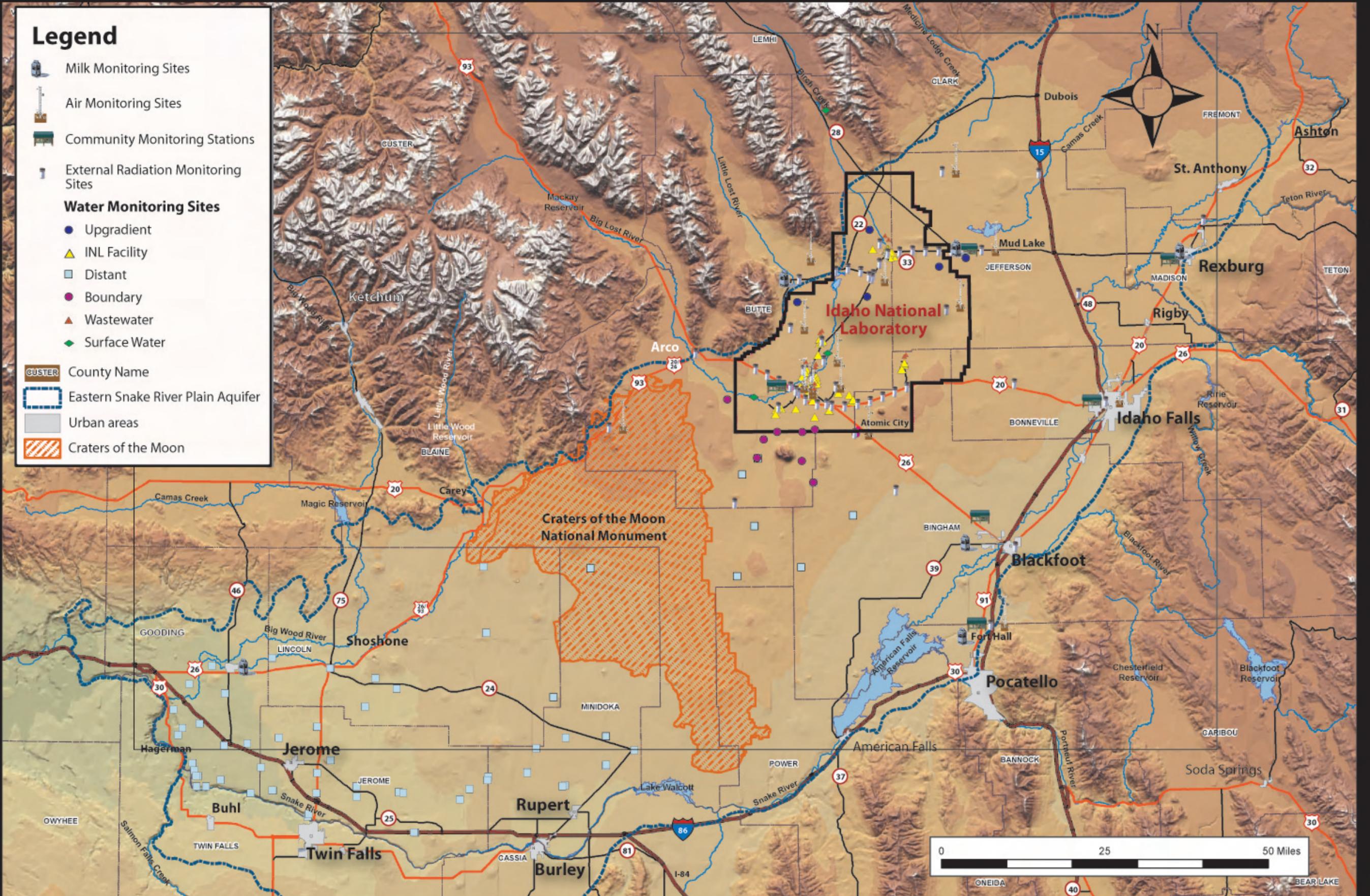


Solar powered remote monitoring HPIC transmits real-time gamma readings back to DEQ



Electret ion chamber for monitoring gamma radiation

# DEQ INL Oversight Program Environmental Monitoring Locations



# Water Monitoring

Contaminants released through infiltration ponds, injection wells, buried wastes, or spills could reach ground water. Many people use ground water for drinking or irrigation. DEQ monitors water in many locations, including the Eastern Snake River Plain Aquifer, to track trends in contaminant concentrations and identify impacts of INL activities.

More than 126 water monitoring locations are sampled along the path of ground water flowing beneath the INL toward the Magic Valley, which is southwest of the INL Site. Water is sampled at ground water (wells and springs), surface water (streams that flow onto the INL), and wastewater (from INL facilities) locations. Water monitoring locations are categorized as up-gradient, INL facility, boundary, and distant. Most water monitoring sites are sampled once a year.

**Water Sampling.** Water samples are analyzed for radioactive and non-radioactive constituents that may be naturally occurring or may be present due to human activities. DEQ co-samples at up-gradient, INL facility, and boundary locations with DOE contractors and the USGS, and DEQ samples distant sites independently.

**Radioactive Constituents.** DEQ analyzes samples from all water monitoring locations for gross alpha and gross beta radioactivity, gamma-emitting radionuclides, and tritium, which can occur naturally or be present due to INL activities. Based on known contamination, selected locations are also sampled for the alpha-emitting radionuclides plutonium-238, plutonium-239/240, plutonium-241, uranium-238, uranium-235, uranium-234, americium-241, and neptunium-237; and the beta-emitting radionuclides technetium-99 and strontium-90.

**Non-radioactive Constituents.** DEQ analyzes water monitoring samples from all locations, for common ions, nutrients, trace metals, and analyzes samples from some locations for organic solvents. Common ions are calcium, magnesium, sodium, potassium, carbonate, sulfate, nitrate, chloride, and silicate. Nutrients are nitrate-plus-nitrite and total phosphorus. Trace metals are iron, chromium, manganese, and lead. Organic solvents are sampled at select locations where they have been detected previously or are suspected to be present. Along with fluoride, these analytes help identify INL impacts. DEQ may also look for other contaminants if their presence is suspected.

INL facility wastewater pond



Ground water sampling

## Water sample location types:

**Up-gradient** - “background” water quality not impacted by INL operations

**INL Facility** - on the INL Site near facilities in areas of known contamination

**Boundary** - on or near the perimeter of the INL Site

**Distant** - down-gradient of the INL Site in locations where the public uses water from the aquifer

# Terrestrial Radiation Monitoring

Radioactive substances can be deposited on soils and foliage, where they can then be taken up by plants and animals and incorporated into their tissue. Consumption of milk, meats, grains, and vegetables provides a possible pathway for radioactive material to enter the body.

**Soil Monitoring.** DEQ takes soil samples annually and analyzes them for radionuclide accumulations to assess long-term trends of radiological conditions in the environment around the INL.

In the field, a portable gamma radiation detector is used to collect in-situ gamma spectroscopy surface radiation measurements in soil. Because this method of sampling does not require a sample to be physically collected and removed from its location, repeated measurements can be taken at the same location. These measurements are used to identify radionuclides present in the soil and to estimate radioactivity concentrations. DEQ measures surface soil radiation once a year at each HPIC radiation monitoring location. In addition to these annual measurements, DEQ also co-samples with DOE and its contractors. This data helps DEQ determine whether the monitoring results reported by DOE and its contractors are consistent with DEQ monitoring results for the same locations.

**Milk Monitoring.** Radioiodine can concentrate in the milk of dairy animals. When radioiodine is ingested by humans, it concentrates in the thyroid gland. Young children are especially at risk because they drink more milk than adults and because the thyroid controls a number of hormones critical to growth and development. DEQ samples cow and goat milk monthly at commercial milk distribution facilities surrounding the INL Site. Milk monitoring is performed to indirectly verify the presence or absence of atmospheric radioiodine deposited in the terrestrial environment.



Cattle grazing near the INL Site

# Community Monitoring Stations

DEQ partners with the National Oceanic and Atmospheric Administration (NOAA), DOE, and the Shoshone-Bannock Tribes to provide community monitoring stations through the Idaho Environmental Monitoring Program. These stations are at locations surrounding the INL. The public can view real time weather and direct radiation measurements taken at these monitoring stations. The stations also include informational displays that explain the function of various instruments, highlight topics about measurements, and describe the roles of participating agencies that support the monitoring stations. Real-time measurements from the monitoring stations can also be viewed at [www.idahoop.org](http://www.idahoop.org). An example of the information on this Web site is shown below.

## Community monitoring stations are strategically located in:

- Idaho Falls - along the northeast end of the Snake River green belt, south of Highway 20
- Mud Lake/Terreton - along the north side of Highway 33
- Big Lost River Rest Area - south of Highway 20/26 along the Big Lost River
- Fort Hall - southwest of the Interstate 15 Exit 80
- Blackfoot – at Mountain View Middle School
- Rexburg – at Madison Middle School

## Each Community Monitoring Stations provides a real-time display of:

- Wind speed
- Wind direction
- Air temperature at 6 feet above ground level
- Air temperature at 50 feet above ground level
- Air temperature maximum since midnight
- Air temperature minimum since midnight
- Relative humidity
- Dew point
- Solar energy received in watts per square meter
- Barometric pressure
- Environmental radiation in millirem per hour (mR/h)

Each year, the average person in the United States receives a radiation dose of about 360 mrem from natural background and medical applications. Calculate your annual radiation dose at [www.deq.idaho.gov/inl\\_oversight/radiation/dose\\_calculator.cfm](http://www.deq.idaho.gov/inl_oversight/radiation/dose_calculator.cfm).

## Public Exposure Limits

**100 mrem per year:** The International Commission on Radiological Protection's recommended dose limit to the public from all sources other than natural background and medical applications.  
**10 mrem per year:** The Environmental Protection Agency (EPA) Clean Air Act limit on public radiation exposure to air emissions of radioactivity from facilities such as the INL Site.

The screenshot shows a web browser window displaying the Idaho Environmental Monitoring Program website. The page title is "Idaho Environmental Monitoring Program" and the URL is "http://www.idahoop.org/". The main content area shows real-time data for the Idaho Falls station as of 08/11/08 14:50 MST. The data includes:

Wind	
direction	202 degrees
speed	10.0 mph
gust	16.6 mph
chill	78 °F

Air Temperature	
50 feet	74.8 °F
6 feet	75.8 °F
maximum since midnight	75.8 °F
minimum since midnight	53.0 °F

Relative Humidity	
Relative Humidity	23 %

Dew Point	
Dew Point	35 °F

Solar Energy	
Solar Energy	829 watts/meter <sup>2</sup>

Barometric Pressure	
Barometric Pressure	29.89 inches mercury

Environmental Radiation	
Environmental Radiation	0.0119 mR/h

The website also features a navigation menu on the left side with links for Home, Community Monitoring, About, Location Map, Description, CMS Tower Data, Blackfoot Tower, About Blackfoot, Fort Hall Tower, About Fort Hall, Idaho Falls Tower, About Idaho Falls, Rest Area Tower, About Rest Area, Rexburg Tower, About Rexburg, Terreton Tower, About Terreton, Weather, Event Monitoring, Feedback, and Links.

This Web page showing real-time conditions at the Community Monitoring Station in Idaho Falls can be viewed by going to [www.idahoop.org](http://www.idahoop.org) clicking on the Community Monitoring link on the left side bar and selecting Idaho Falls from the pull-down menu. Data from the other five Community Monitoring Stations can be viewed by selecting other locations from the pull-down menu.

Real-time metrological data and environmental radiation readings from the Idaho Falls Community Monitoring Station

# Idaho Department of Environmental Quality INL Oversight Program Monitoring and Surveillance of the Idaho National Laboratory

**Program Goal: Protect human health and the environment on and around the Idaho National Laboratory (INL).**

## **Environmental Monitoring and Surveillance**

The Idaho Department of Environmental Quality (DEQ) INL Oversight Program performs environmental monitoring and surveillance independently of the Department of Energy (DOE) on and around the Idaho National Laboratory (INL) Site. DEQ takes air, external radiation, water, and terrestrial samples at locations chosen to best monitor the environment. This monitoring is designed to verify and supplement the more extensive monitoring performed by the DOE. DEQ monitoring results are published in quarterly and annual reports that are available at [www.deq.idaho.gov/inl\\_oversight/monitoring/overview.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/overview.cfm).

## **Community Monitoring Stations**

Community monitoring stations display real-time atmospheric and radiological data. The data from these stations can also be viewed at [www.idahoop.org](http://www.idahoop.org).

## **Community Monitoring Station**



Additional information about the DEQ INL Oversight Program can be obtained at [www.deq.idaho.gov/inl\\_oversight/index.cfm](http://www.deq.idaho.gov/inl_oversight/index.cfm) or by calling 1-800-232-4635. This publication and previous DEQ INL Oversight Program publications are also available at the same Web site. If you would like to be on the mailing list for future issues of the DEQ INL Oversight Program publications, please email us at [inloversight@cableone.net](mailto:inloversight@cableone.net).

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