

**Independent Oversight
Assessment of
Environmental Monitoring
at the**



**Idaho National
Laboratory Site**

May 2010

Office of Independent Oversight
Office of Health, Safety and Security



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Abbreviations Used in This Report

AMWTP	<i>Advanced Mixed Waste Treatment Project</i>
ASER	<i>Annual Site Environmental Report</i>
ATR	<i>Advanced Test Reactor</i>
BEA	<i>Battelle Energy Alliance, LLC</i>
BBWI	<i>Bechtel BWXT Idaho, LLC</i>
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
CWI	<i>CH2M Washington Group Idaho, LLC</i>
DCG	<i>Derived Concentration Guide</i>
DOE	<i>U.S. Department of Energy</i>
DOE-ID	<i>DOE Idaho Operations Office</i>
EM	<i>Office of Environmental Management</i>
ESER	<i>Environmental Surveillance, Education and Research</i>
HSS	<i>Office of Health, Safety and Security</i>
ICP	<i>Idaho Cleanup Project</i>
IDFG	<i>State of Idaho Department of Fish and Game</i>
INL	<i>Idaho National Laboratory (facilities operated by BEA)</i>
INL Site	<i>Idaho National Laboratory Site (cumulative site area and facilities owned by DOE)</i>
IRC	<i>INL Research Center</i>
LTEM	<i>Long-term Ecological Monitoring</i>
M&O	<i>Management and Operating</i>
MAPEP	<i>Mixed Analyte Performance Evaluation Program</i>
MFC	<i>Materials and Fuels Complex</i>
MSC	<i>Monitoring and Surveillance Committee</i>
NE	<i>Office of Nuclear Energy</i>
NERP	<i>National Environmental Research Park</i>
PT	<i>Proficiency Testing</i>
RESL	<i>Radiological and Environmental Sciences Laboratory</i>
SAP	<i>Sampling and Analysis Plan</i>
WAG	<i>Waste Area Group</i>

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Executive Summary

This report presents the results of an assessment of environmental monitoring and surveillance activities at the U.S. Department of Energy (DOE) Idaho National Laboratory (INL) Site during March through April 2010. The assessment was performed by the DOE Office of Independent Oversight, within the Office of Health, Safety and Security at the request of the DOE Idaho Operations Office. The purpose of the assessment was to evaluate the adequacy of the INL Site environmental monitoring and surveillance program in meeting the objectives of DOE Order 450.1A, Sections 4(c)(2)(a-d) for protection of public health and the environment, and (c)(5-6) for conducting monitoring and assuring data quality, and DOE Order 5400.5 for assessing potential pathways of contaminant emissions that may impact the local environment and public living near the INL Site.

Overall, environmental monitoring and surveillance activities at the INL Site are comprehensive and meet the basic objectives of applicable DOE requirements. A number of positive attributes associated with the program were identified, including the use of data management tools and protocols, staff qualifications, plan and procedure infrastructure, and community outreach and stakeholder relationships. These positive attributes provide a sound foundation for basic program elements.

Environmental monitoring and surveillance activities are comprehensive and effectively support the overall assertions about the levels and extent of releases of radionuclides to the environment in the Site Annual Environmental Report. The effectiveness of the overall program in ensuring full understanding of potential environmental impacts could be optimized through various enhancements. These enhancement opportunities exist in a few areas of program design and/or implementation, including concerns with the technical basis for some program elements, coordination and communication among contractors, and clarity and accuracy in some published reports. Other enhancement opportunities involved the implementation of certain quality assurance protocols, as well as several media-specific monitoring and surveillance concerns. From a public health perspective, the potential impact of these concerns is not significant because the monitoring and surveillance activities are designed to be able to detect site impacts that are only slightly in excess of normal background levels. Nevertheless, it is DOE's objective to strive for excellence in environment safety and health programs and to ensure that information provided to the public is accurate and that the basis for the information is sound and transparent. As such, recommendations for enhancement and refinement of the environmental monitoring and surveillance program in the areas of potential concern described in this report are also presented.

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1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Health, Safety and Security (HSS), performed an assessment of environmental monitoring and surveillance at the DOE Idaho National Laboratory (INL) Site during March through April 2010. The assessment was performed at the request of the DOE Idaho Operations Office (DOE-ID). HSS reports directly to the Secretary of Energy, and this INL sitewide environmental monitoring program assessment was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations with support from assessment team members from Nuclear Energy's Integrated Safety and Program Assurance Office, HSS's Office Of Analysis, and National Security Technologies, LLC. This report discusses the results of the review of the INL Site environmental monitoring and surveillance program.

Consistent with the DOE-ID request, this independent assessment focused on determining whether the current INL Site environmental monitoring program components are adequate to evaluate all significant potential impacts from laboratory and cleanup operations on the surrounding environment and the public; potential pathways of contaminant emissions; and on identifying strengths, lessons-learned, and opportunities for improvement in the INL Site environmental monitoring and surveillance program.

Consistent with the DOE-ID's requested scope, the environmental monitoring assessment did not assess compliance with environmental laws and regulations, permit requirements, or certain Federal compliance-driven environmental monitoring activities, such as air effluent (stack) monitoring and dose calculation (National Emission Standards for Hazardous Air Pollutants) and drinking water and groundwater monitoring. The assessment did not evaluate the adequacy of contractor software quality assurance or validation and verification associated with the database tools being utilized.

The Office of Nuclear Energy (NE), within the Office of the Under Secretary of Energy, has line management responsibility for INL. NE provides programmatic direction and funding for advanced civilian nuclear technology research and development, facility infrastructure activities, and emergency management program implementation at INL. At the site level, line management responsibility for operations and emergency management falls under the DOE-ID Manager. Under contract to DOE-ID, INL is managed and operated by Battelle Energy Alliance, LLC (BEA), which has operated INL since February 2005.

In addition to INL programmatic operations, one of the important INL Site missions is to cleanup INL Site facilities that are no longer operational or functionally needed. The DOE Headquarters Office of Environmental Management (EM) is responsible for managing the Idaho Cleanup Project (ICP), which addresses waste management and cleanup of facilities and materials at the INL Site. EM coordinates certain sitewide functions with NE. At the site level, line management responsibility for ICP also falls under the DOE-ID Manager and is implemented primarily by DOE-ID's Office of the Deputy Manager

for ICP. Under contract to DOE-ID, the ICP is managed by CH2M Washington Group Idaho, LLC (CWI), which took over responsibility for the ICP in May 2005.

Environmental monitoring and surveillance for DOE-ID is conducted by several contractors and government agencies as follows:

1. BEA - the INL management and operating (M&O) contractor (onsite monitoring)
2. Stoller Corporation - the environmental surveillance, education and research (ESER) contractor (offsite monitoring, onsite wildlife and game, Annual Site Environmental Report (ASER) preparation)
3. CWI - the ICP contractor (onsite monitoring)
4. Bechtel BWXT Idaho, LLC (BBWI) - the Advanced Mixed Waste Treatment Project (AMWTP) contractor (limited onsite monitoring)
5. US Geological Survey (supplementary groundwater monitoring)
6. National Oceanic and Atmospheric Administration (meteorological data).

CWI is also responsible for various Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act actions associated with their operations.

This review focused principally on the environmental monitoring being performed by the first three contractors listed above, who have the bulk of the responsibility for INL Site environmental monitoring and surveillance. Specific media and environmental monitoring activities assessed included:

- Review of INL Site environmental monitoring activities to ensure that the sitewide environmental monitoring program as a whole is comprehensive and meets the objectives of DOE Order 450.1A, Sections 4(c)(2)(a-d) which address protection of public health and the environment for specific media and (c)(5-6) which addresses monitoring and meeting data quality objectives.
- Review of the INL (BEA), ICP (CWI), and ESER (Stoller) contractor environmental monitoring activities to ensure compliance with the requirements of DOE Order 450.1A, Sections 4(c)(2)(a-d) and (c)(5-6) and DOE Order 5400.5 for their contract responsibilities.
- Determination of whether current monitoring activities meet selected stakeholder (State of Idaho Department of Fish and Game (IDFG), State of Idaho INL Oversight) expectations.
- Review of the effectiveness of communication and timely access to monitoring data between site contractors and with DOE-ID on monitoring activities.
- Review of the effectiveness of BEA self-assessments of environmental monitoring activities.
- Confirmation of the effectiveness of data storage and access, including foreseeable technological issues related to data storage, retrievability, and contractor planning to address such issues.
- Confirmation that data quality objectives are appropriate and are being met.
- Determination of whether monitoring is adequate for the expanding research and development activities of INL in the city of Idaho Falls.
- Review of the INLASER production process to ensure that the information reported is comprehensive, technically sound, written in a manner that is understandable to the public and site stakeholders, and that appropriate efforts are being made to ensure the quality and defensibility of data reported in the ASER.

2 Positive Attributes

As discussed in the following paragraphs, this assessment identified several positive attributes and strengths associated with the environmental monitoring and surveillance program at the INL Site.

Database management protocols are comprehensive and provide effective mechanisms for collection, analysis, and retrieval of vast amounts of environmental sampling data generated by INL Site contractors. Each contractor makes good use of electronic data management and automation tools to manage large amounts of environmental monitoring data generated from sampling activities. The INL and ICP contractors use tailored versions of database software called the Sampling and Analysis Plan (SAP) and Environmental Data Warehouse applications. These databases effectively automate much of the day-to-day logistical, quality control, and recordkeeping requirements associated with implementation of the environmental monitoring programs for the INL Site. For example, the SAP provides automation for many of the repetitive actions needed to complete routine air and liquid sampling evolutions, such as manually recording key sampling parameters (e.g., flow rate, times) as well as generation of chain of custody forms and laboratory shipping labels. Laboratory results are also electronically transmitted back to SAP following sample analysis. These types of automation greatly reduce the potential for data transcription errors associated with traditional sampling methods. Upon completion of the laboratory data validation process, final analytical results are transferred to the Environmental Data Warehouse database, which is capable of providing data presentation in a variety of formats that facilitate generation of graphs and tables published in the ASER.

The ESER contractor does not have access to the site databases but has developed its own customized Microsoft Access-based relational database that it uses to facilitate data generation and reporting for ESER sampling activities. This approach to record keeping and use of databases and tables greatly enhances the ability of the ESER contractor to manage and trend monitoring data and generate data queries that are incorporated into various reports, including the ASER.

Technical and professional staffs are well qualified and knowledgeable. All contractors had well-qualified, experienced, and competent staff managing and executing environmental monitoring programs. Many staff members have professional degrees and/or certifications in their areas of expertise, such as wildlife biology, ecology, or chemistry, and most have several years of relevant experience in environmental sciences at INL Site or other institutions.

INL Site contractors have good working relationships with external stakeholders and regulators. Independent Oversight team interviews with the IDFG staff indicated good interaction and sharing of data collected by Stoller and IDFG. As examples, the coordination and sharing of sage grouse data for population trending, the winter raptor count data, and the Breeding Bird Survey data were effective, and

these data are also valuable to the IDFG. Good working relationships were also noted with the State of Idaho INL Oversight Program, as discussed in Section 4 of this report.

Plan and procedure infrastructure in support of the environmental monitoring and surveillance programs is comprehensive. A comprehensive document hierarchy is in place to ensure proper implementation of environmental monitoring programs at the INL Site. This hierarchy includes overarching plans and management requirements that define the goals and necessary programmatic elements and laboratory instructions and/or implementing procedures governing the conduct of media-specific sampling.

Monitoring of potential Endangered Species Act listed species is proactive. Monitoring activities for the sage grouse and pygmy rabbit are being conducted on the INL Site and have been for several years. Data from these studies are crucial to understanding population trends, potential and occupied habitat, natural history and ecology, and potential impacts from INL Site operations on these species. These data will be invaluable during formal consultation with the U.S. Fish and Wildlife Service in the event these potential Endangered Species Act listed species become listed.

Research and collaboration with institutions of higher learning enhances the knowledge base and the effectiveness of environmental monitoring activities. The INL Site was designated a National Environmental Research Park (NERP) in 1975 and is one of the largest remaining areas of intact sagebrush steppe in North America. As such, the INL Site is an important area for conducting ecological research, training researchers, and attracting new researchers and projects. Several universities and other entities are currently conducting research on the INL Site in collaboration with the ESER contractor as part of the Idaho NERP. Current and potential uses for information from NERP projects include: (1) providing data for enhancing environmental monitoring programs; (2) better land-use planning and ecosystem management; (3) conservation planning purposes; (4) identifying sensitive areas that may require protection or restoration; and (5) providing interpreted research results to support the National Environmental Policy Act process, radionuclide pathway analysis, and ecological risk assessment.

3

Program Enhancements

The environmental monitoring and surveillance activities at the INL Site are comprehensive and effectively support the overall statements in the ASER, and the independent assessment did not identify any program vulnerabilities that would affect the ability of the INL Site to detect significant site impacts. However, several enhancements to the program to ensure full understanding of potential environmental impacts may be hindered by weaknesses in program design and implementation. Addressing these enhancements will optimize the program and ensure that DOE fully meets its goal of achieving the highest standards of technical defensibility in its environment, safety, and health programs and in published reports.

The main areas for enhancement are briefly summarized below and discussed further in Sections 4.2 and 4.3, which include recommendations for program enhancements and refinements for consideration by site management.

The current programmatic design does not provide a complete definition of the technical basis for all environmental monitoring and surveillance activities being conducted at the INL Site. While a significant amount of environmental monitoring and surveillance is being performed to characterize the potential for impact from INL Site operations, there is no well-defined technical basis for each media sampled to support or defend the adequacy of protocols to meet current objectives (i.e., what is sampled, the frequency of sampling, the locations chosen, specific analytes being measured).

Some aspects of the program were not sufficiently coordinated and communicated among contractors. Responsibilities for environmental monitoring and surveillance at the INL Site are split among several contractors, and, in some cases, the coordination and communication between these contractors is not fully effective in ensuring comprehensive and accurate sampling, analysis and reporting, and long-term transition planning.

Some information in published environmental reports was not fully accurate and clear. A summary of overall environmental monitoring and surveillance activities is published annually in the INL Site ASER. While the overall ASER is effective in conveying necessary annual environmental protection and performance information, there are several underlying weaknesses in the presentation and technical defensibility of some of the reported information.

Implementation of certain quality assurance protocols and media specific monitoring and surveillance actions were not fully effective. Quality assurance of laboratory analyses and data reporting is adequate but does not employ consistent application of enhanced techniques, such as consistent use of double blind sampling by each contractor to supplement the mixed analyte performance

evaluation program (MAPEP) goal of ensuring high quality and accuracy in laboratory analyses. In general, media-specific environmental monitoring and surveillance activities were adequate to meet DOE requirements. However, for several media types, weaknesses in the rigor of implementation and/or design of sampling programs have the potential to affect the INL Site's ability to fully characterize the magnitude of potential impacts.

4

INL Site Environmental Monitoring Program

4.1 Overall Assessment

Overall environmental monitoring and surveillance activities at the INL Site are comprehensive and meet the overall objectives of DOE environmental orders. While the positive attributes discussed in Section 2 provide a sound foundation for program effectiveness, the Independent Oversight team identified various weaknesses that hinder the cohesiveness and technical defensibility of environmental monitoring and reporting activities. These weaknesses generally fall into two basic categories: (1) crosscutting concerns that were broad based and spanned all media (i.e., air, liquid, soil, vegetation, food chain) and organizations reviewed and which generally related to program design and management, and (2) media-specific weaknesses that were related to implementation of the program. Specific examples are provided of instances where crosscutting concerns may be responsible for impacting the quality or suitability of environmental monitoring and surveillance activities. These two areas and related recommended opportunities for improvement and program refinement are addressed in detail in this section.

4.2 Crosscutting Concerns and Recommendations

Several crosscutting gaps or weaknesses were identified relating to sampling design and management that reduce the effectiveness of overall environmental monitoring and surveillance programs at the INL Site.

The technical basis for sitewide environmental monitoring and surveillance activities is not fully defined and documented. There is a significant amount of environmental monitoring and surveillance being performed to characterize the potential for impact from INL Site operations on the public and the environment. The information gathered from these activities is comprehensive and generally sufficient to meet regulatory requirements and demonstrates that there are no undue risks being posed by the site. However, the sampling design of many existing environmental monitoring activities dates back to their origins many years ago and there is no well-defined technical basis to support or defend the adequacy of protocols to meet current objectives. For example, the current ambient air monitoring locations have been the same for decades, although there have been many changes in facility operations and site missions that bring into question the current adequacy of the original placement of samplers.

For potentially affected environmental media (air, liquid, soil, vegetation, food chain), the INL Site does not have a sufficiently documented technical basis to justify the sampling strategy (i.e., what is sampled, the frequency of sampling, the locations chosen, and the specific analytes being measured).

(Also see Section 4.3.) Without a sound technical basis in these areas, the monitoring program is inherently vulnerable to any challenge to demonstrate that each element of the monitoring program is meeting associated objectives, including requirements of applicable regulations and DOE orders. This concern applies to environmental monitoring only, since the technical basis for sampling conducted as part of CERCLA actions, specific regulatory permits, and/or required by DOE Order 435.1A was not evaluated as part of this assessment.

Another area where the technical basis has not been fully developed is in the establishment of an overarching strategy for transferring restoration/natural attenuation functions from EM to NE, including transition of responsibility for maintaining data and continued long-term monitoring at restored sites. As restoration sites are closed, they may be transitioned from the responsibility of the ICP or other contractors to the INL M&O contractor. Discussions and planning for future monitoring (e.g., organizational responsibility for conducting and integrating the monitoring into the sitewide monitoring plan, and maintaining monitoring data) are not well defined. Based on concerns found at other DOE sites where restoration actions have been in place for years, particular attention is needed for long-term monitoring to determine if items, such as bio-intrusion or cover cap failure, are allowing contaminants to be released into the environment. Realizing there are specific CERCLA requirements for environmental monitoring during cleanup activities and possibly thereafter, attention must also be paid to monitoring requirements per DOE Order 450.1A or other applicable DOE orders. It may be necessary to transition individual locations within waste area groups (WAGs) to the INL M&O contractor before the overarching strategy for transition is implemented. (See additional discussion and recommendation in Section 5.2.)

Recommendation: Consider establishing formal criteria for preparation of technical basis documents for all aspects of environmental monitoring and surveillance activities. Ensure the technical basis for all monitoring activities (i.e., type, frequency, analytes) is clearly documented, justifiable to meet overall objectives for each media, and ensures minimum standards of consistency across different contractors. Include a mechanism for periodic review of monitoring and surveillance activities based on changes to INL Site mission and operations.

Recommendation: Consider establishing a schedule and preparing one or more technical basis documents that define the technical details associated with all environmental monitoring actions. Use the results of this effort to identify any gaps in current protocols, and implement revisions as necessary.

Coordination and communication among contractors is not sufficiently mature to ensure all program objectives are met. One of the numerous sampling activities conducted at the INL Site is the sampling of areas impacted (close by or within) CERCLA Sites (WAGs 1-9) and those areas away from locations where actions are ongoing (i.e., WAG 10 “Site-wide WAG”). Although the results of these sampling efforts are reported to the various agencies as required and a Long-Term Ecological Monitoring (LTEM) Plan is developed and submitted for approval, much of the monitoring data is not being included or incorporated (either directly or by reference) into the ASER where the data would convey a more complete picture of the actual ongoing environmental monitoring activities at the INL Site. Additionally, the LTEM (WAG10-04) states as one of its purposes “to allow coordination with ongoing environmental monitoring efforts.” However, the various site contractors acknowledge that they are not fully knowledgeable about the LTEM sampling results, and do not take advantage of coordinating sampling efforts or utilization of LTEM data. Additionally, long-term monitoring (i.e., bio intrusion, incidental release) for closed CERCLA operable units or completed actions has not been coordinated between contractors.

As stated above, the technical basis for many sampling activities is undocumented, and existing sampling has not been coordinated among various onsite contractors (i.e., LTEM, BEA/CWI environmental monitoring) or considered in terms of its overall adequacy. For example, sampling from within AMWTP is not integrated or coordinated with the ESER or site contractors, as this is a BBWI managed activity. Although the site contractors and stakeholders voluntarily established a Monitoring and Surveillance Committee (MSC) in 1997, with a charter to address the coordination of environmental surveillance and monitoring at the INL Site, participation by other than the principal site contractors has been limited. This lack of participation has impacted the effectiveness, since BBWI does not actively participate in the MSC.

Recommendation: Consider increasing the formality and rigor of communications between contractors through development of an overarching communications protocol/plan defining the specific elements to be addressed (i.e., MSC, sampling efforts between LTEM and site contractors) and formal roles and responsibilities for achieving the objectives.

Recommendation: Consider incorporating LTEM program data into the ASER and reporting data collection periodically to the MSC.

Recommendation: Consider soliciting information from members of the MSC in advance of meetings for distribution to compensate for scheduling conflicts and/or other obligations which may impact attendance. Ensure distribution of the minutes of the meeting with topics from the previous meeting and for the next meeting to assist the members in planning attendance and participation.

Recommendation: Consider holding ad-hoc meetings under the direction of DOE-ID that focus on specific coordination issues that cannot be accommodated through the mode of casual information exchange among the various entities during the MSC.

There are clarity and accuracy concerns associated with some technical information published in the ASER. While the overall ASER is effective in conveying necessary annual environmental protection and performance information, there are underlying weaknesses in the technical defensibility of some of the reported information.

Some of the narrative contained in the ASER was misleading and/or did not contain sufficient explanation. For example, regarding soil sampling, the second paragraph of Section 7.2 implies that all isotopes of concern are sampled both onsite and offsite. However, the INL contractor only performs in-situ gamma measurements and only reports results for Cs-137 (see Section 4.3.3 for additional details).

In addition, some statements made in the ASER are not technically defensible or accurate. For example, when comparing data on Cesium-137 (Cs-137) levels detected on the INL Site, the narrative states that reported levels were consistent with background or fallout levels. However, this statement did not consider a 2008 in-situ gamma result in excess of 10 pCi/g from the INL contractor, which was also published in this section of the ASER. This value was more than ten times the reported average INL Site fallout levels presented in other INL Site documents.

Similarly, comparisons of anomalous data are sometimes made out of context against the DOE Order 5400.5 air and liquid Derived Concentration Guides (DCGs), without explaining what the DCGs actually represent (i.e., 100 mrem annual exposure). In the Quality Assurance section (Section 10.1.2), the impact of one of the laboratories' failures to meet MAPEP acceptable tolerance for a Pu-238 analysis was not explained, calling into question the validity of sampling results for Pu-238 for that particular

laboratory. Other examples include the inclusion of anomalous data without sufficient explanation of the published results (i.e., reported U-234 data without detection of U-238 and similar detection of a short-lived medical isotope on an air sample at an offsite background location).

Recommendation: Consider a formal DOE-ID-approved protocol for review and concurrence of the ASER by all contractors, with concurrence on predefined deadlines and joint accountability for accuracy and technical defensibility of data tables and narrative prior to ASER publication.

Recommendation: Consider including other entities with expertise and independence, such as the Radiological and Environmental Sciences Laboratory (RESL), in the ASER review and comment cycle to gain additional insights and quality assurance of technical content in their areas of expertise.

Recommendation: Consider documenting a common set of defensible data quality objectives defining background radiation levels, including fallout for all media at the INL Site, that can be used by all contractors for standardized evaluation and interpretation of laboratory-reported results being published in the ASER.

Quality assurance of laboratory analyses and data reporting is adequate but could be improved further with enhanced laboratory oversight and accountability. The MAPEP, administered by the DOE RESL, on behalf of HSS, is an excellent tool to evaluate whether a contracted laboratory has the capability and resources to perform accurate radiological analysis of environmental samples containing known quantities of radioactivity. All laboratories used by INL Site contractors participate in the Department's corporate proficiency testing (PT) program. However, because PT is performed semi-annually for certain analytes within particular matrices (i.e., soil, water, vegetation, and air filters) it cannot be completely relied upon to ensure the validity and reliability of analytical environmental data. This PT weakness was discovered because laboratories participating in the MAPEP have unknowingly been sent double blind spiked and/or blank samples and, in some cases, have failed to report accurate analytical PT results.

While some contractors are using double blind samples to provide for continuing quality assurance of laboratory data, the approach is inconsistent and is not implemented by all contractors. The 2008 ASER section on quality assurance discusses the use of MAPEP-qualified laboratories but does not discuss the use and importance of double blind sampling by INL Site contractors. Various reported data anomalies and inconsistencies in the 2008 ASER call into question laboratory reporting and analysis capabilities for some media and nuclides. For example, reporting of positive U-234 results with corresponding non-detects for U-238 by the same laboratory does not appear reasonable given that both uranium isotopes should be present naturally in measurable quantity. Similarly, I-131 is shown as a positive detection at an offsite background location, which would be highly unlikely for a short half life radioisotope not present naturally. It should be noted that the MAPEP process does not evaluate laboratory capability for the analyte, radioiodine.

Recommendation: As part of the technical basis document development, consider establishing minimum standards that include double blind sampling by all contractors to complement the MAPEP process in the overall quality assurance program for environmental monitoring.

4.3 Media-Specific Perspectives and Recommendations

4.3.1 Air Monitoring

The review of air monitoring focused on sampling for environmental surveillance of air being conducted, pursuant to DOE Order 5400.5 and DOE Order 450.1A, as a means of detecting changes in ambient air concentrations attributable to operations at the INL Site. This review did not evaluate the compliance-based effluent air monitoring conducted by some INL Site facilities, as required by the Clean Air Act under 40 CFR 61. All three contractors perform low volume air sampling at predefined locations to measure ambient air concentrations in the environment.

The locations and/or types of some ambient air monitoring stations may not be representative of the best-suited locations for detecting air releases from current operations. In some cases, placement of sampling heads is not consistent with *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE/EH-0173T) that calls for placement in downwind areas unaffected by vehicular traffic and other environmental factors (i.e., building wake) that could affect the ability to properly detect radioactivity. At the Materials and Fuels Complex (MFC), for example, the only sampler is located directly in the flow of vehicular and bus traffic in the parking lot, which is also upwind of the prevailing wind direction. At the Advanced Test Reactor (ATR) Complex, one of the most significant potential release points is a fugitive emission source, the recently constructed evaporation pond. However, the two existing ambient air monitors at ATR Complex were in place prior to construction of the pond and are not ideally situated downwind of the pond, which would be the best location for reliably detecting and quantifying the magnitude of fugitive emissions. Since the pond is considered a diffuse rather than point source, releases can be estimated via calculations, and there are no Federal requirements for effluent monitoring as with a point source (i.e., stack). Also, all ambient air sampling being performed at the site is considered low volume sampling. There are no high volume samplers being run for comparison and that may have better capability to detect contaminants during adverse meteorological conditions, such as high winds.

Recommendation: For the INL contractor, consider enhancing the current ambient air monitoring around the most significant potential release sources at the INL Site by moving and/or adding low volume samplers complemented by several high volume samplers in the prevalent downwind direction from these sources (i.e., MFC, ATR stack and evaporation pond, transuranic waste retrieval).

Recommendation: For the ESER contractor, consider comparing data from high volume air sampling being performed at the same locations by other entities (State of Idaho, etc) to existing low volume sampling results.

Other than one background location, there is no ambient air monitoring performed in Idaho Falls to detect potential impacts from the INL Research Center (IRC) and related facility operations. Several contractors operate a background air monitoring station situated near the Idaho Falls airport. While the potential for significant emissions from Idaho Falls INL operations is low, there is a potential for radionuclide air releases from various locations and IRC stacks and other Research and Education Campus facilities. This situation is clearly documented in the site Environmental Monitoring Plan and related documents. The impending move of RESL and other radiological operations to Idaho Falls may marginally increase the magnitude of air emissions. Based on the existing and future continued potential for radionuclide air releases, the basis for the lack of any ambient air monitoring near potential sources within Idaho Falls is not well defined.

Recommendation: Consider adding ambient air monitoring station(s) for source characterization downwind of radionuclide operations being conducted in Idaho Falls. Alternatively, ensure a well-defined technical basis is established to support the lack of any ambient air sampling.

4.3.2 Liquid Effluent Monitoring

The INL Site contractor performs most of the liquid effluent sampling, the requirements of which are defined in State and local wastewater discharge or reuse permits. Composite samplers are used to collect representative samples at effluent discharge points and analyzed for parameters defined in the discharge permits. With one exception noted below, liquid effluent sampling protocols adequately characterize potential impacts to wastewater collection systems.

Permit-driven requirements for liquid effluent sampling are rigorously followed; however, these requirements alone do not always ensure sufficient sampling or analysis of radionuclides as needed to demonstrate compliance with DOE Order 5400.5 requirements for radionuclide concentrations in liquid effluent. Although radionuclides are used in various locations in the IRC, the INL contractor performs no radionuclide sampling of liquid effluent as a means of demonstrating compliance with liquid effluent DCG limits defined in DOE Order 5400.5. Wastewater discharge permits for IRC do not currently require the sampling of radionuclides. The ability to demonstrate compliance with the provisions of DOE Order 5400.5 can only be achieved through sampling and/or radionuclide quantity limits low enough to ensure the DCGs cannot be exceeded based on concentration calculations using average facility-specific discharge volumes.

Recommendation: Consider addressing these factors in technical basis documentation for liquid effluent environmental monitoring, and include requirements for radionuclide sampling or calculational methodology that is sufficient to characterize the potential liquid effluent radionuclide concentrations and demonstrate that they are consistent with DOE Order 5400.5 criteria.

4.3.3 Soil Monitoring

Soils are sampled by each of the three contractors to detect trends and determine whether long-term deposition of airborne materials from the INL Site have resulted in any buildup of radionuclides. The following concerns were identified with respect to the current soil sampling activities at the INL Site.

Soil sampling approaches and level of rigor vary between contractors, making comparison of results and ASER interpretation of impacts difficult. Both the ESER and ICP contractor perform traditional soil sampling and report results for various isotopes of interest and concern. Additionally, the LTEM 10-04 program conducts traditional soil sampling, which is comparable but currently not reported in the ASER. However, the INL contractor relies on an in-situ gamma spectroscopy system, which offers the ability to cover much more territory than traditional sampling, but is not capable of detecting some radionuclides of interest being measured by other contractors. In addition, the INL contractor is only currently reporting data for Cs-137. The basis and suitability of this approach for detecting impacts and trends from all site sources and radionuclides are not documented (see Section 4.2 under technical basis discussion). In addition, internal program requirements for soil sampling are not being rigorously followed. For example, PLN-8550 requires that isotopes other than Cs-137 be sampled and reported and requires follow-up investigation and additional sampling if Cs-137 results exceed three times the background levels. While these criteria were exceeded in 2008 sampling, no additional sampling or reporting was performed. Furthermore, the rationale for selection of sampling locations is not well documented (see Section 4.2) and, in some cases, provides no basis for comparison of other media sampled.

Recommendation: Consider collection of some fraction of soil samples concurrently with other media, such as air, to provide comparable results.

Recommendation: Consider formal coordination of sampling protocols and reporting between contractors, including additional information sources (i.e., LTEM) as appropriate.

Recommendation: Consider increasing the level of rigor in performing required soil sampling and reporting consistent with institutional requirements.

4.3.4 Agricultural Products and Game Animals Monitoring

The Independent Oversight assessment of agricultural products and game animals focused on determining whether a monitoring program was in place for evaluating the potential dose to the public through the consumption of these items and if INL Site operations are contributing to this dose, based on the guidelines found in DOE/EH-0173T. It did not evaluate the compliance status of the monitoring results. The ESER contractor is mainly responsible for sampling agricultural products and game animals.

Some products in the food chain are not being fully sampled to assess potential impacts from INL Site operations. Pathway analysis at the INL Site has been ongoing since the 1950s; however, sampling of some biota has decreased over the years, and the current sampling (i.e., wheat, potatoes) is based largely on stakeholder interest. Alfalfa is a medium that is not currently being sampled and is a potential dose pathway for local livestock, as well as livestock in other areas of the country, that consume this forage. Additionally, forage source data are not being collected in conjunction with milk sampling to determine whether dairy cows are eating forage grown locally (i.e., potentially impacted by INL Site operations) or forage brought in from other regions. A questionnaire was completed by local farmers in 2002 in an attempt to identify local sources; however, changes that have taken place in the farming community have not been captured through any update to the questionnaire. Also, a large portion of the INL Site contains cattle and sheep grazing allotments managed by the Bureau of Land Management. Forage at these locations is not routinely sampled, either statistically or from within the known isopleths (wind rose data) in downwind areas potentially impacted from deposition or redistribution of contaminants.

Although ESER monthly reports state that there is routine harvesting of game animals that have foraged on the INL Site, sampling of game animals is limited primarily to animals killed accidentally onsite. Livestock grazing on INL Site used to be sampled for radiological analysis, but this has not occurred for several years.

Recommendation: Consider sampling locally grown alfalfa offsite and native vegetation in grazing allotments or concentrated big game foraging areas onsite from areas with the highest potential to be impacted based on known isopleths and wind rose data. Ensure data are collected on usage.

Recommendation: Consider sampling big game animals that are killed onsite by hunters and livestock that have foraged in areas with the highest potential to be impacted by INL Site operations.

Control samples for agricultural and food chain products may not be sufficient to determine whether any impacts are from INL Site activities or from other causes. Currently, control samples for many media are not being sampled, or, in the case of milk, the control sample is water from a deep well. Using well water may not be a valid comparison, per DOE/EH-0173T, to determine whether any radiation detected is from world-wide fallout, because fallout most likely would not make it into the

aquifer. To determine whether any radiation detected in any media is from INL Site operations or due to other causes, such as world-wide fallout, control samples from other states or regions for each media would need to be collected and analyzed. Results from these samples would need to be compared with samples collected from areas likely to be impacted by INL Site operations to defensibly determine whether impacts are due to INL Site operations or not. DOE/EH-0173T suggests using a commercially available sample of known origin if applicable.

Recommendation: Consider adopting procedures that ensure control samples for each media are from other states or regions that would not be impacted by INL Site operations.

4.3.5 Biota Dose and Ecological Surveillance

The review of the biota dose and ecological surveillance programs was conducted to determine if these programs were sufficient to evaluate the dose to biota and minimize the impact of INL Site operations on the flora and fauna on the INL Site. This review did not evaluate the results of these programs for compliance with regulatory limits.

The biota dose assessment could be optimized, and a list of important species occurring on the INL Site is incomplete. The biota dose assessment program follows the DOE guidelines. Data from the MFC Industrial Waste Pond are being used for the aquatic evaluation; however, data from the ATR pond are likely to have higher concentrations of radionuclides than the MFC Pond and may result in a more conservative dose assessment. Also, waterfowl and other species, such as sage grouse, small mammals, and big game animals, have been sampled in the past. The current list of sensitive species at the INL Site is limited to the U.S. Fish and Wildlife Service list and does not consider other sources, such as the Natural Heritage At-Risk Species list or state protected/regulated species.

Recommendation: Consider using data from the ATR pond instead of MFC pond for the aquatic evaluation in the biota dose assessment. Calculate the dose to waterfowl, sage grouse, small mammals (historic dose exceeds 0.1 rad/day), and big game with data already collected to determine if the value of 0.1 rad/day is being exceeded and include in the biota dose assessment. Continue to pursue using the revised vegetation map with current soil sampling results, including data from LTEM 10-04, to update evaluation areas.

Recommendation: Consider formulating a new list of important or sensitive and protected/regulated species using data from the Natural Heritage At-Risk Species list or state protected/regulated species, including invertebrates and bats. Consider including this list in the ASER, and look for these species during National Environmental Policy Act surveys to demonstrate to stakeholders that important species that occur on the INL Site are being protected.

5

Federal and State Agency Items

Due to the breadth of environmental surveillance and monitoring programs at the INL Site, a number of agencies and stakeholders have been involved with these programs for many years. These include the US Geological Survey, which has been providing groundwater monitoring and support since the site's inception; the National Oceanic and Atmospheric Administration, which performs meteorological monitoring and modeling to support environmental monitoring and emergency management activities; the IDFG, which provides support for managing wildlife resources on the INL Site; and the State of Idaho INL Oversight Program, which conducts independent surveillance and monitoring activities on the site.

The Independent Oversight team met with several of these agencies to discuss their interaction with the site, their expectations for how the site reports environmental monitoring results, and whether their expectations were being met. While the Independent Oversight team and DOE-ID personnel met with each agency without the contractors present to discuss concerns and expectations, the team also had the opportunity to observe the interaction between the agencies and contractor surveillance and monitoring personnel during the bimonthly MSC meeting. Site contractors were also queried on their interaction with these agencies and any concerns they may be having with these interactions.

5.1 Agency Perspectives

The agencies reported that they had excellent working relationships with the site. Personnel from these agencies stated that they received good support during sampling activities. For example, site personnel provided the portable generator used to power the sampling equipment used by each agency. These personnel also reported that they were provided site access training and were allowed reasonable access for performing their independent surveillance and monitoring activities. The site contractors also confirmed an effective working relationship with the agencies.

Agency personnel were aware that sampling results are included in the ASER. However, because of their direct involvement in monitoring activities, they do not rely on ASER reporting to review and compare site results. Instead, they receive monitoring data through required regulatory reporting and are often provided with contractor monitoring data on an ongoing basis.

The State of Idaho INL Oversight Program issues bi-monthly (technical) and annual (public) reports on monitoring results; these results are not reported in the ASER. There is, however, a reference and internet link to these Oversight Program monitoring reports in the ASER. The goal for this Oversight Program is to selectively sample 10-15% of the sampling performed by the site contractors. Results

from this independent sampling are not compared with site monitoring on a regular basis unless there is an unexpected result. The data are compared annually and a variation of less than 20% is considered acceptable. The State Oversight Program expressed a concern that sampling groundwater wells for tracking tritium going off the INL Site may not be identified and included for continued funding for the long-term monitoring as cleanup actions are completed and restoration funding ends. The State Oversight Program questioned DOE regarding how required monitoring would continue as facilities transition from the cleanup program to the M&O contractor.

IDFG interfaces with DOE-ID and its contractors to manage the wildlife resources on the INL Site. The IDFG provides scientific collection permits to DOE-ID and its contractors to conduct wildlife surveys. The ESER contractor then conducts wildlife surveys and makes this data available to IDFG. This working arrangement greatly benefits IDFG by providing good quality data without having to expend resources to conduct the wildlife surveys. IDFG is also contacted for other wildlife issues on the INL Site, such as dealing with problem wildlife (e.g., mountain lion in a facility).

During the bimonthly MSC meeting, those in attendance are queried to determine whether they have had sampling results that exceed normal historical range. Several environmental monitoring assessment review team members attended the March 2010 meeting. This meeting was rescheduled from its normal time and several standing members were not in attendance; however, discussions during this meeting indicated that several standing members do not routinely attend the bi-monthly meeting. Meeting minutes from the January 2010 meeting were presented and discussed, including a discussion about the reasons sampling results from one contractor varied from previous years.

5.2 Independent Oversight Perspectives and Recommendations

The meetings and discussions with the agencies revealed that there is effective communication between INL Site contractors and these agencies, resulting in good working relationships between the site and outside agencies. These relationships provide a means to obtain peer review and input on needed improvements and potential concerns. The discussions also revealed a level of trust between the agencies and site personnel involved in surveillance and monitoring. The minutes from the last MSC meeting indicate that variations in expected monitoring results were discussed. At the March meeting, crosscutting items of interest and future actions, such as the requirements for the next ASER, as well as sampling results outside expected norms, were discussed.

Not having full attendance at the MSC inhibits communication across agencies and contractors. Although the minutes convey major items, there are discussions where only those in attendance would be able to ask a question on a specific interest item or make a request for more information. For example, while discussing wells, attendees learned that there is a list showing organizational leads for maintaining specific wells. As a result, several in attendance requested the list so that they would be able to notify the appropriate organization when a well they needed to sample was in need of repair.

Recommendation: Consider listing the attendees in the MSC minutes and sending an invitation to non-attending standing members and their managers to remind them about the importance of the MSC.

DOE-ID has not adequately explained to stakeholders how long-term monitoring will continue after cleanup is completed. To ensure continued good relations, any concerns expressed by outside

agencies need to be evaluated and addressed, and any identified program gaps that require additional management attention need to be addressed to ensure a sustainable surveillance and monitoring program. The State of Idaho INL Oversight Program expressed concern with transition of monitoring from the cleanup program to the laboratory when cleanup is completed, what will happen to funding associated with monitoring cleaned-up sites, and how DOE-ID will meet requirements for long-term monitoring. The Life Cycle Baseline developed by the ICP contractor contains a requirement for developing a transition process plan to transition between ICP and the M&O contractor. However, while some transitions are already taking place (e.g., Test Area North, buildings at the Idaho National Technology and Engineering Center), current agreements and/or plans between NE and EM on such transitions do not address long-term monitoring. Contamination below the cleanup standard will still be present, and the plan for how the long-term monitoring for this remaining contamination will be managed has not been defined.

Recommendation: Consider developing and implementing a transition plan for continuing the monitoring at locations where cleanup activities have been completed. This plan should also address the continued sitewide monitoring currently being managed as part of the restoration program. This plan could be incorporated into the technical basis for the overall sitewide monitoring program and included in the sitewide Environmental Monitoring Plan. Ensure actions taken to address concerns expressed by stakeholders are communicated to these outside agencies.

6

INL Contractor Self-Assessments

BEA has developed guidance for conducting management assessments. This guidance, LWP-13750, *Performing Management Assessments*, is being used by BEA's Environmental Support and Services to evaluate environmental monitoring program effectiveness.

The Independent Oversight team reviewed the last two assessment activities performed by Environmental Support and Services and compared the concerns identified by these assessments to the concerns from this Independent Assessment of Environmental Monitoring in order to develop recommendations for improving the effectiveness of management assessments. The first assessment, INL Air Monitoring Assessment, was conducted in 2007. For the second assessment, Independent Audit Implementation of Monitoring Program, field observations had been completed and the draft report was under review at the time of this Independent Oversight assessment. To prevent a possible perception that these assessment results influenced the Independent Oversight team, a copy of the draft report was not provided until the Independent Assessment had completed data collection and areas of concern had been identified.

6.1 BEA Environmental Monitoring Assessments

The 2007 INL Air Monitoring Assessment resulted in seven improvement and/or cost saving observations and two positive observations. This 2007 INL assessment found that the ambient air monitoring program was effectively meeting DOE regulatory requirements. Corrective actions were developed and documented for five improvement items; two were dispositioned without corrective action based on a technical justification.

As stated, for the second reviewed assessment, Independent Audit Implementation of Monitoring Program, BEA had completed the data collection phase of a management assessment of environmental monitoring and the report was being validated and reviewed by BEA management. Although still in draft, the overall conclusion in the report was that the monitoring services program is effective, listing eight issues and 68 observations (62 negative and 6 positive). The assessment was led by the BEA Regulatory and Monitoring Services Manager and included members from an environmental peer organization, a mentor for assessments, and a manager from the organization being assessed. The BEA assessment took a number of months because team members were responsible for completing their normal work assignments in addition to the assessment, which involved document review as well as an appropriate strategy to observe field sampling events. As an improvement item, timely issuance of assessment reports should receive additional emphasis to ensure that timely information is provided those being assessed, while they are still focused on the assessment process and results.

6.2 Independent Oversight Perspectives and Recommendations

The 2007 BEA self-assessment focused on compliance of the air monitoring program with requirements outlined in DOE Order 5400.5 and 450.1A and Environmental Regulatory Guide DOE/EH-0173T. The self-assessment concluded that the ambient air monitoring program was effective in meeting these requirements. Although action was taken to resolve most improvement observations, two items were closed without any corrective action. For example, the recommendation to update the 1993 exposure pathway was considered to be a low priority based on an expectation that the pathways were unlikely to have changed, without confirming this expectation. Overall, this BEA self-assessment focused principally on compliance aspects and therefore did not evaluate the effectiveness of air monitoring system design and basis to the same extent as this Independent Oversight assessment.

The Independent Audit Implementation of Monitoring Program had an extensive breadth and scope, and included review of most environmental surveillance and monitoring programs being conducted by Environmental Support and Services. The exceptions were biota, event, and asbestos monitoring. The assessment identified numerous concerns with the suite of documents that set forth the requirements for environmental monitoring. As discussed in the BEA draft report and confirmed by this Independent Assessment, corrective actions were in process to update these documents.

The two BEA assessments determined that overall environmental monitoring programs conducted by Environmental Support and Services were effective. Although this Independent Oversight assessment does not disagree with BEA's overall determination, additional concerns identified in this HSS assessment were not addressed in either of the recent BEA self-assessments. The following observation may need additional management attention to ensure the continued effectiveness of the assessment programs for environmental monitoring.

The BEA 2007 assessment and the ongoing Independent Audit Implementation of Monitoring Program focused on the mechanics of existing surveillance and monitoring programs, but did not address the design adequacy of these programs. As discussed in this Independent Oversight assessment under crosscutting weaknesses, the technical basis for environmental monitoring and surveillance activities is not well defined and documented. There were also concerns with the defensibility of the ASER and data quality.

Recommendation: Consider expanding the scope for the next environmental monitoring self-assessment to include the effectiveness in addressing concerns regarding the mechanics of the documented program, as identified by this Independent Oversight assessment. These concerns would include the adequacy of the technical basis, the adaptability of the monitoring program to changing operations, the defensibility of ASER data, and the supportability of data quality objectives.

Appendix A

Supplemental Information

A.1 Dates of Review

Planning Visit	March 9-11, 2010
Onsite Review Visit	March 22-26, 2010
Report Validation and Closeout	April 13-15, 2010

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
William Eckroade, Deputy Chief for Operations, Office of Health, Safety and Security
John Boulden, Acting Director, Office of Independent Oversight and Office of Enforcement
Thomas Staker, Director, Office of ES&H Evaluations

A.2.2 Quality Review Board

Bill Eckroade	John Boulden	Thomas Staker
Bill Miller	Mike Kilpatrick	George Armstrong

A.2.3 Assessment Team

Victor Crawford, Team Leader

Ross Natoli	Rajendra Sharma (NE)	Joe Lischinsky
Mario Vigliani	Derek Hall (NSTec)	

A.2.4 Administrative Support

Tom Davis
Mary Anne Sirk

