May 2000

SEMI-ANNUAL REPORT

October 1999 - March 2000

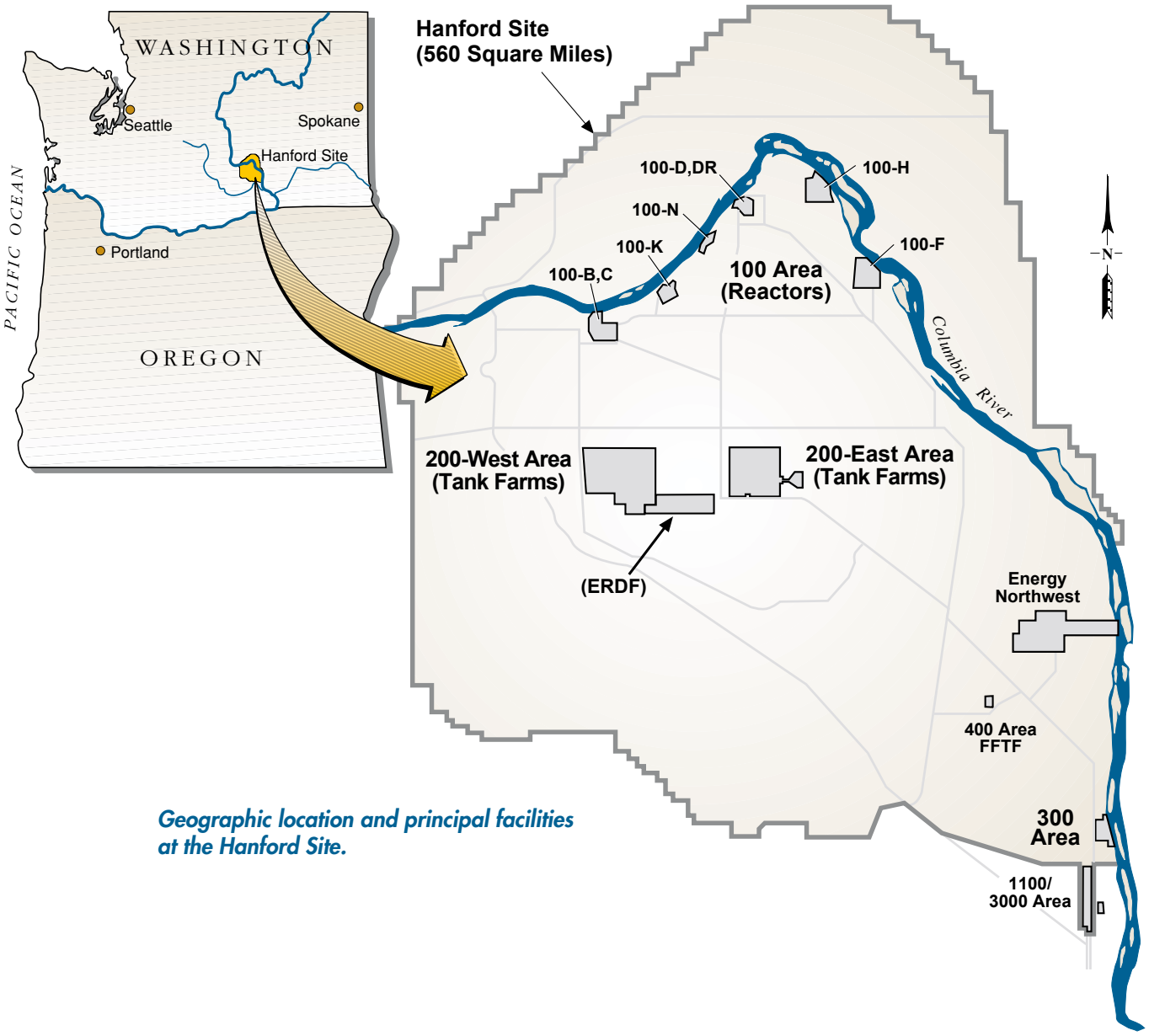
Hanford Site

Groundwater/Vadose Zone Integration Project

Understanding the past,
Defining the present,
Shaping the future.

U.S. Department of Energy
Richland Operations Office

Bechtel Hanford, Inc.
Environmental Restoration Contractor



Geographic location and principal facilities at the Hanford Site.

The Hanford Site is located in a large tract (approximately 560 square miles) of arid land in southeastern Washington. The Columbia River flows through the site, and eventually to the Pacific Ocean. The principal features and facilities of the Hanford Site are shown in the above figure. The arid climate and isolated character of the region made it a particularly attractive site for World War II plutonium production activities, which subsequently continued throughout the Cold War. These activities left a legacy of large volumes of wastes that include toxic chemicals and radioactive substances. Some of these wastes were intentionally (or otherwise) introduced to the vadose zone (the soil above the groundwater), the groundwater, and the Columbia River. The Hanford Site is now committed to an ambitious environmental cleanup mission.

CONTENTS

Section 1

HIGHLIGHTS

PROJECT PURPOSE

The Groundwater/Vadose Zone Integration Project (Integration Project) will inform and influence cleanup decisions by assessing the risks and effects of Hanford waste management and remediation activities upon the many users of the Columbia River. Integration and coordination of science and technology, modeling, monitoring, and ongoing characterization will form the basis for this approach. The Integration Project is committed to openness and technical excellence in all of its work.

This is the third semi-annual report prepared to inform DOE decision makers, stakeholders, the State of Oregon, Tribal Nations, and regulators (including EPA and Ecology) on the progress and findings of the Integration Project. This report covers the first half of fiscal year 2000: October 1, 1999, through March 31, 2000.

THE RIVER, THE PLATEAU, AND THE FUTURE

Over the past year, the Department of Energy (DOE) Richland Operations Office (RL) has been formulating an expansive vision for the future of the Hanford Site. The three elements of that vision are (1) to protect the Columbia River and its shoreline corridor; (2) complete the transition of the 200 Areas, on the Central Plateau, to long-term waste management; and (3) prepare the remainder of the site to contribute to the future welfare and well-being of all its neighbor communities. Keith Klein expressed his vision in these words: "As the Manager of the DOE-RL office, I have been presenting this vision to our staff, contractors, and stakeholders in the following terms":

> *We will restore the river corridor. We will transition the Central Plateau. And we will put Hanford assets to work on future problems of national and global significance.*

This vision captures the key goals that have guided the Integration Project through the two and a half years of its existence. In this semi-annual report to Congress, we will show how the work completed, in progress, and planned for the future contributes to realizing this challenging and hopeful vision for the Hanford Site.

SOMETHING OLD, SOMETHING NEW

Those who have read previous Integration Project reports to Congress will discover in this issue both familiar elements and some innovations, which—if they survive the test of audience approval—we expect to carry forward in subsequent issues.

The Integration Project can be functionally organized into six ***endeavors***, and these endeavors provide the framework for reporting broadly on significant events and accomplishments of the current reporting period (the first half of fiscal year 2000). New in this issue, however, are simple timelines for each endeavor, with key milestones shown for the reporting period and the next two periods.

The status of each endeavor is reported by reference to milestones achieved or missed during this period, with emphasis on (1) how the reported events affect future milestones; and (2) the role of each endeavor in supporting our three-point vision for the Hanford Site. In subsequent issues, any changes to milestones on the previous timeline for an endeavor will be noted, in addition to introducing the key milestones in the new "period after next."

The funding profile table that was used in the previous issue of the semi-annual report (February 2000) has been retained. It leads off and introduces the section of endeavor-by-endeavor status update reports.

The most noticeable change in this issue is a new section of ***feature stories***. While the status updates

convey the ***breadth*** of work performed by the Integration Project in a half-year period, the features are intended to give readers an ***in-depth*** look into the project's operational life. Each feature focuses on a significant event or achievement, an ongoing process, or perhaps a little-understood but illuminating cog in the vast and intricately interacting machinery of Hanford's past, present, and future. Common to all the features, though, will be the intent to tell an interesting story, as openly and truthfully as limited space allows, in a way that brings our audiences inside the work we do every day.

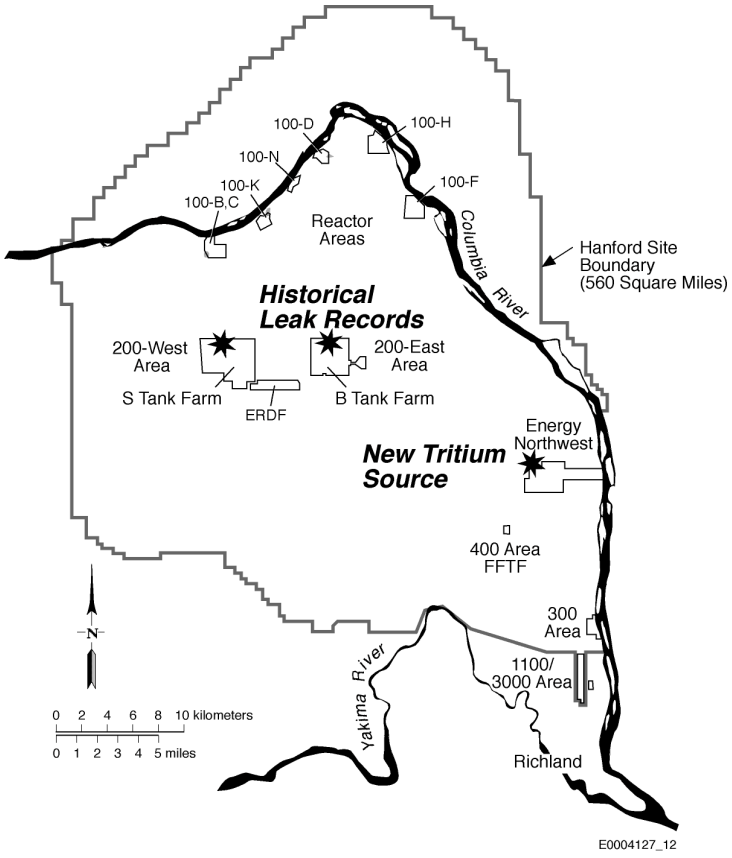
FEATURED IN THIS REPORT

High Tritium Level at Well 699-13-3A. The existence of a tritium plume in the groundwater beneath the Hanford Site has been known for years. In January and February of this year, however, the hot news story about Hanford was the unexpectedly high concentration of tritium found in a single groundwater monitoring well near an old waste burial ground. All other monitoring wells in that area consistently show much lower levels of tritium.

In "Well Beyond the Expected," we explore how the Integration Project staff worked with DOE, regulators, and other site contractors to respond to the most recent of Hanford's unpleasant environmental surprises.

Digging for Needed Information in Hanford's Archives. As the discovery of a new tritium source near Well 699-13-3A demonstrates, a pressing problem for many environmental cleanup decisions at the Hanford Site involves uncertainty about the inventory of contaminants leaked or disposed into the soil. Understanding the soil inventory is fundamental to answering important questions about contaminant movement in the subsurface. How much of what kinds of waste were released at various locations on the Central Plateau, and elsewhere, since nuclear material production began at the Hanford Site?

In "What's Past is Prologue," we visit with Dr. Tom Jones to learn how he and others use recently declassified production records as a valuable tool for reducing this uncertainty. Tom describes the process by which it was determined that a major spill in the BX Tank Farm involved uranium waste, not cesium (as previously thought). Also described is the convergence of soil inventory estimates for the S-SX Tank Farm.



ENDEAVOR HIGHLIGHTS

Fieldwork. The 200 Area Waste Site Assessment progressed from planning to action during this period, including completion of the first unit of waste site characterization in accordance with the implementation plan that was approved in April 1999.

In January, the Tank Farm Vadose Project, which is managed by the CH2M Hill Hanford Group, Inc. (CHG), collected the first cone penetrometer readings and soil samples from inside a Hanford

Site tank at the S Tank Farm. Spectral gamma logging helped bound the uncertainty in soil inventory estimates of gamma emitting radionuclides for the SX Tank Farm. To comply with requirements of the *Resource Conservation and Recovery Act* (RCRA), nine more groundwater monitoring wells became operational in this period.

System Assessment Capability (SAC). The design for the first version of the SAC (SAC Rev. 0) is complete, and software for this version of the SAC is being assembled. The SAC Work Group selected seven radionuclides and three chemical hazards as the prototype set of contaminants whose transport and fate through the vadose zone, groundwater, and Columbia River will be modeled in the SAC (Rev. 0) assessment.

Integration of Information. Hanford's wealth of data and information must be managed, integrated, and made to be easily accessible. Progress is being made on the Hanford Features, Events, and Processes (HFEP) database. Work began on implementing the HFEP and a site-wide Issues Management database using the Systems Level Automation Tool for Engineers (SLATE), which is a systems-engineering software package. The scope document for the Integration Project's Virtual Library was also completed in April.

Science and Technology (S&T). A meeting on Hanford S&T needs was held in November for principal investigators who receive support from the Environmental Management Science Program (EMSP). The EMSP is a DOE grants program for basic research. Materials from drilling cores taken from the Hanford Site are being distributed to EMSP investigators, and to other research scientists across the nation.

A January workshop on advanced technology for characterizing contaminants in the vadose zone provided the basis for planning field experiments on transport through the vadose zone. These experiments will be conducted later this year.

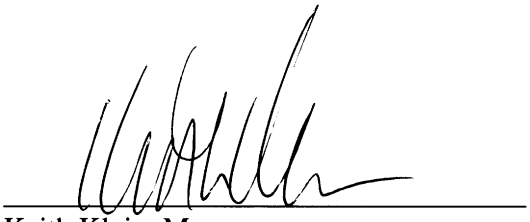
A report on estimates of the soil inventory of contaminants, using a mass-balance inventory approach, was delivered to the SAC team in February.

Technical Review and Public Involvement. An open meeting of the Integration Project Expert Panel (IPEP) in January gave stakeholders, the Tribal Nations, and regulators an opportunity to express their views on the Integration Project and the IPEP's role. The meeting culminated with a set of general recommendations from the IPEP to DOE and the Integration Project on how to improve both the Integration Project and the IPEP's role in overseeing the Integration Project's work.

The first meeting of a new National Academy of Sciences (NAS) study committee on environmental remediation S&T at Hanford was held in April.

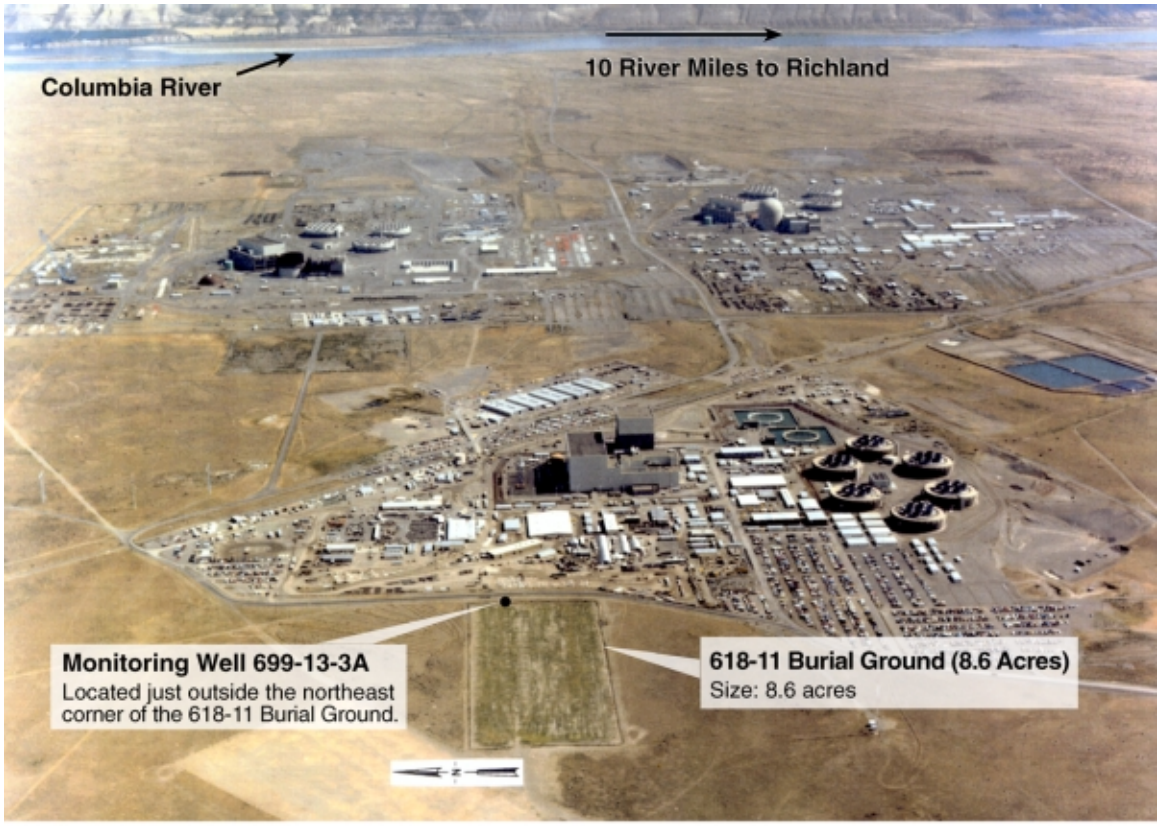
Bi-weekly Open Project Team Meetings were held throughout the reporting period, and the minutes of these meetings have been widely distributed to keep project participants informed of Integration Project progress and issues. The Hanford Advisory Board (HAB) and two of its subcommittees, Environmental Restoration (ER) and Public Involvement, met during this period. The Regulatory Path Forward Work Group is identifying a uniform set of requirements and clean-up standards for the 100 Area waste groups, with a final report scheduled for production in May.

Our semi-annual report, like the Integration Project itself, continues to be a work in progress as we seek ways to improve. If, as you read this experiment in better communication, you find things you like or do not like in how the report is structured, please let us know. The last page of the report tells you how to reach us.



Keith Klein, Manager
U.S. Department of Energy
Richland Operations Office

"WELL BEYOND THE EXPECTED: THE INTEGRATION PROJECT RESPONDS TO A NEW TRITIUM SOURCE"



MEET WELL 699-13-3A

Well 699-13-3A (for brevity, let's call it "Well 3A") extends 75 feet below the sage-dotted sands of the Hanford Site. It lies just west of the Energy Northwest fence (Energy Northwest produces electricity here, at the only operating nuclear power plant in the Pacific Northwest). The closest bank of the Columbia River is 3.6 miles to the east. Well 3A extends into an aquifer: a layer of saturated, porous sediments, through which groundwater moves slowly, east by southeast, toward the Columbia River. The city of Richland, Washington, which is 10 miles south and downstream, draws its water supply from the river.

Well 3A was drilled in August 1995 to monitor the groundwater near an old Hanford burial site for highly radioactive wastes. Based on records of what had been placed in Burial Ground 618-11 years ago, samples from Well 3A were initially tested for two types of radioactivity (gross alpha and beta), uranium, and toxic metals. For the first three years of its existence, the annual samples from Well 3A gave no indication that any of these ***contaminants of concern*** had escaped the burial ground and were moving toward the Columbia River.

DISCOVERING TRITIUM AT WELL 699-13-3A

By 1999, one of the critical issues for the Hanford Site was determining the shape, concentration, and movement of a tritium ***plume*** (a plume is the region of contaminated subsurface water spreading out from a source of contamination). The tritium plume beneath Hanford was known to have spread through the aquifer to the Columbia River, and a team of scientists from Hanford's

Section 2 – Well Beyond the Expected: The Integration Project Responds to a New Tritium Source

Site-Wide Groundwater Monitoring Program was looking for additional monitoring wells that could provide data on the tritium levels in the low-concentration portion of the plume, east of Hanford's 200 Area. The team decided that Well 3A could be useful for this purpose, and recommended that future samples from it be analyzed for tritium.

Tritium is a radioactive isotope of hydrogen. (The nucleus of a tritium atom contains two neutrons, which the common isotope of hydrogen lacks.) It can take the place of the hydrogen atoms in water, and this tritiated water moves through the Hanford subsurface like regular water. Tritium is therefore among the most mobile subsurface contaminants, spreading out from a contamination source at the same rate that water migrates from that source. Like other radionuclides, it decays over time. In the case of tritium, a beta particle is ejected from the nucleus, which becomes a stable helium nucleus. It takes 12.3 years for half of any given amount of tritium to decay into helium.

The beta particles emitted by tritium can be stopped by a piece of paper, or by the outer layer of human skin. But when tritium is ingested (typically, in drinking water), the beta radiation can damage cells. Because of these health risks, the U.S. Environmental Protection Agency (EPA) has set a maximum concentration limit for tritium of 20,000 picocuries per liter (pCi/L) of drinking water. (A curie is a standard amount of a radioactive substance; a picocurie is one-quadrillionth [10^{-12}]) of a curie. For comparison, the water in the Columbia River at the Priest Rapids Dam, upstream from the Hanford Site, had a tritium concentration of about 36 pCi/L in 1998, while the water at the Richland City pumphouse had around 76 pCi/L.

On January 25, 1999, a sample was drawn from Well 3A and sent for analysis. The assay for tritium found 1.8 million pCi/L. As the accompanying map of the Hanford tritium plume illustrates (see page 7), a reading this high is unexpected in that part of the plume. The tritium levels at the wells closest to Well 3A ranged from 230 to 100,000 pCi/L.

The anomalous nature of the tritium reading from Well 3A was not immediately recognized. In some parts of the 200 Areas, tritium readings above 2 million pCi/L are expected. ***It was the location of Well 3A that makes its tritium level stand out***. A formal critique of what happened during the routine review of all the data from the sampling during the first quarter of 1999 was reported at the Integration Project's Open Project Meeting on March 6, 2000. (Minutes of the meeting, which include the full report from the formal critique process, are available on the Internet at *http://www.bhi-erc.com/vadose/minutes.htm*.)

In December 1999, when the Well 3A tritium value was plotted on a new version of the plume map as part of the annual reporting on groundwater monitoring, it began to draw attention. By January 2000, regulators had recognized the Well 3A tritium level as an anomalously high value.

Sampling groundwater for tritium, upgradient of Well 3A, February 2000.

THE INTEGRATION PROJECT ROLE IN RESPONDING TO TRITIUM AT WELL 3A

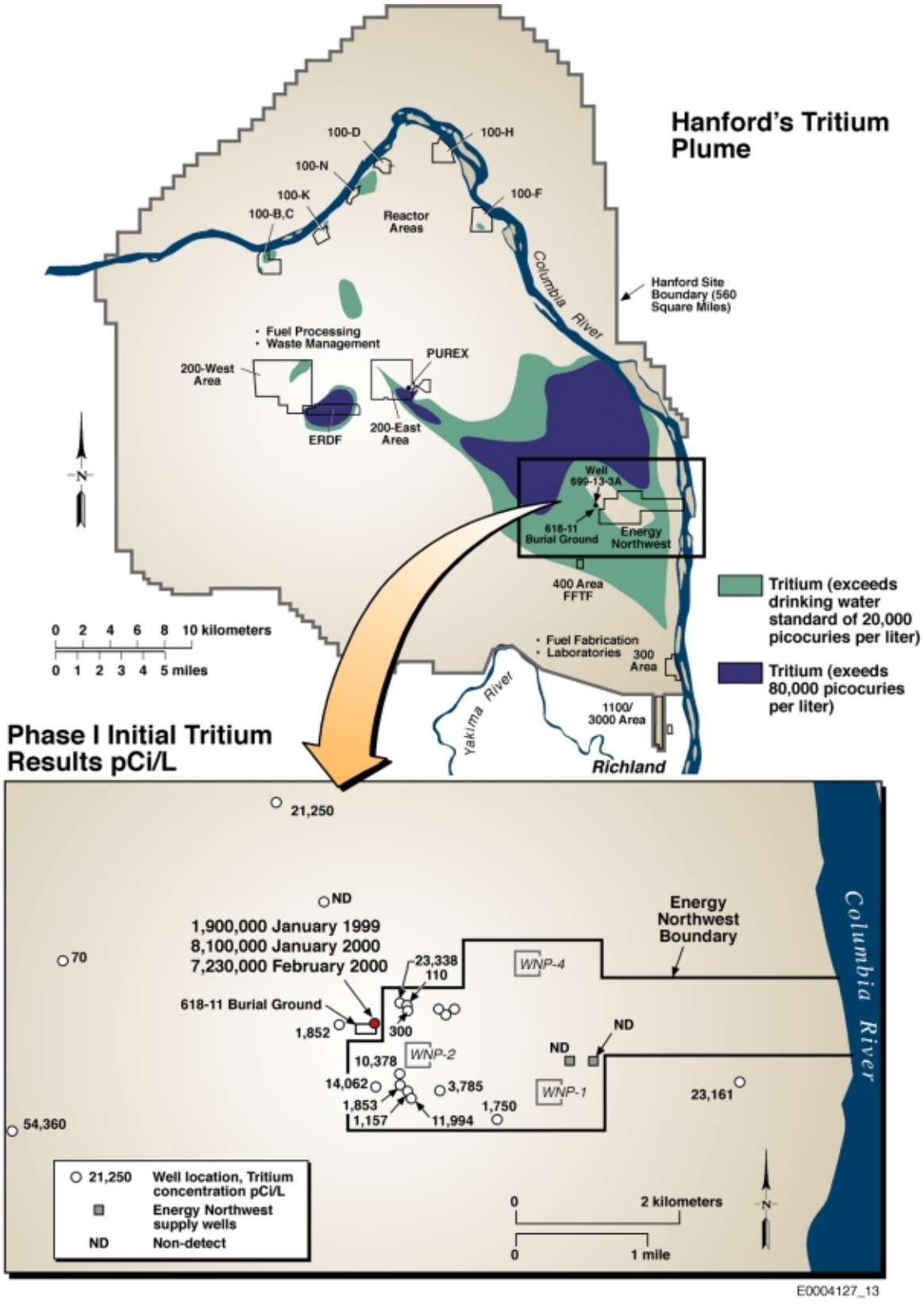
When the high tritium value was brought to light, the Integration Project responded quickly. A new sample was immediately taken from Well 3A. The preliminary screening of this new sample prior to shipping for analysis indicated a high level of beta radiation, potentially greater than 4 million pCi/L of tritium. A reanalysis of the sample taken the previous year confirmed the 1.8 million pCi/L value. Communication to the public about the high level of tritium at Well 3A began on February 1. On February 2, the laboratory analysis reported 8.14 million pCi/L of tritium in the new sample.

On February 3-4, staff from the Integration Project, DOE-RL, regulators (Washington State Departments of Ecology [Ecology] and Health [WSDOH], and the EPA), as well as others, met to develop a plan for further sampling at Well 3A and 22 other wells around it. "The teamwork was phenomenal, and resulted in quick action in the field," commented Jane Borghese, a groundwater specialist for the Integration Project.

This Phase I sampling plan would check the results for Well 3A and begin the task of determining how far the newly discovered region of high tritium concentrations extended. All of the samples were collected by February 15. The tritium analyses showed only Well 3A, with a value of 7.23 million pCi/L for this third sample, had an anomalously higher tritium level than expected from the previously estimated tritium plume.

Phase II of the response to the high level of tritium at Well 3A is still underway. This phase includes vertical sampling of the groundwater in selected wells around the burial ground, to determine the vertical extent of the contamination in the aquifer. Points around the burial ground will have soil gas monitors installed, which can aid in finding how far horizontally from Well 3A this plume of tritium extends (the areal extent of the plume).

Additional groundwater samples will be taken, based on the results from the vertical sampling and the soil gas monitoring. Additional data collection, as part of Phase II, will help determine the source of the high tritium. With this information, the DOE, state and federal regulators, stakeholders, and the Hanford projects will gain a sufficient understanding of the steps we need to take to deal with the contamination source.


Hanford's Tritium Plume
100-D
100-H
100-N
100-K
100-B,C
100-F
Reactor Areas
Columbia River
Hanford Site Boundary (560 Square Miles)
• Fuel Processing
• Waste Management
PUREX
200-West Area
200-East Area
ERDF
Well 699-13-3A
618-11 Burial Ground
Energy Northwest
400 Area FFTF
• Fuel Fabrication
• Laboratories
300 Area
1100/ 3000 Area
Yakima River
Richland
N
0 2 4 6 8 10 kilometers
0 1 2 3 4 5 miles
Tritium (exceeds drinking water standard of 20,000 picocuries per liter)
Tritium (exeeds 80,000 picocuries per liter)
Phase I Initial Tritium Results pCi/L
21,250
ND
1,900,000 January 1999
8,100,000 January 2000
7,230,000 February 2000
70
618-11 Burial Ground
23,338
110
1,852
300
WNP-4
WNP-2
WNP-1
Energy Northwest Boundary
ND
ND
10,378
14,062
3,785
1,853
1,157
11,994
1,750
23,161
54,360
Columbia River
21,250 Well location, Tritium concentration pCi/L
Energy Northwest supply wells
ND Non-detect
0 2 kilometers
0 1 mile
N
E0004127_13

"WHAT'S PAST IS PROLOGUE: MINING HANFORD'S OLD RECORDS ON LEAKS AND RELEASES"

. . . what's past is prologue; what to come,
In yours and my discharge

The Tempest, Act II, Scene 1

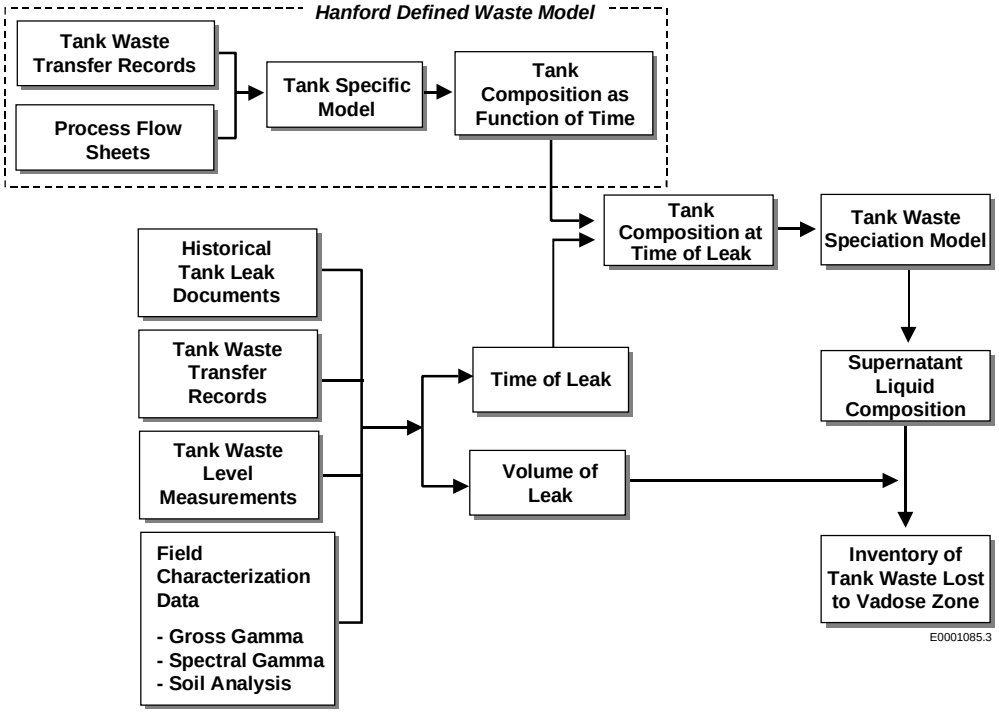
Robert Yasek, who is the DOE Office of River Protection (ORP) Tank Farm Vadose Zone Manager, has said, "Gathering all existing information about Hanford's past operations is critical to gain a clearer picture of Hanford's groundwater and soil contamination today."

Within the Tank Farm Vadose Zone Characterization Project, a multidisciplinary team searches old records from Hanford's past for clues in constructing a ***useful*** picture of the wastes that leaked from a number of the single-shell tanks (SSTs) into the surrounding soil. Many of these records were originally classified as secret, and have only recently been declassified. The team combines the information mined from these newly available Hanford documents with data from other sources to make the picture of the contaminant inventory of the soils in (and under) each tank farm more accurate and reliable.

Leading this team is Dr. Tom Jones, of CHG. Tom stresses that the soil inventory picture need not be perfect. However, it must be good enough to help make sound decisions about near-term waste retrieval from the single-shell tanks, and to limit the uncertainties in project-specific and site-wide models of contaminant release and movement toward the Columbia River. In Tom's words, the picture needs to give a reliable ***engineering estimate***.

Tom's work is far more complicated than just sifting through dusty records for information on past spills and leaks during tank farm operations. The flow chart below shows how historical tank leak documents feed into the team's reconstruction of the volume and duration of a leak. The time of the leak is critical, because the

Getting Convergence on Tank Waste Soil Inventory Estimates



composition of each tank has changed with time, as different wastes were added and the wastes underwent chemical and physical changes. The tank waste transfer records shown in the chart provide the historical records of waste transfers to the tanks. These are compiled in an official DOE document: *Waste Status and Transaction Summary* (1). The waste transfer records, along with details of the composition of different process waste streams, which are available from process flow sheets for all Hanford operations, provide input to a computer model of the composition of a tank at any given time since it began receiving wastes. Tom knows this Hanford Defined Waste (HDW) Model (see reference 2) very well, because he was previously on the team that used the HDW Model to make engineering estimates for the inventory ***inside*** each tank.

Tom's current assignment—estimating the inventory ***outside*** the tanks from spills and leaks—is complicated because of the nature of the problem, which involves dealing with unplanned releases to the environment. The official compilation of single-shell tank (SST) leak information is available in the monthly *Waste Tank Summary Report* (3), which provides a starting point for developing leak inventory estimates. For each tank suspected of having leaked in a farm being studied, the team reconstructs a history of when leaks or spills occurred, and a best estimate of the volumes released.

To test their reconstruction of how much tank waste leaked, and what was in a leak, the team often turns to data from field characterization of the tank farm soil. These data include results from older gross gamma logging, the more recent data from spectral gamma logging, and analyses of soil samples. In effect, the team checks whether the leak history is consistent with the limited information about what is (or was) present in the soil at the time and location represented by the field data.

Of course, if the field characterization data alone provided a complete and sufficiently precise picture of the soil inventory, then reconstructing a tank farm's leak history would be unnecessary. But even the new spectral gamma logging technology only gives information on gamma-emitting radionuclides within about 18 inches of the probe when a measurement is made. Soil analyses only provide data on the location from which the sample was taken.

In the porous subsurface layers of the Hanford vadose zone, the degree of uniformity in the distribution of contaminants is always an open question. Significant assumptions must be made to extrapolate from these point-like measures of contamination to the contaminant inventory and distribution present in the presumed plume. Tom's team looks for convergences or disparities between the soil inventory (based on tank leak histories), and the amounts of contaminants estimated by projecting the shape and concentration contours of plumes, based on the field data.

A good example of convergence among these estimates from different directions occurs in the soil inventory estimates for the S and SX Tank Farms. In a report now being prepared for release, estimates are provided for the cesium-137 inventory through two different methods, based on gamma-ray logging data (one using the old gross gamma data; one using the more recent spectral gamma data).

Sometimes, the careful cross-checking by the team uncovers a significant disparity. For example, late last year the team was working on the subsurface conditions model for the B-BX-BY Tank Farms. The team prepared this model for a farm before doing the actual soil inventory estimate on a tank-by-tank basis. They noted that the spectral gamma logging for Tank BX-102 indicated a significant amount of uranium contamination, but little cesium. The official tank leak history recorded BX-102 as having a large spill of cesium-containing waste. In a 1951 report that was declassified only in 1992, the team found that the spill of 91,600 gallons consisted of uranium-containing waste. Based on the waste stream composition, this one spill released 22.5 tons of

depleted uranium to the soil column under BX-102. The tank leak information included in the monthly *Waste Tank Summary Report* will be updated as a better understanding of leak events is developed.

Whether the results of their work confirm previously accepted assumptions about tank leaks and spills, or force corrections to the official history, the true value of the team's work lies in firming up the foundation for future actions. Decisions on retrieving the remaining wastes in the single-shell tanks, and on how to proceed with tank farm cleanup and closure, will draw on the tank-by-tank leak histories and release estimates reported by Tom's team. Their detailed comparisons of soil inventory estimates for individual tanks and entire tank farms will feed into the conceptual models for inventory and release on which long-term assessments of Hanford's future will depend. In this way, the past is important as the prologue for decisions yet to be made, and those decisions will influence the future "yet to come."

Section 4

INTEGRATION PROJECT STATUS UPDATE

PROJECT OVERVIEW AND BUDGET

The Integration Project Endeavors and Core Projects

The activities specifically funded and managed by the Integration Project (as shown in the budget summary table on page 12), totaling $11.32 million for fiscal year 2000, represent only about ***4%*** of the total DOE budgets for the Richland Office and the Office of River Protection. In addition, the funding for the Integration Project is one-third of the amount the DOE invests each year in the field projects for sampling and analysis or groundwater remediation. These field projects—some of which are overseen by the Richland Office, while others are overseen by the Office of River Protection—form the ***core*** cleanup, characterization, and restoration/monitoring activities that have direct consequences for the Hanford Site's vadose zone and groundwater.

The core projects predate the Integration Project, which was initiated in late 1997 to integrate and coordinate their work and ensure that sufficient attention is paid to site-wide objectives and requirements beyond the scope of any single project. The overarching goals that guide the Integration Project are to protect the Columbia River and the shoreline corridor, transition the Central Plateau for long-term waste management (after the rest of the Hanford Site is cleaned up), and prepare most of the site for eventual return to appropriate and safe civilian uses.

The scope of the Integration Project thus includes integral involvement with the core fieldwork projects, as well as activities that are best performed on a site-wide basis. The total scope of the Integration Project can be understood in terms of six ***endeavors***:

- Fieldwork (with emphasis on coordinating and integrating the work performed by the core projects)
- Integration of information
- System Assessment Capability (SAC)
- Science and technology (S&T)
- Technical review
- Public involvement.

The status reports in the remainder of this section are organized according to these endeavors.

Integration Project Resources: Past, Present, and Future

The project budget summary (see page 12) shows the FY 1999 and FY 2000 funding for the six Integration Project endeavors. Budgets for the core projects are listed under the Fieldwork endeavor. The FY 2001 budget for the Integration Project and core projects, which was developed for DOE guidance, is also shown.

There were two significant and substantive changes in the Integration Project budget from FY 1999 to FY 2000. During this time, the SAC and S&T endeavors progressed from planning to project development, and the major increases in their budgets reflect this progress. For example, in FY1999, developing the S&T Roadmap was a major activity (additionally, some S&T projects got an early start). For FY 2000, the S&T endeavor is focused on projects that characterize the soil inventory of contaminants, and the transport and fate of these contaminants in the vadose zone. In addition, the Environmental Management Science Program awards for FY 2000 included a category for vadose zone research that effectively adds $25 million over a three-year period for S&T activities potentially supporting Hanford's overarching goals.

A significant change in budget categorization occurred by collecting together a number of site-wide activities, whose early planning stages had been lumped into Project Management in FY 1999, under the more descriptive heading of Data Management and Issues Resolution. This change represents a maturation of these

Section 4 – Integration Project Status Update

Integration Project activities from early, formative stages to project work with defined milestones (see the details in the status report on the Integration of Information endeavor).

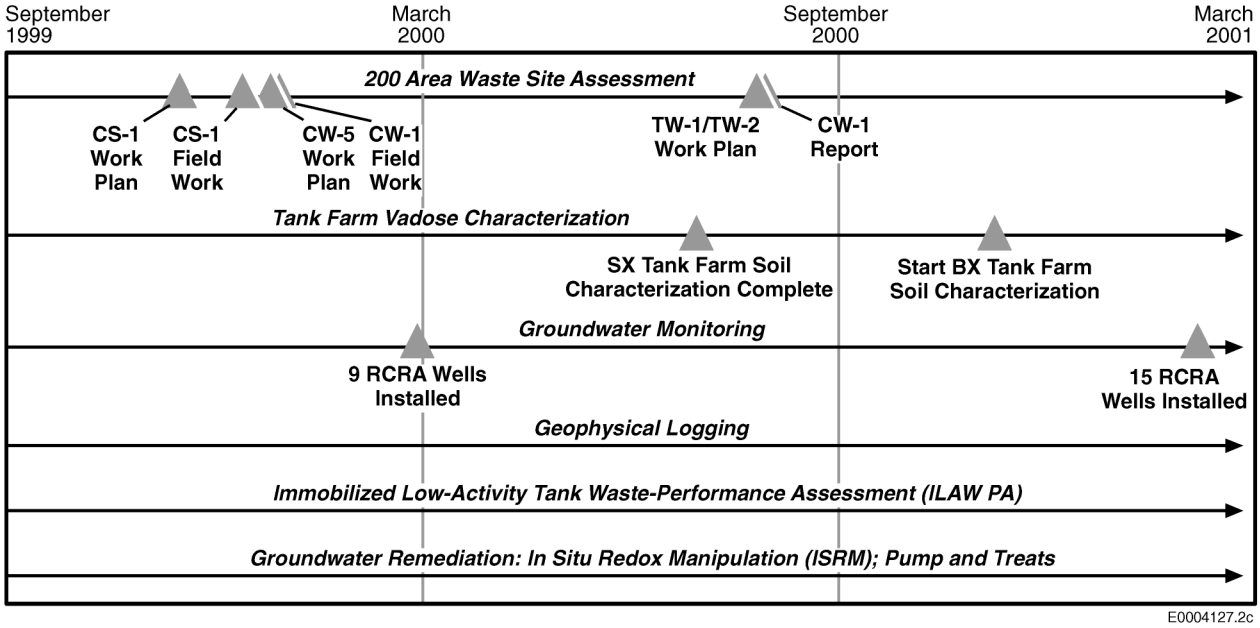
Funding for the Integration Project and Core Projects by Fiscal Year.
(millions of dollars)

	FY 1999 Funding	FY 2000 Funding	FY 2001 Funding Guidance	Responsible DOE Office[a]
System Assessment Capability	$1.90	$2.85	$2.00	RL
Science and Technology	$1.33	$4.70	$4.70	RL
Technical Review	$1.03	$0.99	$0.80	RL
Public Involvement	$0.30	$0.33	$0.30	RL
Integration of Information				
Project Management	$1.82	$0.83	$0.50	RL
Data Management and Issues Resolution		$1.62	$2.00	RL
Integration of Information Subtotal	**$1.82**	**$2.45**	**$2.50**	
Integration Project, Total Funding	**$6.38**	**$11.32**	**$10.30**	
Core Projects (Fieldwork)				
Groundwater and Vadose Zone Monitoring	$12.73	$11.66	$12.40	RL
Well Installation and Maintenance	$1.68	$0.72	$2.60	RL/ORP
River Protection Project Vadose Characterization	$5.57	$7.11	$7.70	ORP
Tank Farm Geophysical Logging	$1.81	$1.08	$0.00	ORP
ILAW Characterization	$1.00	$2.04	$2.10	ORP
ILAW Performance Assessement	$0.50	$0.46	$0.30	ORP
Cone Penetrometer Development & Demonstration	$1.51	$0.00	$0.00	ORP
Columbia River Monitoring	$0.39	$0.39	$0.40	RL
200 Area Waste Site Characterization	$1.99	$3.53	$2.00	RL
100 Area Pump and Treats (HR, KR, NR)	$5.06	$5.35	$7.20	RL
200 Area Pump and Treats (UP, ZP)	$1.02	$1.51	$1.40	RL
200 ZP Vapor Extraction	$0.43	$0.25	$0.30	RL
Core Projects, Total Funding	**$33.69**	**$34.10**	**$36.40**	
Integration Project and Core Projects, Total Funding	**$40.07**	**$45.42**	**$46.70**	
Headquarters Programs				
Environmental Management Science Program ($25 M over FY 2000 - FY 2002)		$10.00	$10.00	HQ
Total Funding, All Activities in Status Report	**$40.07**	**$55.42**	**$56.70**	

[a] RL = DOE Richland Office
ORP = DOE Office of River Protection
HQ= DOE Headquarters (Office of Environmental Management)

FIELDWORK

(Vadose Zone and Groundwater Monitoring, Characterization, and Remediation)



The Fieldwork endeavor includes the 200 Area Waste Site Assessment Project, which is managed under the Integration Project, and Tank Farm Vadose Zone Characterization, which is an Integration Project core project managed under the River Protection Program.

The 200 Area Waste Site Assessment Project is defined in DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan - Environmental Restoration Program* (*Implementation Plan*). This work includes investigation of 23 groups of waste sites, representing more than 750 individual liquid waste disposal sites in the 200 Area, to identify options for final cleanup decisions.

The Tank Farm Vadose Zone Characterization Project performs fieldwork to collect information needed to support cleanup decisions in response to movement of contaminants already in the vadose zone. Information generated by this project also will help develop an understanding of the potential consequences of removing wastes from tanks, while exploring options for final tank closure.

Other projects linked closely to the Fieldwork endeavor are the groundwater monitoring program, the geophysical logging program, the immobilized low-activity tank waste performance assessment (ILAW PA) work, and such groundwater remediation activities as In Situ Redox Manipulation (ISRM) and ongoing groundwater pump-and-treat operations.

Timeline and Key Milestones

The 200 Area Waste Site Assessment includes the **CW** (cooling water and associated wastes group), **CS** (chemical sewer wastes group), and **TW** (tank and scavenged wastes group) milestones on the timeline. These are important milestones required as part of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) Remedial Investigations/Feasibility Studies for the Central Plateau waste sites (200 Area).

The Tank Farm Vadose Characterization milestones also are important steps toward completing RCRA closure plans and CERCLA remedial actions for the tank farms. These regulatory endpoints, in turn, comprise steps

toward completing cleanup on the Central Plateau, in order to protect the Columbia River and transition the plateau for long-term waste management.

The timeline includes two **RCRA Groundwater Well** milestones for installation of additional RCRA monitoring wells (9 wells were installed in this period; 15 more will be installed by April 30, 2001).

The continuing activities for **geophysical logging** and **ILAW PA** are represented by straight lines through the time periods. So, too, are the operations in the 100 and 200 Areas for pumping groundwater at the leading edge of plumes and treating it to remove contaminants (**Pump/Treats**). The recently installed **ISRM** operation for the chromium plume in the 100-H Area near the river continues to show progress.

No milestones in this period were rescheduled, deleted, or added.

In Situ Redox Manipulation, showing installation of injection wells in 100 H Area along the Columbia River.

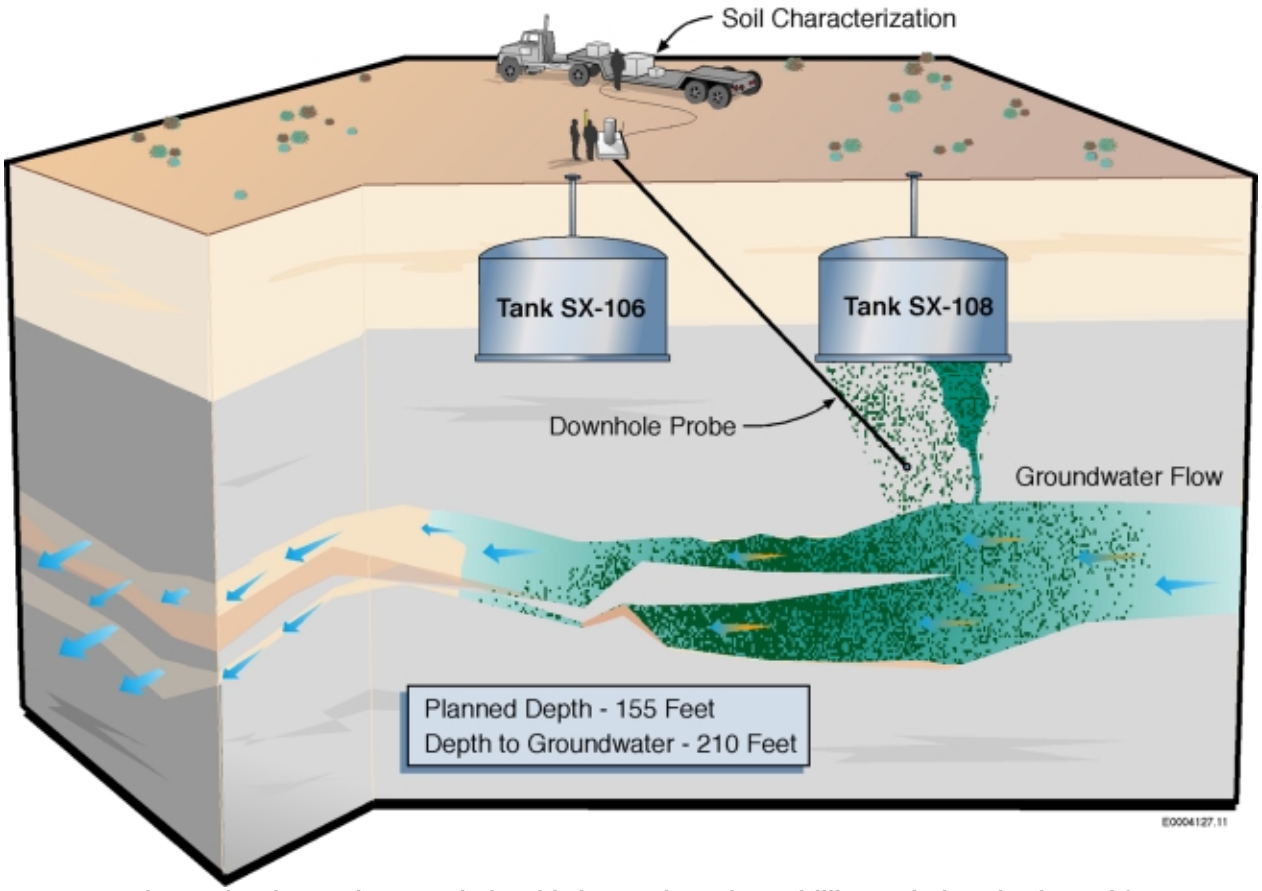
Significant Events During This Period

During this reporting period, the 200 Area Waste Site Assessment Project moved from planning to completion of the first field investigation defined under the *Implementation Plan*. The Gable Mountain/B Pond and Ditches Cooling Water Group (**CW-1**) field investigation, which was completed on schedule in December 1999, covered four sites in the 200 Area, including two multi-acre waste ponds and two trenches. Cooling water and associated liquid wastes were released to the environment at these sites during Hanford operations.

The draft work plan for the Chemical Sewer Group (**CS-1**) investigation, which was submitted for regulatory review in November 1999, covers seven ditches, waste ponds, and trenches. The draft work plan for the U Pond/Z Ditches Cooling Water Group (**CW-5**) investigation, which includes sites that received waste streams containing plutonium and other transuranic radionuclides, was submitted for regulatory review and approval in December 1999. Work plans for the next four investigations are in development.

As reported in the previous *Semi-Annual Report* (October 1998–November 1999), one borehole in the SX Tank Farm was decommissioned (borehole 41-09-39, near tank SX-109) and a new borehole was drilled near tank SX-115. The samples taken during these activities, which were analyzed during the current reporting period, show significant contamination in both holes for the mobile contaminants technetium-99, chromium, and nitrate. A full report on the analyses, covering many radionuclides and chemical hazards, will be released during the next reporting period.

In January, the DOE-ORP deployed a cone penetrometer system for the first time inside a Hanford Site tank farm. The penetrometer was used to characterize subsurface regions under the S Tank Farm, where surface spills and leaks have occurred. The penetrometer system used in this work detected radioactivity and extracted soil samples at depths up to 50 feet (the depth to which the soil was excavated and then compacted when the tank farm was built). As the cone-shaped head of the penetrometer was pushed into the compacted soil, a soil sample was taken if radiation was detected (in this case, cesium-137). These soil samples are now being analyzed. As with all other vadose zone characterization work performed in the tank farms, the cone penetrometer data will have two major uses. In the near term, the data are needed to plan and set



SX Tank Farm/Tank 108 Slant Borehole. This innovative "slant" drilling technique is planned for spring 2000, to gain important information about soil contamination beneath the tank.

priorities for the tank cleanup and stabilization efforts of the DOE-ORP. These data are also essential for the SAC's modeling of the subsurface inventory of contaminants, their current distribution in the vadose zone, and their movement toward the groundwater and the Columbia River.

The installation of nine additional wells in this period brings the number of RCRA groundwater monitoring wells in use at Hanford to about 290. Data from these wells are entered in the Hanford Environmental Information System (HEIS) database and are reported and interpreted in the annual *Groundwater Monitoring Report*. In addition to meeting regulatory requirements, the groundwater monitoring data are useful to the SAC, and to many other project-specific assessments, which provide the basis for remediation decisions to protect the river and prepare the Hanford Site for the future.

The *Semi-Annual Report* for October 1998 to November 1999 described the spectral gamma technique for geophysical logging in the single-shell tank farms. During this reporting period, results from spectral gamma logging conducted by MACTEC-ERS were compared with estimates of the total subsurface cesium-137 under the SX Tank Farm that were developed by scientists at Montana State University (using historical records of gross gamma measurements). The two approaches are in reasonable agreement on the total amount of radiation under the SX Tank Farm (about 90,000 curies). This amount corresponds to a total loss of waste from these tanks of less than 100,000 gallons. The Montana State University study included estimates for the area under each tank, and these estimates correlate well with the loss estimates in official DOE reports (for example, see HNF-EP-0182-143). This convergence of estimates, using different approaches, is important for reducing uncertainties about the assumed amounts and distribution of subsurface contaminants used in site-wide

assessments, such as the SAC, as well as for decisions on tank farm remediation. (See the feature article in this report on information mining.)

The 200 Area Waste Site Assessment Project works in close collaboration with the Tank Farm Vadose Zone Characterization and the Integration Project S&T endeavor. During this period, the sampling needs of these related projects have been incorporated in work plans for remedial investigations through joint participation in the Data Quality Objective (DQO) process. The DOE-ORP provided valuable input for planning waste site assessment work around the tank farms. The S&T endeavor provided proposals for "wrap-around" science needs that could be met at modest additional costs when incorporated with assessments required by the *Implementation Plan*.

Immobilized Low-Activity Tank Waste Performance Assessment. To support disposal authorization of a burial ground in the 200 East Area for immobilized low-activity tank waste (ILAW), a performance assessment (PA) was prepared by the DOE-ORP in 1998 and conditionally approved in the fall of 1999. This ILAW PA continues to be updated and expanded. Reports of the data that will be used for the next version of the ILAW PA were issued in December 2000. They are available on the Integration Project web site. The reports, which underwent peer review prior to being issued, discuss performance objectives, scenarios for future uses of the Hanford Site, ILAW facility design, performance of the waste form, inventory, geology, hydrology (including recharge of subsurface water), geochemistry, and dosimetry.

Significant Events Next Period

The 200 Area Waste Site Assessment Project will continue with submission (for regulatory review and approval) in August 2000 of a single draft work plan for the TW-1 and TW-2 field investigations (**TW-1/TW-2 Work Plan**).

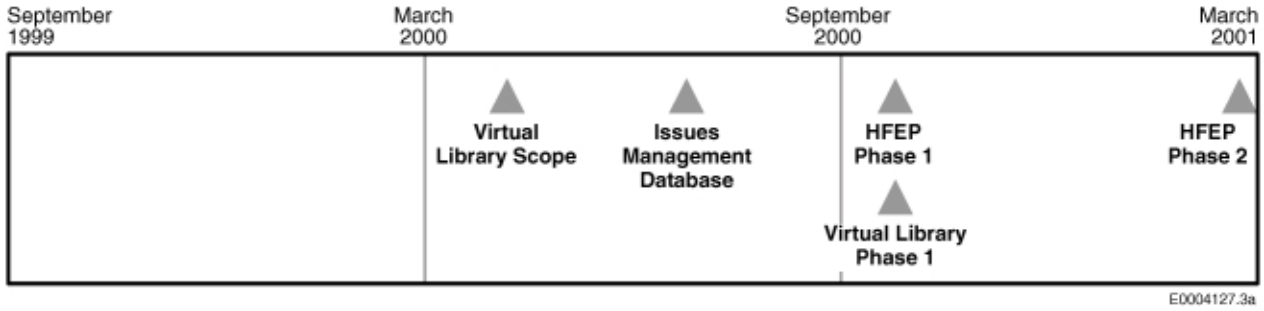
Slant borehole drilling demonstration, near the SX Tank Farm, in an uncontaminated area.

The 64 waste sites included in these investigations received single-shell tank overflow and treated tank wastes during Hanford operations. Release of the report on the **CW-1** investigation is also scheduled for August 2000.

The next major effort for DOE-ORP subsurface characterization inside the SX Tank Farm will be to drill a slant borehole under tank SX-108. This will be the first time that soil samples have been retrieved for analysis from underneath a Hanford tank. Tank SX-108 is thought to be the source of the most concentrated waste released into the subsurface environment at Hanford. To prepare for the drilling beneath SX-108, a demonstration run was conducted during this reporting period in an area outside the tank farm (shown in the photo on page 16). The demonstration drilling was used to address three key technical issues: (1) determining if the drilling would create too great a seismic load on the tank (risking a rupture); (2) optimizing the techniques for drilling, sampling, and sample handling; and (3) ensuring that personnel are proficient in the techniques required. The data from the real borehole will improve our understanding of how moisture flows around the buried tanks and how contaminants move, as well as providing better data on the contaminant concentrations under a single-shell tank that experienced major leaks.

The DOE-ORP has developed a work plan for characterizing the B-BX-BY Tank Farms and will submit it for regulatory review in May 2000.

INTEGRATION OF INFORMATION



The role of the Integration of Information endeavor is to ensure that the wealth of technical information and data about the Hanford Site is well integrated, effectively managed (to ensure its integrity and quality [configuration control]), and is easily accessible to a wide range of potential uses. This endeavor is particularly important in preparing datasets, interpreting data, and describing the current best understanding ("conceptual models") of how much radioactive and hazardous waste was, or will be, produced, and how this waste may move from where it is released to the environment to where it may interact with humans, other species, sensitive natural resources, or impact local economies. A second major objective is to provide open and ***useful*** access to the data for a wide range of users inside Hanford operations, and for external scientific-technical, regulatory, and stakeholder communities.

Timeline and Key Milestones

Two milestones in the timeline above represent important steps in developing the Hanford Features, Events, and Processes database (**HFEP Phase 1** and **HFEP Phase 2**).

The Virtual Library is represented by a milestone for completing the work scope (**Virtual Library Scope**) and a milestone for completed implementation of Phase 1 (**Virtual Library Phase 1**).

The Issues Management Database is scheduled to be operational by June 30, 2000 (**Issues Management Database**).

Significant Events This Period

A major task of the Integration of Information endeavor is to learn from experience in managing technical information and issues at other DOE sites and apply this knowledge at Hanford. In particular, the Integration Project has focused on the lessons learned at the Waste Isolation Pilot Project (WIPP) in New Mexico and at the Yucca Mountain Project in Nevada. Integration Project staff are working closely with the Sandia National Laboratory team that developed the technical database for the WIPP.

One area of concentrated work has been to define a set of features, events, and processes (FEPs) that should be considered when developing conceptual models that are used as the foundation to develop tools (such as the SAC) to assess the potential risks from contaminant release to the environment. Some examples of information that is captured using the FEPs process include descriptions of geologic layers beneath waste sites (stratigraphy), the way contaminants interact with soils (sorption), and even such extreme, or catastrophic, events as the frequency and expected magnitude of earthquakes (seismic events). The FEPs list used by Sandia for the WIPP was originally compiled through consultations with an international body of scientists from the disciplines relevant to understand and assess these risks. During the current reporting period, staff from the Integration Project and Sandia have been tailoring this "international" list of FEPs into Hanford-specific FEPs that are organized according to the set of technical elements used for the SAC and other Integration Project activities.

During this period, work continued on the Virtual Library. This Internet-based set of tools will allow all interested users (Hanford Projects, regulators, and stakeholders) to search and retrieve data from a number of existing Hanford Site technical databases, much as one would search for and copy information in a reference library. The Virtual Library will initially provide standard data formats for data to be retrieved from its "reference" datasets. In time, the library will also provide tools for users to customize the data content and format. A secondary but significant role of the Virtual Library is to capture additional datasets, existing now in either printed or electronic forms, that are valuable for the Hanford Site's base of technical knowledge but are not currently within any computer-based system generally accessible to Hanford operations.

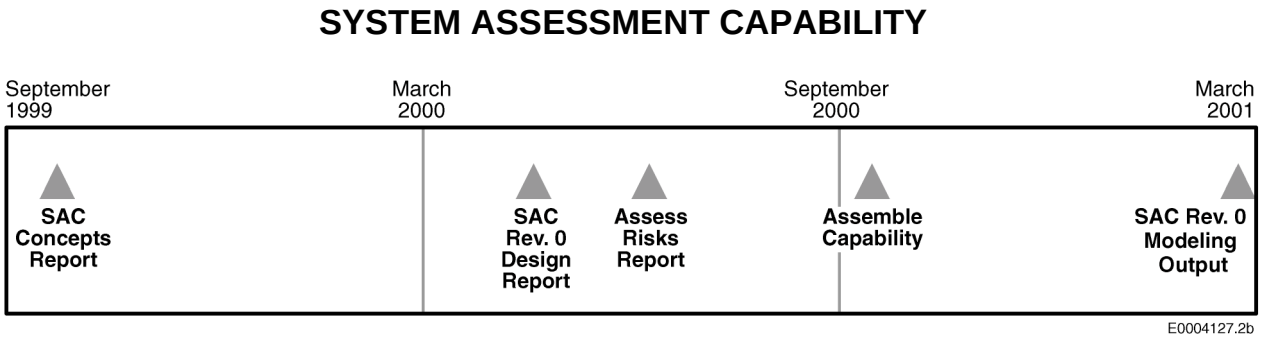
Work began this period on implementing a systems-engineering software package called "System Level Automation Tools for Engineers" (or SLATE). Initial uses for SLATE include a technical issues database and tools for systematically collecting, tracking, and distributing site characterization data, including the HFEP data. An added benefit of selecting SLATE will be realized when it is fully implemented by all the major Hanford Site contractors, as this will make the transfer of data and requirements among site contractors faster, easier, and more reliable.

Significant Events Next Period

Virtual Library. The scope document for the Virtual Library (**Virtual Library Scope**) was completed in April. Completion of Phase 1 of the Virtual Library in September 2000 (**Virtual Library Phase 1**) will give users access to the existing Hanford databases that are most used by the technical community. Work will be in progress on capturing key datasets not currently available in any of the Hanford Site's major databases.

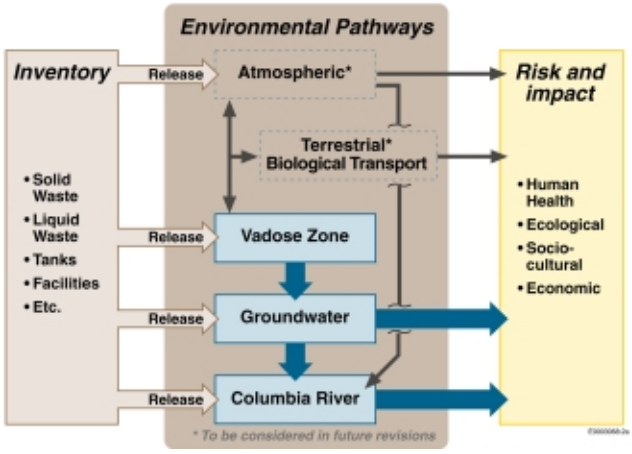
Hanford Features, Events, and Processes Database. Work on the HFEP database will continue, with this year's emphasis being on gathering information in a SLATE database to resolve HFEPs that directly support the SAC for the inventory, release, and vadose zone technical elements (**HFEP Phase 1**). By April 2001, the HFEPs for the groundwater, groundwater/river interface, and Columbia River technical elements, will be added to this database (**HFEP Phase 2**). Throughout FY 2001, work will continue on capturing the site technical knowledge applicable to the SAC.

The Issues Management Database, which is also implemented in SLATE, is scheduled to be operational and accessible to all users of the Integration Project web site by June 30, 2000 (**Issues Management Database**).



The SAC will provide a set of tools for assessing future cumulative, site-wide impacts from the environmental release of contaminants during past Hanford operations, or from the existing stored inventory. The SAC is also envisioned as a tool for assessing the merits of remediation, isolation, and containment alternatives for specific areas of Hanford (and the entire site).

At the heart of the SAC will be a set of models for simulating two sets of ***technical elements*** (see the diagram below). There are six technical elements within the SAC. First is the ***inventory*** of potential contaminants from past Hanford operations. Next is the ***release*** of contaminants to the environment through deliberate disposal actions or accidents (such as spill and leaks). The third element follows the transport and fate of contaminants as they move through the unsaturated strata of the ***vadose zone***. When contaminants reach the ***groundwater*** beneath the Hanford surface, they can flow toward the ***groundwater-river interface***. From there they enter the ***Columbia River*** ecosystem.



SAC Technical Elements: Inventory, Environmental Pathways, and Risk and Impact.

The Risk and Impact portion of the SAC will include four technical elements to model ***human health risks***, ***ecological risks***, ***economic impacts***, and ***sociocultural impacts***.

Timeline and Key Milestones

Key milestones in creating the first version of the SAC, called the SAC Rev. 0, include the **SAC Concepts** report, released in September 1999, completion of the **Rev. 0 Design Report**, an interim report on assessing risks (**Assess Risks**), and completion of the modeling components that will be used in Rev. 0 (**Assemble Capability**). The modeling runs from SAC Rev 0 (**SAC Rev. 0 Modeling Output**) are scheduled for completion by March 2001.

No key milestones for the reporting period were added. The milestone for identifying SAC Rev. 1 requirements has been moved from May 2000 to FY 2002 because the basis for these requirements is not yet available. By 2002, the essential work of creating the HFEP database, which the models in the SAC (Rev. 1) must incorporate, will have progressed to the point that requirements can be clearly defined. In addition, staff from the Integration Project, DOE-ORP, and DOE-RL, as well as regulators and stakeholders, will have had time to review the SAC Rev. 0 output and provide comments on improvements desired for SAC Rev. 1.

Significant Events This Period

The SAC Rev. 0 design report has been drafted. Delivery of the draft design to DOE-RL for review occurred in April. It will be distributed for public review in May. The design reflects extensive interactions throughout the preceding year among staff from the Integration Project, DOE-ORP, DOE-RL, federal and state regulators, and representatives of the Tribal Nations and stakeholders. Regulators and stakeholders participated in SAC work group meetings that identified the set of contaminants for this version of SAC, the impact measures to be used, and the methods for evaluating and representing the uncertainties in the projections of each technical element.

Activities to assemble the software needed for the SAC Rev. 0 began during this period.

Because the SAC Rev. 0 is the prototyping stage in SAC development, part of the design process was to select a limited set of contaminants, which will be used to test how well the initial modeling capability performs. Seven radionuclides were selected, based on their anticipated dominance in projections of risks and impacts. These are tritium, techetium-99, iodine-129, uranium-238, strontium-90, cesium-137, and plutonium-239/240. Three chemical hazards—carbon tetrachloride, chromium, and total uranium—round out the set of ten contaminants for the SAC Rev. 0 assessment. Within this set are contaminants that move at different rates through the subsurface environment. The transport and fate of the contaminants will be modeled in SAC Rev. 0 assessment, all the way from their presence in the Hanford inventory to their movement in the groundwater and Columbia River. The projections of risks and impacts made with SAC Rev. 0 assessment will cover the entire Hanford Site and the Columbia River from Priest Rapids Dam above Hanford to McNary Dam on the Washington-Oregon border.

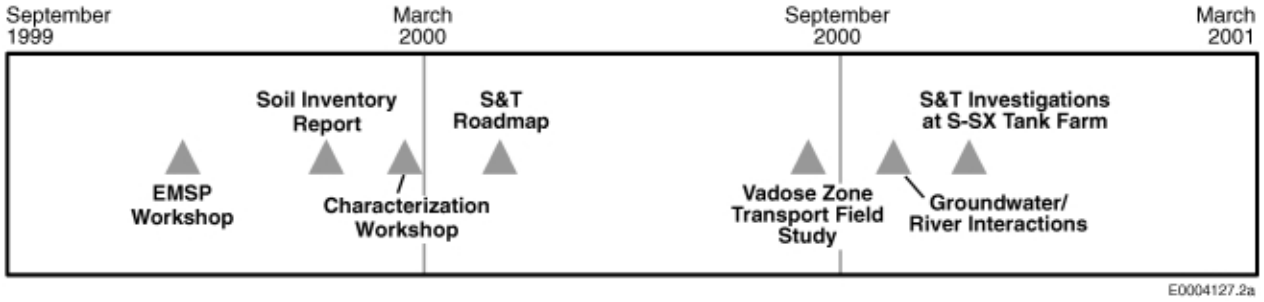
The SAC team is coordinating with the core projects to develop the estimates of released contaminants (amounts and locations of releases) that will be used in the SAC Rev. 0 modeling runs. (See the Fieldwork endeavor update and the feature article in this report on information mining.)

Significant Events Next Period

The major report from the design process—*System Assessment Capability (Revision 0) Assessment Description, Requirements, Software Design, and Test Plan*—was sent to DOE for review in April, and the resulting version will be distributed in May for public review. This report will show technical reviewers and potential users of the SAC the basis for the first assessment and the software to be used.

Another major milestone for the next period will be the release of an interim report on the challenges to assessing risks and impacts for Hanford and the approach that will be used for the SAC Rev. 0 assessment. Work began during this period on the report, which is tentatively titled *Looking at Risk: Hanford's Site-Wide Approach*. Release of this report for public reviews is expected in June.

SCIENCE AND TECHNOLOGY



The role of the Science and Technology (S&T) endeavor is to provide new knowledge, data, and tools for the cleanup and stewardship mission at Hanford. In addition to promoting new technology and methods to solve Hanford's problems, this endeavor seeks to improve the scientific basis for decisions on protecting the Columbia River and its ecological systems, while preparing the Hanford Site for the future. S&T activities are funded by the Integration Project and by DOE's Environmental Management Science Program (EMSP).

Timeline and Key Milestones

A meeting in Richland for EMSP principal investigators (**EMSP Workshop**) brought technical experts from across the nation into contact with staff from Hanford's cleanup projects. Field studies at representative sites are conducted to take advantage of scheduled field characterization work, such as the S&T field investigation at the S-SX Tank Farm (**S&T Investigation at S-SX Tank Farm**). The **Soil Inventory** milestone involves products from ongoing tasks to develop better estimates of the amounts of contaminants released to Hanford Site soils at specific locations.

During this period, the S&T endeavor completed a series of workshops with experts from the DOE national laboratories, universities, and the DOE Center for Risk Excellence to define the risk technical element of the S&T Roadmap. The detailed S&T work plans for the Integration Project endeavors are presented in the **S&T Roadmap**, which was updated and released in May 2000. The S&T endeavor also conducted an Advanced Characterization Workshop (**Characterization Workshop**) to identify technologies and methods that will be evaluated as part of the Vadose Zone Transport Field Study during the spring and summer of 2000. In September, the S&T endeavor will deliver an enhanced conceptual model for groundwater/river interactions (**Groundwater/River Interactions**), which will be used in the SAC.

Significant Events This Period

The first half of FY 2000 represents the first period of fully implementing the S&T Roadmap. During earlier periods, generating the roadmap was the principal activity, although several key tasks were begun.

The **EMSP Workshop** in November brought to Hanford nearly all of this year's winners of grants under the EMSP, which is DOE's national competitive grant program for basic research. The EMSP researchers learned about the technical issues that confront Hanford Site contractors, while site contractors and DOE staff who attended learned more about research by these investigators and others that could be useful at Hanford. The workshop helped to coordinate EMSP research plans with Integration Project activities and schedules, so that research results from EMSP projects will be timely and useful. One sign of the workshop's success is that several EMSP scientists are now directly supporting some of the Hanford core projects, in addition to their EMSP-funded work.

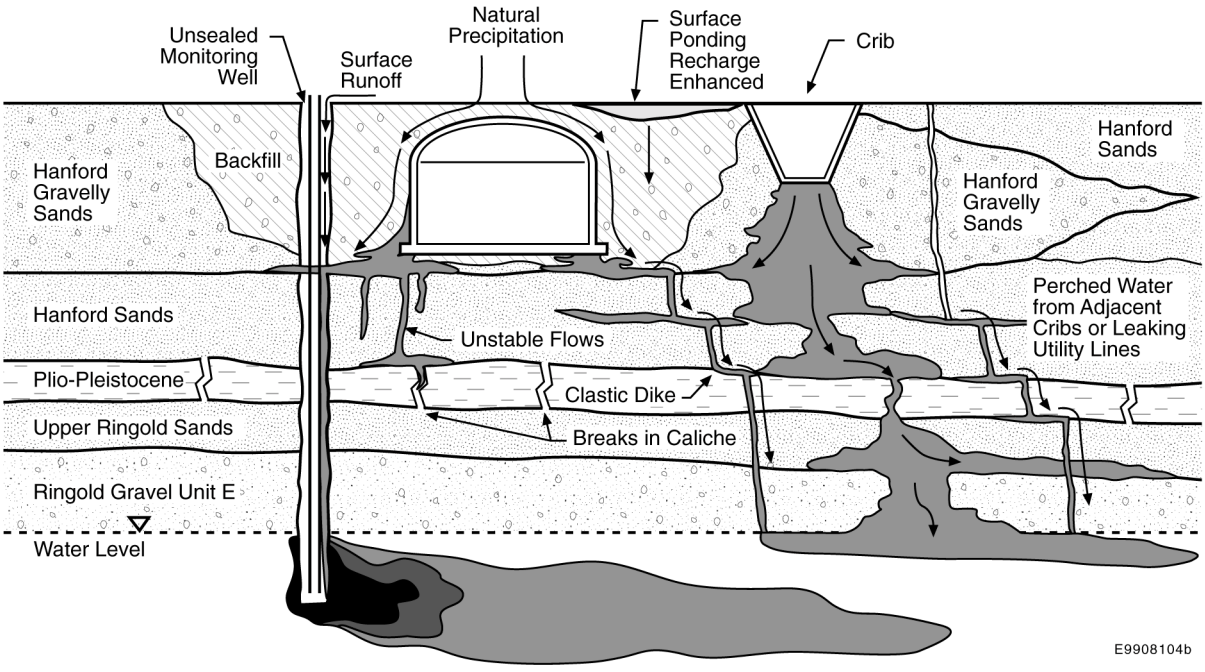
A related element in the efforts to link EMSP research to Hanford needs is distribution to

research scientists of core materials from drilling at the Hanford Site. When scientists are able to use actual samples of the geologic formations underneath the site, their research is likely to have greater relevance to Hanford's site characterization, assessment, and remediation work.

Advanced Characterization Workshop. A major objective of the S&T endeavor during this period was to develop plans for a Vadose Zone Transport Field Study. As part of this field study, new and better technology for use at Hanford will be evaluated. A workshop was held in January on advanced technologies and methods for characterizing and monitoring the movement of water and contaminants in the vadose zone. The workshop brought technologists and scientists from the DOE laboratories, the EMSP, and private industry together with Hanford Site regulators and stakeholder representatives, including the Tribal Nations, to confer on techniques for advanced characterization and monitoring technologies applicable to the Hanford subsurface. Workshop presentations described methods for injecting water and harmless tracer chemicals into the subsurface, then using advanced detection methods to follow the movement of the tracer plume.

Based on the workshop results, Integration Project staff are developing a detailed work plan for controlled field experiments that will be conducted during the next reporting period. These experiments will provide data to improve the conceptual models of water and contaminant migration in the vadose zone.

Soil Inventory Report. In February the S&T staff delivered to the SAC team a report on estimates for some of the contaminant inventory released to Hanford soils. The report included estimates of the uncertainty about the amount released. These soil inventory and uncertainty estimates, which will be used in the SAC Rev. 0, are part of a continuing S&T task to improve the estimates of the amount of soil contaminants. The method is based on reconstructing the chemical composition of the waste streams at the time of disposal and on calculating how much of each contaminant was in the volume of waste released. The result is called a ***mass-balanced inventory*** estimate.



Movement of Contamination in the Vadose Zone.

Developing good mass-balanced inventory estimates is one of the highest S&T priorities at the Hanford Site. These estimates affect the SAC, other Integration Project tasks, and near-term remediation decisions on other Hanford Site projects.

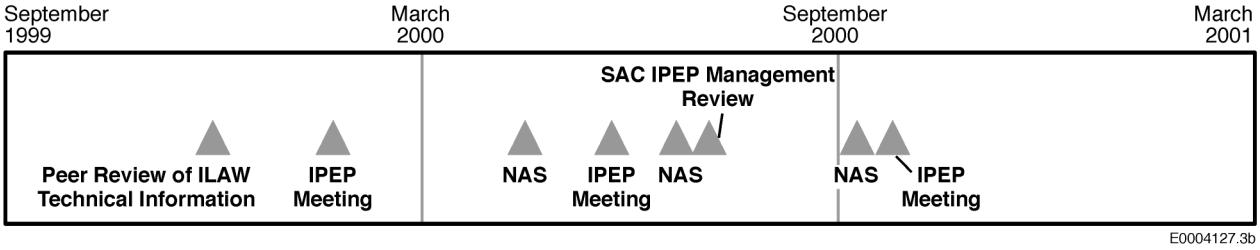
Significant Events Next Period

The annual revision of the **S&T Roadmap** was released in May 2000. It incorporates changes resulting from the risk workshops, as well as changes in the schedules for the SAC and the core projects.

Coordination with the Fieldwork endeavor and the core projects to perform wrap-around science, in conjunction with ongoing characterization work, will continue throughout the period. Laboratory evaluations of transport processes, using uncontaminated cores from drilling new boreholes and wells, will continue. Evaluations using contaminated core material from tank farm characterization work will begin. S&T input to the S-SX Tank Farm Field Investigation Report is scheduled for October 2000 (**S&T Investigation at S-SX Tank Farm**).

The next stage in the Vadose Zone Transport Field Study will be to conduct the controlled field tests and evaluate the results by September. An enhanced conceptual model for the ***groundwater/river interaction*** technical element will also be delivered in September (**Groundwater/River Interactions**). This milestone will include a published report and a preliminary numerical model for how contaminants in the groundwater are discharged into the Columbia River. Vadose zone transport modeling to support the S-SX Tank Farm Characterization is scheduled to be completed in October 2000 (**S&T Investigation at S-SX Tank Farm**).

TECHNICAL REVIEW



The Technical Review endeavor ensures that outside, independent reviews are conducted on the scientific merit, technical content, and managerial leadership of Integration Project activities. Technical review activities in support of the Integration Project include the Integration Project Expert Panel (IPEP), study committees of the National Academy of Sciences/National Research Council (NAS), reviews of the Hanford consolidated groundwater model, and other project-specific reviews.

The IPEP, which has eight members from diverse disciplines, provides broad and independent oversight for all Integration Project activities. Panel members review and comment on key programmatic, managerial, technical, and stakeholder issues. The IPEP operates primarily as a merit review panel, but periodically conducts technical reviews.

Timeline and Key Milestones

The IPEP meets periodically throughout the year at the Hanford Site (**IPEP Meeting**). In FY 1999, the IPEP met four times. A newly formed NAS study committee (**NAS**) had been scheduled to have its first meeting during this reporting period. Due to delays at the National Research Council in constituting the committee and establishing a meeting date, this meeting was rescheduled to April.

Integration Project Expert Panel. From left to right, front row, Dr. John Conaway, Dr. James Karr, Dr. Michael Kavanaugh, Dr. Peter Wierenga. Back row, Dr. Randy Bassett, Mr. Ralph Patt, Dr. John Matuszek, and Dr. Edgar Berkey, Chair.

Significant Events This Period

IPEP Meetings. At each of its meetings, which are open to the public, the IPEP provides constructive comments and recommendations on Integration Project endeavors. The meeting agendas, IPEP closing comments, and full close-out reports (prepared by the IPEP after each meeting), can be found on the Integration Project web site at *http://www.bhi-erc.com/vadose/peer.htm*.

The IPEP met in Richland on January 26-28, 2000. The agenda for this meeting included the following:

- A session to hear perspectives and comments from stakeholders, the Tribal Nations, and regulators.
- Briefings and discussions on the Integration Project Science and Technology Program.
- Briefings and discussions on the SAC.
- Briefings and discussions on modeling and transport efforts.
- Briefings and discussions on subsurface investigations (the characterization activities described under the Fieldwork endeavor).
- Briefings and discussions on the overall status of the Integration Project

Dr. Berkey, Chair of the IPEP, made the following observations in his close-out review of the January meeting:

- The IPEP is encouraged by overall progress and direction of the Integration Project.
- The Integration Project is now yielding results, not just plans.
- The IPEP remains concerned about the ability of the Integration Project to retain momentum and meet expectations.
- It is evident to the IPEP that Hanford Site management wants the Integration Project to increase the relevance and applicability of Integration Project work.
- The IPEP is not clear which major Hanford Site decisions require contributions from the Integration Project.

The Chair also made the following general recommendations to DOE and the Integration Project, on behalf of the panel:

- Fill the role of DOE Project Manager for the Integration Project on a permanent basis.
- Increase the emphasis on making the Integration Project output relevant to site decisions.
- Revisit benefits to customers of Integration Project products, which must be meaningful and understandable to these customers.
- Work on defining the hierarchy of decisions that the Integration Project can support.

Significant Events Next Period

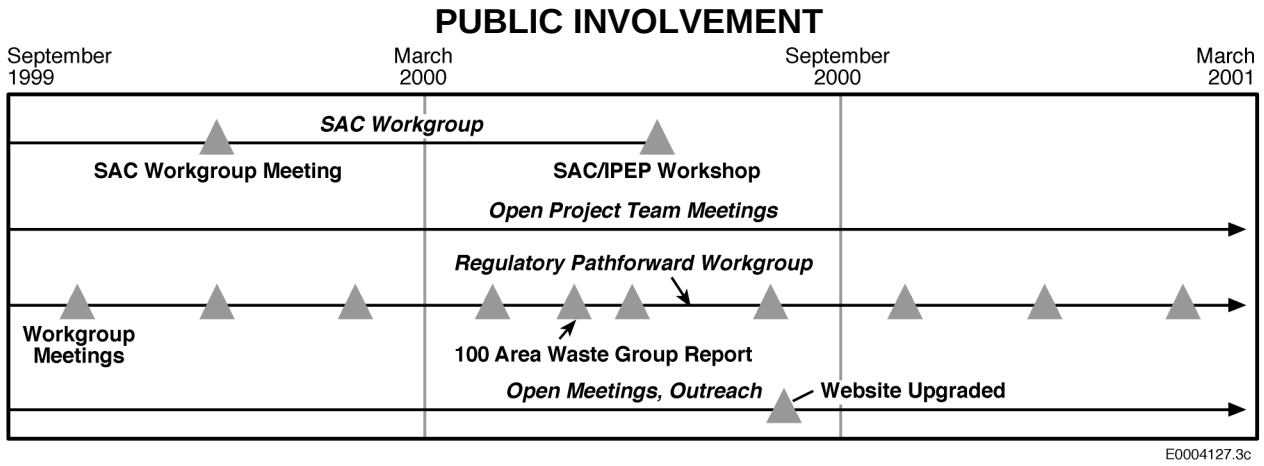
The IPEP will meet next in Richland, May 24–26, 2000. The areas of focus are likely to include the following:

- Project management issues (adequacy of budgets, planning, stakeholder involvement).
- Subsurface characterization and monitoring (subsurface investigations, interpretation of results).
- Approaches to understanding waste inventories.
- Groundwater remediation.

A subpanel of the IPEP will meet in Richland on June 20–21, 2000, to review project management issues related to designing the SAC (as described in the SAC endeavor).

The NAS Committee on Environmental Remediation Science and Technology at the Hanford Site held its initial meeting in April 2000, in Richland, Washington. The second and third meetings are expected to be held in June 2000 and September 2000 (also in Richland). The charge to this committee is to provide recommendations to improve the technical quality and relevance of the S&T program. The committee, which is composed of 15 members, will meet approximately six times during the 18-month study and will produce at least one peer-reviewed report at the conclusion of the study in 2001.

Reports describing the technical information collected to support ILAW underwent a multi-layered peer review in both June and December 1999. Reports are available on the Integration Project web site.



The role of the Public Involvement endeavor is to provide opportunities for Hanford's community of affected people to share information and views, consult with DOE and Integration Project staff, and collaborate on Integration Project activities. This community, which is large, passionate, diverse, and geographically dispersed, is united by a common interest in protecting the Columbia River and having a voice about the future of the Hanford Site. Building the mutual trust and support to move ahead on difficult issues requires a fully open, accessible, and inclusive program for involving all elements of this community.

Timeline and Key Milestones

The final report on the 100 Area Waste Groups by the Regulatory Path Forward Work Group was be produced in May 2000 (**100 Area Waste Group Report**). Ongoing activities include **Open Project Team Meetings**, **SAC** and **Regulatory Path Forward Work Groups**, and various other **open meetings and outreach** activities. The Integration Project **web site** is being upgraded to better organize the information it contains and to implement technologies to allow for smoother access to that information.

Significant Events This Period

During this reporting period, the Integration Project progressed from primarily planning activities to specific fieldwork and data analysis. As a result, the venues for public involvement and the roles in which community members can participate have been changing. Through the Public Involvement endeavor, the Integration Project seeks better ways to articulate, coordinate, and incorporate the needs of stakeholders, regulators, Tribal Nations, and other Hanford projects. The Integration Project remains committed to a fully open process for informing and involving this broad community in project planning, reviews of results, and the decision-making process.

Open Project Team Meetings bring Integration Project managers and staff; DOE staff from Headquarters, the Richland Field Office, and the Office of River Protection; and Hanford Site contractors together twice per month in a roundtable format with regulators and representatives of Tribal Nations, stakeholders, and the public. These informal meetings allow discussion of current issues, with emphasis on the progress that is being made to resolve these issues. The meetings also help to highlight upcoming opportunities for involvement (meetings, documents undergoing public comments, etc.).

It is not possible for all interested parties to attend every Open Project Team Meeting in Richland. Consequently, detailed meeting minutes are prepared and distributed to over 200 interested individuals and organizations. The meeting minutes are also available on the Integration Project web site at *http://www.bhi-erc.com/vadose/minutes.htm*. The response to the meeting minutes has been positive: the minutes provide a valuable way for those unable to attend a meeting to remain

updated and engaged. A "1-800" toll-free call-in line is available for those wishing to participate in the Open Project Team Meetings by telephone.

Work Groups bring participants from the broad community together with Integration Project team members to focus on a critical Hanford issue or project within the Integration Project's scope. A typical work group is of limited duration and targets specific technical or policy issues. During this period the Regulatory Path Forward Work Group and the SAC Work Group were active.

The Regulatory Path Forward Work Group is focused on identifying and resolving the overlapping—and sometimes conflicting—regulatory requirements that now apply to individual cleanup projects at the Hanford Site. The group is reviewing cleanup standards, risk scenarios, and points of compliance.

The initial focus of the Regulatory Path Forward Work Group has been on the 100 Area regulatory endpoints for source units and groundwater. Regulators have been active participants in the group's activities, and have worked with the Integration Project staff to identify a uniform set of overarching requirements and standards for cleanup work that is either planned or underway. The Hanford Advisory Board stays abreast of the work group's progress, and a final report on the **100 Area Waste Groups** will be produced in May 2000.

The SAC Work Group met in December 1999 to discuss previous issues that were raised. These issues were grouped and plans for their resolution were discussed.

Open Meetings and Information Access. The Integration Project aims to ensure that all significant meetings with high levels of public interest are open and inclusive. For example, IPEP meetings are conducted as open meetings and are announced well in advance. The time for public comment is included in IPEP agendas, and the meeting reports are posted on the Integration Project web site. Press releases are issued to inform the public of significant events, planned or otherwise.

The Integration Project web site provides public access to all Integration Project reports, including related documents and meeting notes. Beginning in March an "issues submission form" is being tested on the web site. This form, and an associated Issues database, will be used to record issues of all types that are raised by the Hanford community. Integration Project staff will track, resolve, and report back on the issues submitted. The Integration Project web site also provides hyperlinks to other web sites with Hanford-related information, such as the site-wide groundwater monitoring data produced by the Pacific Northwest National Laboratory.

Outreach. Integration Project staff members meet periodically with interested groups and organizations to discuss concerns and topics of interest, as well as to explain the continuing work of the Integration Project. During this period, Integration Project staff met with or provided presentations to these organizations and Tribal Nations:

- The U.S. Environmental Protection Agency and Washington State Department of Ecology
- The Hanford Advisory Board, including the Environmental Restoration Committee and Public Involvement Committee of the Board
- Richland city officials
- The Oregon Office of Energy and Oregon Hanford Waste Board
- Technical representatives of the Nez Perce Tribe
- Technical representatives of the Yakama Nation
- Liberty School Key Club
- Columbia River Comprehensive Impact Assessment Team
- Health of the Hanford Site Conference, 1999 (sponsored by the University of Washington)
- Waste Management Symposium 2000.

Significant Events for the Next Period

The Regulatory Framework Work Group will produce its report on the 100 Area in May and will shift its focus to the 300 or 200 Area.

To gain broad community input into the assumptions and planning process for next year's *Detailed Work Plan*, one-on-one meetings will be held with federal and Washington State regulators, the Oregon Office of Energy, and representatives of the Tribal Nations and other interested groups.

The draft *SAC Rev. 0 Design Report* (produced in May), and the draft report on assessing risk (scheduled for June), will undergo a 45-day public comment period to gain input from interested stakeholders and potential users. An open workshop will be held, in which an IPEP subpanel examines the draft SAC design document.

The Hanford Advisory Board and its Environmental Restoration Committee will be briefed on issues and progress.

Section 5

FOR MORE INFORMATION

GENERAL INFORMATION ABOUT THE GROUNDWATER/VADOSE ZONE INTEGRATION PROJECT AND HANFORD

Published reports and documents, along with many other kinds of background information, are available on the following Internet sites:

Home page for the Groundwater/Vadose Zone Integration Project:
http://www.bhi-erc.com/vadose/vadose.htm

Hanford Site home page:
http://www.hanford.gov/

Office of River Protection home page:
http://www.hanford.gov/orp/index.html

Hanford stakeholders:
http://www.hanford.gov/misc_info/stakehld.html

From the IP home page you can go to a page that links to other DOE, national laboratory, and community or stakeholder sites that have information related to the Hanford Site and environmental remediation work.

FURTHER INFORMATION ON SIGNIFICANT EVENTS AND FEATURES IN THIS REPORT

Cone penetrometer technology used in the SX Tank Farm: available on the internet at *http://www.ara.com/cpt/index.html*.

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, B. L. Young, 1997, *Waste Status and Transaction Record Sum*mary (WSTRS Rev. 4), LA-UR-97-311, Los Alamos National Laboratory, Los Alamos, New Mexico. *This is referred to as (1) in the text sections of this report*.

Agnew, S. F., 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model, Rev. 4*, LA-UR-96-3860, Rev. 4, Los Alamos National Laboratory, Los Alamos, New Mexico. *This is referred to as (2) in the text sections of this report*.

Hanlon, B. M., 2000, *Waste Tank Summary Report for Month Ending February 29, 2000*, HNF-EP-0182-143, CH2M HILL Hanford Group, Inc., Richland, Washington. *This is referred to as (3) in the text sections of this report*.

The SAC concepts report: *Preliminary System Assessment Capability Concepts for Architecture, Platform, and Data Management*, September 1999. Available on the internet at *http://www/bhi-erc.com/vadose/docs.htm*

Information on the Science and Technology Endeavor is available on the internet at *http://www.bhi-erc.com/vadose/s&t.htm*

The 200 Area Implementation Plan: *200 Areas Remedial Investigation/Feasibility Study Implementation Plan - Environmental Restoration Program*, DOE/RL-98-28, Rev. 0, April 1999, available on the internet at *http://www.bhi-erc.com/200Area/200Area.htm*

For more information, or to become involved in the Integration Project, contact Karen Strickland at (509) 372-9236.