# SEMI-ANNUAL REPORT

## Hanford Site

# Groundwater/Vadose Zone Integration Project

U.S. Department of Energy
Richland Operations Office

Bechtel Hanford, Inc.
Environmental Restoration Contractor

PROTECTING THE COLUMBIA RIVER

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August 5, 1999

# Introduction

## Purpose

This is the first semi-annual report prepared to inform decision makers, stakeholders, State of Oregon, Tribal Nations, and regulators on the state of the Groundwater/Vadose Zone Integration Project. Project progress, budget, and FY 2000 opportunities are included. This report includes project progress through June 30, 1999.

**Salmon smolt**

### *Background*

The Groundwater/Vadose Zone Integration Project (Integration Project) was established in late 1997 by the U.S. Department of Energy (DOE) to provide a bold, new approach to protect the Columbia River. Undersecretary of Energy, Dr. Ernest Moniz, directed the Integration Project to be science-based, to include strong participation from DOE's National Laboratories, to incorporate rigorous technical review, and to engage diverse stakeholders in a meaningful way.

The Integration Project is responsible for protecting Hanford's water resources (vadose zone/soils and groundwater) and all of the uses and users of the Columbia River.

The Integration Project has incorporated the principles of the Columbia River Comprehensive Impact Assessment (CRCIA) Part II into its overall approach and assessment construct.

The Integration Project brings benefits and products to Hanford's cleanup mission. The five endeavors or objectives listed below of the Integration Project reflect the sitewide, strategic approach and resulting benefits to Hanford.

1. **Sitewide Integration** of vadose zone characterization, assessments, modeling, and monitoring.

- *Duplication of effort and overlaps between Hanford's multiple projects are being identified and eliminated.*
- *Critical data gaps have been identified and prioritized for additional characterization work and science.*
- *Technical inconsistencies are being identified and will be reconciled as information is shared and work is planned for fiscal year 2000.*
- *Hanford's cleanup planning baseline and multiple regulatory drivers have been compiled and evaluated. Opportunities for regulatory and schedule integration will be prepared in cooperation with the regulators. When complete, dollars and time will be saved.*

2. Develop the **Capability to Assess** the cumulative long-term impact of Hanford-derived contaminants on the Columbia River and the Northwest Region.

- *The System Assessment Capability (SAC) is developing sitewide assessment tools to assist in making well informed, scientifically defensible closure and cleanup decisions.*
- *The SAC includes an expanded evaluation and way to communicate "risk" to include human, ecological, cultural, and socioeconomic health.*

3. Apply **Science and Technology (S&T)** to critical Hanford vadose zone, groundwater, and Columbia River needs.

- *A sitewide S&T Roadmap has been prepared to link funding to support key Hanford decision points, and to help fill critical gaps in scientific understanding about Hanford's subsurface and Columbia River impacts.*
- *Key S&T work was launched, and DOE-Headquarters (HQ) funds provided support.*

4. Provide early and meaningful **Public Involvement** to build trust and understanding and to move toward consensus on the Integration Project path forward.

- *Create routine, open, and inclusive ways to share information and provide input on Project direction and products.*
- *Bring all of Hanford's vadose zone, groundwater, and Columbia River public involvement opportunities together into a common forum to better serve the stakeholders, State of Oregon, Tribal Nations, and the Hanford Projects.*

5. Build **Technical Review** capabilities to support all Hanford vadose zone, groundwater, and Columbia River work.

- *A Groundwater/Vadose Zone (GW/VZ) Expert Panel was established and is assisting the Integration Project in "protecting the Columbia River".*

The Integration Project will provide a basis to inform and influence key Hanford cleanup decisions. These decisions will continue to be made and managed by the Hanford projects (i.e., River Protection Project (RPP), the Office of Assistant Manager Environmental Management (AME), etc.), with input and assistance from the Integration Project. These decisions must be supported by DOE and the regulators, and will continue to require stakeholder support and technical defensibility. Key decisions that the Integration Project will influence include:

- *Single- and double-shelled tank retrieval and closure*
- *Remediation of 200 Area (Hanford's central plateau) waste sites*
- *Final Hanford closure, and endstate plans and projections*
- *Interim actions to protect groundwater*
- *Operational practices to protect water resources and the Columbia River*

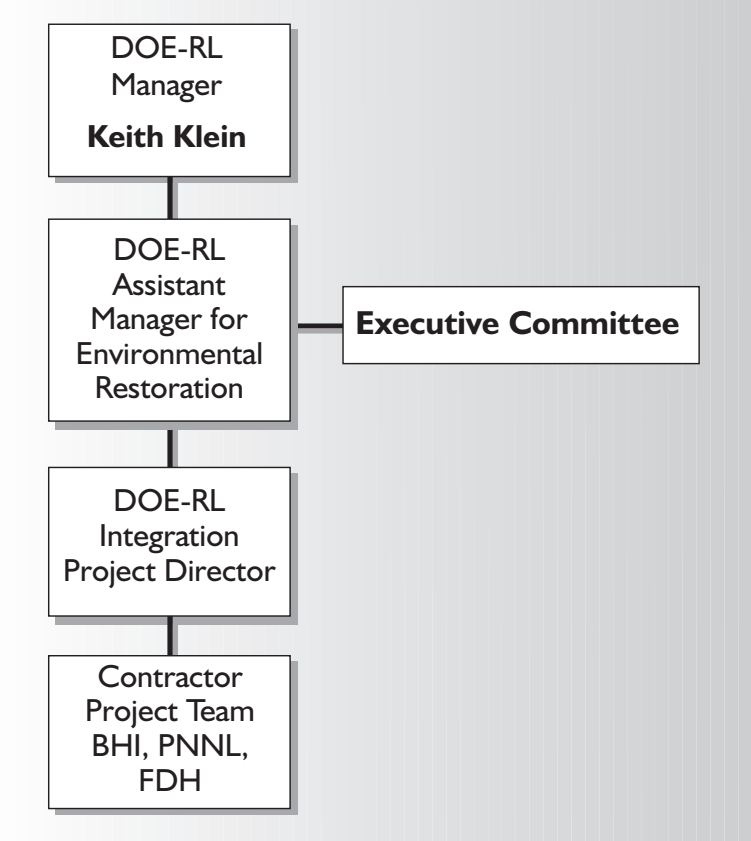
The scope of the Integration Project crosscuts all of the major projects at Hanford. To effectively proceed, a multi-contractor team was formed, and is co-located. Bechtel Hanford, Inc. (BHI), which is the Hanford Environmental Restoration Contractor, is assigned to lead the Project Team. DOE-HQ, DOE-Richland Operations Office (RL), and DOE-Office of River Protection (ORP) are actively involved in directing the Integration Project.

# ORGANIZATION

The Integration Project is organizationally located within the DOE Office of the Assistant Manager for Environmental Restoration (AME).

An Executive Committee supports the Integration Project, and consists of the DOE-RL/ORP Assistant Managers, and contractor principals for the projects that integrate or interface with the Integration Project. Issues that cross-cut DOE-RL and ORP will require concurrence from the DOE-RL Manager and the DOE-ORP Manager.

The Integration Project is implemented by a contractor team led by BHI with integrated support from the Pacific Northwest National Laboratory (PNNL) and Fluor Daniel Hanford, Inc. (FDH).




### Department of Energy, Richland Operations Office

**Rich Holten** is director of Restoration Projects within the RL-AME. The RL-AME is the lead DOE organization for the GW/VZ Integration Project. The AME is also responsible for integrating other DOE offices and projects with the Integration Project.

### Bechtel Hanford, Inc.

**Michael Graham** is project manager of the GW/VZ Integration Project. BHI is the lead contractor on the Integration Project. Other BHI workscope includes sitewide environmental restoration, and facility decontamination and decommissioning.

### Pacific Northwest National Laboratory

**Terri Stewart** is the project lead for PNNL. The Laboratory is responsible for development and implementation of the Science and Technology Plan, which inputs the applied science and technology needs for the Integration Project.

### Fluor Daniel Hanford, Inc.

**John Williams** is the project lead for the Project Hanford Management Contract (PHMC). Led by FDH and the DOE-ORP, the PHMC is responsible for vadose characterization at Tank Farms.

# INTEGRATION

The Integration objective ensures that sitewide characterization data is collected, used, and maintained consistently to benefit all of Hanford's information needs. There are three focus areas for integration:

**Columbia River sampling**

*Planned and Ongoing Characterization.* Vadose zone, groundwater, and Columbia River characterization activities (i.e., well drilling and data collection) are being integrated. A new borehole is being drilled in SX Tank Farm. To maximize the benefit of this borehole, an inclusive process was used to determine the location and the suite of data to be collected.

Planning and implementation of "data quality objectives," which govern how data will be collected and used, will continue to be applied consistently to all vadose zone characterization and assessment work.

*Data and Conceptual Model Consistency.* The Integration Project is ensuring that performance and risk assessment methods and conceptual models used at Hanford credibly portray reality. Configuration and quality control of data is being standardized by the Integration Project.

A conceptual model is a way to describe the level of scientific understanding available. A conceptual model will describe what is known, and where major uncertainties in understanding exist. A conceptual model is often the first step in the design of environmental assessment work.

The Integration Project has convened a "challenge team" to review existing data, including Hanford Project planning assumptions.

*Regulatory Integration.* Hanford's cleanup activities are operating under multiple and sometimes conflicting regulatory requirements (including multiple environmental rules, DOE orders, and Nuclear Regulatory Commission Standards).

The Integration Project is working with the regulators, State of Oregon, Tribal Nations, stakeholders, and Hanford Projects to:

- *Reach the agreement regarding Hanford endstate assumptions (the Hanford cleanup endstate is defined as the completion of the cleanup mission on or around 2040)*
- *Document the regulatory basis for key cleanup decisions*
- *Identify near-term opportunities for regulatory integration*
- *Identify key cleanup decisions and their requirements for an assessment of the cumulative impacts on regional water resources and users*

The 200 Area has been identified as the first priority for regulatory integration of RCRA and CERCLA soil and groundwater characterization requirements. The regulators and DOE must agree on schedule and scope, and then modify the Tri-Party Agreement (TPA) accordingly.

### KEY ENDEAVORS

*Integrate and improve the data from all vadose, groundwater characterization, and assessment work at Hanford*

### ACCOMPLISHMENTS

- *Characterization of SX Tank Farms vadose zone initiated*
- *All Hanford vadose zone characterization work planning integrated*
- *Partnering with Sandia National Lab to utilize lessons learned at the Waste Isolation Pilot Project and Repository Projects*
- *Established and co-located a sitewide multicontractor project team*
- *"Challenge Team" formed to review and optimize FY 2000 work planning assumptions*
- *Regulatory Path Working Group initiated to prepare regulatory integration strategy and build consensus*

**Characterization well drilling**

# System Assessment Capability

### KEY ENDEAVORS

*Assess potential long-term effects of Hanford-derived contaminants*

### ACCOMPLISHMENTS

- *Developed cumulative impact assessment approach*
- *Partnered with Tribal Nations to expand risk assessment to include cultural and socio-economic impacts*
- *Utilized a new risk assessment methodology –"dependency webs"*
- *Completed a GIS map layer to display critical locations*
- *Developed holistic Inventory Scoping Study of Hanford contaminants*
- *Incorporated CRCIA principles into SAC, white paper prepared*

The SAC will provide the predictive tools to perform the assessments required to understand the human, environmental, cultural, and socio-economic health effects resulting from Hanford contaminants. The SAC will provide information for setting cleanup priorities, allocation of funding, and determining the need for additional technical and scientific data.

In the longer term, the sitewide SAC will provide important information (including predictive models and qualitative assessment information) that will enable informed Hanford Site closure decisions to be made.

The SAC will be developed and improved through iterative cycles. The first iteration is due December 2000.

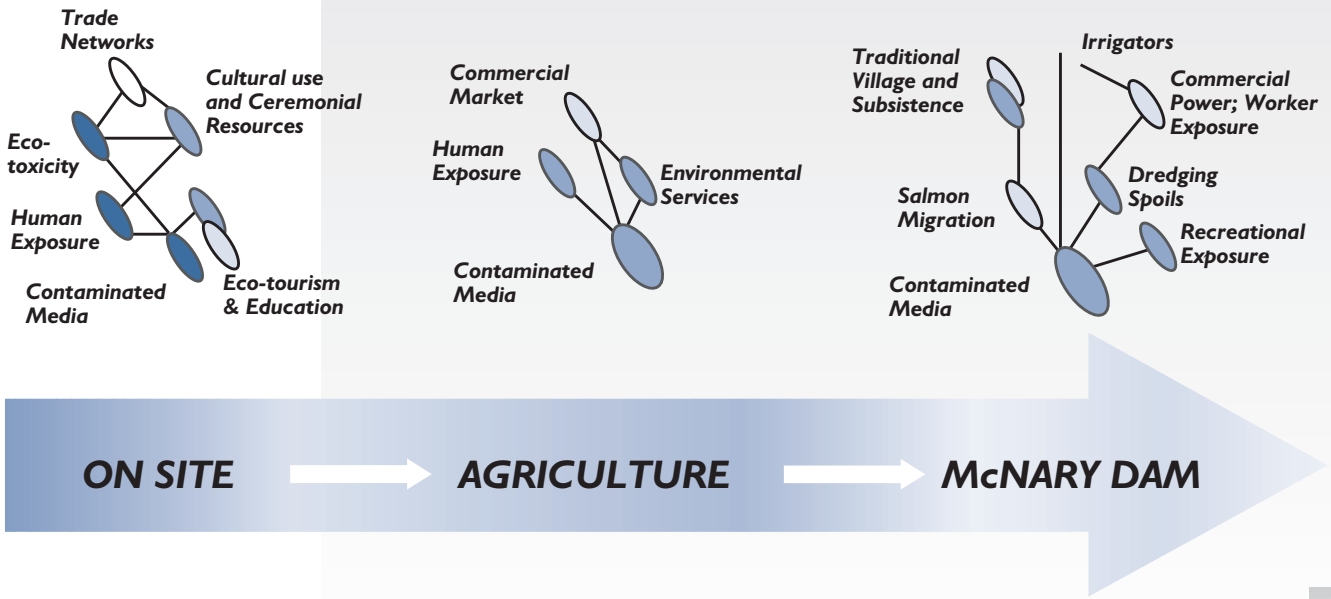
The CRCIA principles, which are being used to form the SAC approach, include:

- *Dominance (the assessment must not leave out factors that dominate the results)*
- *Uncertainty (determine level of uncertainty in assessment results)*
- *Fidelity of assessment results (assessment care and depth)*
- *Completeness (assessment scope encompasses all contaminants, locations, and time span)*

A white paper has been prepared to document how these principles are crosswalked to the Integration Project requirements. A Draft "Inventory" Scoping Study has been prepared as an important first step in evaluating chemical and radioactive wastes in Hanford facilities, soils, and in the groundwater. The next step is to determine the physical and chemical waste forms and related contaminant release rates.

Impacts to human and ecological health, as well as cultural and socio-economic systems, are being evaluated. A "Dependency Web" approach is being used to communicate and record potential impacts and uses at important geographic locations. The preparation of metrics to measure these comprehensive impacts is underway.

***Risk Impact "Dependency Webs"***



# SCIENCE AND TECHNOLOGY

The main objective of the S&T endeavor is to provide new knowledge, data, tools, and the understanding required to enable the Integration Project's mission. S&T is focused on resolving key technical issues that influence decisions on remediation and closure of Tank Farms and contaminated soil sites, in partnership with both the SAC and Hanford projects.

The scope of the S&T program reflects *five technical elements* that describe Hanford's physical systems: the chemical and radioactive inventory, vadose zone, groundwater, river, and risk.

The *inventory technical element* is the development of data and tools to provide the quantity, location, timing of release, mechanism of release, and composition of releases to the soil. The uncertainty associated with these data is an area of emphasis and focus.

The *vadose zone technical element* focuses on the processes that control contaminant movement through the vadose zone (soil) to the groundwater. Varying geologic, hydrologic, and chemical conditions must be assessed.

The *groundwater technical element* focuses on filling the gaps in knowledge about contamination plumes. The physical and chemical interface between the vadose zone and the groundwater, and the movement of contaminants between the groundwater and river are of concern.

The *river technical element* includes the conceptual and predictive models, including the behavior of the physical and living systems of the river.

The *risk technical element* centers on the development of comprehensive methodologies for assessing impacts (and determining metrics) to determine human, environmental, cultural, and socio-economic health.

The implementation approach used for the S&T program involves a "roadmapping process". This process brings the problem holders (e.g., DOE, State of Oregon, Tribal Nations, regulators, stakeholders, and Hanford Projects) together with problem solvers (e.g., scientists and engineers from National Laboratories and Universities) to define problems and target solutions.

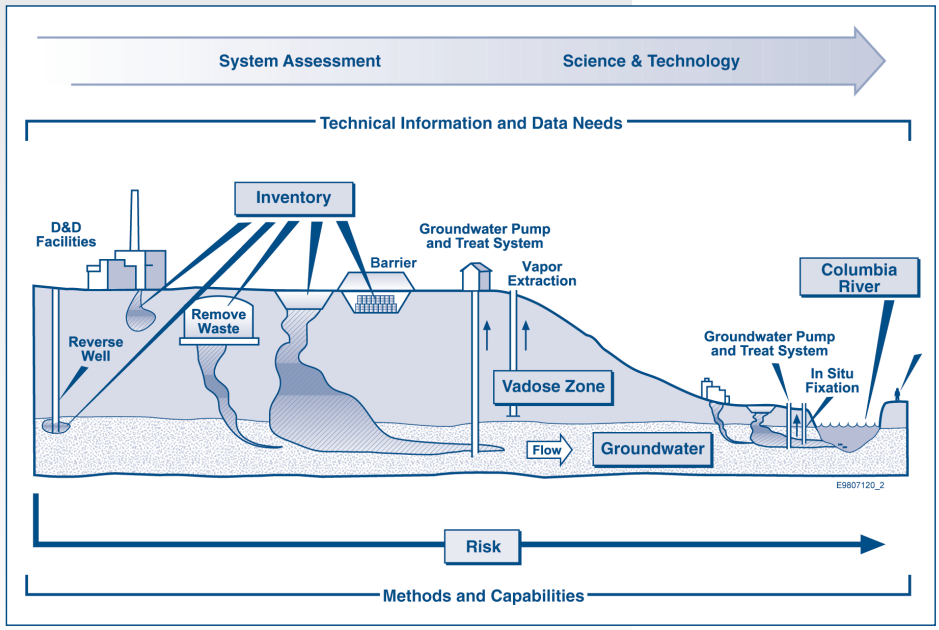
### KEY ENDEAVORS

*Use science and technology as the basis to make informed cleanup decisions, and to enable completion of a scientifically credible SAC*

### ACCOMPLISHMENTS

- *Developed sitewide S&T Roadmap*
- *A new DOE science initiative was created: DOE-HQ Environmental Management Science Program*
- *DOE National Lab initiatives focused on Hanford inventory research needs*
- *"Vadose Zone Field Study Site" is under development*

***The Five Technical Elements - Inventory, Vadose Zone, Groundwater, Columbia River, and Risk***



# Public Involvement

### KEY ENDEAVORS

*Provide effective, real-time project involvement for all interested participants*

### ACCOMPLISHMENTS

- *Set new standard for public involvement and openness at Hanford*
- *Established working groups with participation of regulators, stakeholders, the State of Oregon, and Tribal Nations*
- *Project web site available with current project information (www.bhi-erc.com/vadose)*
- *Ongoing outreach to organizations, agencies, and people throughout the Northwest*

Hanford's community of affected people is large, passionate, diverse, and geographically dispersed, but they are all united by a desire to protect the Columbia River. A fully open, accessible, and inclusive involvement process is being used to build trust and support for moving ahead.

Opportunities for involvement range from the sharing of information, to consultation, to collaboration, and are described below:

*Tribal Nations.* Technical discussions and ongoing involvement on an informal basis is conducted with Tribal representatives. Consultations, including a more formal interface with Tribal Nations, are conducted in conjunction with RL's Office of External Affairs (OEA).

*Hanford Advisory Board (HAB).* Information is provided to the HAB's Environmental Restoration (ER) Committee and Public Involvement Committee. The ER Committee determines when project information should be presented to the full HAB for consideration. The Integration Project provides the ER Committee with information at their monthly meetings.

*One-on-One Outreach Meetings.* Individual discussions held with interested individuals and organizations are encouraged. This venue has been effective in gaining input and insight into stakeholder values.

*Media Relations.* Regional communication of project-specific information is made to general audiences through the media. Press releases and interviews are used to engage the media.

***Hanford Advisory Board Members***

*Project Team Meetings.* Project team meetings will be held twice monthly to encourage effective two-way communication. Meetings are open to all interested audiences, and meeting minutes are provided. A project web site is also maintained with up-to-date information and documents (www.bhi-erc.com/vadose).

*Working Groups.* Focused working groups are used to bring all interested people together with the Project Team to address critical project issues. These work groups are expected to be of limited duration, and will target technical or policy issues. These meetings are open and inclusive.

Public and Tribal involvement challenges include:

- *How to effectively involve remote regional stakeholders in frequent Project meetings when it is not possible to pay their travel costs*
- *How to make Project decisions and make progress when there is not complete consensus*
- *How to appropriately involve regulators in the Project*

Contact the BHI Project Team at (509) 372-9236 to become involved or get information about the project.

# Technical Review

The objective is to assure that the appropriate level of management and independent technical review is applied to all Hanford vadose zone, groundwater, river, and risk work scope. The technical review activities, which support the project, include the Expert Panel and sub-panels, National Academy of Science (NAS), and other project-specific reviews.

An Expert Panel has been established to provide broad oversight of the Integration Project. The Expert Panel focuses on problem resolution and technical review. The Expert Panel was selected from a field of more than 80 names submitted by regulators, stakeholders, DOE, and Tribal Nations. Professors from the University of Washington and University of Oregon selected a short list of candidates for DOE to use to select the final eight panel members. The Expert Panel has expertise in areas of environmental management, geophysics, ecological health, radiochemistry, and hydrology.

Areas of greatest importance for the Expert Panel reviews include, but are not limited to, those that have (1) a high degree of technical uncertainty; (2) significant impacts on project outcomes; and (3) unresolved issues resulting from differences in technical interpretation.

The Expert Panel has the ability to establish sub-panels comprised of experts focused on a specific technical topic. The panel meets approximately four times a year.

The DOE has also requested that independent, external peer reviews be conducted by the NAS on a periodic basis. These reviews will be coordinated with the Expert Panel work. In accordance with NAS standards, their review will be conducted by nationally recognized technical experts.

The Hanford Site projects utilize various technical and peer review methods to ensure quality and technically sound products. Those relevant reviews are coordinated with the Integration Project.

***Expert Panel***

### *KEY ENDEAVORS*

*Provide DOE with independent technical review to improve decisions and Project effectiveness in achieving its mission*

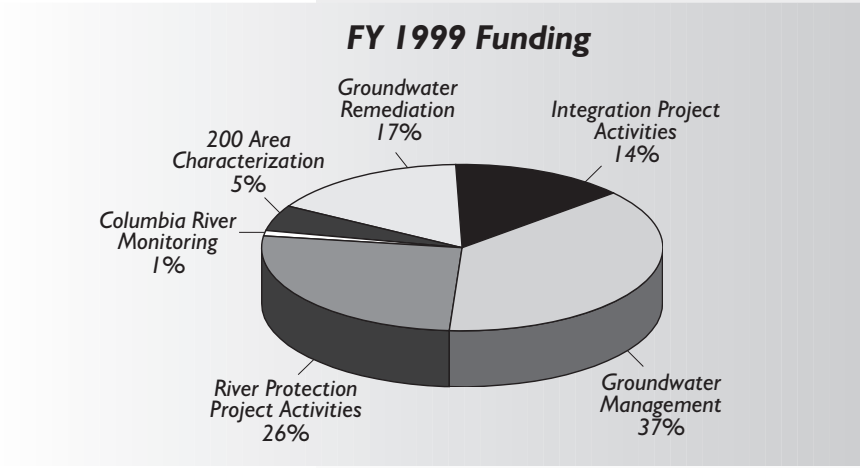
### *ACCOMPLISHMENTS*

- *Expert Panel and sub-panels formed and actively engaged in providing guidance*
- *Groundwater Sub-Panel reviewed conceptual sitewide groundwater model*
- *Washington Advisory Group review completed*
- *Established interface with National Academy of Sciences*

# FY 1999 Funding Profile

## Integration Project Fiscal Year 1999 Data

| | Dollars in Millions<br>Funding |
|---|---|
| ***Integration Project*** | |
| System Assessment Capability | $1.53 |
| Science and Technology | $1.15 |
| Technical Review | $0.82 |
| Public Involvement | $0.43 |
| Project Management | $1.80 |
| **Subtotal** | **$5.73** |
| ***Core Projects Characterization*** | |
| Groundwater and Vadose Zone Monitoring | $11.11 |
| Groundwater and Composite Modeling | $1.05 |
| Well Installation and Maintenance | $2.75 |
| River Protection Project Vadose Characterization | $5.57 |
| Tank Farm Geophysical Logging | $1.81 |
| ILAW Characterization and Performance Assessment | $1.51 |
| Cone Penetrometer Development & Demonstration | $1.51 |
| Columbia River Monitoring | $0.39 |
| 200 Area Waste Site Characterization | $1.99 |
| ***Groundwater Remediation*** | |
| 100 Area Pump and Treats (HR, KR, NR) | $4.71 |
| 200 Area Pump and Treats (UP, ZP) | $1.29 |
| 200 ZP Vapor Extraction | $0.59 |
| **Totals** | **$40.01** |




***Funding to maintain the momentum of the Integration Project, and Hanford's "core" Projects, will be required and requested for FY 2000.***

# ACCOMPLISHMENTS TIMELINE

## Integration Project Accomplishments Timeline

November 1997 – June 1999

| | | |
|---|---|---|
| **1997** | Nov | Project created by DOE |
| **1998** | Feb | "Plan for the Plan" to guide Project |
| | Mar | Multi-Contractor Project Team convened |
| | May | Open public involvement meetings begin |
| | June | GW/VZ Expert Panel selected |
| | July | National Labs convened to identify knowledge/data gaps |
| | Aug | Draft Project Specification (Rev. 0) prepared / CRCIA cross-walk to Project requirements prepared |
| | Sep | GW/VZ Expert Panel Meeting / 3 Work Groups begin (SAC, Policy, Long Range Plan) / Draft State of Knowledge report completed |
| | Nov | GW/VZ Expert Panel Meeting<br>Groundwater Sub-Panel Meeting |
| | Dec | Draft Project Specification (Rev. 1), Long Range Plan, and S&T Roadmap issued / Tank Farm Interim/Corrective Actions (TPA milestone M-45) negotiated |
| **1999** | Feb | GW/VZ Expert Panel Meeting / Regulatory Pathway Workshop conducted and Work Group formed |
| | Mar | Expert Panel Sub-Panel Meetings on Peer Review and Field Investigations & Data Gathering / SAC Uncertainty Workshop |
| | Apr | System Engineering Mission Analysis begins / Expert Panel Sub-Panel Meeting on Risk / Tank Farm Corrective Action–DQO process complete / 200 Area RIFS Implementation Plan completed / ILAW Performance Assessment documents provided for public review |
| | May | GW/VZ Expert Panel Meeting / SAC Risk Workshop<br>Tank Farm Corrective Measure–Infiltration Reduction Technology Seminar |
| | June | SAC Inventory Scoping Study drafted / SAC Risk Dependency Webs drafted / GW/VZ Integration Project Summary Document; Long Range Plan, and S&T Roadmap issued / Preparation of integrated workplans for fiscal year 2000 / Groundwater Sub-Panel Meeting |

# FY 2000 Direction

As the Integration Project begins its detailed work planning for FY 2000, the focus will be on "making progress" in the following areas:

- Ensure that the collection of field data follows sampling and analysis plans based on rigorous, cost-effective DQO processes, which are inclusive of all the associated Hanford projects, Tribal Nations, State of Oregon, regulators, and stakeholders.
- Conceptual models to guide predictive modeling (such as a sitewide groundwater model) will be coordinated and made consistent across Hanford.
- All Hanford Projects will be provided with guidance and requirements for conducting consistent and compatible performance/assessments.
- A common set of inventory, vadose zone, groundwater, and river data will be developed, compiled, and maintained under configuration control. This data will be available to all Project customers and participants.
- Information generated by non-DOE agencies will be utilized and compiled (e.g., United States Geologic Survey, the State of Oregon, Bonneville Power Administration), and opportunities for coordinated studies, data collection, and sharing will be pursued.
- Vadose zone and groundwater and characterization monitoring activities will be reviewed, "challenged," and coordinated across the Hanford Site.
- Well services, including well drilling, maintenance, rehabilitation, and decommissioning, will be integrated and coordinated to share knowledge and save money and time.
- Working with regulators, Tribal Nations, stakeholders, and the State of Oregon will develop an integrated regulatory framework for the Hanford Site. In FY 2000, the DOE would like to begin negotiating TPA milestone changes to the 200 Area characterization activities to enhance data collection and vadose and groundwater monitoring and characterization opportunities.

The efforts made to date have been focused on developing the foundation and plans for a credible, science-based approach to solve Hanford Site problems. But, as stated by the Expert Panel, **"Planning is not progress, only a prelude to progress."** The Integration Project must now effectively implement its plans, using both discipline and wisdom.

***Columbia River***