

**CATEGORICAL EXCLUSION FOR AN INTEGRATED FIELD-SCALE
SUBSURFACE RESEARCH CHALLENGE,
300 AREA, HANFORD SITE, RICHLAND, WASHINGTON**

Proposed Action: The Environmental Remediation Sciences Division (ERSD) within the Office of Biological and Environmental Research in the U.S. Department of Energy (DOE) Office of Science proposes to establish an Integrated Field-Scale Subsurface Research Challenge (IFC) in the 300-FF-5 operable unit, focusing on a groundwater plume of hexavalent uranium. Using a holistic approach, scientists would conduct research designed to understand where uranium is moving through the subsurface, how it reacts with the chemistry of the subsurface sediments, and how soil microbes may change the uranium. The broad scientific theme of the proposed IFC is mass transfer of uranium from immobile to mobile domains at multiple scales. The mass-transfer process results in significant uncertainty in predicting migration rates of reactive contaminants such as uranium and ultimately, in remediating the operable unit.

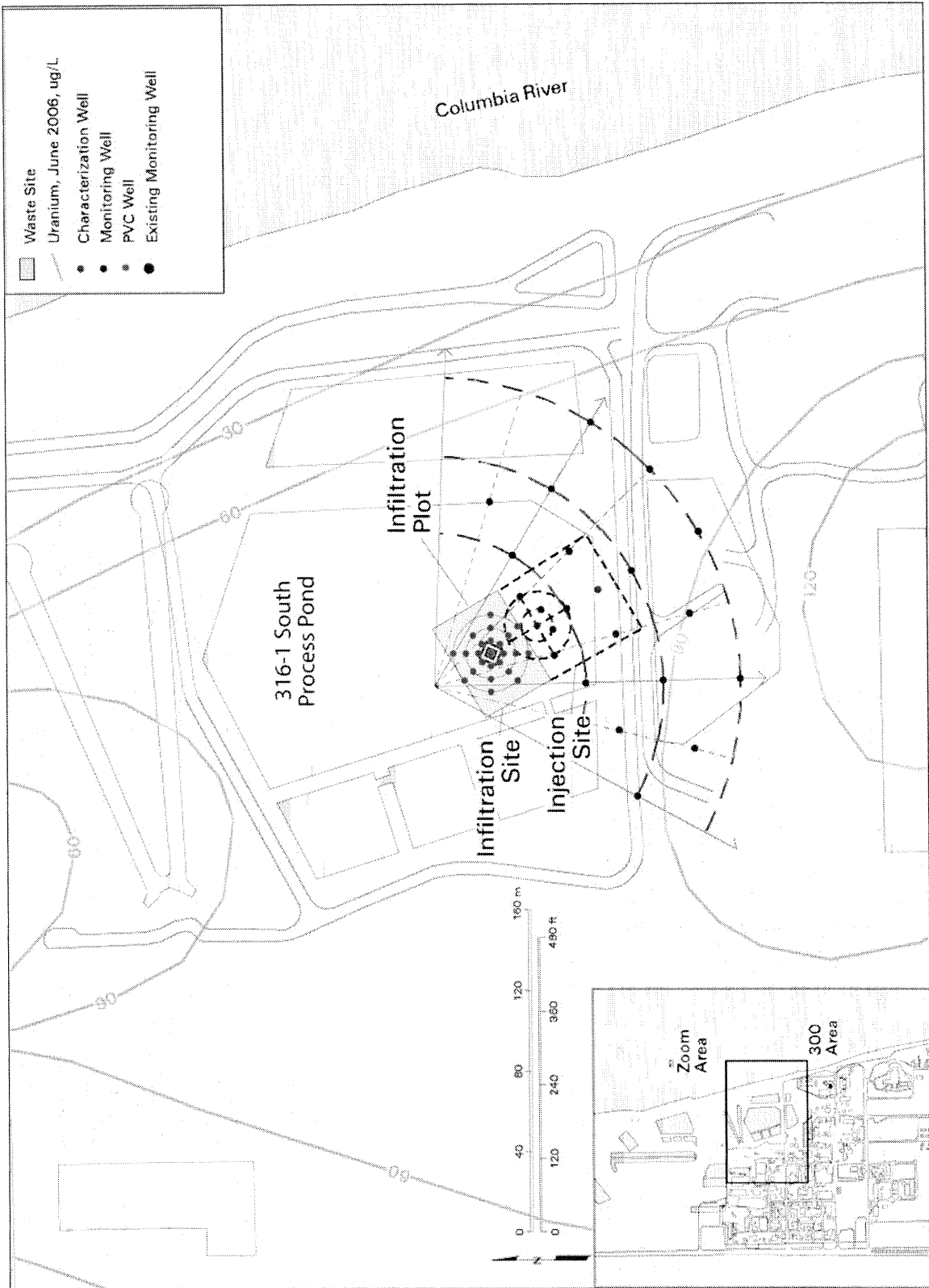
Location of Action: The IFC would be located within the footprint of the South Process Pond (SPP) in the north part of the 300 Area. The exact location would be selected by non-invasive geophysical characterization, modeling, results of the cultural and ecological resource reviews, and other knowledge of the site. Excavation will not interfere with the remediation of the 618-1 burial ground, UPR 316-3 nor the removal of wastes associated with the 340 facility.

Description of the Proposed Action: DOE proposes to establish a new field experimental plot composed of a groundwater flow path transect from a uranium source through the groundwater pathway. The site would include an injection well surrounded by a radial downgradient monitoring system that links a vadose zone injection experimental plot with a groundwater well network. Figure 1 shows the configuration of the injection well and monitoring system. This configuration would enable uranium plumes to be tracked during both low and high river stages, which is essential because of the seasonal changes in groundwater flow direction observed in the 300 Area.

This research is necessary to update the conceptual model for groundwater flow and contaminant transport. In 1996, an interim remedy of monitored natural attenuation was selected for the 300 Area hexavalent uranium plume in the 300-FF-5 operable unit, but the plume has not dissipated as quickly as expected. Challenges have arisen from an incomplete understanding of field-scale subsurface transport processes. The rate at which uranium mobilizes from the soil is slow and made slower by the continual rising and dropping of the level of the adjacent Columbia River. Considerable progress has been made updating the conceptual model through a limited field investigation and science and technology studies by the DOE Richland Operations Office. Nonetheless, key scientific questions remain that would be addressed by the IFC project.

At the IFC site, three site-specific hypotheses would be evaluated that take advantage of the unique hydrogeologic attributes of the 300 Area site. The hypotheses would focus on multi-scale mass-transfer processes in the vadose zone and saturated zone, their influence on field-scale hexavalent uranium biogeochemistry and transport, and their implications

to natural attenuation and remediation. Results from these studies would be incorporated into models of groundwater contamination at Hanford to better predict behavior.



Research would be coordinated by Pacific Northwest National Laboratory (PNNL) staff; core team members from around the country would participate, including researchers from other national laboratories, universities, and the U.S. Geological Survey.

The IFC site would include a plot for vadose zone studies and a controlled source zone for groundwater experiments. The vadose zone plot would be drilled through the pond backfill within the footprint of the SPP. Subsurface structure would be characterized using minimally invasive geophysical tools, including high-resolution seismic reflection, ground-penetrating radar, electrical-resistance tomography (ERT), and borehole lithologic logs. Sealed 2-inch PVC access tubes would be installed on a 5-meter radial grid to the depth of the water table. These tubes would be fitted with electrodes on the outside at a variable spacing to permit ERT and automated water-content measurements with depth. The center of the plot would be configured to allow manipulation of surface infiltration of water and tracers. Four large (20-cm) diameter characterization boreholes would be drilled. One of these, located within the infiltration plot, would be drilled from the base of the infiltration plot to a total depth of ~4.9 m, to just below the water table. This shallow characterization borehole would not be completed as a well, but would be used to place vadose zone instrumentation, such as solution samplers and moisture probes. The remaining characterization boreholes would be drilled from the ground surface to a total depth of ~16.8 meters, to the top of the Ringold Formation. Approximately 21 15-cm monitoring wells would be installed, and cone penetrometer wells would be installed to facilitate extrapolation between the 21 monitoring wells. All monitoring and injection wells would be equipped for continuous monitoring of data, such as water level, temperature, and electrical conductivity, with wireless relay of results to the project data-management system.

A variety of tracer materials would be used to fully characterize the local-scale mass-transfer processes and evaluate the effectiveness of the hypotheses. Tracers would include nonreactive compounds such as potassium chloride and benzoic acid tracers (trifluoromethylbenzoate; 2,6-difluorobenzoate; pentafluorobenzoate; and 2,3,6-trifluorobenzoate), bromides, sodium bicarbonate, polyphosphates, and uranium-233. Uranium-233 is not present in the uranium-isotope suite in the 300-FF-5 operable unit and is necessary for characterizing mass-transfer rates for uranium in the 300 Area. Uranium-233 would be added to the contaminated groundwater at levels that do not observably increase the total uranium concentration.

When the IFC site is established, researchers from around the country would focus on advancing basic scientific understanding of field-scale reactive transport of contaminants where mass-transfer processes control contaminant behavior. The project is expected to lead to an improved conceptual model for uranium behavior and transfer scientific results and models to the Hanford remediation contractor for completing remediation of the 300 Area. The IFC site would also be made available to other ERSD researchers to perform work under the direction of the 300 Area IFC Project. Field research would be expected to continue for a period of about 5 years. At the end of the research period, any wells and boreholes not needed for other purposes would be closed in accordance with WAC 173-160, *Minimum Standards for Construction and Maintenance of Wells*. The soil cover would be replaced and re-contoured over the site and revegetated with plant species and varieties appropriate for the site and climate. Budget is included in the IFC Project for

decommissioning the site and restoring it to existing conditions. There would be no permanent change to the ecosystem.

The proposed activities would also include foreseeable actions necessary to implement these activities, such as any necessary surveying, onsite access, well drilling, test-pit excavation, a field trailer establishment, material and sample storage, waste management, periodic equipment maintenance, and award of grants and contracts.

Cultural and Biological Resources Review: Both reviews are attached to this categorical exclusion (CX). The reviews indicate that sensitive resources would not be adversely affected by the proposed IFC establishment.

Categorical Exclusion to Be Applied: The following CX is listed in the DOE National Environmental Policy Act (NEPA) Implementing Procedures, 10 CFR 1021, Subpart D, published in the Tuesday, July 9, 1996, Federal Register (61 FR 36221):

- B3.8 Outdoor ecological and other environmental research (including siting, construction, and operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis) in a small area (generally less than five acres) that would not result in any permanent change to the ecosystem.

Eligibility Criteria: The proposed activity meets the eligibility criteria of 10 CFR 1021.410(b) because there are no extraordinary circumstances that might affect the significance of the environmental effects of the proposal. The proposed activity is not connected to other actions with potentially significant impacts [40 CFR 1508.25(a)(1)] or with cumulatively significant impacts [40 CFR 1508.25(a)(2)] and is not precluded by 10 CFR 1021.211.

The “Integral Elements” of 10 CFR 1021 are satisfied as discussed in the following table:

INTEGRAL ELEMENTS, 10 CFR 1021, APPENDIX B, SUBPART D	
WOULD THE PROPOSED ACTION:	COMMENT OR EXPLANATION:
Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including requirements of DOE and/or Executive Orders?	The proposed action would not threaten a violation of regulations or DOE or Executive Orders.
Require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities?	Waste generation is expected to be minimal. Wastes created by the proposed action would be treated, stored, or disposed of in existing waste facilities.
Disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases?	The proposed action must necessarily occur within an area of groundwater contamination. However, no preexisting hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act-excluded petroleum and natural gas products would be disturbed in a manner that would result in uncontrolled or unpermitted releases.
Adversely affect environmentally sensitive resources, including, but not limited, to: (a) property of historic, archeological, or architectural	No environmentally sensitive resources would be adversely affected. Refer to the attached resource reviews.

INTEGRAL ELEMENTS, 10 CFR 1021, APPENDIX B, SUBPART D

<p>significance designated by federal, state, or local governments or property eligible for listing on the National Register of Historic Places</p> <p>(b) federally listed threatened or endangered species or their habitat, federally proposed or candidate species or their habitat, or state-listed endangered or threatened species or their habitat</p> <p>(c) wetlands regulated under the Clean Water Act and floodplains</p> <p>(d) federal- and state-designated wilderness areas, national parks, national natural landmarks, wild and scenic rivers, state and federal wildlife refuges, and marine sanctuaries, prime agricultural lands, special sources of water, tundra, coral reefs, or rainforests.</p>	<p>Please refer to the attached cultural and biological resource reviews. The proposed action would not adversely affect floodplains; wetlands regulated under the Clean Water Act; national monuments or other specially designated areas; prime agricultural lands; special sources of water; or tundra, coral reefs, or rainforests.</p>
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Checklist Summarizing Environmental Impacts: The following checklist summarizes environmental impacts that were considered when preparing this CX determination. Answers to relevant questions are explained in detail in the text following the checklist.

IMPACT TO AIR

Would the proposed action:		YES	NO
1	Result in more than minor and temporary gaseous discharges to the environment?		X
2	Release other than nominal and temporary particulates or drops to the atmosphere?		X
3	Result in more than minor thermal discharges?		X
4	Increase offsite radiation dose to >0.1 mrem (40 CFR 61 Subpart H)?		X

IMPACT TO WATER

Would the proposed action:		YES	NO
5	Discharge any liquids to the environment?	X	
6	Discharge heat to surface or subsurface water?		X
7	Release soluble solids to natural waters?		X
8	Provide interconnection between aquifers?		X
9	Require installation of wells?	X	
10	Require a Spill Prevention Control and Countermeasures plan?		X
11	Violate water quality standards (Washington Administrative Code [WAC] 173-200, Table 1)?		X

IMPACT TO LAND

Would the proposed action:		YES	NO
12	Conflict with existing zoning or land use?		X
13	Involve hazardous, radioactive, polychlorinated biphenyl, or asbestos waste?	X	
14	Cause erosion?		X
15	Occur on the Hanford Reach National Monument?		X
16	Require an excavation permit?	X	
17	Disturb an undeveloped area?		X

GENERAL

Would the proposed action:		YES	NO
18	Cause other than a minor or temporary increase in noise level?		X
19	Make a long-term commitment of large quantities of nonrenewable resources?		X
20	Require new utilities or modifications to utilities?	X	
21	Use pesticides, carcinogens, or toxic chemicals?	X	
22	Require a radiation work permit?	X	

Explanations:

1. During establishment of the IFC site, the use of a drill rig and the possible use of a temporary generator would be expected to result in short-term minor air emissions. Notifications or approvals might be required from the Benton Clean Air Authority to use these types of equipment with internal combustion engines.

5. Well development, maintenance, and sampling might require purging of groundwater. Purgewater would be dispositioned in compliance with the *Strategy for Handling and Disposing of Purgewater on the Hanford Site*. Although not expected, provisions would be made to address the potential for accidental spills of hydraulic fluids, gas, oil, antifreeze, etc.

During sampling and monitoring activities, there might be other minor quantities of liquid effluents, for example, sampling-equipment cleanup rinsewater. Effluents would be managed in accordance with PNNL Standards-Based Management System requirements and best-management practices.

In addition, well registration might be required from the State of Washington Department of Ecology (Ecology) for the injection of tracers into the subsurface through an underground injection control well in accordance with the requirements of WAC 173-218, *Underground Injection Control Program*. The injection of tracers is covered under the existing State Waste Discharge permit ST 4511 for the Hanford Site, which requires injected fluids to meet the Groundwater Quality Criteria (WAC 173-200-040). Concurrence would be requested from Ecology because of the proximity of the injection point to former waste-disposal sites.

7. Adding water and tracers of even slightly different chemistry to the groundwater could be expected to release minor amounts of sorbed uranium in the sediments to the vadose zone and/or groundwater.
9. The Hanford groundwater remediation contractor would be responsible for well drilling, sample recovery, waste management during drilling operations, and well completion. All activities would be conducted in compliance with DOE direction and applicable State of Washington regulations. Notifications and well-construction reports might be required by Ecology to meet the minimum standards for construction and maintenance of resource protection and geotechnical wells needed for site characterization and environmental monitoring.
13. Well development and field-research activities would generate hazardous and/or radioactive waste. If not recyclable, such wastes would be packaged, transported, stored, and/or disposed of in appropriate waste-management areas or in existing permitted treatment, storage, and disposal facilities in accordance with applicable local, state, and Federal regulations and DOE orders.
16. A Hanford excavation permit would be obtained to avoid existing utilities and other buried features and confirm the avoidance of sensitive cultural and ecological resources.
18. The temporary use of drilling equipment may temporarily increase the noise level in the immediate area for short durations of time, with the greatest noise levels expected during the initial phases of the project.
20. The placement of a field support trailer might require the minor extension of existing utility services. A temporary extension of electrical service would be routed to the project trailer, or a generator would be used to provide electricity. Potable or process water might be extended to the site if it is determined to be cost-effective and feasible.
21. Proposed activities might involve pesticides, carcinogens, and/or toxic chemicals. For example, certain research or well-construction equipment might contain or require the use of chemicals such as antifreeze, hydraulic fluids, or fuel. In addition, field-research activities might require the use of cleaning solvents and other potentially toxic substances. Hazardous materials would be managed in compliance with applicable local, state, and Federal regulations, and DOE orders.

Samples would be managed in compliance with PNNL's Standards-Based Management System subject area for Sample Handling, Archival, and Disposal. The project would comply with all applicable environmental regulations.

Introduced tracer materials are expected to have negligible impacts because of the small volumes used and generally benign nature of the materials. As previously stated, uranium-233 would be added to the contaminated groundwater at levels that do not observably increase the total uranium concentration. Material Safety Data

Sheets for these materials would be maintained at the IFC Project site once it is established.

22. The well installation and follow-on research activities would be conducted within the 300-FF-5 operable unit. The primary contaminant of concern is hexavalent uranium. Appropriate worker controls would be in place, and work would be conducted in accordance with the applicable radiological work permits. Proposed activities would be performed in compliance with "as low as reasonably achievable" principles; applicable local, state, and Federal regulations; DOE Orders; and contractor guidelines. Radiation received by workers would be administratively controlled below DOE limits as defined in 10 CFR 835.202(a). Under normal circumstances, those limits control individual radiation exposure to below an annual effective dose equivalent of 5 rem.

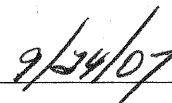
Compliance Action:

I have determined that the proposed action satisfies the eligibility criteria, does not pose extraordinary circumstances, and meets the requirements for the CX referenced above. Therefore, using the authority delegated to me by DOE Order 451.1B, Change 1, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

Signature: _____


Woody Russell

Date: _____



Hanford NEPA Compliance Officer

Attachments (2)

Distribution:

R.H. Engelmann, FH

M.T. Jansky, FH

R.S. Weeks, PNNL

Attachment 1. Cultural Resources Review

From: McFarland, Douglas P
Sent: Tuesday, August 14, 2007 5:43 PM
To: Freshley, Mark D; Jurachich, Samuel P
Cc: Prendergast-Kennedy, Ellen L; Rodriguez, Annabelle L; McFarland, Douglas P
Subject: Cultural Resource Review Notice To Proceed: Integrated Field-Scale Subsurface Research Challenge-- Characterization and Monitoring Wells in the 300 Area (NPCE#2007-300-021A)

Mr. Freshley and Mr. Jurachich

Thank you for contacting our office regarding your project. The project area is located in the 300 Area, Hanford Site. The project activities consist of the possible excavation of an area 30 x 30 feet up to a depth of ~15 feet (the depth of the remediation fill), installation of 4 characterization boreholes, 21 monitoring wells, and up to 25 access pvc wells in the remediated "South Pond" of the 300 Area. This task is part of a large 5-yr project running from October 2007 through September 2011.

Per 36 CFR Part 800, Subpart B, 800.3.a, the DOE-RL Cultural Resources Program has determined that this project is **not** the type of undertaking with potential to cause effects to historic properties and no further actions are required. The finding is based on the following:

- Aerial photographs confirm extensive disturbance in this location.
- Field visits confirm disturbance evident in aerial photographs

All workers should be directed to watch for cultural materials (e.g. bones, artifacts) during all work activities. If any are encountered, work in the vicinity of the discovery must stop until an HCRP archaeologist has been notified, assessed the significance of the find, and, if necessary arranged for mitigation of the impacts to the find. Please contact Doug McFarland or Ellen Prendergast-Kennedy, HCRP, if any changes to project location or scope are anticipated.

For tracking purposes, NPCE# 2007-300-021A has been assigned to your request.

Again, thank you for contacting us regarding your project.

Doug McFarland
Scientist/Archaeologist
Pacific Northwest National Laboratory
PO Box 999, MSIN: K6-75
Richland, WA 99352
phone (509) 371-7109
E-mail: douglas.mcfarland@pnl.gov
<http://www.hanford.gov/doe/history/>

Attachment 2. Biological Resources Review

AUG 14 2007 3:22PM

BATTELLE

NO. 2865 P. 1

Pacific Northwest National Laboratory

Operated by Battelle for the
U.S. Department of Energy

August 13, 2007

Mr. Mark Freshley
Pacific Northwest National Laboratory
P.O. Box 999, MSIN K9-33
Richland, WA 99352

Post-it* Fax Note	7671	8/14/07	# of pages 3
To: <i>M. Freshley</i>		From: <i>S. Sakschewsky</i>	
Co./Dept:		Co:	
Phone #		Phone #	
Fax # <i>375-4426</i>		Fax #	

Dear Mr. Freshley:

BIOLOGICAL REVIEW OF THE PROJECT "INTEGRATED FIELD-SCALE SUBSURFACE RESEARCH CHALLENGE", ECR #2007-300-021A.

Project Description:

- The project area is located in the 300 Area, Hanford Site. The project activities consist of the possible excavation of an area 30 x 30 m up to a depth of 5 m (the depth of the remediation fill), installation of 4 characterization boreholes, 21 monitoring wells, and up to 25 cone penetrometer wells in the remediated "South Pond" of the 300 Area. This task is part of a large 5-yr project running from October 2007 through September 2011 and is associated with a previous review, ECR# 2007-300-021. The proposed project is located in an area that has been remediated with clean fill brought in and revegetated.

Survey Objectives:

- Determine the occurrence in the project area of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act (MBTA).
- Evaluate and quantify the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

Survey Methods:

- Pedestrian and visual reconnaissance of the proposed project site was performed by M.A. Chamness on June 5, 2007. The percent cover of dominant vegetation was visually estimated.

903 Battelle Boulevard • P.O. Box 999 • Richland, WA 99352

Telephone (509) 371-7187 □ E-mail: michael.sakschewsky@pnl.gov □ FAX: (509) 371-7160

Mr. Mark Freshley
2007-300-021A
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- Priority habitats and species of concern are documented in: Washington Department of Fish and Wildlife (2006a, 2006b), and Washington State Department of Natural Resources (2007). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the U.S. Fish and Wildlife Service are maintained at 50 CFR 17.11 and 50 CFR 17.12; the list of birds protected under the MBTA is maintained at 50 CFR 10.13.

Survey Results:

- Most of the area of interest has been disturbed and revegetated with non-native plants in the past. The plant community is dominated by introduced large bunchgrasses (30-55% cover), with cheatgrass (*Bromus tectorum*) and small sixweeks fescue (*Festuca microstachys*) providing an additional 1-10% cover). Gray rabbitbrush (*Ericameria nauseosa*) and big sagebrush (*Artemisia tridentata*) are present along the undisturbed eastern side of the proposed site, providing 25% cover in that strip.
- Although several migratory birds were noted and potentially nesting in the area during the previous survey on June 5, 2007, nesting should be done for the year any young should have fledged and be able to move about freely.

Considerations and Recommendations:

Based on the previous survey covered under ECR# 2007-300-021

- No plant or animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed in the vicinity of the proposed site.
- Three ground-nesting migratory bird species, horned larks, meadowlarks, and common nighthawks were found within the proposed site although nests were not observed. The nests and eggs of these species are nondescript and therefore often not readily observed. Other ground-nesting birds potentially in the area include killdeer (*Charadrius vociferous*) and long-billed curlew (*Nimentus americanus*). The nesting season is nominally March 1 through July 15, and work performed outside of this time period should not affect nesting birds.
- Where reasonable, minimize disturbance of the revegetated surface since the vegetation serves to reduce dust, and provides potential habitat for ground-nesting birds during the spring.

Mr. Mark Freshley
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- Assuming compliance with the above recommendation, no adverse impacts to species, habitats, or other biological resources are expected to result from the proposed action.
- This Ecological Compliance Review is valid until 15 April 2008.

Sincerely,

Nickie Chambers for

Michael R. Sackschewsky
Compliance Assessment Manager
Ecological Monitoring and Compliance Project

LB:mrs

REFERENCES

- Washington Department of Fish and Wildlife. 2006a. Species of Special Concern in Washington. WDFW web site <http://wdfw.wa.gov/wlm/diversity/soc/soc.htm>
- Washington Department of Fish and Wildlife. 2006b. Priority Habitats and Species List. WDFW web site. <http://wdfw.wa.gov/hab/phshabs.htm>
- Washington Department of Natural Resources. 2007. Washington Natural Heritage Information System Plant Ranks. <http://www.dnr.wa.gov/nhp/refdesk/lists/plantmk.html>