0049469

Meeting Minutes Transmittal

300 Area BWHC Facility Transition General Topics
Project Managers' Meeting
Federal Building/Room 590-A
Richland, Washington

June 4, 1998
1:30 p.m. to 2:00 p.m.

The undersigned indicate by their signatures that these meetings minutes reflect the actual occurrences of the above dated Unit Managers Meeting.

for [signature] Date: 7/9/98
David W. Templeton, Project Manager, RL

[signature] Date: 7/9/98
J. J. Wallace, Project Manager, Washington State Department of Ecology

[signature] Date: 7/8/98
O. A. Farabee, RL, FFTF Standby Project Office

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300 Area BWHC Facility Transition General Topics PMM, BWHC Concurrence

[signature] Date: 7/31/98
D. E. Rasmussen, Contractor Representative, BWHC

Purpose: Discuss BWHC 300 Area Facility Transition General Topics

Meeting Minutes are attached. The minutes are comprised of the following:

Attachment 1 - Agenda
Attachment 2 - Summary of Discussion and Commitments/Agreements
Attachment 3 - Attendance List
Attachment 4 - 324 Building Hot Cell Equipment Size-Reduction and Decontamination Using Robotic System

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Attachment 1

300 Area BWHC Facility Transition General Topics
Project Managers' Meeting
Federal Building/Room 590-A
Richland, Washington

June 4, 1998
1:30 p.m. - 2:00 p.m.

Agenda

1. Introductions

2. Previous Meeting Minutes

3. 303-K status

4. 3718F status

5. Special Case Waste (SCW) study

   a. Status of 324 Building Special-Case Waste Assessment in Support of the 324 Building Closure, HNF-2570, Revision 0 (TPA Milestone M-89-05)

   b. Status of 324/327 Waste Designation Document

6. Action item review

   a. Silver list issues closeout status

7. Other topics/discussion

   a. 327 TRU SCW one-gallon containers status

8. Schedule Next Meeting

Attachment 2

300 Area BWHC Facility Transition General Topics
Project Manager's Meeting
Federal Building, Room 590A
Richland, Washington

June 4, 1998
1:30 p.m. - 2:00 p.m.

1. Introductions

Introductions were made.

2. Previous meeting minutes

No minutes were available for signature. The May 7, 1998 Project Manager Meeting (PMM) minutes are in review.

3. 303-K status

J. Adler (WMH) stated that there are 303-K meeting minutes being kept that are separate from these meetings, and those minutes are in review.

There were two action items related to the 303-K to status:

Action item 03/05/98: Arrange a meeting between Ecology, DOE-RL, and the PHMC to allow DOE-RL and the PHMC to review Ecology's data. The meeting occurred on May 27, 1998. This action item is closed.

Action item 05/07/98: Meet to discuss the 303-K path forward document. The meeting occurred on May 27, 1998. This action item is closed.

During the May 27, 1998 meeting, Ecology indicated that they would be willing to review the mercury data to determine whether they consider it usable. J. Bartz (Ecology) took an action to provide a response regarding the mercury data.

J. Adler requested a meeting with Ecology and DOE-RL to discuss the uranium and PCB's, the 303-K path forward document, and funding. A meeting was set up for June 16, 1998. Regarding the uranium and PCB's, J. Bartz noted that a specific permit condition was written by Ecology to incorporate all of the hazardous constituents; uranium and PCBs are included in the current Model Toxics Control Act (MTCA) tables.

J. Bartz requested that the discussion on funding is also included as part of the 300 Area BWHC minutes.

J. Bartz referred to the permit condition that requires the Professional Engineer (PE) certification submittal by the end of September 1998, and stated that if there is a change in the submittal date, the chapter would have to be opened for public comment since it is a specific permit condition. A brief discussion ensued regarding the possibility of including the chapter in the sitewide permit modification (Mod D), which goes out for public comment on July 8, 1998.

Two action items were generated from the discussion:

1) Ecology will make a determination by June 23, 1998 whether the permit condition regarding the PE certification can be included in Mod D;
2) WMH will make a determination by June 23, 1998 on what the new date for submittal of the PE certification will be.

E. Mattlin (DOE-RL) provided Ecology a heads-up regarding the 340 vault 90-day clock status. The above-ground tanks were sluiced and the waste moved to the 340 vault. The 90-day clock for moving the waste out of the 340 vault expires June 17, 1998. Additional sampling is being performed to ensure the waste meets TWRS acceptance criteria, which may create the possibility of an extension of the 90-day period. J. Wallace indicated that she would approve a brief extension, if necessary.

4. 3718F status

T. Dillhoff (BWHC) reported that the aluminum plate that was hit during auger sampling of the sumps last year was sampled, and all of the oxide was aluminum and no sodium. The samples taken from the ground are under the limits.

E. Mattlin (DOE-RL) inquired about an acceptable approach for documenting the sampling activity since the 3718-F certification has already been submitted to Ecology. J. Wallace (Ecology) stated that an attachment to the certification explaining the sampling activity would be acceptable.

5. Special case waste (SCW) study

a. Status of 324 Building Special Case Waste Assessment in Support of the 324 Building Closure, HNF-2570, Revision 0

D. Rasmussen (BWHC) stated that the Special Case Waste (SCW) document is being prepared for submittal to Ecology by DOE-RL. The SCW document is being submitted to support of Tri-Party Agreement (TPA) milestone M-89-05, which is due to Ecology on June 30, 1998.

b. Status of 324/327 waste designation document

D. Rasmussen (BWHC) stated that the 324/327 Waste Designation document, which summarizes the waste designation process for several waste streams in 324, is in DOE-RL and FDH review.

6. Action item review

a. Silver list issues closeout status

H. Tilden (PNNL) stated that Ecology signed the closeout forms for Silver list item Nos. 16.1.8 and 16.5.8. Silver list issues 16.1.9 and 16.3.10 are in Ecology review.

7. Other topics/discussion

a. 327 TRU SCW one-gallon containers status

D. Rasmussen stated that 58 containers have been packaged into 16 drums which have gone through nondestructive assay (NDA). Nine of the 16 drums are transuranic (TRU) waste, and five of the 16 drums are low level waste.

D. Rasmussen reported that BWHC is developing a proposal to

ultra high pressure water spray 7/9/98 [illegible]

utilize a commercial ~~vacuum~~ system for decontamination in the 324 building. The current Notice of Construction (NOC) for B-Cell covers high pressure water washing and various vacuum systems. The proposal outlines the use of a high pressure wash which has a ~~vacuum~~ suction head near the point of impact. spray

J. Wallace stated that she received a document describing proposed decontamination processes for B-Cell, including the commercial ~~vacuum~~ system, and she requested that the document be attached to the PMM minutes (Attachment 4). J. Wallace noted that the robotic size reduction and the first two decon techniques in the document were acceptable; however, she expressed concern with the technique of deconning the concrete under the cell liner because of the breach in A-Cell, and that the approach would not be acceptable until it is confirmed there is no possibility for spreading contamination.

[illegible] 7/9/98

8. Schedule Next Meeting

The next meeting was scheduled for July 9, 1998, at in the Federal Building, Richland, Washington.

Attachment 3

Attendance List

Meeting Title: 300 Area BWHC Facility Transition General Topics Project Managers Meeting

Date: June 4, 1998

Name	Company	Phone Number
DAVE E. RASMUSSEN	BWHC	376-3288
Greta P. Davis	Ecology	736-3025
Joanne J Wallace	Ecology	736-3019
Andrea L. Prignano	WMH - ES	376-1057
AL Farabee	DOE	376-8089
Harold Tilden	PNNL	376-0499
Jack Sonnichsen	WMH	376-9956
Jason Adler	WMH	376-3513
ELLEN MATTLIN	DOE-RL	376-2385
Michelle Anderson-Moore	Ecology	736-5714
R.L. Guillen (Leo)	DOE/RL	376-0254
J.A. REMAIZE	BWHC	372-1962
Nancy Ballantyne	FDH	372-1547
Tom DILLHOFF	BWHC	376-0441
JOHN K. BARTZ	ECOLOGY	736-5707
ANDREA HOPKINS	FDH	373-5395
Dave Templeton	DOE-RL	373-2966

Attachment 4

300 Area BWHC Facility Transition General Topics
Project Managers' Meeting
Federal Building/Room 590-A
Richland, Washington

June 4, 1998
1:30 p.m. to 2:00 p.m.

324 Building Hot Cell Equipment Size-Reduction and Decontamination
Using Robotic System

RL-F-1325.6 (02/98)

United States Government **Department of Energy**

memorandum

Richland Operations Office

DATE:

REPLY TO ATTN OF: AMF:DCL/98-AMF-026

SUBJECT: CALL FOR FISCAL YEAR (FY) 1999 TECHNOLOGY DEPLOYMENT PROPOSALS

TO: Robert M. Rosselli
Assistant Manager for Science
and Technology

In response to your memorandum 98-STP-297, dated May 20, 1998, same subject as above, AMF is pleased to submit the above proposal (Enclosure 1) in response to the Accelerated Site Technology Deployment (ASTD) call for proposals. I strongly endorse the ASTD concept and view it as a unique opportunity to jump-start the deployment of technologies that will reduce baseline costs, accelerate schedules and more efficiently meet the DOE Environmental Management mission.

This proposal has been subjected to extensive review and includes project commitment for leveraged funding at Hanford. The Site Technology Coordinating Group, Decontamination and Decommissioning Group (D&D) Subgroup, provided independent review of this proposal; their endorsement for this proposal is enclosed (Enclosure 2). Cavanaugh Mimms, from the Oak Ridge Operations Office, has also endorsed the future deployment of the proposed technology for D&D of hot cells at the Oak Ridge National Laboratory (Enclosure 3).

RL is committed to providing the resources (personnel, facilities and equipment) necessary to manage and execute this project. Cost savings obtained due to the deployment of this proposal will be reinvested appropriately into completing the DOE Environmental Management mission, which includes future deployments of new technologies.

If you have any questions, please contact me or David Langstaff, of the Transition Program Division, at (509) 376-5580.

James E. Kleco
for Peter M. Knollmeyer, Assistant Manager
for Facility Transition

Enclosures

cc w/encls: See page 2.

cc w/encls:
L. K. Bauer, AME
C. A. Hansen, AMW
J. E. Kinzer, TWRS

Enclosure 1

FLUOR DANIEL

Fluor Daniel Hanford, Inc.
P.O. Box 1000
Richland, WA 99352

June 5, 1998

FDH-9854906

Mr. P. M. Knollmeyer, Assistant Manager
Facility Transition
Department of Energy
Richland Operations Office A5-11
P. O. Box 550
Richland, Washington 99352

Dear Mr. Knollmeyer:

CONTRACT NO. DE-AC06-96RL13200 - SUBMITTAL OF "REMOTE SIZE-REDUCTION AND DECONTAMINATION IN LARGE HOT CELLS BY DEPLOYING ROBOTIC TECHNOLOGIES," PROPOSAL FOR ACCELERATED SITE TECHNOLOGY DEPLOYMENT PROGRAM

In response to the Department of Energy call for technology deployment proposals, enclosed for your consideration is a proposal entitled "Remote Size-Reduction and Decontamination in Large Hot Cells by Deploying Robotic Technologies." The proposal was drafted based on the criteria contained in the Accelerated Site Technology Deployment (ASTD) call for proposals dated May 1, 1998. On behalf of the Project Hanford Management Contract (PHMC) team, I strongly endorse this proposal and view it as a unique opportunity to accelerate our cleanup efforts and jump-start the deployment of a technology that will reduce baseline costs.

This proposal has been through an internal review in parallel with reviews by your staff. This current version of the proposal incorporates comments received through June 4, 1998. If you or your staff have additional comments or concerns, please contact Singh Bath at 376-1840.

Sincerely,

for L. J. Olguin, Project Director
Facility Stabilization

LJO/md/jm

Attachment

RECEIVED
JUN 09 1998
DOE-RL/RLCC

FDH-9854906

ATTACHMENT

ACCELERATED SITE TECHNOLOGY DEPLOYMENT PROPOSAL

TITLE: REMOTE SIZE-REDUCTION AND DECONTAMINATION IN LARGE HOT CELLS BY DEPLOYING ROBOTIC TECHNOLOGIES

YEAR: FY 1999

Rich L. Hobart
BWHC Principal Investigator

6-5-98
Date

Larry J. Olguin
FDH Facility Transition Project Director

6-8-98
Date

for James E. Mecca
Peter M. Knollmeyer
DOE-RL Assistant Manager

6/9/98
Date

U.S. Department of Energy
Office of Environmental Management

Remote Size-Reduction and Decontamination in Large Hot Cells by Deploying Robotic Technologies

Executive Summary

The 324 Building, located at Hanford Site in Richland, Washington, contains many large hot cells and tank vaults that are highly radioactive and filled with large complex equipment. This facility is being decontaminated. This cleanup need is documented as Environmental Management (EM) Hanford Site Technology Coordination Group, Need RL-DD06, Decontamination of Building 324. More rapid remote size-reduction and debris collection methods are needed to clear the area for decontamination to take place. Readily deployable decontamination methods that minimize worker exposure, secondary waste generation, costs, and risk are needed. The specific need is to deactivate the 324 Building to support U.S. Department of Energy (DOE) mortgage reduction goals.

The present systems are based on overhead bridge cranes and mechanical master-slave manipulator systems. Serious problems exist in accessing various hot cell spaces thereby hampering equipment removal and decontamination activities that are scheduled in the overall project plan. Many tasks are very difficult to achieve and inefficient because access to the cell floor, ceiling and corner areas is accessible only through design and procurement of special tooling for the overhead crane and for the manipulators. Deployment of a robot work platform, including full reach capabilities, will significantly accelerate work tasks, eliminate the need for multiple specialized tool design and procurement, and reduce the overall program risks.

Deployment of a robot work platform suspended from a crane to perform size-reduction and decontamination activities is proposed through the Accelerated Site Technology Deployment (ASTD) program to accelerate cleanup. All the 324 Building hot cells have cranes. The robot work platform may be suitable for deployment at multiple hot cell and canyon facilities complex-wide if the facility is equipped with an overhead crane. The robot has two arms that can be used for stabilization or for manipulating various tools for size-reduction or decontamination. Deployment of a robot suspended from a crane will be used to accelerate size-reduction of large and complex contaminated excess equipment and debris collection so that the hot cell can be decontaminated after the equipment is removed.

Following size-reduction and removal of excess equipment, other components will be available to be attached to the robotic arm to accelerate 324 hot cell clean up and reduce secondary waste generation during hot cell decontamination. Both the robotic system and the waste management decontamination technologies are demonstrated technologies that can be coupled into an integrated tool.

This proposal for funding of $1,544,800 conservatively estimates the **cost savings for the Fiscal Years FY 1999 and FY 2000 at $221,000**, including procurement, installation, and testing, and **a conservative life cycle (FY99-2005) savings of $2,679,000** primarily based on time savings in FY 1999 and FY2000. In addition this proposal conservatively estimates the man-rem **savings to the onsite worker at 30-50 man-rem in FY 1999 and FY2000**. Finally this investment significantly increases the confidence in meeting the baseline requirements and schedule. This ASTD proposal is to finance the cost of the equipment (estimated ~$1,250,000 for the robotics). **Matching funds** will come from the baseline operations funds (**~$40 million**) planned for clean up of the 324 Building.

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Appendix A. 324 Cleanup Project Schedule (Visio)

Appendix B. Spreadsheet Showing Impact of Technology on Baseline Cost and Estimated Cost Savings

1.0 Introduction and Background

1.1 Overview

Four advanced technologies were considered for accelerating the work in the 324 Building, including B-Cell. The first technology considered included an immediate process improvement technology, i.e., remote robotics, the remaining were future decontamination technologies to be employed in 2001 – 2007, including solid carbon dioxide blasting, laser ablation (cleaning), and ultra-high pressure water scarification. The decontamination strategies will be developed in a future proposal, but will be integrated into the specification for the remote robotics to ensure future usability.

The first step in the 324 Radiochemical Engineering Cell cleanout is the removal of highly contaminated process equipment. Existing overhead bridge crane and mechanical master-slave technology is inefficient compared to modern methods. Deploying robotics using a suspended work platform is the primary focus of this presentation.

This proposal recommends a robotic workstation to accelerate the size reduction, sorting and removal of highly contaminated equipment for B-Cell and other areas of the 324 Building. The primary short-term benefit of technology deployment in Fiscal Year (FY) 1999 would stem from the use of a mobile robotic system in the 324 Building B-Cell. Future use of the remote robotics for equipment removal will be deployed in the other various 324 hot cells, and the High- and Low-Level Storage Tank Vaults

1.2 Present Practices

Currently B-Cell cleanout actions involve using mechanical master-slave manipulators at the midpoint of three walls and two overhead conventional bridge cranes. Equipment assemblies are moved to one of the manipulator stations where the outside operator uses plasma arc cutting and Skil saw abrasive disk cutting to disassemble and size-reduce the process rack. If a saw binds, it can break the control tapes or other parts of the manipulator very quickly. This requires manipulator removal, decontamination, replacement, and repair to sustain the work progress. Access to the rack is limited to those areas that the manipulator can reach. Visibility is limited by the partial transmission of thick lead glass windows. This problem has been partially solved by using in-cell video; however, the resolution of that is low. Dispersibles on the floor and debris on the floor must be concentrated in 'piles' using crane pulled rakes or other objects, and then the solids are retrieved using special remote devices suspended from the crane hook such as a pneumatic clamshell. Any action requiring horizontal actions is severely limited by the overhead crane 30 feet above the floor. Near the ceiling, floor areas, and corner areas, such actions are possible with severe limitations or are impossible with the existing equipment. Special adapters or tools must be designed and fabricated for even the simplest of tasks. Other hot cells have similar conditions, but with lower ceiling to floor distances and somewhat better coverage by the master slave manipulators.

Similar problems will be faced when the decontamination activities occur in FY 2000. Under this circumstance the lack of cell access could require the design and fabrication of multiple tools to make use of decontamination technologies. Equipment required to meet Closure Plan (regulatory) requirements for cleaning the cell liner, removing the wall and floor cladding if heavy contamination exists behind the clad, or removing highly contaminated concrete under the clad if leakage has occurred may require special remote equipment.

Current baseline plans incorporate chemical decontamination methods to clean the cell surfaces because the reagents used for this approach can be distributed with the existing gear (hose and spray). If

remote equipment was available that could reach all areas within the cell, alternate technology resulting in minimal waste generation reduced worker exposure could be used. Chemical decontamination is an effective removal method that has been proven in the field; however, it does bring with it a liquid disposal problem. Waste disposal costs are significant.

2.0 Part I - Technical Proposal Overview

2.1 Impact/Technical Approach

The proposal recommends using a crane-hung two-arm robot work platform to perform tasks in all parts of the cell. Operations such as metal cutting, piece retrieval, small equipment moving, floor cleaning, inspection by camera, characterization actions, and decontamination activities are all possible using a variety of tools associated with the robot arms. Considerable time savings should occur with the use of the robot work platform. Existing methods consist of moving the heavy equipment to one of the manipulator stations and using the plasma arc torch or Skil saws to cut parts/pieces from the structure and equipment. This procedure is very slow at best. Activities in any other part of the cell are restricted to crane operated devices, which are very limited.

An existing robot available and produced by Nuclear Materials Company, Chatillion, France (COGEMA), Societe Generale Des Technologie Nouvelle (SGN)[1] is designed to hang from a crane hook and has two hydraulic arms with a 6-foot reach. It is designed to operate with a variety of tool devices that would be used for hot cell equipment/debris removal in addition to decontamination operations. The unit would be able to reach all areas of B-Cell and other cells, where used. A major benefit of this system is that it hangs on a crane hook and thus may be moved from one area to another after appropriate decontamination. One arm of the 1000 kg device can be used to stabilize the robot body while the other arm is employed to do the task. In some cases both arms may be employed for task work or a one armed version with stabilization might be deployed. The device is designed to operate in a high radiation environment in a variety of control modes. Robotic equipment has been deployed in the French system to do complex deactivation tasks in 1000 to 2000 R/hr fields. Robotic equipment has matured significantly as a result of this operating history (*Decontamination and Dismantling of the Piver Prototype Vitrification Facility at Marcoule (France)*, S. Roudil, SGN, France etal, presented at Waste Management Conference, Tucson, AZ, 1992).

The in-cell requirements for equipment removal and decontamination are listed in Table 1.

Table 1 Robot Tooling

Impact wrenches	Pipe jumpers	Full range Decon equipment
Hydraulic shears	Lights	Spraying gear
Electric circular saws	Video cameras	Grinders
Electric reciprocating saws	Plasma arc torch	CO_2 blast
Two or more mounted video cameras with lighting integral with unit	Media blast equipment	Ultra-High Press water

A robot addresses a given task directly with a minimum of accessory equipment. With the use of in-cell and on-board video the robot can access all cell areas with good visualization and control. The robot can also place additional camera equipment for optimum viewing as needed. This will be very

[1] COGEMA, SGN, contact Dennis Crass 509-372-2034, Thierry Flament 509-372-1682 at Numatec, 2420 Stevens, Richland, WA.; http://www.cogema.fr/index-gb.html

important when decontamination work occurs. Such maneuvers are impossible with existing equipment. Existing methods do not provide even an approximation of this. Robot equipment can operate with a variety of tooling including shears and cutoff saws. Plasma-arc cutting should be possible by using optical filters on the video units. The robot can assess all sides of the work piece whereas normal shield window/manipulator technology does not.

Because the robot has access to the entire cell, solids retrieval and debris retrieval are straight-forward and direct with minimal delay. The tooling on the arms grasps or collects directly and quickly with minimal delay. No time or other resources are expended designing and building 'gadgets' to accomplish simple tasks. Solids collection is a direct task with vacuum equipment or powered scouring devices. Collection should be rapid with vacuuming equipment. This will benefit the overall cell radiation levels because at least 1.5 million curies are known to be on the floor.

Deployment timing for the proposed technology is shown in Section 2.1.7 and would be a step-wise sequence, beginning with robot cold testing in a non-radiation environment. All robot work platform functions would be verified. It is possible that some of this task could be completed at the vendor site. If necessary, the system could be tested in a low radiation environment prior to hot cell use. If the proposal is successful, current plans would deploy the robot work platform in B-Cell to accelerate the cell equipment/debris removal followed by the cleaning decontamination operation, which employs the scarifier in FY 2000 or later.

2.1.1 Integrate Multiple Site Applications

The robot work platform will be used for in cell equipment/debris removal and future final cell cleanout of 324 Building B-Cell, the Radiochemical Engineering Cell Airlock, High- and Low-Vault tanks, and other hot cell areas.

Other potential Hanford applications include other highly contaminated environments that utilize overhead cranes including canyon facilities and other laboratories. Equipment decontamination is required prior to a move. Some locations without overhead cranes could use a floor mount deployment with a vertical component. The vendor can provide non-crane mounting.

2.1.2 Partners

Two industrial partners would participate in this deployment as presented.

- Sandia National Laboratory
- COGEMA, SGN would provide the robotic equipment and technology.
- WaterJet Technology, Inc.[2] Kent, Washington, developers of the scarifier.

2.1.3 Accelerate EM Efforts Across DOE Complex

Use of robotics and multiple tools associated with cleaning technology should have extensive application across the DOE complex. The use of robotic technology accelerates remote operations and enables many kinds of actions that are impossible with the older overhead crane technology. This approach also minimizes personnel exposure and hazards, which will have a substantial safety impact. In addition, Oak Ridge National Laboratory, Cavanaugh Mims, DOE Oak Ridge Operations office will provide a letter

[2] http.//www.waterjet-tech.com/

stating that Oakridge National Laboratory is interested in deploying this technology after the ASTD project is complete.

2.1.4 End User Needs

End user needs are identified through the EM Integration Disposition Maps and/or outlined in Accelerating cleanup in DOE/EM-0342, *Paths to Closure*, Needs lists, 1998 Decontamination and Decommissioning Technology Needs, item RL-DD06 Decontamination of Building 324, STCG[3].

2.1.5 Improvement over Existing Site Baseline

Existing baseline plans utilize the two bridge cranes and the three master-slave manipulator stations along with special fixture and tooling to perform the rack cutting, debris collection and removal actions. For example, the rack cutting operations use mainly the plasma arc torch and mechanical Skil saw for breakdown of the equipment. Floor debris is collected by a remote pneumatic clamshell device suspended from the bridge crane. This is a very slow arduous process at best. Future work will likely include ceiling cleaning, wall and floor liner removal and contaminated concrete removal behind the liner. These activities represent a risk because present planning includes them as contact operations. If nuclide sources are significant then the work must be remote and robotics or an equivalent become necessary. A robot work platform enables all of these operations to proceed in a radiation environment, if necessary, which minimizes program risk.

2.1.6 Scientific and Technical Merit of Proposal

Because bridge cranes are a common denominator in the 324 Building (and elsewhere on site) this provides the means to mobilize the robot work platform at different locations. In some cases where reaction forces on the robot are minimal, both hydraulic arms could be employed to perform the task with nearly the dexterity of a human being. The one ton mass of the robot assists with the stability of the configuration. In cases where the unit is used to apply horizontal forces, some additional stabilization will be used for optimum performance. This will consist of using one of the arms to stabilize the robot unit while the other arm deploys the tool for the task. The arm could anchor to any fixture nearby the work. If such a fixture is not available then a mechanical device that could be easily positioned and secured, would be deployed. For example, if work is near the floor, a weighted fixture could be placed nearby. If the work is in a cell with consistent limited width, a cross-cell pole fixture with pneumatic locking devices could be pre-positioned near the work. A circular device with vacuum could be considered if the surface of the wall is smooth (requires a local vane pump). The primary requirement would be rapid placement and adjustment to maintain the work pace. Pneumatics are preferred because no feedback to the gallery areas would be involved.

The robot work platform being considered is built with 'radiation hardening' throughout and has hydraulic arms that have been extensively used in high radiation fields. The internal hydraulic actuator parts are easily replaceable, as are the internal electrical pathways in the arm. The unit is fitted with a variety of tooling. Tool devices are matched with the design of the hydraulic arm to provide convenient attachment and firm coupling. This provides enhanced control of the 'end effector' device. Many robotic devices and designs are available on the market today but only a very few have been designed for high radiation environments. Polymeric materials must be carefully chosen and minimized and/or shielded to withstand the radiation damage that occurs. Components that are prone to damage must be modular to

[3] http://www.pnl.gov/stcg/decon/rldd06.stm

allow rapid changeout. The overall device must withstand the rigors of high-pressure water or other decontamination methods to allow maintenance work to proceed in reasonable fields. The hydraulic power unit in the proposed robot is contained within a shielded confinement to protect the radiation susceptible parts.

2.1.7 Deployment Project Schedule and Implementation in FY 1999 (see Appendix A)

Request for bid	FY 1998
If project approved-bid award	Oct 1998
Fabrication/Assembly robot	Oct 1998 – Mar 1999
Cold shakedown testing to	May 1999
If necessary, low-radiation test	Jun 1999
Deployment in Radiochemical Engineering cells	Aug 1999

2.2 Business/Management Approach

2.2.1 Written Commitment

The following companies will provide written concurrence for deploying the robot work platform:

B&W Hanford Company
Fluor Daniel Hanford Company
U.S. Department of Energy, Richland Operations Office
COGEMA, SGN- NUMATEC
Oakridge National Laboratory
Sandia National Laboratory

2.2.2 Proposed Schedule

Request for bid	FY 1998
If project approved-bid award	Oct 1998
Fabrication/Assembly robot	Oct 1998 – Mar 1999
Cold shakedown testing to	May 1999
If necessary, low-radiation test	Jun 1999
Deployment in Radiochemical Engineering cells	Aug 1999

2.3 Stakeholder/Regulatory Approach

The baseline cleanup permits for the 324 Building allow for the deployment of robotics. The cutting and cleanup tools remain the same during the course of this project, only the operations schedule and cost are decreased. Adding other cleanup technologies that can be deployed with the robotics workstation in the future will be addressed on an individual basis with the regulators as required. There do not appear to be any barriers to integrate this technology to other sites and states. The Washington State Department of Health Notice of Construction, AIR-95-903, covers the regulatory issues.

3.0 Part II - Cost Overview

3.1 Cost Benefit Analysis

3.1.1 ALARA

Four areas result in most of the roentgen-equivalent man (rem) in the Radiochemical Engineering Cells. These are the shield window workstations, airlock entries, waste shipments and manipulator servicing.

If a robotic workstation is deployed in 324, then two of the major dose contributions could be reduced significantly. The first 324 category includes airlock entries, which involve high levels of contamination and area dose rates in the 100 to 300 mr/hr. Robotics used in the airlock should reduce the 25 rem per year (minimum) for airlock work. The second 324 category includes the master-slave manipulator servicing. Robotics used in B-Cell and the other cells should reduce the manipulator servicing work to an estimated 50% of normal and would allow some cell work with the manipulator stations with the major loading carried by the robot work platform. Savings are derived from the lower effort involved with removal, installation and maintenance of the mechanical manipulators. Each servicing cycle causes approximately 20-25 mrem (minimum) worker exposure, which translates to 1-2 rem for the estimated 50 cycle saving.

3.1.2 Work Efficiency Improvement in Hot Cells

Use of the robot work platform in the Radiochemical Engineering Cell hot cells would reduce the work time associated with manipulator change out and repair, rigging of equipment to be size reduced (since the current system does not have complete access), installation, use, and removal of special tooling, and final cell cleaning (see Section 3.2 Additional Cost Information). The specific efficiency percentages have been provided by experienced staff (i.e. Project Managers/Engineers, Planners/Schedulers, and First Line Supervision) and estimated for each sub-activity in the project. It is important to note that the increase in efficiency is highly variable and depends heavily on the task involved, however conservative assumptions were made and the overall increase in efficiency is anticipated to exceed the proposed savings. The result is a shorter cleanup schedule and less costly project (Appendix). In addition to size reduction the following sections are other specific sub-activities that will benefit from this technology deployment.

3.1.2.1 Task- B-Cell Dispersible Removal/Miscellaneous Material Removal

The robot work platform can readily access the floor areas and can be used to manipulate powered vacuuming devices and scouring devices. A robotic workstation will remove the maximum possible amount of solids from the floor surfaces, which will minimize the dose contribution from this material (1.5 million Ci).

With existing equipment the only option would be a unit either moved by the overhead crane or a special self-powered unit. The recovery effectiveness will be poor due to poor maneuverability and control.

Miscellaneous item removal would also be enhanced by the robot work platform because it consists of removal of rack equipment or items that are difficult to process with the existing crane.

3.1.2.2 Task-Liner Integrity Assessment.

Prior to and after cell decontamination the liner must be examined for defects and breaching. This will be accomplished by a combination of techniques. There could be substantial dose involved in either case. The robot work platform is capable of performing this activity and thus will reduce the as-low-as reasonably achievable (ALARA) risk factor and will improve the quality of inspection over that provided by the existing crane.

3.1.2.3 Task-Sealing Penetrations

Prior to aqueous chemical decontamination the cell liner penetrations must be sealed to prevent chemical solutions laden with radionuclides from migrating behind the liner. This action will involve sealing the penetrations on the inside. These consist mainly of the split plug penetrations (8 by each window). The robot work platform could efficiently seal these penetrations with significant time savings due to its dexterity and visualization.

During decontamination, the robot work platform could direct the decon technique specifically to all areas of the cell with much greater effectiveness. Existing mechanical master-slave units access a roughly hemispherical zone near each mid-wall penetration, not including the floor, ceiling, corners and parts of the central room.

3.1.6 Schedule Confidence Level- Risk Reduction

Existing project management planning includes certain activities as contact operations assuming a sufficient level of decontamination (see Appendix A). Cell liner removal could involve cutting operations in a radiation field if liner leakage has occurred. The robot work platform could readily accomplish this task using its tooling resulting in rem savings. If liner leakage has occurred, particularly on the floor, concrete removal will be required. This can be done by the robot work platform with rem savings.

A widely dispersed system of piping runs all through the Radiochemical Engineering Cells, connecting the cells to the High-Level Vault and Low-Level Vault tanks with many lines terminating in the hot pipe trench and loadout bay. Robotic operation, particularly in the hot pipe trench, would save significant rem exposure during the piping flushing. There may also be an application for robotic activity in pipe flushing in the High-Level Vault and Low-Level Vault after the tanks are removed. Flushing connections must be attached in all of these areas to clean the process-related lines.

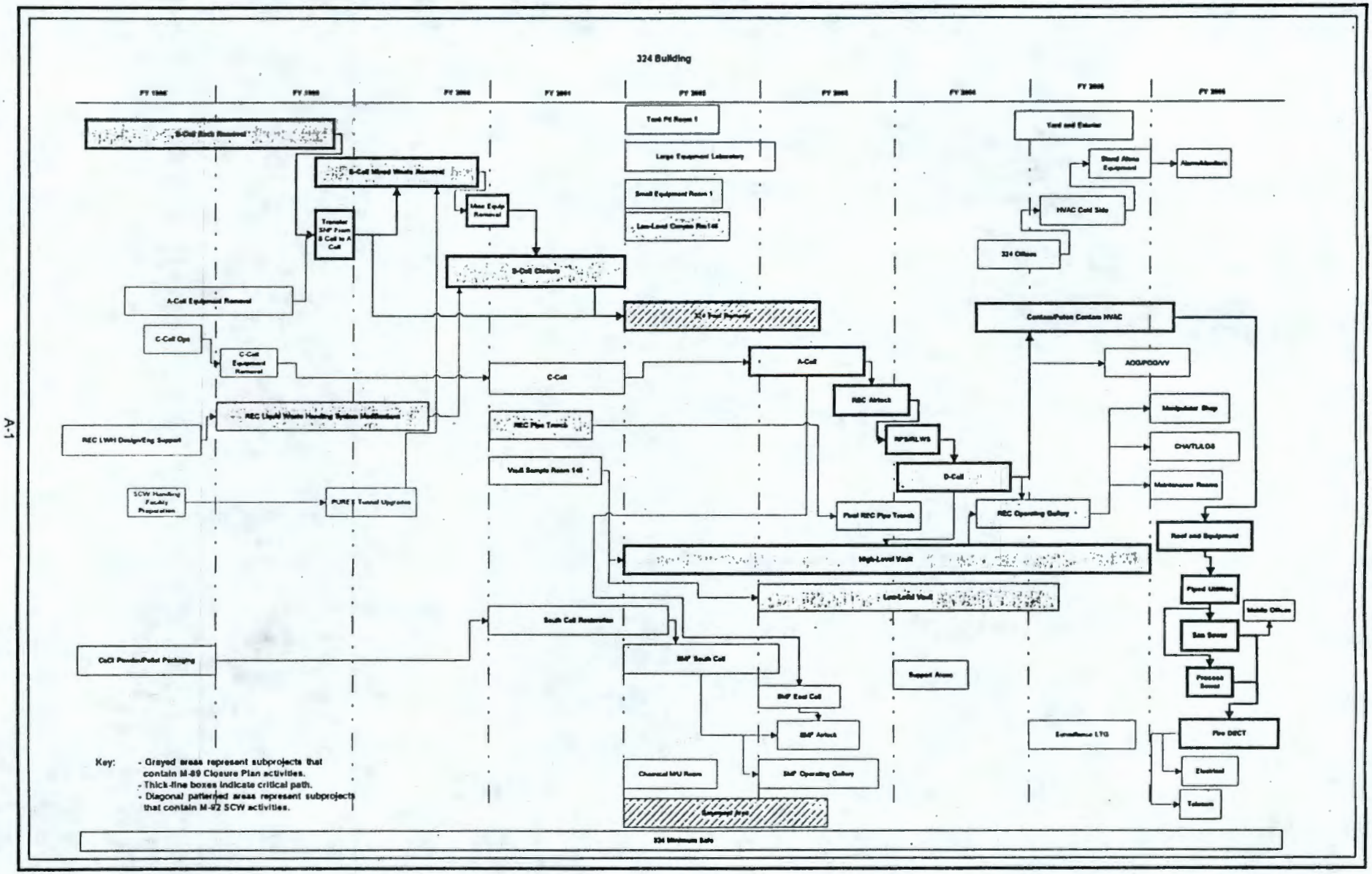
Closure of the High-Level Vault will involve removal of the tanks and piping prior to vault cleaning. This vault has only partial cover block access thus the robot work station would assist with cutting and removal of piping if residual activity cannot be removed from the vault as planned.

3.1.7 Project Cost and Return on Investment

The proposed ASTD funding is $1,544,800 as shown in Appendix B, which will be more than matched with the baseline project expenditures (~$40 million). The Life Cycle Cost Savings for FY 1999-FY 2005 are estimated conservatively to be $2.7 million (Appendix). It is expected there will be a net savings (including procurement, installation, and testing of $221K by the end of FY 2000. The robotics will be fully deployed in FY 1999.

Appendix A

324 Cleanup Project Schedule (Visio)


324 Building
Tank Pit Room 1
Large Equipment Laboratory
Small Equipment Room 1
Yard and Exterior
HVAC Cold Side
324 Offices
Transfer SNF From B Cell to A Cell
A-Cell Equipment Removal
C-Cell Ops
C-Cell Equipment Removal
REC LWH Design/Eng Support
SCW Handling Facility Preparation
PURET Tunnel Upgrades
C-Cell
REC Pipe Trench
Vault Sample Room 145
A-Cell
REC Airlock
RPS/RLWS
D-Cell
Final REC Pipe Trench
REC Operating Gallery
Contam/Poten Contam HVAC
AOG/POG/VV
Manipulator Shop
CHA/TL/LOS
Maintenance Rooms
Roof and Equipment
High-Level Vault
Low-Level Vault
Piped Utilities
Mobile Offices
San Sewer
Process Sewer
Fire DECT
Electrical
Telecom
South Cell Restoration
CsCl Powder/Pellet Packaging
SMF South Cell
SMF East Cell
SMF Airlock
SMF Operating Gallery
Support Areas
Surveillance LTG
Chemical M/U Room
Equipment Area
324 Minimum Safe
Key:
- Grayed areas represent subprojects that contain M-89 Closure Plan activities.
- Thick-line boxes indicate critical path.
- Diagonal patterned areas represent subprojects that contain M-92 SCW activities.

Appendix B

Spreadsheet Showing Impact of Technology on
Baseline Cost and Estimated Cost Savings

B-Cell Cleanout Project

		Current Baseline		Change	Proposed Baseline	
		Dollars	Days		Dollars	Days
B-CELL PROJECT CONTROLS						
Project Controls						
	Project Controls	$1,114,576	-	No Change	$1,114,576	-
1-A RACK REMOVAL						
Removal/Size Reduction						
	Size Reduction	$187,473	28	20% Increase in Productivity	$149,978	23
	In-Cell Packaging	$43,983	9	20% Increase in Productivity	$43,983	8
In-Cell Support						
	Procedures, ALARA, JCS	$28,262	-	30% Reduction in Procedures	$19,783	-
	Manipulator Maintenance	$98,442	5	50% Reduction in Maint	$49,221	3
	Filter Maintenance	$22,490	2	No Change	$22,490	2
	Cutting System Maintenance	$8,136	-	20% Reduction in Maint	$6,509	-
	Packaging System Maintenance	$5,686	-	20% Reduction in Maint	$4,549	-
	Relamp and Window Replaceme	$1,944	1	No Change	$1,944	1
Waste Removal & Disposition						
	Procedures, ALARA, JCS	$28,262	-	No Change	$28,262	-
	Contact Handled CAT1-LLW	$6,021	-	No Change	$6,021	-
	Contact Handled CAT3-LLW	$15,581	-	No Change	$15,581	-
	Contact Handled CAT3-LLMW	$3,393	-	No Change	$3,393	-
	Remote Handled CAT3-LLW	$87,870	12	No Change	$87,870	12
MISC. ITEMS REMOVAL						
Removal Preparation						
	Planning & Procedures	$236,764	-	No Change	$236,764	-
	Tools/Equipment Procurement	$33,626	-	25% Reduction in Tooling	$25,220	-
	Tools/Equipment Fabrication	$19,813	-	50% Reduction in Tooling	$9,907	-
	Training	$32,951	-	No Change	$32,951	-
Removal						
	Removal/Size Reduction	$240,972	33	20% Increase in Productivity	$192,778	27
	In-Cell Packaging	$18,502	9	20% Increase in Productivity	$14,802	8
In-Cell Support						
	Procedures, ALARA, JCS	$69,832	-	30% Reduction in Procedures	$48,882	-
	Manipulator Maintenance	$106,139	4	50% Reduction in Maint	$53,070	2
	Filter Maintenance	$49,174	2	No Change	$49,174	2
	Cutting System Maintenance	$15,900	-	20% Reduction in Maint	$12,720	-
	Packaging System Maintenance	$20,621	-	20% Reduction in Maint	$16,497	-
	Relamp and Window Replaceme	$4,089	2	No Change	$4,089	2
Waste Removal & Disposition						
	Procedures ALARA, JCS	$69,832	-	No Change	$69,832	-
	Contact Handled CAT1-LLW	$14,022	-	No Change	$14,022	-
	Contact Handled CAT3-LLW	$58,217	-	No Change	$58,217	-
	Contact Handled CAT3-LLMW	$8,553	-	No Change	$8,553	-
	Remote Handled CAT3-LLW	$231,891	12	No Change	$231,891	12
MIXED WASTE						
Removal Preparation						
	Planning & Procedures	$448,812	-	No Change	$448,812	-
	Training	$22,265	-	No Change	$22,265	-
	Tools/Equipment Procurement	$1,014,800	-	No Change	$1,014,800	-
	Tools/Equipment Fabrication	$108,994	-	50% Reduction in Tooling	$54,497	-
Removal						
	Packaging	$234,852	44	20% Increase in Productivity	$187,882	36
	Loadout	$206,682	107	No Change	$206,682	107
	In-Cell Packaging of LLW	$7,932	-	20% Increase in Productivity	$6,346	-
Sample & Anaysis						
	Dispersible/Tank Heels Sampling	$308,020	-	No Change	$308,020	-
	Filter Sampling	$110,514	-	No Change	$110,514	-
In Cell Support						
	Manipulator Maintenance	$634,337	24	50% Reduction in Maint	$317,169	12
	Filter Maintenance	$39,899	-	No Change	$39,899	-
	Packaging System Maintenance	$16,339	-	20% Reduction in Maint	$13,071	-
	Relamp and Window Replaceme	$12,266	6	No Change	$12,266	6
Waste Removal & Disposition						
	Procedures, ALARA, JCS	$132,552	-	No Change	$132,552	-
	Contact Handled CAT1-LLW	$132,552	-	No Change	$132,552	-
	Contact Handled CAT3-LLW	$41,819	-	No Change	$41,819	-
	Contact Handled CAT3-LLMW	$76,863	-	No Change	$76,863	-
	Remote Handled CAT3-LLW	$17,277	4	No Change	$17,277	4
	In-Cell Support Proc., ALARA, JC	$84,427	-	No Change	$84,427	-

CELL CLEANING						
Preparation						
	Planning & Procedures	$974,833	-	No Change	$974,833	-
	Training	$40,372	-	No Change	$40,372	-
	Tools/Equipment Procurement	$1,098,000	-	20% Reduction in Tooling	$878,400	-
	Tools/Equipment Fabrication	$43,215	-	50% Reduction in Tooling	$21,608	-
Cell Cleaning						
	Initial Integrity Assesment	$127,068	10	25% Increase in Productivity	$95,301	8
	Cell Cleaning	$1,106,606	135	25% Increase in Productivity	$829,954.50	102
	Post Integrity Assesment	$163,579	15	No Change	$163,579	15
	Post Integrity NDE	$210,097	15	No Change	$210,097	15
	Liner Removal	$574,304	69	25% Increase in Productivity	$430,728	52
	Post Int. Gamma Scan & Rad Cha	$174,046	15	No Change	$174,046	15
	Task Closure	$54,792	-	No Change	$54,792	-
	Endpoint Closure	$54,792	-	No Change	$54,792	-
	RCRA Closure	$164,376	-	No Change	$164,376	-
Sampling & Analysis						
	RLW Sampling	$301,816	-	No Change	$301,816	-
In Cell Support						
	Procedures, ALARA, JCS	$259,387	-	30% Reduction in Procedures	$181,571	-
	Manipulator Maintenance	$475,885	18	50% Reduction in Maint	$237,943	9
	Filter Maintenance	$52,812	2	No Change	$52,812	2
	Cutting System Maintenance	$28,573	-	20% Reduction in Maint	$22,858	-
	Relamp and Window Replaceme	$8,178	4	No Change	$8,178	4
Waste Removal & Disposition						
	Procedures, ALARA, JCS	$258,387	-	No Change	$258,387	-
	Contact Handled CAT1-LLW	$75,802	-	No Change	$75,802	-
	Contact Handled CAT3-LLW	$132,827	-	No Change	$132,827	-
	Contact Handled CAT3-LLMW	$20,176	-	No Change	$20,176	-
	Radioactive Liquid Waste	$1,248,599	-	No Change	$1,248,599	-
CELL MAINTENANCE						
Cell Maintenance						
	Crane Maintenance	$218,794	30	15% Reduction in Maint.	$185,975	26
	Door Maintenance	$181,806	-	No Change	$181,806	-
	Window Maintenance	$270,652	-	No Change	$270,652	-
	Remote Viewing System Maint.	$306,375	-	15% Reduction in Maint.	$260,419	-
	Lighting Maintenance	$95,306	-	No Change	$95,306	-
	Gallery Maintenance	$136,167	-	No Change	$136,167	-
	A-Frame Filter Maintenance	$60,611	-	No Change	$60,611	-
TOTAL COST FOR BCCP		$15,452,452	617		$13,686,022	515
INST. COST OF ROBOT		$0	0		$1,544,800	45
324 MIN. SAFE ($40k/day)		$24,680,000	617		$22,400,000	560
B-CELL PROJ. MAN.		$1,916,221	617		$1,739,196	560
TOTAL COST		$42,048,673			$39,370,017	
TOTAL SAVINGS					*$2,678,656*	

Robot Arm Installation and Operation					
	Duration (Days)	Resource	Hours/ Unit	Rate/Cost	Total
Procurement of Robot Arm	180				
		Material	1	$1,200,000	$1,200,000
Training/Development/OJT	20	Procedure Writer	160	$60	$9,600
		Trainers	320	$60	$19,200
		Hot Cell Technician	640	$60	$38,400
Develop Preventative Maintenance Program	30				
		Planner	160	$60	$9,600
		Supervisor	160	$60	$9,600
		Electrician	160	$50	$8,000
Install Controls	30				
		Electrician	320	$60	$19,200
		Rad Con Technician	160	$50	$8,000
		Hot Cell Technician	160	$50	$8,000
		Person In Charge	160	$50	$8,000
Install Robotics	30				
		Engineer	320	$60	$19,200
		Supervisor	160	$50	$8,000
		Hot Cell Technician	320	$50	$16,000
		Rad Control Techici	160	$50	$8,000
Acceptance/Operational Test	15				
		Engineer	320	$60	$19,200
		Supervisor	80	$60	$4,800
		Hot Cell Technician	160	$50	$8,000
		Rad Control Techici	80	$50	$4,000
Spare Parts	30				
		Material	1	$75,000	$120,000
Total Cost					**$1,544,800**
Total Curation for Critical Path	45				
Note: Traning duration is not on the critical path and Installation of Controls and Robotics are in parrallel					

RL-F-1325.6 (02/98)

Enclosure 2

United States Government

Department of Energy

memorandum

Richland Operations Office

059180

DATE: JUN 1 0 1998

REPLY TO ATTN OF: DDP:JDG

SUBJECT: ENDORSEMENT FOR ACCELERATED SITE TECHNOLOGY DEPLOYMENT (ASTD) PROPOSAL

TO: Lloyd Piper
Deputy Manager

The Site Technology Coordinating Group, Decontamination and Decommissioning Subgroup, endorses the ASTD proposal: Remote Size-Reduction and Decontamination in Large Hot Cells prepared by the Facility Stabilization Project.

The mobility of a stable work platform suspended from a crane and the ability to easily reach otherwise inaccessible areas of the hot cells, are important elements of this proposal. The functional flexibility of the robot work platform provided by using an array of different tools (end effectors) on the ends of the robotic arms make deployment of the platform a high priority for Facility Stabilization Projects. The scope of this proposal also corresponds to future scope of the Canyon Disposition Initiative, including remote size reduction of equipment on the canyon deck and in process cells.

If the results of the technology deployment are successful, there may be an opportunity to deploy this technology across the five Hanford materials processing facilities.

If you want to discuss this matter further or require additional information, please contact J. D. Goodenough at 376-0893, or D. C. Langstaff at 376-5580.

James D. Goodenough, Senior Project Manager
Decontamination and Decommissioning Project

D. C. Langstaff, Project Manager
Transition Program Division

Enclosure 3

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dr. Norman J. Olson
FDH-Technology Management
MS K9-46
Post Office Box 1000
Richland, Washington 993252

Dear Dr. Olson:

SUPPORT FOR HANFORD ASTD ROBOTICS PROPOSAL

I support the Hanford ASTD Proposal: REMOTE SUZEOREDYCTUIN AND DECONTAMINATION IN LARGE HOT CELLS BY DEPLOYING ROBOTIC TECHNOLOGIES. This would represent a big step forward in reducing schedule risk and cost of hot cell cleanup. The flexibility offered by Robotics Work Stations allow additional cleanup technologies to be deployed such as the sacrificer at a later date would significantly increase the cost savings in the future. We have demonstrated the technologies at Oak Ridge National Laboratory and have found them to be easily transferred to other sites and states.

Sincerely,

Cavanaugh S. Mills, Team Leader
Bethel Valley Watershed Team
ORR Remediation Management Group

XC: Andrea Prognans

PR

Memo Date 6/16/98

to George Hayner L5-65
Rich Hobart L5-65
Rick Millikan L5-65

Attached is the entire (Final/Fun 324 Bldg Robotics ASTD proposal with signatures and support letters for your file

From Norm Olson

54-3000-458 (3-65)

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Please send comments on distribution list to A. L. Prignano (H6-24), (509)-376-1057.

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