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WHC-EP-0693

Idaho Chemical Processing Plant and Plutonium-Uranium Extraction Plant Phaseout/Deactivation Study

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

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Date Published
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EXECUTIVE SUMMARY

The decision to cease all U.S. Department of Energy (DOE) reprocessing of nuclear fuels was made on April 28, 1992. This study provides insight into and a comparison of the management, technical, compliance, and safety strategies for deactivating the Idaho Chemical Processing Plant (ICPP) at Westinghouse Idaho Nuclear Company (WINCO) and the Westinghouse Hanford Company (WHC) Plutonium-Uranium Extraction (PUREX) Plant. The purpose of this study is to ensure that lessons-learned and future plans are coordinated between the two facilities.

End State. The PUREX Plant and the Uranium-Trioxide Plant (UO_3) will be in a surveillance status ready for decontamination and decommissioning. Both plants will be locked and employ normal industrial practices with minimal electrical service for quarterly surveillance. PUREX will maintain only minimal canyon ventilation.

At the ICPP, fuel reprocessing systems and associated facilities will be placed in a phased-out status (no fuel dissolution or uranium recovery) with interface activities continuing to support waste management, analytical, and fuel storage activities. A transition plan is being prepared to characterize ICPP fuel processing facilities for future uses or proceeding with decontamination and decommissioning.

While the PUREX Plant deactivation end state and the ICPP fuel reprocessing phaseout end state are slightly different, they share the same objective, to cease reprocessing fuel.

Technical Comparison. The original missions for the PUREX Plant and ICPP differed significantly. The primary mission of the ICPP was to recover highly enriched uranium, while the primary mission of PUREX was to recover plutonium. Consequently, there were significant differences in nuclear fuel input and composition, physical size of the plants, and product output. However, the plants have many similar unit operations.

The most significant difference between deactivating PUREX/UO_3 and phasing out fuel reprocessing at ICPP is that PUREX/UO_3 can be isolated from other site activities while fuel reprocessing at ICPP is closely integrated with other site activities (i.e., waste management, fuel storage, and analytical chemistry).

Saving Through Sharing. The greatest opportunity for savings through sharing is to avoid repeating activities at the two sites (i.e., sharing lessons-learned). The ICPP staff has already taken advantage of PUREX's transition-to-standby by establishing the ICPP Phaseout Plan through independent review by WHC. However, specific activities such as using excess chemicals are also advantageous. PUREX has shipped excess chemicals (specifically, aluminum nitrate nonahydrate) that were used in the ICPP process. Other excess chemicals, such as PUREX organic, are potentially usable at ICPP.

The phaseout/deactivation plans for the plants are expected to be revised as lessons learned and stakeholder input are received. As detailed plans for specific activities are developed and GOCO site exchanges occur, additional savings through sharing are expected.

The Westinghouse Government-Owned Contractor-Operated (GOCO) committee on facility transition, which was initiated by Westinghouse Electric Corporation (WEC), is a key activity to ensure that savings through sharing occurs. The committee is made up of representatives from all GOCO WEC contractors and forms the basis for the managerial, technical, and compliance interfaces.

Stakeholder Involvement. Westinghouse Hanford Company and Westinghouse Idaho Nuclear Company are committed to involving of all stakeholders. Currently, extensive communication efforts use local news media, workshops, organizational meetings, and internal company mechanisms. The continued success of these activities depends on stakeholder involvement.

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DOE	U. S. Department of Energy
FDP	Fluorinel dissolution process
FSAR	Final Safety Analysis Report
GOCO	Government-Owned Contractor-Operated
HQ	U.S. Department of Energy, Headquarters
ICPP	Idaho Chemical Processing Plant
MCS	Management Control System
NEPA	*National Environmental Policy Act*
OSR	Operational Safety Requirement
PSD	Plant Safety Document
PCM	Process Control Manual
PUREX	Plutonium-Uranium Extraction (Plant)
RL	U.S. Department of Energy, Richland Operations Office
TRQ	technical requirements
TS/S	technical standards and specifications
UNH	uranyl nitrate hexahydrate
USQ	Unreviewed Safety Question
UO_3	Uranium-Trioxide Plant
WAC	*Washington Administrative Code*
WEC	Westinghouse Electric Corporation
WHC	Westinghouse Hanford Company
WINCO	Westinghouse Idaho Nuclear Company

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1.0 PURPOSE

This study provides a comparison of the management, technical, compliance, and safety strategies for the phaseout of nuclear fuel reprocessing at the Idaho Chemical Processing Plant (ICPP) and deactivation of the Plutonium-Uranium Extraction (PUREX) Plant. The purpose of the study is to ensure that lessons-learned and future plans are shared to provide the maximum mutual benefit.

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2.0 MANAGEMENT APPROACH

An integrated management approach has been established between Westinghouse Hanford Company (WHC) and Westinghouse Idaho Nuclear Company (WINCO). The integrated management approach will ensure that lessons-learned, future plans, and common technical activities are achieved for safe, efficient, and environmentally sound deactivation.

2.1 PROJECT/PROGRAM PLANS

A DOE-Headquarters (HQ) approved plan (October 1992) is in place and being used at ICPP. The *PUREX/UO_3 Deactivation Project Management Plan* was approved and submitted to the U.S. Department of Energy (DOE) Richland Operations Office (RL) on September 30, 1993. The basic content and purpose (to cease nuclear fuel processing) are essentially the same in the plans. However, because of physical facility configuration, some differences exist in the transition end points. These differences are presented and discussed in subsequent sections of this document.

The principle difference is the close integration of chemical processing facilities at ICPP with other ongoing activities as opposed to the isolated nature of PUREX. After the phaseout of reprocessing, the ICPP closely approximates PUREX in standby except that future maintenance activities at the ICPP will not be directed toward the restart of fuel reprocessing operations.

2.2 ORGANIZATION

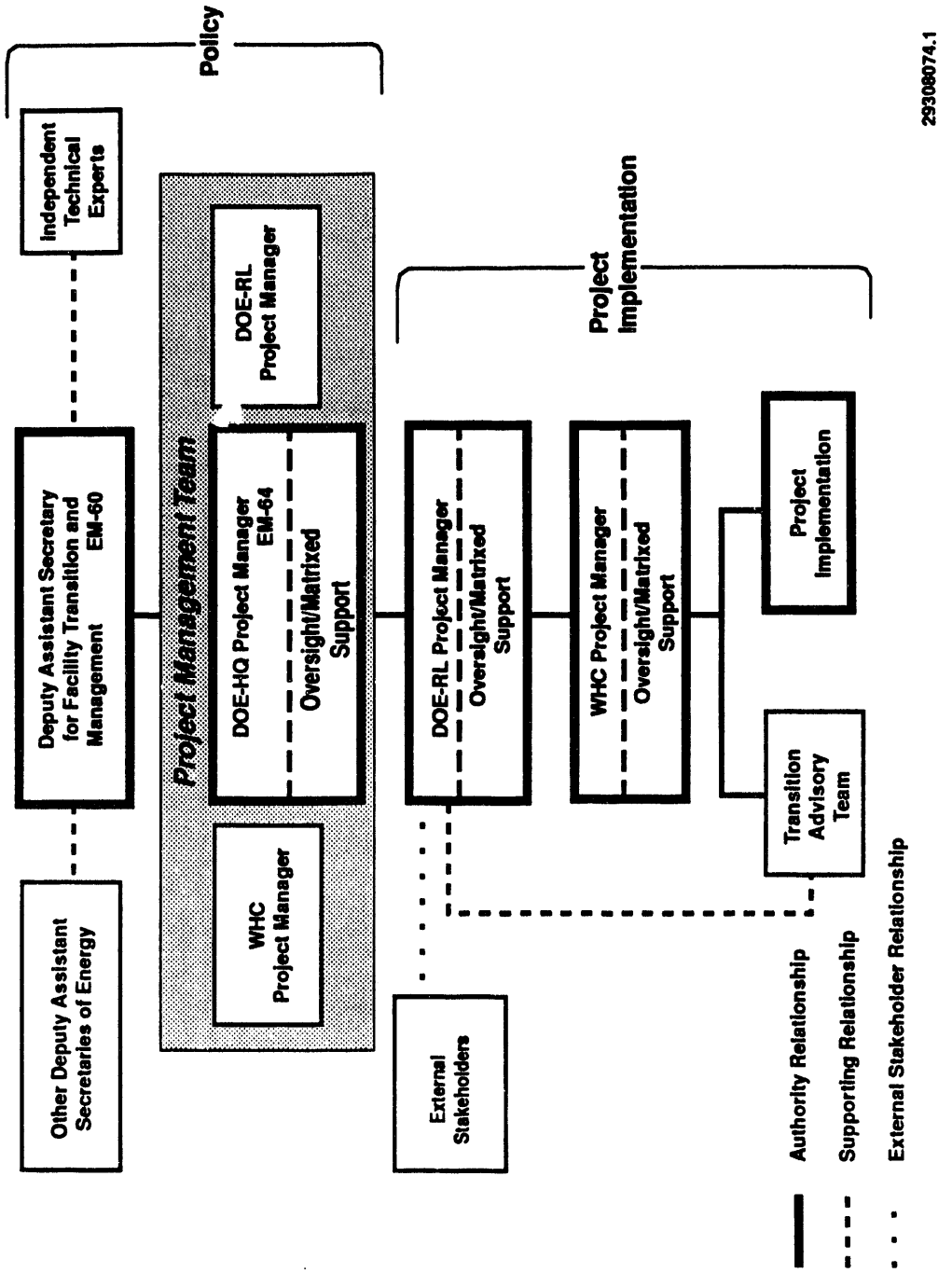
The PUREX transition to deactivation organization is tailored to meet the guidelines for a project activity as provided in DOE Order 4700.1, *Project Management System* (DOE 1992). Several innovative features are included to ensure timely decision making, and stakeholder and expert overview involvement.

The PUREX/UO_3 Deactivation Project Management relationships are shown in Figure 1. Strong line authority is provided from the Deputy Assistant Secretary for Facility Transition and Management (EM-60) to HQ (EM-64), RL, and WHC project managers and operating personnel.

Within the PUREX organization, the three project managers are assisted by (1) a decision-making authority called the Project Team, (2) independent technical experts, (3) a transition advisory team (from the Red Team), which provides technical oversight, and (4) external stakeholders, who are involved at the RL site office level.

The ICPP organization follows a more conventional program (expense) structure as ICPP reprocessing facilities transition from defense production to environmental management. This more conventional approach is appropriate based on the close integration of phaseout (transition) activities with other ICPP site activities.

Figure 1. PUREX/UO_3 Deactivation Project/DOE/WHC Management Relationships.



WINCO management is subdivided into nine departments under one president, who is the chief executive officer. The departments are arranged in a conventional organization. Line management in each department is responsible for applicable phaseout/transition activities as well as ongoing operations.

When phaseout activities are completed, WINCO will organize as appropriate to manage the rest of the transition process. The re-organization will provide for the management of future plant characterization, decontamination, and ultimate disposition of facilities in transition. Disposition may include reuse by DOE, release to non-DOE users, or decommissioning.

2.3 PROJECT/PROGRAM CONTROL SYSTEM

WHC and WINCO currently use a conventional management control system (MCS) consisting of cost accounts, monthly status reports, milestone reporting systems, and annual budgets.

The MCS implemented on the PUREX/UO_3 Deactivation Project uses the WHC MCS, documented in WHC-CM-2-5, ***Management Control System***. The project MCS provides a uniform approach to be used throughout the project. The primary goal of this management system is to ensure planning and execution of this project in a manner that is technically sound, timely, and cost-effective. All planning is identified and correlated to the Project Summary Work Breakdown Structure, as shown in Figure 2.

The system focuses on establishing and controlling baselines at the overall project level and at the principal functional organization level. The summary project level baselines are managed by RL.

Management reports provide timely, accurate data to provide the contractor Project Team and DOE management with current and projected conditions. Information contained in these reports is obtained from the same database that supports day-to-day management by the Project Team. A comparison of the two MCSs is provided in Table 1. The type and number of reports used at both sites are similar. However, the management structures are different and different managers and organizations receive and use the reports.

2.4 STAKEHOLDER INVOLVEMENT

The extent of stakeholder involvement is based on regional interest and requirements. In general, the planning for stakeholder involvement for PUREX is similar to that for ICPP. WHC and WINCO are committed to fully communicating information to all interested individuals and groups. Table 2 summarizes the communication activities for the two companies.

Figure 2. PUREX/UO_3 Transition Project Work Breakdown Structure.

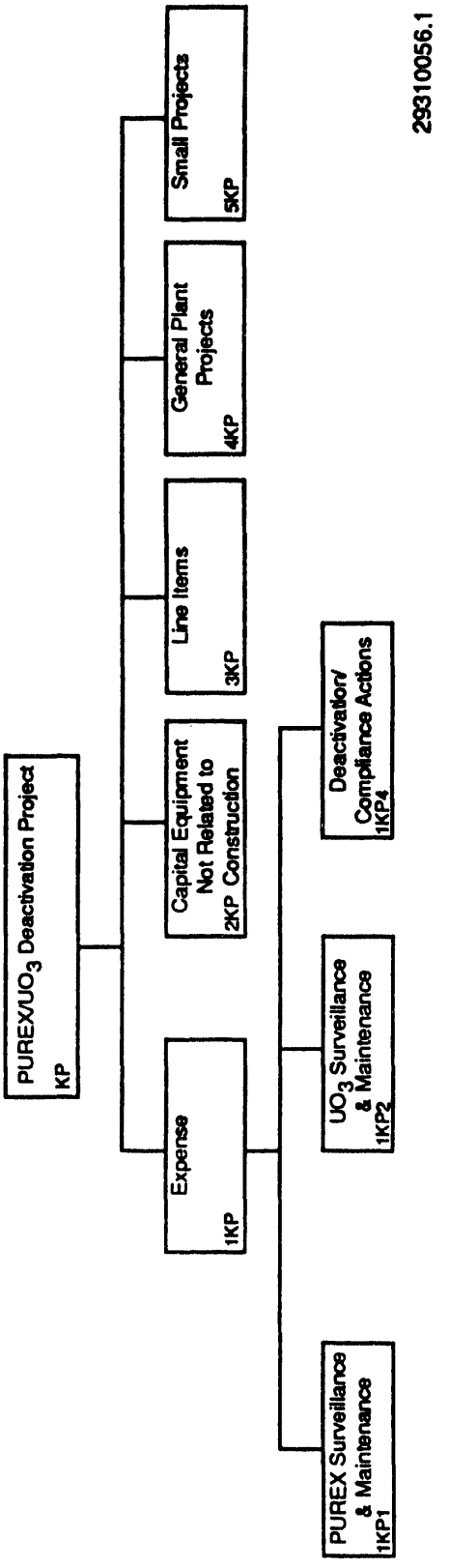


Table 1. A Comparison of Management Control Systems for PUREX and ICPP.

PUREX	ICPP
Site Management System Report (Monthly) • Given to RL • Deactivation status incorporated • Provides data for HQ Progress Tracking System	Site Management System Report (Monthly) • Given to ID • Phaseout status included • Provides data for HQ Progress Tracking System
Cost Performance Report (Monthly) • To project manager • Provides cost performance • Problem/variance analysis • Incorporated into the Site Management System	Cost Performance Report (Monthly) • To Manager, Programs Cost Control and Budget • Provides cost performance • Problem/variance analysis
Milestone Schedule Status Report (Monthly) • To project manager • Baseline project schedule with status • Statused DOE milestone list • Brief narrative of current schedule position	Milestone Schedule Status Report (Monthly) • To Manager, Planning Integration • Baseline phaseout schedule with status • Statused DOE milestone list • Brief narrative of current schedule position
	DOE-ID/ICPP Operations Report • Weekly phaseout status

Table 2. Stakeholder/Project Communication.

Activity	Westinghouse Hanford Company	Westinghouse Idaho Nuclear Company
Public/Legislative Involvement	Tri-Party Agreement Quarterly Tri-Party Agreement Monthly Project and Unit Managers Meeting Washington State Historic Preservation Office Meetings Environmental Restoration and Advisory Committee Meetings Site Specific Advisory Board State and Tribal Working Group Meetings Project Workshops	Eastern Idaho Business/Educators Meetings State Oversight Committee Weekly Meetings State EPA Meetings/Tours Snake River Alliance Meetings/Tours Shoshone/Bannock Working Group Meetings General Public Semiannual Briefings and Workshops INEL Reporter INEL Outreach Offices
News Media	Regional Newspapers Television News Media	Regional Newspapers Television News Media

Table 2. Stakeholder/Project Communication.

Activity	Westinghouse Hanford Company	Westinghouse Idaho Nuclear Company
Employee Information	The Hanford Reach (weekly newspaper) Hanford Update (quarterly) All-Managers Meetings (quarterly) All-Employee Meetings (annually) Total Quality Awareness Training Management/Union Meetings Employee Assistance Program	WINCOmmunicator (biweekly newspaper) The Pulse (monthly) All-Managers Meetings (Semi-annually) All-Employee Meetings (annually) Management Round Table Meetings Total Quality Awareness Training Joint Labor Management Quality Committee Employee Assistance Program All-Employee Newsletter

The success of the ICPP and PUREX phaseout/transition depends on whether it is accepted by the organizations and groups who can impact the activities. The following is a list of these organizations and groups.

- Existing DOE, WHC, and WINCO organizational structures (e.g., the matrixed and support groups who have project concurrence or approval authority)
- Legislated authority structure (e.g., the Washington State Department of Ecology, the Defense Nuclear Facilities Safety Board, and the Idaho Department of Environmental Quality [DEQ])
- Public pressure generated by public advocates, advisory groups, or public opinion.

The purpose of the activities outlined in the ICPP and PUREX deactivation plans is to accomplish the following actions.

- Establish a common information base from which interested parties can learn about the facilities, their current status, and the decisions that have been made and will be made as facility status evolves.
- Inform stakeholders about transition-to-deactivation alternatives, end point objectives, and the constraints, costs, and timetable associated with each of these.
- Facilitate the transfer of information, feedback, and verification as transition-to-deactivation alternatives are evaluated, selected, and implemented.
- Keep stakeholders apprised of the progress of the deactivation activities.

2.5 APPROACH TO END-STATE DEFINITION

The end-state of PUREX and ICPP fuel reprocessing facilities are significantly different. Parts of the ICPP processing facilities will remain active to support waste transfers, chemical makeup, and laboratory services. In contrast, PUREX will be unoccupied and locked with no active systems except limited ventilation and lighting.

2.5.1 PUREX/UO_3 Deactivation Project End State

The PUREX/UO_3 Plants will be passively safe, environmentally secure, unoccupied, and locked. At PUREX, there will be no active systems or utilities within the confinement structures except for minimum canyon ventilation and lighting. A quarterly surveillance of the PUREX/UO_3 Plants will be performed.

2.5.2 ICPP Phaseout End State

There will be no active fuel processing at the ICPP at the completion of phaseout. Operations to support waste transfers, laboratory functions, and chemical makeup will continue in the same facilities to support ongoing missions. A comparison of key features with PUREX is shown in Table 3.

The facilities will be transitioned to a safe and stable shutdown condition. Fissile and hazardous materials will be removed, although no specific attempt will be made to decontaminate equipment or processing cells to given contamination or radiation levels. Pipes and tanks will have been rinsed or flushed, and the facility's uranium content will be removed and accounted for. Maintenance needs for equipment with possible future uses will be identified. Characterization, defined as the data gathering and evaluations necessary for DOE to make decisions regarding decontamination, decommissioning, and future use, will be completed. Surveillance and maintenance activities will be performed until future disposition decisions are made.

Table 3. End-State Key Features Comparison.

PUREX/UO_3	ICPP
Fuel processing systems inactive	Fuel processing systems inactive
Industrial security only	Special nuclear material security (nuclear fuel and final products only)
Analytical laboratory deactivated	Normal site laboratory support
Office and facility space vacated	Office space for support operations
No liquid effluents	Limited liquid effluents for support services
Utilities isolated (except limited electrical and lighting)	Normal utilities (except directly to process cells and equipment)
Limited canyon ventilation only	Normal ventilation services
Canyon cranes shall be mothballed	Access systems active

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3.0 FACILITY TECHNICAL COMPARISON

The PUREX Plant (202-A Building), where the fuels are reprocessed, is a reinforced concrete structure that is 306 m (1,005 ft) long, 36 m (119 ft) wide at its maximum, and 30.5 (100 ft) high, with about 12 m (40 ft) of this height below grade. The building consists of three main structural components; (1) a thick-walled concrete canyon where the equipment for radioactive processing is contained (in cells, below grade); (2) the Pipe and Operating (P&O), Sample, and Storage galleries; and (3) a steel-and-transite annex that houses offices, process control rooms, laboratories, and the building services. The basic features and arrangement are shown in Figure 3. The portion of the canyon below grade is subdivided into a row of process equipment cells paralleled by a ventilation air tunnel and pipe tunnel through which intercell solution transfers are made. The air tunnel exhausts the ventilation air from the cells to the main ventilation filters and stack.

A craneway for three gantry-type maintenance cranes runs nearly the full length of the canyon building, above the cells and pipe trench. The cranes are used to handle cell cover blocks, remotely remove and replace process cell equipment, and charge irradiated fuel into the dissolvers.

The galleries contain service piping to the cells, samplers for obtaining process samples, and electrical switchgear.

The service section next to the galleries consists of two separate annexes. The larger annex contains the maintenance ships, offices, lunchroom, locker room, radiation zone entry lobby, blower room, a switchgear room, compressor room, central control room, and the aqueous makeup area. The smaller annex contains the analytical laboratory, the headend control room, and a switchgear room.

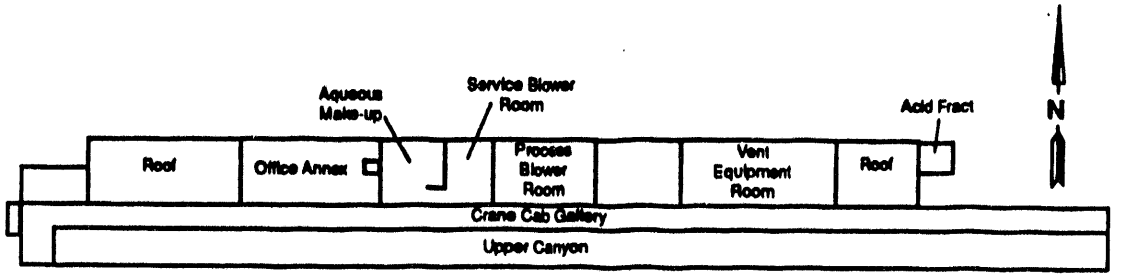
Figure 4 is an aerial view of the PUREX Plant that shows the main processing building (202-A Building) and surrounding supporting facilities that will be deactivated. Figure 5 is the PUREX yard plan, which identifies major components of the PUREX/UO_3 Deactivation Project. Excluded from the project scope are the PUREX Storage Tunnel Number 1 and Number 2.

All processing operations for converting uranyl nitrate hexahydrate (UNH) to UO_3 are contained within two main structures. The 224-U Building contains a set process involving UNH concentration. The 224-UA Building contains a dry process, which involves converting UNH to UO_3 powder. Buildings 224-U and 224-UA are located in the 200 West Area.

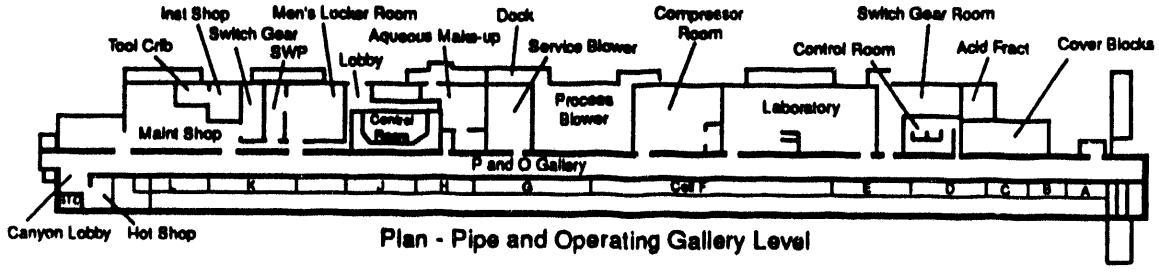
The UO_3 Plant supports the PUREX Plant by further processing uranium recovered from irradiated fuel elements. UNH from the PUREX Plant is converted to UO_3 powder at the UO_3 Plant. Functions at the UO_3 Plant that support UNH conversion to UO_3 powder include the following.

- Receive, store, and concentrate UNH
- Recover nitric acid to reuse at the PUREX Plant
- Package, store, and ship UO_3 powder
- Dispose of waste and recover scrap.

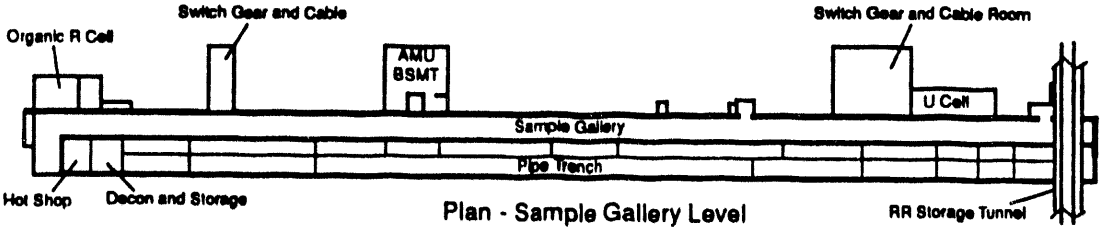
Figure 3. Plan Views of the PUREX Plant (202-A Building).



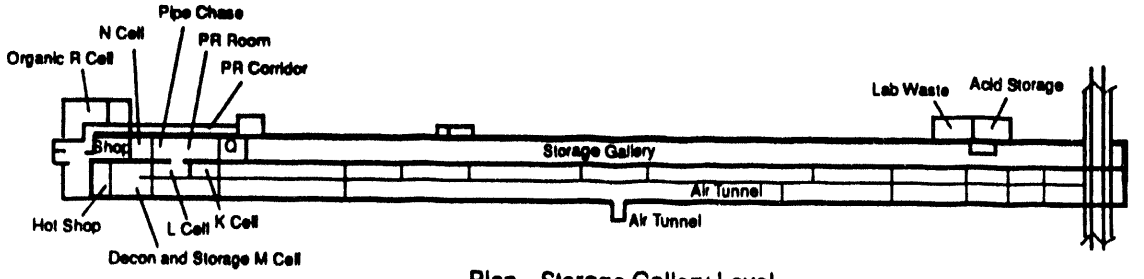
Plan - Crane Cab Gallery Level



Plan - Pipe and Operating Gallery Level



Plan - Sample Gallery Level



Plan - Storage Gallery Level

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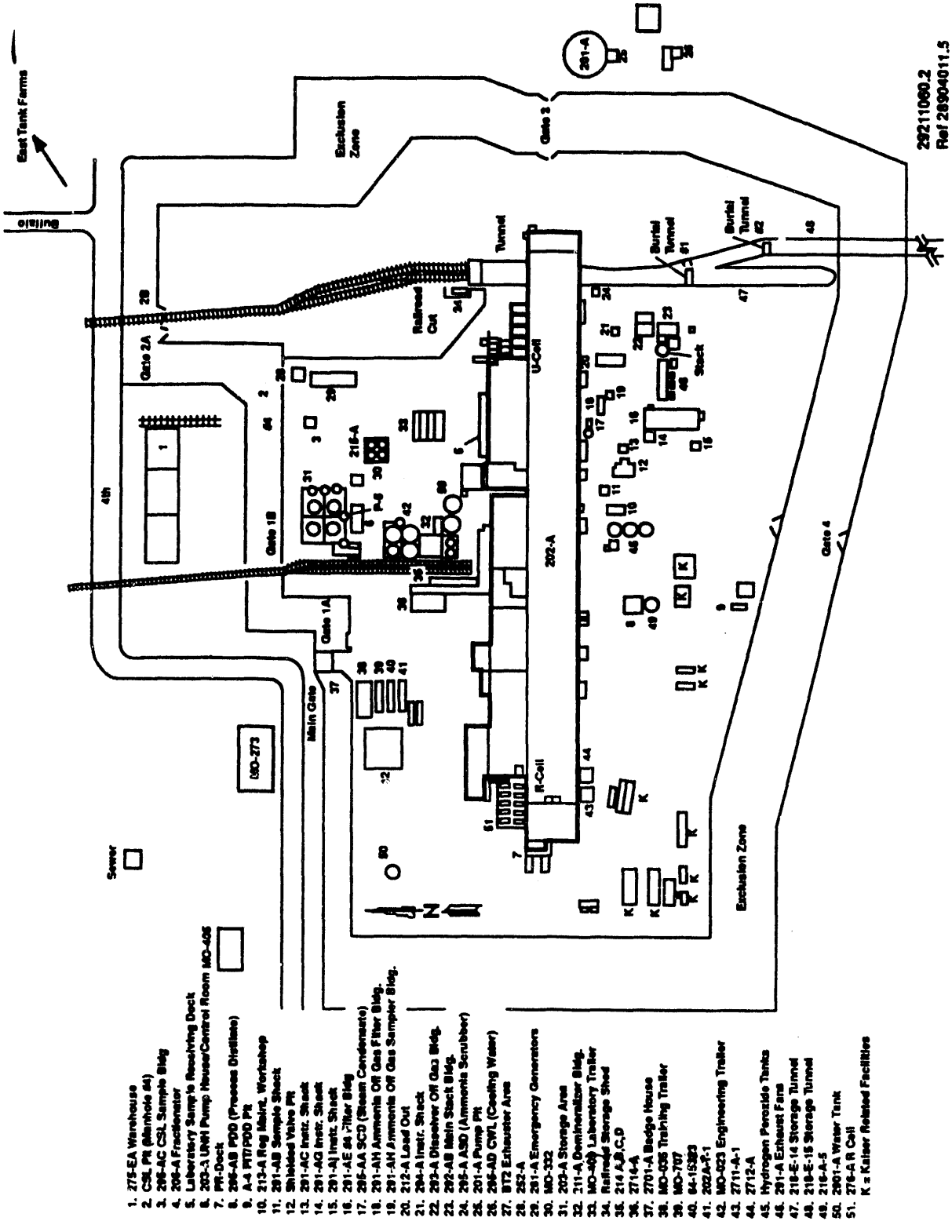
Figure 4. Aerial Photograph of the PUREX Plant.

Figure 5. PUREX/UO_3 Deactivation Project PUREX Yard Plan.



The 224-UA Building was built in 1956. The foundation is 23 m (75 ft) long and 20 m (67 ft) wide. The floor slab and footing is reinforced concrete 15 cm to 20 cm (6 in. to 8 in.) thick. Equipment footings and supports are reinforced concrete pier columns with steel "I" beam framing. Outside walls consists of insulated 18-gauge metallic coated steel panels.

The structure, comprising 1,113 m^2 (11,982 ft^2), is 60 m (197 ft) long, 18 m (60 ft) wide, and 18 m (60 ft) tall. The building is divided lengthwise by a 30 cm (12 in.) -thick concrete shield wall into a gallery side and a canyon side. The gallery side is a three-story reinforced concrete frame structure with concrete floor and roof slabs. Exterior and interior infill walls are non-reinforced, 20 cm (8 in.) concrete blocks.

Figure 6 is an aerial photograph of the UO_3 Plant that shows the main processing buildings (Buildings 224-U and 224-UA) and the surrounding support facilities to be deactivated. Figure 7 is the UO_3 yard plan that identifies major elements of the UO_3 Plant that support the UO_3 Plant and are part of the PUREX/UO_3 Deactivation Project.

The ICPP contains more than 100 facilities and support buildings located on approximately 200 acres in southeast Idaho. An aerial view of the site is provided in Figure 8. Current activities include storing spent and unirradiated fuel, managing waste, and developing and transferring advanced new technologies. The ICPP contains seven major processes/facilities once designated for use in part or wholly for nuclear fuels reprocessing:

- Fluorinel Dissolution Process (CPP-666)
- Custom Dissolution Process (CPP-627)
- Head-end Processes (CPP-640)
- Separations Facilities (CPP-601 and CPP-602 Denitrator)
- Rare Gas Plant (CPP-604)
- Fuel Processing Restoration Facility (CPP-691)
- Waste Calcining Facility (CPP-633).

A yard plan of the ICPP, which is shown in Figure 9, identifies the seven facility locations with hash marks.

The heart of reprocessing at ICPP is the uranium-extraction process, which is primarily contained in CPP-601. A floor plan of CPP-601 is shown in Figure 10. The process building contains 29 process cells, most of which are about 1.9 m^2 (20 ft^2) and 8.5 m (28 ft) deep, numerous corridors, and auxiliary cells that house equipment and controls. The bottom of each cell is lined with stainless steel, and most of the equipment is made of stainless steel. Most of the processing equipment in the building is located in heavily shielded cells and must be operated remotely. The entire plant was designed with a direct-contact philosophy, in that maintenance is performed by direct manual contact during periodic shutdowns after the cell and equipment are decontaminated to reduce radiation fields.

Figure 6. Aerial Photograph of the UO_3 Plant.

Figure 7. PUREX/UO_3 Deactivation Project - UO_3 Plant Yard Plan.

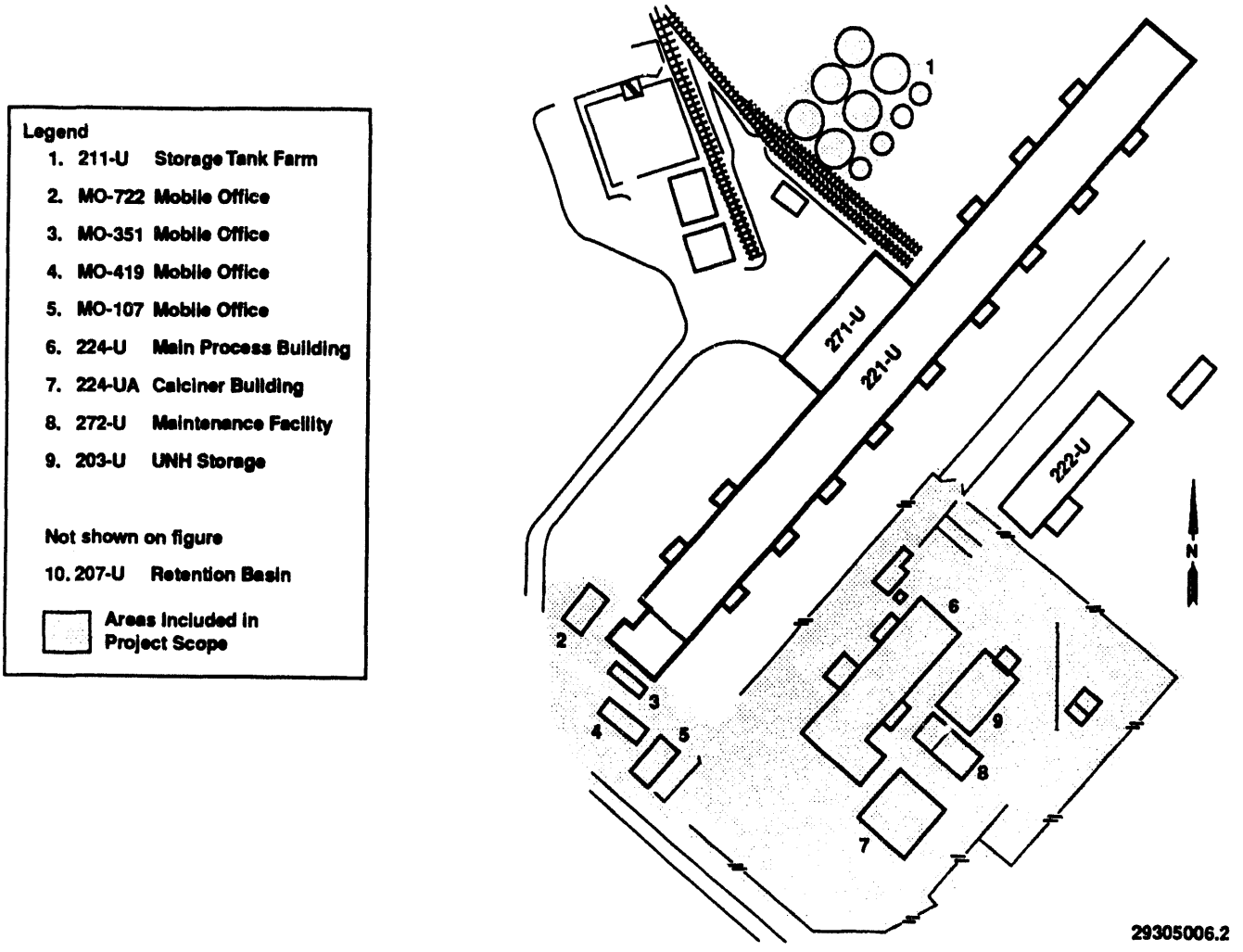


Figure 8. Aerial View of ICPP Site.

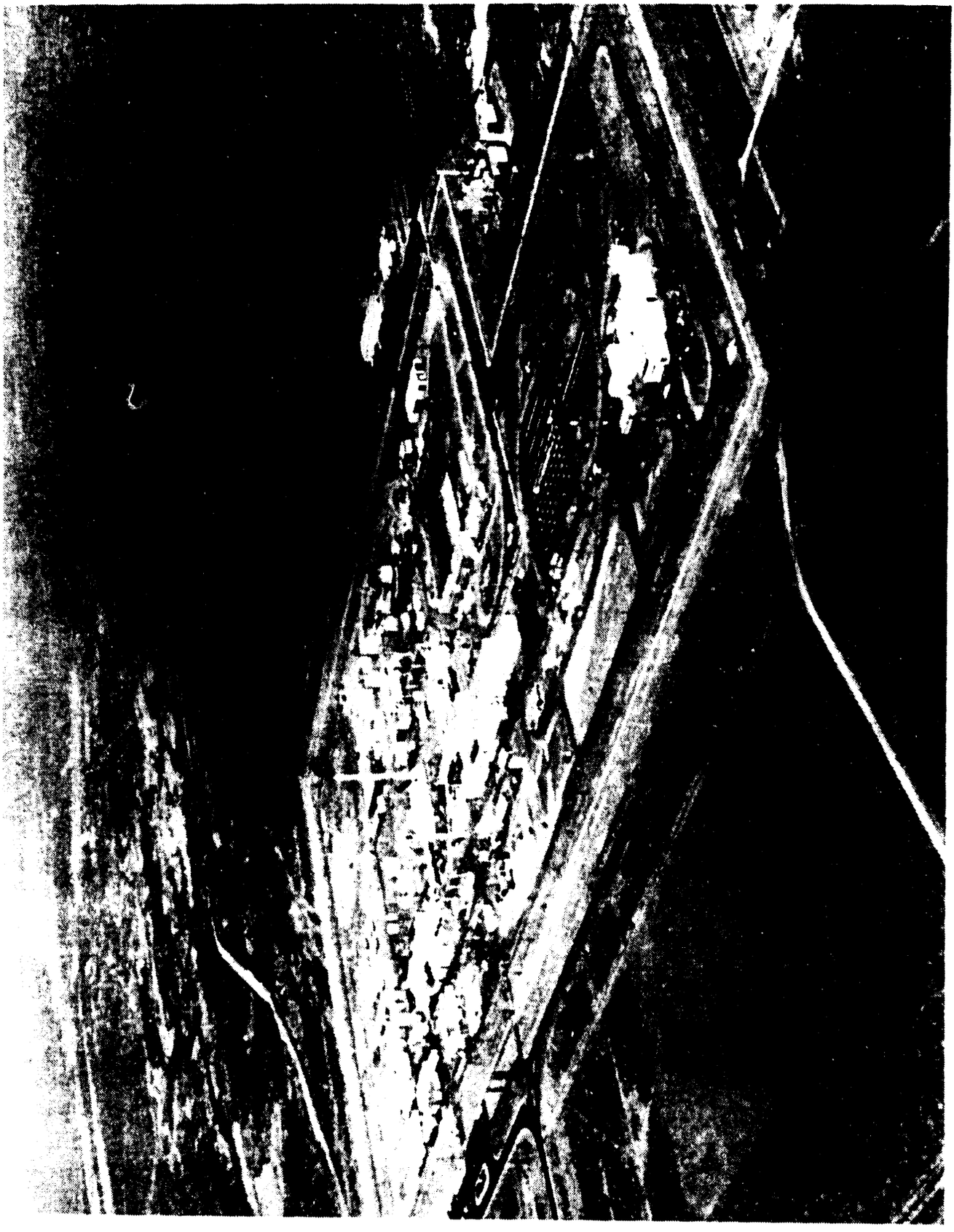


Figure 9. ICPP Yard Plan.

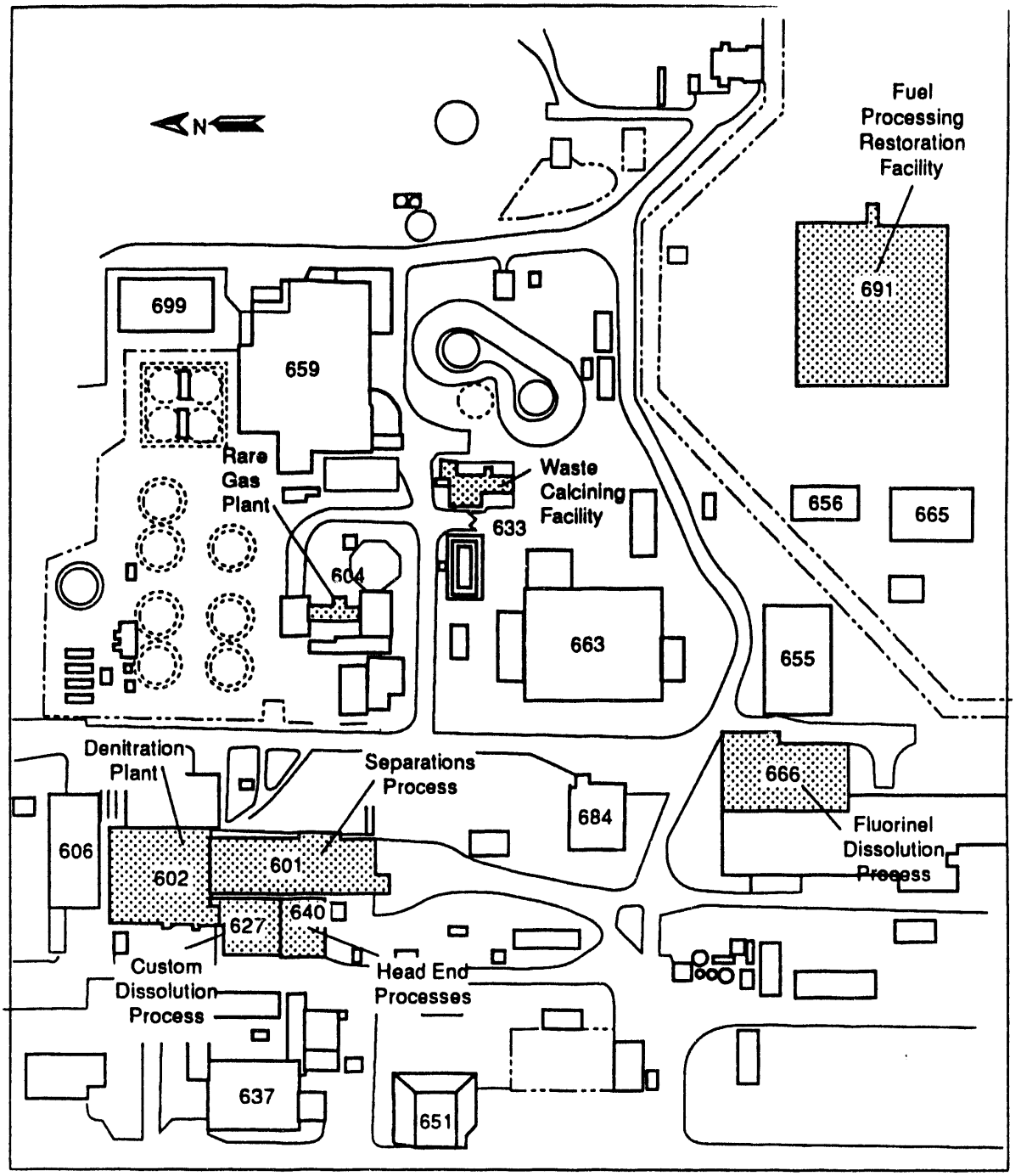
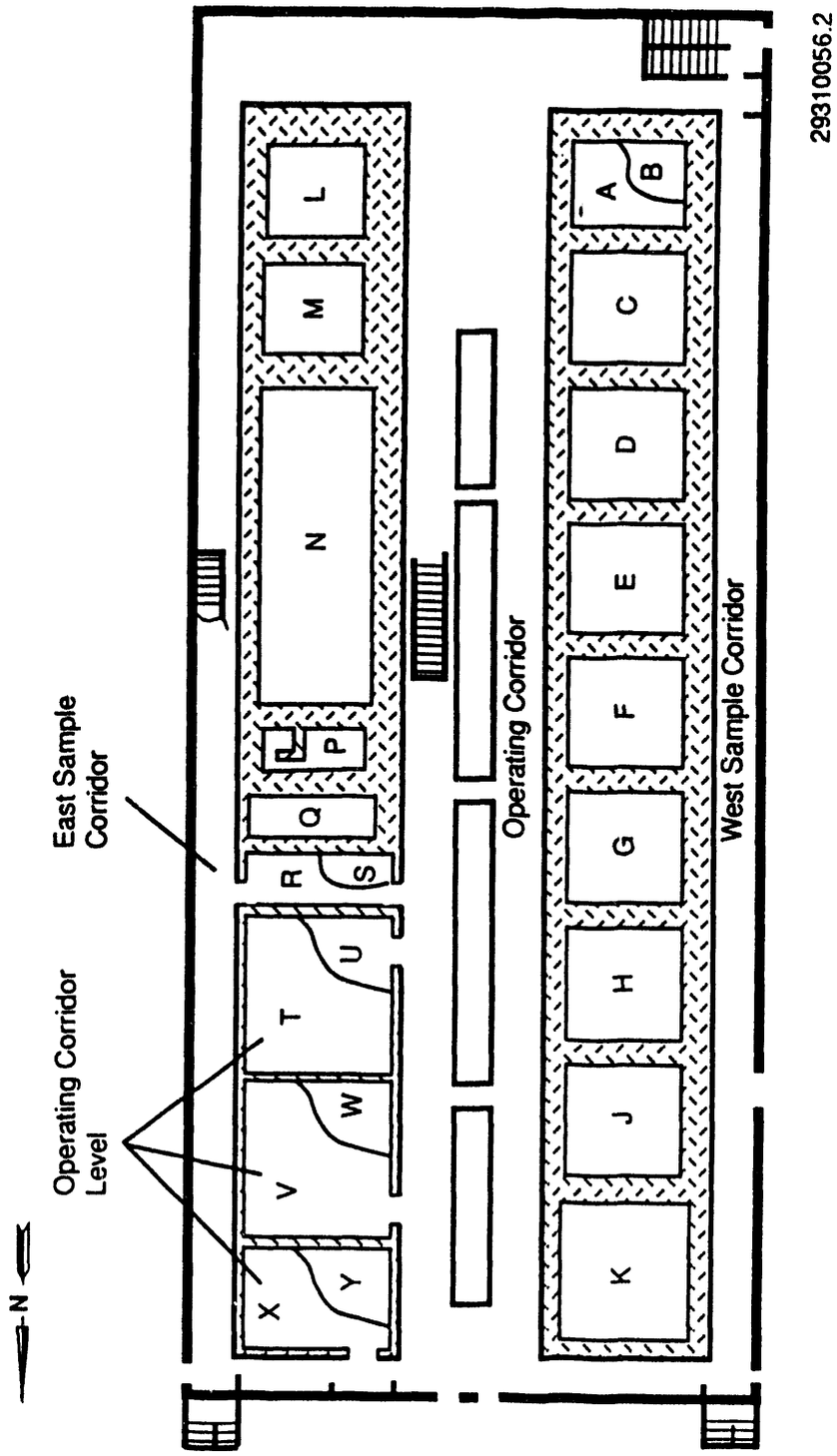


Figure 10. Floor Plan View of ICPP Separations Facilities.



Functions of the CPP-601 Separations Facility include the following.

- Head-end dissolution of aluminum and zirconium fuel
- Solvent extraction (three cycles) of uranium from dissolved fuels
- Solvent recovery
- Inter-cycle storage of uranyl nitrate
- Denitration of uranyl nitrate to UO_3.

Three of the buildings under transition contain four head-end processes for uranium extraction. Each contains one or more dissolution process for a different type of fuel. Each head-end process feeds the extraction process in CPP-601. The four head-end processes are as follows.

- Fluorinel dissolution process (FDP) - zirconium fuels
- ROVER dissolution process - graphite fuels
- Electrolytic dissolution process - stainless steel fuels
- Custom dissolution - small quantities of custom fuel.

Three additional facilities are designated for transition: the Waste Calcining Facility in CPP-633, the Rare Gas Plant in CPP-604, and the Fuel Processing Restoration Facility in CPP-691. Construction on the Fuel Processing Restoration Facility is not complete. The original purpose of each facility is as follows.

- The Waste Calcining Facility calcined high-level liquid waste from the tank farm to produce a granular stable waste form.

- The Rare Gas Plant recovered krypton and xenon gases from aluminum and zirconium fuel dissolution off gases.

- The Fuel Processing Restoration Facility was designed to replace the fuel separations systems currently contained in CPP-601.

A comparison of PUREX and the ICPP reveals several similarities and differences. Both facilities were used to separate and recover fissile material from expended fuel cells using liquid-liquid extraction through a series of columns. However, PUREX was designed to recover uranium and plutonium in production quantities while the ICPP reprocessing facilities were designed to recover highly enriched uranium from a wide variety of fuels. This difference explains why PUREX is larger and designed as a canyon; whereas, the ICPP is smaller and designed around a cell concept. For a technical comparison of unit operations and pertinent functions of ICPP/PUREX, refer to Table 4.

3.1 OPERATIONAL TECHNICAL COMPARISON

Many similarities exist between ICPP and PUREX/UO_3 processes and technical principles. Table 4 provides an overall comparison of fuel, unit operations, radiation contamination levels, utilities status (at completion of

Table 4. Technical Comparison.

FUEL	
PUREX	**ICPP**
• Composition range - 0.72 U^{235} to 2.1% U^{235} early) 0.94% U^{235} to 1.25% U^{235} (recent) • Cladding - Zirconium (N Reactor) - Aluminum (early reactors)	• Composition range - Highly enriched U^{235} (> 50% typically) • Cladding - Aluminum - Zirconium - Stainless steel - Graphite - Exotics (i.e., ceramics)
UNIT OPERATIONS - DISSOLVERS	
• 3 Identical dissolvers - Annular (H = 24', OD = 10') - Zirflex process - 10 to 11 metric tons per charge per dissolver • Capacity - 10 to 30 MTU/day	• FDP: 3 identical dissolvers - (H = 17', OD = 3') - Flourinel dissolution process - <1 Metric ton per Charge • G-Cell (aluminum) • Electrolytic (SS) • Rover (graphite) • Custom (exotics) • Capacity < 1 MTU/day)

Table 4. Technical Comparison.

UNIT OPERATIONS - SOLVENT EXTRACTION	
PUREX	**ICPP**
• Media: TBP/NPH • Decon cycle feed rate: 9,000 L/hour • Partitioning cycle (plutonium/uranium separations) • Uranium purification • Plutonium purification • Storage - UNH - $Pu(NO_3)_4$ - UO_3 (UO_3 Plant)	• Media: TBP/N-dodecane and hexone/menthyl isobutyl ketone • Decon cycle feed rate: 600 L/hour • No partitioning • Uranium purification • No Plutonium purification Storage - UNH - UO_3 • Storage - UN - UO_3
UNIT OPERATIONS - OFF-GAS TREATMENT	
• Silver nitrate reactors - Iodine removal • Deep bed fiberglass filters and HEPA filters	• Rare Gas Plant - Krypton recovery - Xenon recovery • HEPA filters

Table 4. Technical Comparison.

EVAPORATORS/CONCENTRATORS AND TANKS	
PUREX	**ICPP**
• Concentrators - 5 Large • Average concentrator - Height = 30' - Reboiler OD = 54" - Total diameter: 25' - Operating volume: ~ 3,500 Gal • Tanks - Several hundred - 1.5 to 15,000 gal - Standard: 5,000 gal	• Evaporators - 5 Small, varied • Largest evaporator - Height = 15' - ID = 5' - Steam chest diameter: 7' - Operating volume: ~ 20 Gal • Tanks - Several hundred - Largest volume: 4,500 gal - Most 20 to 200 gal range (criticality considerations)
UNIT OPERATIONS - DENITRATION	
PUREX	**ICPP**
• UO_3 Plant - Design throughput - 34.7 MTU/day - Continuous rotary calcining • PUREX Plant - PuO_2 weapons grade - PuO_2 fuels grade - Dual rotary calciners - ~ 1 Kg/hour	• UNH Denitrator (CPP-602) < 1 MTU/day - Throughput - ~ 4L/hour - Fluidized bed

Table 4. Technical Comparison.

RADIATION/CONTAMINATION LEVELS	
PUREX	ICPP
• Varied (alpha, beta, gamma) • Remote decontamination - Concrete cells - Very limited access - Dunnage: carbon steel • 0.3 - 300 R/hr	• Varied (alpha, beta, gamma) • Hands-on decontamination (external surfaces only) - Stainless steel floors/liners - Doors/hatches - Dunnage: stainless steel • 0 - 0.4 R/hr (with localized fields up to 100 R/hour)
UTILITIES*	
PUREX	ICPP
• Steam - none • Water - none • Power - limited • HVAC - limited	• Steam - minimal change • Water - minimal change • Power - minimal change • HVAC - minimal change
* At completion of deactivation/phaseout.	

Table 4. Technical Comparison.

UNIT OPERATIONS - SUPPORT SYSTEMS	
PUREX	ICPP

• Solvent recovery
• Acid recovery (HNO_3)
• Waste treatment (solid, gaseous, liquid)
• Filtration (HEPA)
• Long-term storage
  - UO_3 (UO_3 Plant)
• Calcination (Denitration)
  - UO_3 (Complete)
  - PUO_2 (Complete)
	• Solvent recovery
	• None
	• Waste treatment (solid, gaseous, liquid)
	• Filtration (HEPA)
	• Long-term storage - ongoing
	  - UO_3
	  - Fuel (irradiated or uniradiated)
	• Denitration
	  - UO_3 (Ongoing for phaseout)

to deactivation phaseout) and support systems for the two sites. The following are key issues relative to the current status of ICPP and PUREX/UO^3.

- PUREX/UO_3 calcination is complete.
- ICPP (in phaseout) will complete denitration activities.
- PUREX/UO_3 utilities will be limited at the conclusion of deactivation.
- ICPP utilities will change minimally at the conclusion of phaseout.
- PUREX/UO_3 will be secured using the best industrial safety practices with no routine occupancy.
- ICPP will require security in fuel and UO_3 storage areas.
- ICPP phaseout facilities will be occupied by personnel.
- PUREX will use quarterly safety surveillance.
- ICPP separations facilities will have limited changes in surveillance status.

3.2 POSSIBLE FUTURE USE

There are no anticipated future uses for PUREX/UO_3 and the plants are being deactivated in preparation for decontamination and decommissioning. ICPP is being evaluated and characterized for possible future uses or for decontamination and decommissioning.

The development groups at WINCO will need additional space for nonradioactive component testing by fiscal year 1995. By fiscal year 2000, space will be needed for integrated pilot-plant tests of new processes. These development activities will require more space than is currently available. There are plans to construct a multifunction pilot plant facility or a process demonstration facility to provide areas for integrated testing. Process demonstrations might be placed in one of the transition facilities such as the Fuel Processing Restoration Building. One or more of the integrated pilot plants may eventually be converted to a radioactive production process. Placement in a transition facility would eliminate the need to construct a new production facility. After the technology is proven, process operations could begin years sooner than scheduled, and facility costs would be greatly reduced.

Although most of the development activities will be performed using nonradioactive simulations, the technology must be verified with radioactive feed (e.g., using calcine, tank farm waste, or irradiated fuel). Radioactive cells, which may be required as soon as fiscal year 1996, could be located in existing facilities at the ICPP (e.g., the FDP cell or multicurie cell).

Although fuel reprocessing activities will end, analytical chemistry supports several ICPP activities and will remain an important organization as the mission changes. Analyses will be required for (1) facility characterizations during transition, (2) samples generated from waste processing operations, and (3) development work from the applied technology development programs. Analytical services will be required on a regular basis to support all of these operations.

4.0 COMPLIANCE STRATEGIES

WHC and WINCO have similar approaches to deactivation and phaseout. The transition facilities are in compliance with the *National Environmental Policy Act* (NEPA) for their operation. Flushing activities that occur during phaseout are considered operational activities by DOE Order 5820.2A, *Radioactive Waste Management*. As such, they do not require additional NEPA documentation because these activities do not include significant physical modifications.

Some specific activities at both sites may fall outside the scope of existing documentation. Additionally, new NEPA documentation may be required following deactivation and phaseout. Transition facilities at the ICPP will be included in the 1995 site-wide Environmental Impact Statement. Final disposition of PUREX will be addressed by the Hanford Site Remedial Action Environmental Impact Statement and the final selection of land use for Hanford Site areas. It is the intent of WHC and WINCO to meet all applicable state and federal requirements. Where issues are raised, both sites will prepare and reach agreement on an appropriate approach to compliance.

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5.0 SAFETY DOCUMENTATION STRATEGY

ICPP and PUREX are consistent in applying safety documentation for transition activities. Both are using previously prepared operational safety analyses to describe the facility safety scope. Specific variations are described in the following subsections. The goal of the project is to provide safety assurance while avoiding unnecessary and costly reevaluations.

5.1 CURRENT FINAL SAFETY ANALYSIS REPORT STATUS

The following documents contain operational safety requirement (OSR) information for PUREX.

- WHC-SD-HS-SAR-001, *PUREX Plant Final Safety Analysis Report*, (FSAR). Chapter 11 of the FSAR was written for an operating plant and contains 132 OSRs in the form of 23 safety boundaries or conditions and 109 control features. Safety boundaries provide specific values and technical requirements while safety conditions define requirements but are not directly measurable, and control features state what is controlled but do not list specific values or limits.

- WHC-CM-5-24, *PUREX Process Control Manual (PCM)*. This document implements Chapter 11 safety boundaries/conditions and control features through a total of 186 control feature requirements as limiting conditions for operation, limiting control settings, administrative requirements, and surveillance requirements.

- WHC-SD-CP-OSR-006, *Applicability of PUREX Operational Safety Requirements During Shutdown/Standby*, (Applicability Document). This document evaluated the PCM requirements to determine which control feature requirements are applicable when PUREX is in a shutdown/standby mode. The purpose of the evaluation was to make it possible to better use the plant resources by eliminating unneeded instrument calibrations while maintaining the plant within the constraints of the current safety scope.

- WHC-SD-CP-RD-020, *Application of Standardized Operational Safety Requirement Criteria to PUREX Operational Safety Requirements*, (Split Report). Applicability of existing OSRs to standby conditions was evaluated using Draft DOE Order 5480.23, *The Crosswalk Documentation* and screening criteria.

The OSRs, as indicated in the section applicability statements, were written for an operating plant. The applicability statements in the PCM will be enhanced and expanded to cover the current plant status, thus reducing the number of OSRs requiring surveillance during deactivation. This action will release plant resources that can then be applied directly to completing defined tasks.

The PCM will be reissued as a supporting document and will include the tables that are in the current applicability document. The reissued PCM will be maintained current to provide clear directions for implementing in facility procedures and tracking systems. The split report will be used as a reference document that supplies the basis for the revised applicability statements. Applicable OSRs will be identified by exception and flagged as necessary.

The current PCM requires only simple and easily understood revisions to a minimum number of documents, retains the current PCM format, which is familiar to Operations supervision, and eliminates the need to go through two document control systems. Applicability statements are common elements of commercial nuclear facility SARs and allow flexibility in applying the OSRs based on the facility operating mode.

As one of the conditions for transfer of the facility to decontamination and decommissioning, the PUREX Plant SAR will be reviewed and updated for deactivation/shutdown status in accordance with applicable WHC management requirements and procedures. Because PUREX will be a low-hazard (category 3) facility at that time, the effort will be directed primarily at updating the description of the physical plant.

The ICCP Final Safety Analysis Report contains technical standards and specifications (TS/S) and technical requirements (TRQ) for ICPP.

- ICPP Final Safety Analysis Report. Thirty-nine individual FSARs apply to facilities/processes that are in transition. The FSARs are compiled in the Plant Safety Document (PSD). As new systems or facilities were added to the ICPP, FSARs were prepared and added to the PSD.

The existing ICPP FSAR, Plant Safety Document, and the Technical Specifications/Standards describe the safety scope envelope for cleanout operations and will not require rewrite for phaseout, except for selective modifications. They are written to provide (1) successively larger margins to the safety envelope to prevent safety limits from being exceeded, (2) limiting conditions for operation, and (3) limiting control settings. After phaseout, the FSAR and implementing documents will be revised to reflect the shutdown status of processes and equipment.

5.2 SAFETY DOCUMENTATION FOR TRANSITION

Figure 12 shows the transition unreviewed safety question (USQ) process used by PUREX and ICPP as a safety strategy for transition and phaseout activities. In accordance with DOE Order 5480.21, *Unreviewed Safety Questions*, the USQ screening process is used to cover phaseout/deactivation tasks. The USQ process provides early identification of tasks that may require additional safety evaluation and analysis. The facility administrative manuals provide the specific requirements for implementation of DOE Order 5480.21.

5.3 KEY RISKS AND HAZARDS

The PUREX issues relative to residual organics were reviewed by the TOMSK-1 lessons-learned review team. The team's conclusions are as follows.

- The PUREX Plant SAR considers only the operational mode for safety scope definition.
- The PUREX Plant is shutdown as far as processing is concerned and the solvent isolated in two tanks.
- The steam and acid lines are blanked.
- The only concern is mixing for sampling and temperature monitoring.
- The PUREX Plant solvent storage tanks are equipped with mixers and temperature monitoring.
- No unacceptable risk exists because of PUREX solvent.

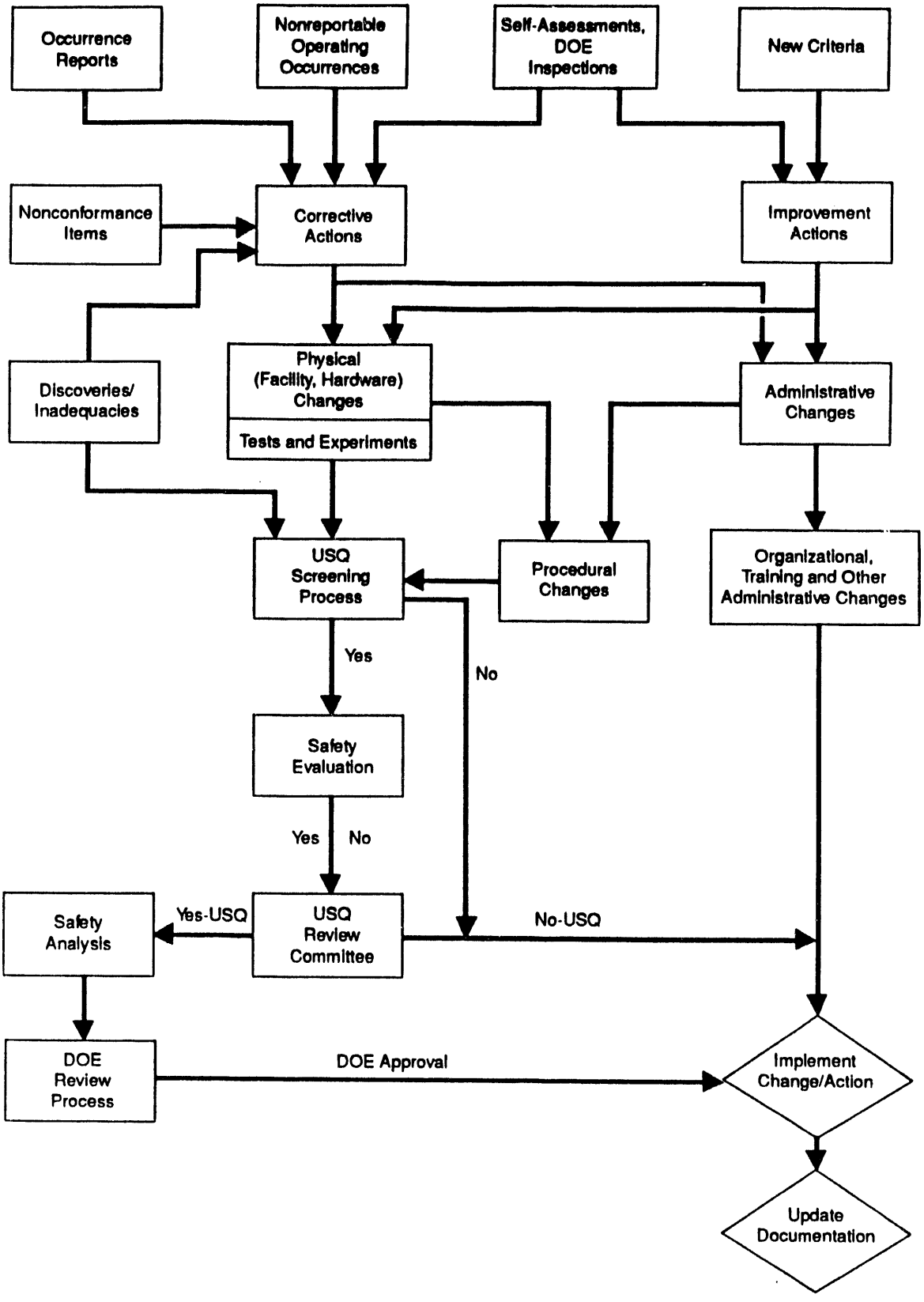
There may be safety issues related to disposing metal solution at PUREX, depending on the method selected for removal. At the present time, the metal solutions are isolated in two tanks.

Once the method for removal from the plant is selected, the process outlined in Section 5.2 will be used (safety documentation for one-time activities) to evaluate solution removal.

The remaining risks and hazards for PUREX and UO_3 are typical industrial scenarios relative to a nuclear type facility. All activities are to be screened according to Section 5.2. There are risks and hazards (as with any activity) but appropriate controls and reviews are in place to minimize safety concerns for the workers, the environment, and the public.

At the ICPP, issues relative to the TOMSK-7 incident in Siberia were presented by a member of the review team that visited the TOMSK-7 facility.

Figure 11. Transition USQ Process.



A thorough in-house review of ICPP systems identified the need to limit the acid concentration in the hexone extraction, hexone recovery, hexone storage, and overall rework systems to 3M HNO_3. The 3 M limit also applies to the 2/3 cycle extraction raffinate tanks. To implement this limit, the following changes were made to the technical requirements when organics are present in the affected system.

- The hexone storage system (T-Cell) is now limited to 3M HNO_3.
- The rework system (L Cell)is now limited to 3M HNO_3.
- Sections were added to the basis of the technical requirements to reflect the new requirements.

Implementation is provided by the operational run plan and the operating procedures. These changes were reviewed by the TOMSK-7 lessons-learned review team. No unacceptable risks were identified and implementing the new limits is not expected to delay the ongoing phaseout.

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6.0 WASTE MANAGEMENT

Waste generated during the phaseout/deactivation for PUREX/UO_3 and ICPP will be managed in accordance with DOE Orders 5400.1, *General Environmental Protection Program*," 5400.3, *Hazardous and Radioactive Waste Program*, and 5820.A, *Radioactive Waste Management*,, the *Resource Conservation and Recovery Act of 1976* (RCRA), and the *Washington Administrative Code* (WAC) "Dangerous Waste Regulations," (WAC 173-303). This section describes the handling, treatment, and disposal of waste, and summarizes the techniques that are planned for waste minimization during the project.

6.1 WASTE MINIMIZATION

Waste minimization programs have been implemented for phaseout/ transition. Waste minimization objectives have been incorporated during planning to ensure that the waste minimization techniques are fully integrated into the work. The waste minimization objectives for transition, which are applied sequentially to the work, are as follows.

- Avoid generating waste
- Minimize the waste that is generated
- Recycle what is minimized
- Treat the waste that cannot be recycled.

Practical waste minimization efforts include eliminating characteristic hazardous waste, segregating wastes into compatible categories, compacting solid waste, and concentrating dilute liquid waste. Key waste minimization activities are described in the following paragraphs.

Currently, there are 3 liquid and 13 gaseous effluent discharges from PUREX and the UO_3 Plant. By project completion, the liquid effluent discharges to the soil column and the three UO_3 Plant gaseous effluent discharges will have been eliminated. The 10 PUREX gaseous effluents will be consolidated into a single stream and significantly reduced in flow.

During transition, solid waste volumes will be minimized by incorporating the waste minimization objectives into the transition plan.For example, waste will be segregated by type to prevent category crossover, such as trash being converted to low-level waste through careless waste practices. In addition, compacting and reducing the size of the waste will reduce void space in the waste packages.

The generation of solid waste at PUREX and the UO_3 Plant will be eliminated after the project is complete, except for the small amounts created by surveillance entries and maintenance inside radiation zones.

Similarly, phaseout of reprocessing activities at ICPP will result in significant reduction of effluent emissions and solid waste generation. The number of effluent emission points for gaseous and liquid streams will be

reduced by more than two-thirds and the volume of solid waste will be reduced by approximately two-thirds. A comparison of the effluent and solid reduction for operational and post deactivation/phaseout activities is presented in Table 5.

Table 5. Comparison of Waste Management Activities.

Activity	PUREX/UO_3		ICPP Phaseout facilities	
	Standby	Deactivation	During operation	Phaseout
Gaseous effluent discharge, number of points	13	1	24	7
Liquid effluent discharge, number of points	3	0	17	7
Solid volume (M^3/yr)	2,400	Minimal*	345	120

*Waste generated by quarterly surveillance and limited maintenance.

7.0 SAVINGS THROUGH SHARING

The Westinghouse GOCO committee on facility transition, initiated by WEC, is a key activity for promoting savings through sharing. The committee, which is made up of representatives from all WEC GOCO contractors, forms the basis for the managerial, technical, and compliance interfaces.

Savings through sharing is an ongoing WEC activity at WEC.Some accomplishments made by saving through sharing include the following.

- The ICPP Phaseout Plan (reference) was reviewed independently by WHC to ensure that lessons learned for PUREX cleanout/standby were incorporated.
- Excess PUREX aluminum nitrate nonahydrate chemicals were shipped to ICPP and consumed as part of the ICPP process.
- Other intersite support is in progress such as excess PUREX organic use at ICPP.

Past experience and ongoing work such as the decommissioning and decontamination at West Valley Nuclear Fuel Services provides additional opportunity for savings at other Westinghouse facilities. Actual savings may take the form of reduced cost to the government but may also be in the form of improved worker safety and reduced environmental impact.

The key to the success of savings through sharing is the close cooperation and communication provided by the GOCO committee on facility transition. The committee plans quarterly information exchanges to foster direct communication between the DOE site contractor personnel.

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