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7. Abstract

This functional design criteria for the upgrade to the 340 radioactive liquid waste storage facility (Project W-302) specifically addresses the secondary containment issues at the current vault facility of the 340 Complex. This vault serves as the terminus for the Radioactive Liquid Waste System (RLWS). Project W-302 is necessary in order to bring this portion of the Complex into full regulatory compliance. The project title, "340 Facility Secondary Containment and Leak Detection", illustrates preliminary thoughts of taking corrective action directly upon the existing vault (such as removing the tanks, lining the vault, and replacing tanks). However, based on the conclusion of the engineering study, "Engineering Study of the 300 Area Process Wastewater Handling System", WHC-SD-WM-ER-277 (as well as numerous follow-up meetings with cognizant staff), this FDC prescribes a complete replacement of the current tank/vault system. This offers a greater array of tanks, and provides greater operating flexibility and ease of maintenance. This approach also minimizes disruption to RLWS services during "tie-in", as compared to the alternative of trying to renovate the old vault. The proposed site is within the current Complex area, and maintains the receipt of RLWS solutions through gravity flow.

8. RELEASE STAMP

A-6400-073 (08/94) WEF124

340 FACILITY SECONDARY CONTAINMENT AND LEAK DETECTION

PROJECT W-302

FUNCTIONAL DESIGN CRITERIA

Prepared by
R.T. Stordeur
February 1995

Westinghouse Hanford Company
Project & Site Services
Liquid Effluents Services
Liquid Effluent Advanced Engineering

for the

United States Department of Energy
Richland Operations Office
Richland, Washington

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In keeping with the requirements of DOE/RL-94-0070 (the *Hanford Metric Implementation Plan*), this FDC uses metric units (along with English equivalents) except (as allowed) for radiological units. Should it be needed; one can convert curies to becquerels by multiplying by 37,000,000,000 (3.7E+10), and rems to sieverts by multiplying by 0.01.

ABBREVIATIONS/ACRONYMS LIST

ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	as low as reasonably achievable
AMCA	Air Movement Contractor Association
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ATP	acceptance test procedure
AWWA	American Water Works Association
CDR	conceptual design report
CFR	code of federal regulations
CMS	control and monitor system
D&D	decontamination and decommissioning
DCG	derived concentration guideline
DOE	U.S. Department of Energy
DOT	Department of Transportation
DST	double shell tanks
ECM	environmental compliance manual
Ecology	State of Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDA	U.S. Energy Research & Development Agency (DOE predecessor)
ES	engineering study
FDC	functional design criteria
FEMP	facility environmental monitoring plan
FSAR	final safety analysis report
HEPA	high efficiency particulate air [filter]
HLAN	Hanford [Site] local area network
HPS	Hanford plant standard
HPT	health physics technician
HVAC	heating, ventilating, and air conditioning
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
ISB	interim safety basis
KEH	ICF-Kaiser Engineering Hanford
LCCA	life cycle cost analysis
LLW	low level waste
MCM	minimum critical mass
NC	Noise criteria
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NOI	notice of intent
OTP	operations test procedure
PNL	Pacific Northwest Laboratories
PS	process sewer
PSAR	preliminary safety analysis report
PSE	preliminary safety evaluation
QA	quality assurance

QAPP	quality assurance program plan
RCRA	Resource Conservation and Recovery Act
RL	[U.S. Department of Energy-]Richland Field Office
RLID	DOE-RL Implementing Directive
RLIP	DOE-RL Implementing Procedure
RLW	radioactive liquid waste
RLWS	radioactive liquid waste system
RPS	retention process sewer
SARP	safety analysis report for packaging
SEF	site evaluation form
SER	site evaluation report
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
Sp.G.	specific gravity
TEDF	Treated Effluent Disposal Facility
TLV	threshold limit values (set by ACGIH)
TLV-C	TLV ceiling (instantaneous)
TLV-STEL	TLV short term exposure limit (15 minutes)
TLV-TWA	TLV time weighted average (40 hour/week)
TOE	total operating efficiency
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order
TRU	transuranic
TSD	treatment, storage, and disposal
UL	Underwriters' Laboratories
UPS	uninterruptible power supply
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WRAP	Waste Receiving and Packaging [facility]

Chemical symbols

Ag	silver
Al	aluminum
Am	americium
Ba	barium
Cd	cadmium
Ce	cerium
Cl	chlorine, chloride
Cm	curium
Co	cobalt
CO_2	carbon dioxide
CO_3	carbonate
Cr	chromium
Cs	cesium
Cu	copper
Eu	europium
F	fluorine, fluoride
HCO_3	bicarbonate
Hg	mercury
Mn	manganese
Na	sodium
Nb	niobium
NO_2	nitrite
NO_3	nitrate
OH	hydroxide, hydroxyl
Pb	lead
PO_4	phosphate
Pu	plutonium
Ru	ruthenium
Sb	antimony
Se	selenium
SO_4	sulfate
Sr	strontium
Ta	tantalum
Tc	technetium
TOC	total organic carbon
U	uranium
Zr	zirconium

TABLE OF CONTENTS

1.0 INTRODUCTION

Project W-302 shall* provide a replacement facility [to be called here 340-C, subject to a later official building number designation] to the current vault at the 340 Complex, to allow RCRA compliant storage of radioactive mixed process sewer effluents in the Hanford Site 300 Area. The existing facility will be by-passed and turned over for later D&D.

1.1 Background

The existing 340 Complex serves 300 Area facilities which generate radioactively contaminated liquid wastes, some of which are also contaminated with hazardous materials. The wastes transferred to the 340 Facility storage tanks primarily arrive by one of two sewer systems: 1) direct from the radioactive liquid waste system (RLWS); or 2) through diversions from the retention process sewer (RPS). The RPS serves sources that are normally free of radioactive contamination, but the effluent may become contaminated during abnormal or upset conditions. Under normal conditions wastes from the RPS are conveyed by a third sewer system (the process sewer, or PS) to the Treated Effluent Disposal Facility (TEDF); otherwise it is routed to the RLWS/340 System.

The RLWS is used to collect liquid wastes which are known to contain radioactive constituents. The primary facilities generating liquid waste discharged to the RLWS system are the 324, 325, 326, 327, and 329 buildings. Other generator facilities transfer containerized wastes via these connected facilities or directly to the 340 Complex where the wastes are then discharged to the RLWS via a sump (WHC 1992d). The existing requirements for use of the RLWS are summarized in Table 1-1, which is

* In this criteria document, the terms "shall", "must", and/or "will" reflect critical requirements; while "should" is reserved for highly desirable traits or features that, while strongly recommended for consideration, are not essential.

from WHC 1993b, *Technical Requirements Document for the use of the RLWS and RPS.* The generator is responsible for ensuring that these requirements are met. {Note Project W-302 upgrades may allow some changes to these requirements (see Section 3.2), beyond the scope of this FDC}.

The RLWS system includes the 340 Complex and an underground double-wall pipe network connecting the previously mentioned 300 Area buildings with the Complex. The radioactive liquid waste (RLW) is collected at the 340 Complex and periodically transferred to a rail tank car in the 340-B Load-out Facility, which then transports the RLW to the 200 Area's 204-AR Waste Unloading Facility for eventual storage in double shell tanks. The 340 Complex includes the 340, 340-A, and 340-B buildings. The following provides a brief description of the buildings within the 340 Complex.

The 340 Building was originally constructed in the early 1950's and houses the sampling hood, decontamination area, equipment room, control room, and an underground concrete vault. The vault houses two 57 kiloliter (15,000 gal.) stainless steel tanks, and is provided with a removable concrete cover. In the early 1960's an addition was added to the 340 Building which included a garage and load-out facility for tanker trucks (WHC 1992c).

The 340-A Building sits partially below grade and contains six 30 kiloliter (8,000 gal.) stainless steel tanks. All six of these tanks are currently deemed available as backup storage for the vault tanks.

The 340-B Building is termed the rail load-out facility. The building was initially constructed to accommodate two 76 kiloliter (20,000 gal.) rail tank cars. Currently, only the east side can receive rail cars. The tracks on the west side have been removed and this area is only used for storage. The two sides are now divided by a concrete shielding wall. As stated above, the railcars transport waste out to the 204-AR Facility. The railcars are periodically tested at T Plant in 200W Area.

Table 1-1 RLWS (radioactive liquid waste system) Acceptance Requirements

Item	Limit
Waste Form	Radioactive liquid wastes containing >4% of the Derived Concentration Guides for radioactivity.
pH	7< pH <12.
Chloride Ions	<0.01 M.
Fissile Material	Prior notification and <0.0026 grams/liter.
Solids	≤100 microns.
Solidifying Substances	Prohibited.
Shipping Restriction	Isotope — Quantity Pu-238 — 2.00E-5 g/l Pu-240 — 1.25E-3 g/l Am-241 — 8.50E-5 g/l Pu-241 — 1.50E-4 g/l When more than one isotope is present, the sum of the fractions shall not exceed unity.
Separable Organics	Prohibited.
Volume Restriction	<760 liters (200 gal.) or prior approval.
Dose Rate	Hot cell waste accepted on a case-by-case basis.
Waste Designation	Completed designation forms forwarded to 340 Operations prior to waste disposal.
Waste Accumulation	Notify 340 Ops. on day a 90 day clock is started.
Waste Codes	D002 D009 D028 D036 WT01 F001 D004 D010 D029 D038 WT02 F002 D005 D011 D030 D039 WC01 F003 D006 D018 D033 D040 WC02 F004 D007 D019 D034 D041 WP01 F005 D008 D022 D035 D043 WP02 F039
Radioiodine Use	Prior notification for any facility using radioiodine that has the potential to enter the system.
Source: WHC 1993b, *Technical Requirements Document for use of the RLWS and RPS*, WHC-SD-WM-TI-468, Rev. 2, Westinghouse Hanford Company, Richland, Washington, July 1993. (F039 waste code added per WHC 1994g)	

The 340 Complex, via the RLWS, normally collects approximately 11 kiloliters (3,000 gal.) every 90 days. Potential additional volume can be generated as a result of diversions from the RPS (some estimates for this are given in Section 2.2). Analyses of the liquids in the 340 Vault Tanks are summarized in Table 1-2. The sampling is periodic and is consistently performed concurrently with rail car shipments. The values in Table 1-2 were derived from 27 samples collected over a 5-year period (WHC 1994b). Data on individual RLWS transfers (reflecting a greater range of values over Table 1-2 tank "composites") is maintained by both Pacific Northwest Laboratories (PNL) and 300 Area Liquid Effluent Process Engineering. This database consistently provides volume, chloride, gross radionuclide, and pH information; at times supplemented, through analysis or process knowledge, with more complete chemical composition data.

Although the 340 Facility currently handles radioactive mixed wastes, wastes are not allowed to accumulate for more than 90 days. However, a notice of intent (NOI) was transmitted by WHC to DOE-RL in early January 1994, for the purpose of permitting the facility for treatment and greater than 90 day storage. It is anticipated that the NOI will be submitted to Ecology in the near future. The NOI was prepared in accordance with the Ecology Dangerous Waste Regulations (WAC 173-303-281) which requires that dangerous waste facility owners and/or operators submit a NOI before submittal of a Part A permit application. After submittal of the NOI, there will be an opportunity for public notification and review for 150 days. Submittal of the Hanford Facility Dangerous Waste Part A Permit Application for the 340 Complex will occur after the public comment period. The two tanks in the 340 Vault, the six tanks in the 340-A building, and ancillary equipment as deemed necessary by WHC, PNL, and DOE, will be the only systems permitted for > 90-day storage. The two tanks in the 340 Vault will be the only tanks permitted for treatment. The Part A will also address Project W-302 upgrades.

Table 1-2 Summary of Analyses of Liquids in the 340 Building Tanks
Page 1 of 2

Parameter/ constituent	Units	Low	Average *	High
RADIONUCLIDES				
Alpha total	μCi/L	0.00e+00	5.36e+02	1.18e+04
Beta total	μCi/L	1.22e+00	3.83e+03	2.77e+04
Am-241	μCi/L	0.00e+00	7.69e+01	6.26e+02
Ce-144	μCi/L	0.00e+00	3.65e+01	3.14e+02
Cm-243/244	μCi/L	0.00e+00	1.59e-01	1.67e+00
Co-60	μCi/L	0.00e+00	2.44e-01	1.85e+00
Cs-134	μCi/L	0.00e+00	1.21e+01	6.87e+01
Cs-137	μCi/L	6.76e+01	2.19e+03	2.37e+04
Eu-152	μCi/L	0.00e+00	6.61e+02	4.49e+03
Eu-154	μCi/L	0.00e+00	1.17e+03	7.90e+03
Eu-155	μCi/L	0.00e+00	1.99e+02	1.90e+03
Mn-54	μCi/L	0.00e+00	5.79e-02	7.66e-01
Nb-95	μCi/L	0.00e+00	2.50e-01	4.02e+00
Pu-238	g/L	0.00e+00	1.34e-06	1.59e-05
Pu-239/240	g/L	0.00e+00	1.22e-04	9.37e-04
Pu-241	g/L	0.00e+00	6.55e-06	7.26e-05
Pu-242	g/L	0.00e+00	5.01e-06	6.02e-05
Ru-106	μCi/L	0.00e+00	5.73e+00	4.97e+01
Sb-125	μCi/L	0.00e+00	2.93e+00	3.96e+01
Sr-90	μCi/L	0.00e+00	1.36e+02	1.07e+03
Ta-182	μCi/L	0.00e+00	1.89e+00	1.14e+01
Tc-99	μCi/L	0.00e+00	4.89e-03	4.73e-02
Uranium Total	g/L	0.00e+00	2.86e-02	1.78e-01
U-234	g/L	0.00e+00	2.73e-06	2.40e-05
U-235	g/L	0.00e+00	1.43e-04	8.70e-04
U-236	g/L	0.00e+00	2.20e-05	1.90e-04

Table 1-2 (cont'd) Page 2 of 2

	Units	Low	Average *	High
U-238	g/L	0.00e+00	2.69e-02	1.78e-01
Zr-95	μCi/L	0.00e+00	1.41e-01	2.25e+00
OTHER DATA				
pH	-	1.13e+00	8.17e+00	1.24e+01
Cl	M	3.40e-06	9.06e-03	9.60e-02
CO_2	ppm	1.34e+02	3.32e+02	5.30e+02
CO_3	ppm	4.00e+00	1.05e+01	2.80e+01
F	ppm	5.30e+00	9.35e+00	1.49e+01
HCO_3	ppm	7.50e+01	2.27e+02	5.18e+02
NO_2	ppm	0.00e+00	3.68e+02	2.90e+03
NO_3	ppm	3.59e+02	5.08e+03	3.29e+04
OH	M	1.35e-13	1.61e-03	2.50e-02
PO_4	ppm	0.00e+00	9.07e+02	7.00e+03
SO_4	ppm	9.80e+01	1.35e+02	1.55e+02
TOC	ppm	5.00e+01	6.26e+02	3.50e+03
Sp.G.	-	9.92e-01	1.01e+00	1.04e+00
Solids	%	7.20e-03	2.32e-01	2.57e+00
Ag	ppm	1.00e-02	1.66e+00	3.60e+00
Al	ppm	1.00e-02	4.38e+02	3.08e+03
As	ppm	1.00e-01	9.01e-01	4.00e+00
Ba	ppm	3.00e-03	2.13e+00	1.10e+01
Cd	ppm	7.00e-03	8.12e-01	6.40e+00
Cr	ppm	1.00e-02	1.21e+01	6.60e+01
Hg	ppm	2.80e-02	7.25e-02	1.20e-01
Na	ppm	9.00e+00	5.12e+02	2.00e+03
Pb	ppm	6.00e-02	9.24e+00	8.40e+00
Se	ppm	1.20e-02	1.37e+00	6.00e+00

* Average of 27 analyses from 2/21/89 - 12/1/93 (WHC 1994b)

The other potential waste source for storage at the 340 Vault, the RPS system, serves as a collection system for non-regulated liquids which are potentially radioactively contaminated. The RPS system includes underground piping, the 307 Basins, and several diverter stations. The RPS diverter stations are capable of routing the wastes to either the RPS or the RLWS, and are being upgraded under Project W-353. (WHC 1993c, WHC 1995a)

The 307 Basins were constructed during the same time frame as the RLWS and 340 Complex. The 307 Basins currently consist of four 190 kiloliter (50,000 gal., each) basins (of which only 2 are in use) with associated valves, pumps, and pump controls. The basins discharge to the process trenches unless the diversion detection levels are exceeded; in which case the PS discharge pumps are deactivated and the basin contents then are transferred to the 340 Tanks. Project W-345 (WHC 1993a) has re-lined the two basins currently in use, lined the two previously unused basins, and will provide the system with batch-release capability. Upon completion of that project, wastewater determined to be outside acceptance criteria for the 300 Area TEDF (WHC 1994h) can be transferred to the 340 Facility vault storage tanks.

1.2 Scope of work

Project W-302 shall provide a tank system which is compliant with RCRA regulatory requirements to allow for permitted treatment and storage facilities. The Engineering Study (WHC 1994b) recommended a new vault and tank facility as the preferred alternative. The ensuing Section 2.0 provides greater detail of the vault replacement and its desired features.

Project W-302 is also responsible for providing the means of routing the waste effluent, from near the existing vault (assumed at or in the vicinity of Valve Box 9, subject to later design determinations), over to the new storage facility. The project shall also provide a means for transferring the contents of the various storage tanks (described in Section 2; at least from the 45 and 76 kiloliter--12,000 and 20,000 gal.--tanks) over to the 340-B Load-out Facility, as well as to the 340-A Building above ground tanks. It shall also include return lines from both the 340-B Load-out Facility (spill containment area), and from 340-A Building tanks, to the new 340-C Vault/Tank facility. A dedicated line between the 307 Basins and the new vault tanks should also be included; as well as consideration of a direct line from the 307 Basins to the 340-A Tanks, if readily incorporated into the above piping network. The latter feature(s) would help maintain waste segregation, avoiding a potential mixed waste stigma for basin effluent first sent through the main 340-C Tanks. All of the above tie-ins shall be completed in a manner which minimizes disruption of normal RLWS and RPS operations.

Project W-302 must address any pre- or post-construction conditions involving radioactive or hazardous contamination that require immediate attention, such as any piping clean-out needed prior to disconnections, or the disposal of excavated debris. However, the Project will not be required to further dismantle surplus equipment, nor other-wise remediate or re-classify the abandoned vault and tanks beyond such attendant concerns. The longer-range decontamination and closure activities will be funded through and performed by organizations within WHC such as: Facility Transition Projects, Hanford Technical Services, and Projects and Site Services; as well as ICF Kaiser and Bechtel Hanford; or such equivalent entities as might exist in the interval after Project W-302 completion.

1.3 Site location

A formal Site Evaluation Report was not required per WHC-CM-8-7, Section 3.0, since only one site has been deemed viable for accommodating this project. A Site Evaluation Form (WHC 1995b) has been prepared and approved by the site planning group. An environmental checklist (WHC 1994i) has been issued by the Environmental Services organization, and identifies a number of environmental media that are applicable. Two of these, a cultural resource review (PNL 1994a), and a biological review for endangered species (PNL 1994b), have already been completed.

The facility will be placed adjacent to the existing 340 Buildings (within the NE quadrant of the 340 Complex area) with the tanks to be installed in a below grade. The approximate Hanford coordinates are N-54517 to N-54588 and E-15450 to E-15500. This is the same site that had been selected by a mid-1970's Vitro proposal for a 340 upgrade (a 1977 Vitro drawing, SK-3-18844, zone E8, "Plot Plan: 340 Vault Bldg.", depicts this location; see Appendix A). Use of this location is not anticipated to involve the excavation of contaminated soil, based upon a bore-hole survey performed by ICF Kaiser at the site in the fall of 1994, although additional confirmation might be sought prior to any excavation.

The facility should be situated with adequate exterior space such that: the truck port will have unobstructed access, there is room for an external crane (e.g., to emplace or retrieve large pieces of equipment), fire code separations are maintained, there is room for expansion along one side, and interferences with other projects are minimized.

1.4 Project Interfaces

The new facility will directly interface with the upstream RLWS network and the downstream 340-B Load-out Facility. Since this primarily involves a replacement facility in the same locale, there will be little or no residual impact on personnel support facilities (e.g., offices, the transportation system, communications, etc.). There may be a marginal increase in demand for electric power and supply water due to additional pumps and mixers, and the neutralization system. There may also be a need to demonstrate that ancillary equipment complies with RCRA requirements. [The process sewer pipe replacement project (L-070, WHC 1994k) plans on a pump station access road around the north and east sides of the site.]

Environmental Projects is coordinating the overall project. Site Planning approves the Site Evaluation Form. Liquid Effluent Advanced Engineering has completed an Engineering Study (WHC 1994b) as well as this FDC, and shall continue to provide engineering support and review. Liquid Effluent Process Engineering has provided engineering input/review to the ES and FDC, and will so continue. The 340 Facility Operations group has similarly provided support to the ES and FDC, and also will continue--the latter two groups will operate the facility upon completion. Regulatory Program Integration has prepared the environmental checklist, and will bring in Regulatory Analysis and Permitting as needed, and interface (through RL) with the regulators. Safety will prepare necessary safety evaluations, determine the hazards classification, provide shielding calculations, perform fire protection reviews, etc. The Liquid Effluent Program Office will acquire, distribute and monitor the needed budget. ICF-Kaiser Engineering Hanford will prepare the Conceptual Design Report. Quality Assurance, Purchasing, etc. will also be involved at various stages of the project. PNL is responsible for the cultural resource evaluation, and [as the primary waste generator] will continue to provide the project with related technical input and review (from groups such as Waste Management and Effluent Monitoring).

2.0 PROJECT CRITERIA

Project W-302 shall provide a replacement facility to the current 340 Facility vault/tanks, to permit RCRA compliant storage of radioactive mixed sewer effluents in the 300 Area of the Hanford site. The facility should be flexible in terms of supporting 300 Area growth and overall Hanford mission changes. Section 2 provides general design requirements.

Briefly, the desired features include: one 76 kiloliter (20,000 gal.), one 45 kiloliter (12,000 gal.), and two 19 kiloliter (5,000 gal.), storage tanks; a pH adjustment system; pumps and agitators on each tank (including an operating gallery and access to the top of the cells to facilitate their replacement/maintenance); a means of obtaining samples from each tank, as well as the RLWS influent directly; a glovebox/hood to permit sample handling (and some simple screening tests); the ability to receive waste transported by small containers; a stainless steel liner and sump (protective chemical coatings may be substituted if both durable and meets regulatory requirements); shielding walls (&/or space for inserting temporary shields); cover blocks (if deemed necessary); video surveillance camera(s) (or comparable); catwalks to simplify access to principal vault components; an HVAC system; a bridge crane to facilitate removal of, pumps, agitators, small tanks, and (if any) cover blocks [removable roof panels and external cranes may be considered as a trade-off when sizing the bridge crane]; and a load-out truck bay to expedite small waste container receipts, sample shipments, equipment replacements, etc. The above ground enclosure (with sufficient roof height for bridge crane) will also provide rooms for chemical storage, mechanical equipment, and process controls. As identified in Section 1.2, interties shall also be provided with the RLWS, the 307 basins, and the 340-A Tanks. The Project shall obtain needed services and utilities from the 300 Area system as required.

The assortment of tank sizes is based upon the following operating philosophy. The 340 Operator would use the two 19 kiloliter (5,000 gal.)

tanks for the receipt of planned RLWS waste transfers. These small tanks afford the ability to segregate receipts, which in turn allows for volume confirmation, verification sampling, possible chemical adjustments, and interim isolation--say of higher activity waste (see Section 3.2.1). The 45 kiloliter (12,000 gal.) tank would otherwise be the "on-line" tank to receive any unplanned RPS diversions or planned 307 Basin transfers, and would also serve as back-up for the 76 kL tank. The 76 kiloliter (20,000 gal.) tank would serve as the primary batch accumulation tank for load-out staging of rail car tanker shipments (taking advantage of the RCRA permit to minimize shipment frequency).

This new capacity (discussed further in Section 2.2), of about 160 kiloliters (or 42,000 gal.) provides for a 40% increase over the current 340 Vault/Tank capacity (which is around 114 kiloliters or 30,000 gal.). This volume is expected to: allow for its full use as a RCRA permitted facility (i.e., with reduced frequency of waste shipments); facilitate receipt of waste from the new 307 batch release system; afford greater operating flexibility; and maintain adequate contingency space (e.g., for leaking tanks) as required by DOE Orders (DOE 1988b). Since it is not possible over the projected 20^{+} year design life for the waste generators to rule out an increase above currently expected needs, room for expansion will be accommodated by the design and site placement, to facilitate the addition of future tanks should they prove necessary. If this space for expansion was instead used to exercise the option of building an adjoining treatment facility (see Section 1.3), the existing 19 kL tanks could also serve as support staging tanks.

2.1 Functional Requirements

Whenever practicable, the facility provided by this project shall use commercially available equipment/technologies currently in use by industry for storing/sampling/neutralizing industrial wastewaters. The design must implement DOE requirements for radioactive waste handling. The treatment and confinement features shall also comply with requirements necessary to support the RCRA permit previously identified. The systems provided shall minimize the impact on existing facilities and operations, by avoiding service interruptions during the construction, testing, and operation of the project.

The overall system shall be capable of supporting routine operation at the 340 Complex. While typically a batch process, it must be available around the clock (24 hours/day, 7 days/week, year-round) for the receipt of RPS diversions.

The new facility will not be manned around the clock, and so should not need offices, lunch room, change rooms, nor restrooms (also, these personnel facilities are already provided by other portions of the 340 Complex). The control room may be occupied several hours per day and should be considered "normally occupied" (e.g., for purposes of Section 4.1.2 and 4.2.1 guidance). Due to the need for periodic sampling activities as well as manned entry to the vault, a step-off pad area shall be provided to facilitate personnel radiation surveys; and, as noted in Section 5.1.5, a safety shower and eye wash shall be provided.

2.2 Performance Requirements

The waste collection (RLWS piping) and HVAC containment systems must have an effective average Total Operating Efficiency (TOE) of 100%. The storage tanks (and associated pumps/mixers), neutralization system, and other peripheral systems which operate intermittently (or have back-up, as in multiple tanks) can have TOEs as low as 60%.

All tanks shall be properly designed in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory. They shall be constructed by a manufacturer who is licensed by that same nationally recognized association or independent testing laboratory and installed in accordance with the manufacturers instructions. A list of nationally accepted tank design standards can be found in reference EPA 1986a.

While the average annual storage needs for the 300 Area RLWS effluent is expected to be in the 45 to 76 kiloliter (12,000 to 20,000 gal.) range, the new facility should also be capable of handling additional volumes, in order to account for possible diverted solutions from the RPS system. Some estimated RPS diverts (by Laboratory) are 15 kiloliters (4,000 gal.) from 324, 17 kiloliters (4500 gal.) from 325, 31 kiloliters (8,000 gal.) from 327, 16 kiloliters (4100 gal.) from 326, or 11 kiloliters (3,000 gal.) from 329. Also, a 307 Basin could present a batch load of 45 kiloliters (12,000 gal.). Since all these sources are unlikely to appear at one time, the total capacity (of about 160 kiloliters or 42,000 gal.) afforded by the series of previously listed tanks should be adequate. In addition, emergency use of the 340-A Tanks (if still allowed) provides an additional 180 kiloliters (48,000 gal.) of temporary space; and an added 76 kiloliters (20,000 gal.) could be made available by use of a railcar in 340-B for liquid waste storage.

In addition to the basic design storage capacity, the system should be designed for ease of expansion to facilitate adjustment to potential future growth in the 300 Area, mission changes, and/or restrictions on use of the 340-A Tanks (or even upon waste shipments to the 204-AR Facility). This flexibility should be accommodated through appropriate sizing of the infrastructure and utilities, strategic placement of blanked "tees" in pipe manifolds, and overall consideration of the layout of the site and components. The provision for growth should also consider external space for the later housing of waste treatment equipment, say for radionuclide removal of off-specification 307 Basin water to allow its return to the process sewer and then to TEDF (as opposed to shipment to the 200 Area).

The glove box/hood shall afford a means of safely collecting, labeling, and packaging samples of incoming or stored wastes. Enough space should be allocated to allow performance of some basic tests, such as: pH, gross radiation activity, and simple visual observations (color, presence of solids or separable organics layer). This latter capability could expedite receipt of process information and reduce the number of laboratory shipments. Related sampling activities would be further aided by the truck load-out bay mentioned earlier.

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3.0 PROCESS CRITERIA

This section covers the general chemical, instrumental and mechanical process systems. The project shall be designed to handle waste streams that are considered to: require secondary containment, be RCRA hazardous waste, and be above the DOE radionuclide requirements for secondary containment (such that the "-..99" Sections of each division within DOE Order 6430.1A, and/or the Specific Facility Section, General Requirements, of Division 13, apply) (DOE 1989b).

All selected equipment should be commercially available and include sufficient vendor documentation to support safe operation and maintenance. Equipment requiring special handling features should be avoided. All systems shall be configured to permit fail-safe recovery upon power loss.

3.1 Instrumentation and Control

The project shall provide instrumentation to control and monitor the process during normal, upset, and accident conditions sufficient to ensure environmental and personnel safety. Instrumentation will be provided so that, during routine operation, the process will be self-functioning (i.e., the system shall be designed to minimize the number of operating and oversight personnel). Waste neutralization, inter-tank waste transfers, and similar activities are not considered routine operations, therefore, local operator control for these systems will be sufficient. The project should also consider signal consolidation and/or re-routing of other RLWS alarms currently housed in the 340 Facility control room.

3.1.1 Functional Requirements

The control/monitor system (CMS) shall be located in a dedicated area of the above-grade portion of the storage facility. Computer control systems shall incorporate high resolution, state-of-the-art color monitors; dedicated keyboards and printers; along with data storage and retrieval capability.

The CMS, along with associated instrumentation, shall provide the following functions, as deemed necessary and practical (e.g., sampling and remote pH analysis could substitute for pH probes, which require a wetted location and frequent calibration): tank status (level, leak detection, selection--per manifold valving); monitoring of the influent, effluent, and/or stored wastes (pH, flow, temperature, sampling); remote visual inspection system; operator controls and alarms to maintain process system safety (such as pressure and temperature alarms, as well as on any sump or tank level, or on leak detection sensors); position and indication on all actuated valves and on any manual valves that are critical to providing routing or process information (separate on/off confirms, indication of all positions of multi-way valves, and 0-100% position indication for modulated valves); on/off confirms for all critical motor starters, contactors, etc., and current indication for rotating equipment and other applicable equipment.

The system shall be designed to be "fail safe" with regard to both personnel safety and environmental protection. In the event of a loss of power, an alarm shall indicate this condition; and an uninterruptible power supply (UPS) system should be provided as needed to insure safe and reliable operations (power for key instruments, valves, and controls; other valves should fail safe). Human factors engineering principles should be incorporated into the design and layout of the system, including the placement and location of visual indicators, calibration equipment, and maintenance access areas. Instrumentation shall accommodate required calibrations and testing. Misrouting protection on chemical make-up lines and on process lines shall be provided (using check valves, electric interlocks, etc. where feasible and in preference over administrative controls). Signal and data communication lines shall be provided with a minimum of 20% spare capacity.

Local instruments shall be provided for components requiring manual control to ensure normal operations, ease of trouble-shooting and maintenance, and personnel safety. Local instruments will be located in a noncorrosive environment, where practicable, or be rated for corrosive service. Instrumentation, control wiring, signal wiring, etc., installed within the vault or other process areas, shall be water resistant to allow for washdown and decontamination. Remote read-out of selected information (e.g., sump levels, pump status, monitor out-put, etc.) shall be provided at the 300 Area liquid effluent operations center (i.e., the TEDF control room) if required for safe/effective operation. In such a case, master control shall remain at the 340-C Building.

3.1.2 Performance Requirements

The instrumentation shall conform to applicable American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), and Instrument Society of America (ISA) standards, as well as comply with relevant Hanford Plant Standards. The instrumentation should demonstrate proven industrial application as field process equipment, suitable for the anticipated wastewater and operating conditions. Key components (defined as needed to meet permit conditions, or critical for safe operation) shall have redundant capabilities. With regard to alarm redundancy, it is believed (due to periodic surveillances at the 340 Facility, and the envisioned minimal chances for any serious situation developing needing immediate attention), that a single communication line to the TEDF control room should suffice.

3.2 Piping and Vessels

Piping and vessel materials of construction and capacities shall be compatible with the characteristics and flows of relevant wastewater solutions (see Tables 1-1 and 1-2). Note that the implementation of a 340-C neutralization system via this project (see 3.3), as well as the continued use of stainless steel or other corrosion resistant materials, should allow the Table 1-1 acceptance requirements for pH to be expanded to a pH near 0 (however, any such revision must consider other possible impacts, such as an increase in radionuclides). The 90-day clock constraint should similarly be amendable (i.e., one of the main goals of Project W-302 is for 340-C to be RCRA compliant).

3.2.1 Functional Requirements

The Project W-302 transfer piping, from the point of tie-in (as noted in Section 1.2 as possibly at or near valve box 9) to the tanks at the new storage facility shall be designed to handle the routine flow capacities indicated in Section 2.2. The piping between tie-in point and abandoned tanks shall be isolated to ensure that no additional waste nor rainwater flows will enter. The installation and tie-ins of the new pipeline shall minimize interruptions to the present facilities.

The tanks shall elect top penetrations when feasible (e.g., overflow ports can be off on the side), and adopt geometries such that they may be pumped essentially dry. This could involve dished-bottom vertical tanks, or sloped horizontal tanks (the exact configuration subject to other design considerations such as tank spacing, access, penetrations, materials of construction, etc.), along with the pump inlets positioned as low as practical within the tanks.

The vault design shall provide either for fixed shielding between tanks, and/or for space (and perhaps channels) to permit the emplacement of temporary shield walls around in-use tanks, in order to reduce exposure to maintenance or instrument craftsmen working on/around empty tanks. The two smaller tanks shall be protected by added shielding (Section 5.1.4), in order to isolate high level waste batches (Section 5.1.3). The vault shall also contain a common* spill/leak collection trench with a single* sump [* optimum configuration subject to later design study]. The sump(s) shall be equipped with level detection and pump(s). The sump pump(s) should be tied into the waste feed/inlet manifold such that sump contents can be directed to any tank. The vault shall also contain a leak-tight stainless steel* liner of sufficient height to contain 100% of the largest tank volume (inter-tank shielding walls may rest upon this liner to simplify construction; in which case they shall be encased or coated to facilitate clean-up). [*While stainless is preferred for its durability and ease decontamination, the use of alternative linings/coatings may be employed if they can be shown to satisfy usage, lifetime, and regulatory requirements]. The vault must also preclude any intrusion of external ground water or precipitation. Catwalks near the tank tops (for access to equipment) and for selected corridors just above floor level (to prevent slipping, and/or contacting possible spills) should be provided within the vault. All surfaces, corners, catwalks, and tank supports shall be designed to facilitate decontamination.

3.2.2 Performance Requirements

Pipes

Double-wall pipes shall be provided for the connection to the RLWS system, and all transfer piping located outside of a secondary containment area. Single-wall pipes should be adequate within the lined vault. All piping, whether metallic or non, shall be ASME B31.3 Chemical Plant and Petroleum Refinery Piping. While stainless steel pipes are typically selected, consideration could be given for the use of non-metallic materials for secondary containment. The size and slope for gravity flow lines shall be sufficient to allow drainage compatible with the existing RLWS system, with the inner pipe of not less than five centimeters (2") in diameter. Pressurized pipe systems may be needed for transfers involving: tank-to-tank w/in 340-C, 340-C/340-A/307 inter-facility, and 340-C tank to 340-B railcar tankers. All pipelines shall be clearly marked/identified. The routing shall conform to any restrictions set by the site selection committee. Sufficient piping corridor space should be provided where feasible, to facilitate inspection, maintenance, and emergency repair. Freeze protection for above ground pipes (if any) shall be provided as necessary. Underground pipes shall be buried below the frost line.

Tanks

The tanks shall be ASME section VIII code stamped pressure vessels, or, for non-metallic tanks, ASME section X code stamped. Penetrations shall be provided for the waste inlet and outlet pipes, chemical addition lines, vents or pressure relief valves, level indication, pH probes, overflow lines, and agitators (mechanical or hydraulic). Inspection or clean-out ports should also be provided if deemed necessary (i.e, if none of the other openings could serve that purpose). The tanks should have built-in spray rings near the top (to help remove residues, as well as to help wash-down pumps or agitators upon their withdrawal). The smaller tanks shall have lifting lugs to facilitate both installation and later replacement or removal. The tanks shall be supported above the vault floor at least 20 cm (8") to permit inspection of the bottoms, unless this presents a seismic design problem. A minimum of one meter (40") of free space between tank wall and vault liner shall be provided on at least two adjacent sides of each tank (and no less than 0.5 m (20") clearance on remaining sides), to facilitate maintenance and inspections. A flexible camera or periscope system for the vault area (with display in control room) shall also be installed to permit more frequent, remote inspections.

The tanks should be interconnected by both inlet and outlet piping manifold systems, valved in a manner such that individual tanks may be taken out of service, or may be involved in a waste transfer, without impacting the ability of the system as a whole to receive RLWS or diverted RPS wastes. Also, to the practical extent possible, these manifolds should not interfere with any maintenance/inspection activities involving vault access, system component removal, or the emplacement of temporary shielding. If flexible or fabricated jumpers are considered, they should employ dry-disconnect couplings, as opposed to quick-disconnect or other less reliable means of pipe and hose connections (EPA 1986, p9-39). Valves (other than simple isolation valves) shall allow remote operation, by means of either pneumatic, electrical, or manual activation (e.g., by way of handles extended into shielded zones, or the use of an operating gallery). The CMS shall be provided with position indication for key valves (whether these valves are manual or automatic).

3.3 General Chemical Process

The only chemical process will consist of a neutralization system. Any other waste treatment package would involve some future upgrade to the external contingency space requested in Section 2.2. The Project W-302 engineering study (WHC 1994b) depicts some conceptual block schematics for possible future waste treatment packages.

3.3.1 Functional Requirements

The neutralization system shall include chemical receipt, storage, transfer/delivery/addition, and process control sub-systems, sufficient to permit both in-tank and/or in-line caustic (assumed NaOH) and acid (asumed nitric or sulfuric) additions. In-line refers to the transfer line between storage tanks and load-out tankers. The acid would be available primarily to counter any excess caustic addition, as well as for possible use in dissolving waste residuals/residue in tanks or piping, or in removing "hot spots" due to solids accumulation. In addition to on-line pH monitors, the glove box/hood mentioned in 2.2, could be used for performing process control sampling and manual pH analyses.

3.3.2 Performance Requirements

The neutralization system shall provide for the safe receipt and stored supply of two or three drums of concentrated caustic and one drum of concentrated acid. The system shall include adequate freeze protection for the caustic system (maintain above 19°C (60°F)); and delivery/addition systems capable of accommodating the potential range of incoming transfer solution pH (0.5 - 7) and still meet the 7-11 pH shipment requirements. A pH monitor system shall be provided per 3.1 criteria (as well as a control system, if deemed appropriate).

3.4 General Mechanical Process

3.4.1 Functional Requirements

The equipment must be either readily maintainable, and designed to operate unattended for long periods, and/or after long idle periods (e.g., some valves and pumps may only be operated as little as once a year). As Section 2.2 indicated, sub-systems which are not needed on a continuous basis can tolerate significant down-time. Since the transfer pumps and tank mixers are used only periodically, full back-up or 100% reliability are not required. Similarly, the sump should see little use, and, with a vault liner designed to accommodate the entire contents of the largest tank, the sump pump need not be sized for a rapid sump draw-down, nor should it require a backup. It shall be made possible to obtain samples of the sump contents or of sump transfers. Mixers may be mechanical or hydraulic. All parts contacting waste solutions shall be made of suitable materials. While the ventilation system should preclude build-up, system components must withstand a possibly corrosive air environment as well.

The transfer pumps should be able to empty a tank within 1-4 hours. The tank agitators shall be able to resuspend any settled solids to allow their removal by the pumps. The sump pump shall be able to essentially empty the entire vault liner contents within a 24-hr period. It shall be routed to a point in the inlet manifold such that it may be directed to any storage tank within the 340-C Vault.

3.4.2 Performance Requirements

There are no specific performance requirements beyond the design standards listed in Section 6.0, "Codes and Standards". Subsequent design efforts have significant flexibility in meeting the Section 3.4.1 functional needs.

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4.0 FACILITY CRITERIA

4.1 Architectural, Civil/Structural

4.1.1 Functional Requirements

The neutralization system, HVAC equipment, and control/monitoring system shall be enclosed within the vault's protective enclosure, or auxiliary structures if necessary. The structures shall protect the equipment, components, and personnel from the environmental conditions anticipated for the Hanford Site. While not expected as the routine operating mode (see 2.1), the facility shall be designed to accommodate short periods (2-3 days) of continuous manned operation, maintenance and/or surveillance.

As stated in Section 2.0, the enclosure dimensions and bridge crane shall accommodate the removal and servicing of small vault equipment (e.g., pumps, agitators, filters, catwalks, etc., including moveable shielding walls, or cover blocks--if any). Removable roof panels should also be considered to deal with possible tank removal/replacement using an external crane. It is preferred that the neutralization system, HVAC equipment, control/monitoring systems, and electrical equipment, etc. be located within this enclosure. However, if the surface area requirements for the vault and any operating gallery/maintenance lay-down area, coupled with the needed external space (dictated by previous sections), exceed the available room, adjacent or nearby auxiliary structures are acceptable.

4.1.2 Performance Requirements

The enclosure must conform to and comply with the general safety and environmental design requirements and anticipated natural forces laid out in Section 5.0. Pipe and electrical conduit trays/racks, and personnel catwalks, must be routed to accommodate the access to the vault (by the bridge crane or through roof panels) for extra shielding emplacement, tank removal, or other maintenance related items mentioned in other sections of this FDC.

4.2 Heating Ventilation and Air Conditioning (HVAC)

4.2.1 Functional Requirements

Portions of the vault's protective enclosure and/or any ancillary structures, that require normal personnel occupancy or contain sensitive computer or monitoring instrumentation shall be heated and air conditioned per standard practice. Buildings, or portions of the buildings, that are not normally occupied, but which house equipment and components that require access by operators or maintenance personnel, should be heated and cooled. The degree of heating and cooling shall be based upon the requirements of the equipment and human factors regarding the operations and maintenance personnel per standard practice for industrial facilities.

The ventilation systems must maintain a controlled, continuous airflow pattern from the environment into the confinement building, and then from non-contaminated areas of the building to potentially contaminated areas, and then to normally contaminated areas under both normal operation and during upset conditions (DOE 6430.1A, Sections 1300-7.2 and 1550-99.0.1). The vault and individual storage tanks shall be maintained under a partial negative pressure with respect to occupied areas and the environment. The possible need for continuous air monitors will be addressed by subsequent safety evaluations.

The use of washable, sintered metal high efficiency particulate air (HEPA) filters is acceptable. They may cost more initially, but can reduce operating costs associated with filter replacement and burials. However, since none of the currently accepted HEPA testing methods deals with these new metal filters, standard paper HEPAs are required back-up.

Another possible air treatment need is for a carbon filter on the ventilation exhaust system. This would be primarily to contain radio-iodine releases; a potential past source that the safety documentation outlined in Section 5.1.3 should re-assess.

4.2.2 Performance Requirements

Any process-related HVAC confinement systems required in the design shall be separate and independent of the general personnel and building systems. The systems applied shall comply with the appropriate requirements of DOE Order 6430.1A, Section 1550, e.g., as regards OSHA and ACGIH air quality limits. Also, refer to Hanford Plant Standards SDC 5.1, "Heating Ventilation, and Air Conditioning" (DOE-RL 1990a).

Ducts shall be sized for the transport velocities needed to convey, without settling, all particulate contaminants (DOE 6430.1A, Sections 1550-2.5.1 and 1550-99.0.2). Ductwork, accessories, and support systems shall be designed to comply with the ASHRAE Fundamentals handbook, SMACNA HVAC Duct Design Manual, ERDA 76-21, NFPA 45 and the appropriate SMACNA duct construction standards. Ductwork shall also be designed to comply with NFPA 90A, including specification and installation of smoke and fire dampers at fire wall penetrations (with the exception of exhaust system ducting if it is required to maintain confinement of hazardous materials during and after a fire event). Exhaust ductwork must also comply with NFPA 91 (DOE 6430.1A, Section 2.5.6).

Provide for filtering zone II recirculation streams (if any) and the exhaust streams discharging to atmosphere to within acceptable recirculation or discharge limits (DOE 6430.1A, Section 1550-99.0.2). HEPA filter assemblies shall comply with ASME N509 (DOE 6430.1A, Section 1550-2.5.5). Ensure integrity of final filters are maintained during a design basis fire. The exhaust system design must ensure that effluents are safely directed through the appropriate ventilation ducts and not spread beyond the physical boundary of the ventilation system until treated (DOE 6430.1A, Section 1550-99.0.2).

Design the ventilation system to facilitate in-place testing of HEPA filters. In-place testing design requirements are established by the recommendations of UL 586, ASME N510, and ERDA 76-21 (DOE 6430.1A, Section 1550-2.5.5).

To ensure that failure of any single component or control function does not compromise minimum adequate ventilation, provide for increased capacity of the exhaust fans and supply fans to allow for single fan operation with a second fan in standby (DOE 6430.1A, Section 1161-4) and a static pressure rise to accommodate additional loads.

The modifications to the fans shall be designed and specified to assure stable, nonpulsing aerodynamic operation in the range of operation over varying speeds (DOE 6430.1A, Section 1550-2.5.3).

The performance requirements for the HVAC system are as follows: 1) Ventilation zone differential pressures for this project, relative to outside atmospheric pressures, (except as noted) required for facility operations should be per Table 4-1 (subject to later design refinement); 2) The primary confinement exhaust system must be designed to automatically ensure a minimum inward air velocity of 30 m/min (100 ft/min) through a credible breach in the glovebox system (DOE 6430.1A, Section 1161-4, ERDA 76-21); 3) The air handling system equipment (fans, air handling units, etc.) must be provided with vibration isolators and flexible ductwork connectors to minimize transmission of vibration and noise. Systems shall satisfy the NC levels recommended for various types of spaces and vibration criteria as listed in the ASHRAE handbooks (DOE 6430.1A, Section 1550-2.5.1); 5) Fans with motors of 7500 watts (10 hp) or less should be provided with adjustable motor pulley sheaves to assist in air balancing of systems.

Table 4-1. Nominal Ventilation Zone Differential Pressures.

ZONE	AREA	PRESSURE (" H_2O)
I	Enclosures (i.e., tanks)	-0.60 ± 0.10*
II	Enclosure Area (i.e., vault)	-0.25 ± 0.05
IIIa	Radiological Operating and Equipment Area	-0.10 ± 0.05
IIIb	Buffer Zone, if any	0.05 + 0.05, - 0.00
IV	Atmospheric	0.0 + 0.05, - 0.00

NOTE Multiply inches of water times 249 to get pascals.

*Relative to surrounding Zone II area

Fans with motors greater than 7500 watts (10 hp) should use fixed (non-adjustable) drives that can be adjusted by substituting fixed motor pulley sheaves of different diameters. The use of variable speed fan motors could be considered as an alternative. All fans must comply with AMCA Standard 210, ASHRAE Standard 51, and ASHRAE Equipment handbook (DOE 6430.1A, Section 1550-2.5.3); 6) Operation of the supply fans shall be changed from both operating in parallel to one operating and one in standby; 7) Modification of any existing exhaust fans and supply fans shall accommodate any increase in needed ventilation system capacity. The modification of the exhaust fans must also accommodate an increase in the static pressure rise which may result from the installation of a Zone I ventilation system if it contains additional HEPA filters for ventilation of any or all tanks; 8) The room exhausts and any recirculation returns from the secondary confinement areas must be provided with HEPA filtration to prevent potential contamination of the ducts (DOE 6430.1A, Section 1304-5). These HEPA filter installations must also include prefilters installed upstream of the HEPA filter to extend the HEPA filter's life

(DOE 6430.1A, Section 1550-2.5.5); 9) HEPA filter installations are to be coordinated with WHC to allow for testing of the HEPA filters using existing methods and equipment. Utility services shall be extended to the filter locations (e.g., electrical receptacles and compressed air) to facilitate testing work (DOE 6430.1A, Section 1550-2.5.5).

4.3 Utilities

The utilities to service the project shall be extended from the 300 Area services as required and feasible. Back-up power also, as required, may be locally supplied, if during definitive design it is deemed more appropriate than use of the 300 Area emergency service. Water services required for process applications shall be protected from potential back-flows and contaminations from the process system. The capacity and quality of the electrical power supply shall consider all instrumentation and equipment needs. The utility system should be designed with consideration given to the spare capacity appropriate with the system design. Compressed air (for valves) and a vacuum source (for monitors) will be needed.

4.3.1 Steam

Not applicable. [Steam should not be required for any purposes by the new facility. The trend in the 300 Areas is away from steam usage]

4.3.2 Water

4.3.2.1 Functional Requirements

Water will be needed for fire suppression, the tank spray rings (Section 3.2.2), the safety/eyewash shower (Section 5.1.5), and transfer line flushing, as well as possibly for chemical make-up, and vault liner & sump wash-down.

4.3.2.2 Performance Requirements

Sanitary water feeds to the new facility must meet cross connection control requirements stated in WHC-CM-8-7, Section 731 (WHC 1992b), and in the American Water Works Association *Cross-connection Manual* (AWWA 1990), e.g., install backflow prevention approved by the State of Washington Department of Health for protecting potable water systems.

4.3.3 Sewage

There should be no need for any sanitary or process sewer tie-ins under this project. The sump, and any secondary piping system drains, shall be integrally accommodated within the RLWS/340 System. As stated in Section 5.1.5, even the eyewash/safety shower should drain to a tank within the 340-C Facility. It can be noted that pipelines for both the process and sanitary sewers pass nearby, such that, should a needed connection be later identified, it might be readily accommodated.

4.3.4 Electrical

4.3.4.1 Functional Requirements

Electrical capacity shall be provided to handle average and peak loads. If possible, it might be wise to oversize capacity (if a new or upgraded supply is needed), to facilitate any future expansion (e.g., should a treatment system be added).

4.3.4.2 Performance Requirements

Refer to Hanford Plant Standards SDC-7.4, "Underground Power Distribution" and -7.5, "Interior Power and Lighting", as well as WHC-CM-8-7, Sections 720, 721 and 724, (WHC 1992b).

4.3.5 Lighting

4.3.5.1 Functional Requirements

Standard industrial lighting, appropriate to the various areas, shall be employed. The vault area should also be furnished with durable lighting--providing illumination suitable for both manned entry and the remote surveillance system requested in Section 3.2.2.

4.3.5.2 Performance Requirements

Use Hanford Plant Standards SDC 7.2, "Outside Lighting and Aerial Distribution Systems" and 7.5, "Interior Power and Lighting" (DOE-RL 1990a), and Sections 0278, 1650 and 1655 of the latest version of the *General Design Criteria* (DOE 1989b).

4.4 Communications Systems

4.4.1 Functional Requirements

A telephone key system shall provide communications access to key work areas within the building, and other occupied areas. A paging system should be considered for contacting plant operational forces at other locations within the 340 Complex. Data and LAN communications should be provided for the control room. Direct visual communication between the control room and storage area should be provided by the surveillance system mentioned in Section 3.2.2.

4.4.2 Performance Requirements

The degree of reliability provided shall enable the system, or systems, to function efficiently throughout the intended useful life of the facility without undue maintenance and repair under normal operating and accident conditions, for which they are designed. Refer to Hanford Plant Standards SDC 7.7, "Communications, Signaling, and Low-Voltage Control Systems" (DOE-RL 1990a), and Sections 1670 and 1671 of reference DOE 1989b.

4.5 Automatic Data Processing (ADP)

Aside from any process control computers covered in Section 3.1, there are no other, special ADP requirements.

4.6 Energy Conservation

4.6.1 Functional Requirements

The facility design should minimize the consumption of nonrenewable energy sources on the basis of life cycle cost effectiveness, as well as encourage the use of renewable energy sources.

4.6.2 Performance Requirements

The facilities provided by the project shall comply with the Energy Conservation requirements and shall be justified by life cycle cost analysis (LCCA), as defined in DOE Order 6430.1A., 0110-12 and 1694.

4.7 Maintenance

4.7.1 Facility

The facility shall be designed to function for 30 years. Treatment and process equipment, instrumentation, and consumable components may have a design life less than 30 years if designed to accommodate repair and/or replacement, and if economically justified.

4.7.2 Equipment

The system shall be designed to facilitate safe clean-up and shall provide sufficient backup capacity to allow at least one storage unit to be out-of-service for maintenance or repair. Consideration should be given to in-place or in-service repair and preventive maintenance of equipment to minimize cost of disassembly and interruption of service.

4.7.3 Materials

The systems and components employed shall be designed to facilitate maintenance--with provisions for access, equipment and material removal, lubrication, and testing as applicable.

5.0 GENERAL REQUIREMENTS

5.1 Safety

Unacceptable risks include fire/explosions, criticality, as well as exposure of personnel to toxic chemical and physical agents in excess of the 40-hour time weighted average, short-term exposure limit, or ceiling threshold limit values (TLV-TWA, TLV-STEL, TLV-C) of the American Conference of Governmental Industrial Hygienists as defined by WHC-CM-4-46 (WHC 1988d).

5.1.1 Criticality

The 340 Facility is presently classified as an Isolated Facility in the Nuclear Criticality Safety Manual, WHC-CM-4-29 (WHC 1994c, see also WHC 1994j). This category identifies facilities that contain or could contain more than 3% of a minimum critical mass of fissionable material (such as, ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Am, et.al.), but no more than ⅓ of an MCM. The new storage facility shall comply with all requirements for an Isolated Facility per WHC-CM-4-29.

5.1.2 Safety Analysis

Safety classification of systems, components, and structures shall meet the requirements stated under the Westinghouse Hanford Company, *Management Requirements and Procedures Manual*, WHC-CM-1-3, (WHC 1991), MRP 5.46, "Safety Classification of System, Components, and Structures." [Note that WHC-CM-4-46, Section 9.0, complements and will soon supersede MRP 5.46]. On the basis of the MRP 5.46 requirements and the preliminary safety evaluation, the relevant safety classification anticipated for any system, component, and/or structure shall be determined and then applied to this project, subject to other pending project safety evaluations and documentation (see Section 5.6.2).

5.1.3 Contamination Control

The 340-C Facility is expected to be a hazard category 3, nuclear facility. The vault tanks and related monitoring and control equipment should comply with Safety Class 2 seismic design requirements to preclude a release of radioactive waste to the environment; while all other systems, structures, and components should be Safety Class 3. As noted in 5.1.2 and 5.6.2, a hazards analysis, preliminary safety evaluation (PSE), and a safety analysis report will be required to confirm the above classifications, and further resolve that operation of the facility will not pose a significant threat to the offsite population, nor to onsite or in-facility operations personnel (WHC 1988d).

Radioactive and hazardous material dose and release assessments were performed for the 340 Facility Effluent Monitoring Plan (WHC 1992d). Another useful reference is the 340 Interim Safety Basis (ISB) (WHC 1994f), expected to be released shortly; as may also be a radiological accident analysis related to the liquid waste railroad tankcars (WHC 1994a). The possible impact of increased inventories of radionuclides at 340 should be considered in the pending safety evaluations mentioned above. This might arise, e.g., due to a return to pre-1989, acidic waste transfers from PNL (without the reduction resulting from precipitation upon neutralization), which the new [Project W-302 provided] 340-C "end-of pipe" neutralization system could allow (as noted in Section 3.2).

5.1.4 Shielding

Shielding of the tanks will be required to reduce worker (operator, maintenance, and instrument personnel, etc.) exposure to ALARA levels. This may be fixed or moveable as stated previously (3.2.1, 4.1.2). Early conceptual planning could assume the use of shielding thicknesses now in place within the 300 Area for similar liquid wastes, although radiological engineering calculations shall be made to define specific needs during later design refinement. The inventory shown in Table 5-1 is suggested as a basis for future calculations. The beta-gamma emitters in Table 5-1 should be multiplied by 25 as input for calculations regarding the additional shielding needs requested in Section 3.2.1 for the smaller tanks. This table (and the factor of 25) were taken from the 340 Facility ISB just mentioned in Section 5.1.3. Another useful reference might be a shielding study performed for the 340-A Building above ground storage tanks (WHC 1994e).

5.1.5 Industrial Safety

Risk during construction is relatively low. Some excavation work may require worker proximity to radionuclide contamination. All controls warranted to afford protection from potential radionuclide releases will be implemented. Existing work procedures will also be implemented to ensure the safety of the construction and operating personnel in the area of the existing facilities. It is expected that this facility will warrant a safety shower/eye wash station. This should be drained to a vault storage tank to permit its use for personnel decontamination if needed. State and federal safety and health standards will be used and enforced during all construction phases of this project.

5.1.6 Fire Protection

5.1.6.1 Functional Requirements

The design of the fire detection and protection systems should consider the limitations of the facility, equipment and modifications related to fire, explosion, hazardous materials, and industrial safety, including hazards to and from the proposed project. A Fire Hazards Analysis is required as part of the safety documentation.

Table 5-1. Maximum 340 Facility Radionuclide Inventory (WHC 1994f).

Item	Maximum Ci/L*
Total alpha	7.40 E-04
Total beta	2.77 E-02
^{54}Mn	7.66 E-07
^{60}Co	1.85 E-06
^{90}Sr	1.07 E-03
^{95}Zr	2.25 E-06
^{95}Nb	4.01 E-06
^{99}Tc	4.73 E-08
^{106}Ru	4.96 E-05
^{125}Sb	3.96 E-05
^{134}Cs	6.87 E-05
^{137}Cs	2.37 E-02
^{144}Ce	3.15 E-04
^{152}Eu	4.49 E-03
^{154}Eu	7.90 E-03
^{155}Eu	1.90 E-03
^{182}Ta	1.14 E-05
^{234}U	1.50 E-07
^{235}U	1.88 E-09
^{236}U	1.23 E-08
^{238}U	5.98 E-08
^{238}Pu	2.72 E-04
$^{239/240}Pu$	5.81 E-05
^{240}Pu	7.85 E-05
^{241}Pu	7.48 E-03
^{242}Pu	2.35 E-07
^{241}Am	6.26 E-04
$^{243/244}Cm$	1.67 E-06

*Based on rail car shipping concentrations, 1989 through 1993.

5.1.6.2 Performance Requirements

Fire protection shall be provided to meet the "Improved Risk" criteria defined in and required by DOE Orders 6430.1A and 5480.7A and RLID 5480.7 (DOE 1989b, DOE 1993, DOE-RL 1994), as well as the Westinghouse fire protection manual (WHC, 1992a). Also applicable are National Fire Protection Association codes 101, 801 and 820 (NFPA 1991a, 1991b, 1992). A fire alarm system (if necessary) shall be connected to the 300 Area fire alarm system. Refer to Hanford Plant Standards SDC 7.8, "Fire Alarm Systems" (DOE-RL 1990a). Fire extinguishers shall be installed, as needed, in and around the new facility.

5.1.7 Traffic Safety

The proposed site is in a remote portion of the 300 Area, not subject to through traffic. The project shall provide extensions of the road and streets if required to provide access to the new facility. New roads or extensions shall be designed for economical maintenance and upkeep based on their expected service and use. Refer to Section number 906, "Road and Traffic Systems" of the *Operations Support Services* manual, (WHC 1992b). Paving should be employed when justified on safety or environmental grounds, e.g., in areas where bulk chemical or waste transfers will occur. Existing streets and roads disturbed by the installation of the project shall be restored to their original conditions. The storage facility shall be enclosed by an appropriate fence and shall provide appropriate personnel and vehicle access.

5.2 Environmental Protection and Compliance

An environmental requirements check-list (WHC 1994i) has been prepared by Environmental Services, through the Environmental Project Services group. All environmental permits, reviews, and approvals related to construction shall also be obtained by Environmental Services.

5.3 Safeguards and Security

The project has no special design requirements regarding safeguards and security facility requirements. Those portions of the project within the 300 Area Limited Security Areas shall require personnel with the minimum clearance needed for unescorted access--the specific area access designation, and the associated clearance requirements, should be assessed as late as possible, to reflect possible changes Security is likely to make over the next several months/years.

5.3.1 Functional Requirements

A Safeguards and Security approved Construction and Security Plan shall be provided per WHC-CM-4-33, *Security Manual* (WHC 1990a). In addition, it is recommended per DOE Order 6430.1A, Section 0150-5, that during construction, a temporary security fence be erected around the lay-down and tool/equipment storage areas.

5.3.2 Performance Requirements

As appropriate, refer to Hanford Plant Standards SDC 8.1, "Installation Details for Safeguards/Security Equipment" (DOE-RL 1990a).

5.4 Natural Forces

The facility shall comply with the earthquake, snow, and wind criteria defined in *Standard Architectural-Civil Design Criteria*, "Design Load for Structures," HPS SDC-4.1, (DOE-RL 1990a), for Safety Class 3 facility criteria. Also must comply with 40 CFR 264.18 & 264.192 (EPA 1986b) regarding seismic design features. Appropriate measures should be taken to deal with periodic increases in the local atmospheric particulate loading typical of a desert climate, i.e., wind-blown, sand, dust. All enclosed vessels shall have appropriate vacuum protection (which could include pressure/vacuum relief valves and/or rupture discs). All electrical equipment shall be weather protected as required.

5.5 Design Format

Use Hanford Plant Standards SDC-1.3, "Preparation and Control of Engineering and Fabrication Drawings" (DOE-RL 1990a).

5.6 Quality Assurance

Quality Assurance (QA) activities for all contractors involved in the development, design, construction, testing and inspection of the proposed facility shall be formulated and executed through the use of a Quality Assurance Project Plan (QAPP). The QAPP shall identify the WHC QA program requirements and provide direction for the types of verifications necessary to satisfy the functional requirements of the facility within the project scope.

5.6.1 QA Program Requirements

The Quality Assurance program requirements, for all onsite and offsite Architects, Engineers and Constructors shall be in accordance with DOE Order 6430.1A, Section 0140 "Quality Assurance" (DOE 1989b); DOE Order 5700.6C, "Quality Assurance" (DOE 1991); and WHC-CM-4-2, "Quality Assurance Manual" (WHC 1988a). The basis for establishing the Quality Assurance program requirements is the Safety Classification Program as defined in WHC-CM-1-3, (WHC 1991), MRP 5.46, "Safety Classification of Systems, Components, and Structures"; WHC-CM-4-46, (WHC 1988d), Section 9.0; and the Approval Designator System as defined in WHC-CM-3-5, "Document Control and Records Management Manual" (WHC 1988i), Section 12.7, "Approval of Environmental, Safety and Quality Affecting Documents.

5.6.2 Safety Class Requirements

Safety classification of systems, components, and structures shall be determined by risk analyses in accordance with DOE Order 6430.1A, Section 1300-3, using the criteria and methodology provided in MRP 5.46. All safety classifications shall be supported by documented analysis. A preliminary list of safety items shall be included in a PSE. A preliminary safety equipment list shall be prepared in conjunction with a Preliminary Safety Analysis Report (PSAR). A final safety equipment list shall be prepared in conjunction with a Final Safety Analysis Report (FSAR). The overall safety classes for the major systems, components and structures or items for each project shall be determined in the PSE/PSAR prior to the start of definitive design.

5.6.3 Approval Designator Requirements

Approval Designator and approval requirements of documents important to safety, quality, environmental or DOE shall be determined in accordance with the procedure defined in WHC-CM-3-5, Section 12.7 and identified in Table 1. The approval designator shall be entered in the approval section of the document. Additional requirements for approval of documents may be specified in project, program, or division/department implementing procedures.

5.6.4 Interface Control

The Westinghouse Hanford Co (WHC), Cognizant Quality Engineer is responsible for the review and approval of all quality related documentation, as well as the surveillance, of all quality related activities for the project design, fabrication and construction, including project procurement.

5.6.4.1 Architect/Engineer (A/E) - Engineer/Constructor (E/C)

The A/E - E/C is responsible for ensuring that the applicable quality requirements are included in the project documents and for transmitting the applicable quality requirements on to their subcontractors. If the A/E - E/C determines it necessary to expand or delete the quality requirements of this plan, all changes shall be approved by the WHC Cognizant Quality Engineer.

5.6.4.2 Construction Management (CM)

CM is responsible for ensuring that the contractor(s) meet their contract obligations and shall serve as contract coordinator for quality activities during construction and procurement to stay in compliance.

5.6.4.3 Construction Contractors (CC)

All contractors and subcontractors are responsible for the quality requirements that are applicable to their portion of the contract and each contractor is responsible for transmitting the applicable quality requirements on to their subcontractors.

5.7 Decontamination and Decommissioning

All equipment and/or facilities provided by this project shall be designed and constructed to facilitate periodic decontamination, as well as the eventual final, decontamination and decommissioning (D&D) and environmental restoration.

No D&D of existing facilities or piping is required by the scope of this project, except as noted in Section 1.2. Any waste piping systems that are removed from service by this project shall be isolated in an environmentally acceptable manner.

5.7.1 U.S. Department of Energy Regulations

Refer to *General Design Criteria*, (DOE 1989b), Sections 0205 and 1300-11 regarding decontamination and decommissioning.

5.7.2 Miscellaneous Design Features

Examples: the stainless steel vault liner and integral floor trench drain/sump shall have rounded corners and smooth seam joints; the shield walls, catwalk grating and other vault surfaces shall have non-porous surfaces (integral or applied); any tank, ladder, conduit, ductwork, piping and pump supports shall minimize hidden pockets or other difficult to clean "catchments"; and unavoidable recesses should be sealed &/or sloped for drainage where possible.

5.8 Operating Personnel and Services

The operating procedures and requirements of the systems are not anticipated to present (due to an improved design) any significant safety or environmental risks under routine operation and maintenance. Depending upon the frequency of needed vault entries, additional health physics service support may be required over current levels.

5.9 Testing

The Project ATP and OTP should address most of these requirements; at a minimum covering the verification of adequacy with regard to secondary containment, specified waste transfer capabilities, ventilation (HVAC) requirements, monitoring/sampling provisions, ease of equipment servicing, and functioning of controls and alarms. Design and specification reviews, followed by QA checks during equipment procurement, construction, and installation, should validate proper layout and material selection.

6.0 CODES AND STANDARDS

The criterion for this project shall be based on DOE Order 6430.1A (DOE 1989b) and DOE-RL 6430.1C (DOE-RL 1990a) *Hanford Plant Standards Program*, as they apply to low hazard, nuclear facilities (e.g., Section 1323, "Radioactive Liquid Waste Facilities", in DOE Order 6430.1A). The following outline defines additional appropriate codes, orders, standards, regulations, and guidelines that may not be defined within DOE Order 6430.1A:

- DOE-RL Implementing Procedure 4700.1A, *Project Management System* (DOE-RL 1991)
- DOE Order 5400.1, *General Environmental Protection Program*, (DOE 1988a)
- DOE Order 5400.2A, *Environmental Compliance Issue Coordination*, (DOE 1989a)
- DOE Order 5400.5, *Radiation Protection of Public and Environment*, (DOE 1994)
- DOE-RL Order 5440.1A, *Implementation of the National Environmental Policy Act at the Richland Operations Office* (DOE-RL 1987)
- DOE Order 5440.1E, *National Environmental Policy Act Compliance Program* (DOE 1992c)
- DOE-RL Order 5480.1A, *Environment, Safety, and Health Program for Department of Energy Operations for Richland Operations* (DOE-RL 1988)

- DOE Order 5480.1B, *Environment, Safety, and Health Program for Department of Energy Operations* (DOE 1986b)
- DOE Order 5480.3, *Safety Requirements for the Packaging of Hazardous Materials, Hazardous Substances, and Hazardous Wastes* (DOE 1985)
- DOE Order 5480.4, *Environmental Protection, Safety and Health Protection Standards* (DOE 1984)
- DOE-RL Implementing Procedure 5480.4C, *Environmental Protection, Safety and Health Protection Standards* (DOE-RL 1992)
- DOE-RL Implementing Directive 5480.7, *Fire Protection* (DOE-RL 1994)
- DOE Order 5480.7A, *Fire Protection* (DOE 1993)
- DOE-RL Implementing Procedure 5480.10, *Industrial Hygiene Program* (DOE-RL 1990b)
- DOE Order 5480.11, *Radiation Protection of Occupational Worker*, (DOE 1988c).
- DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, (DOE 1990)
- DOE Order 5480.22, *Technical Safety Requirements*, (DOE 1992a).
- DOE Order 5480.23, *Nuclear Safety Analysis Reports*, (DOE 1992b).
- DOE-RL Order 5481.1, *Safety Analysis and Review System* (DOE-RL 1983)

- DOE Order 5481.1B, *Safety Analysis and Review System* (DOE 1986a)

- DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements* (DOE 1981)

- DOE-RL Implementing Procedure 5484.1A, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements* (DOE-RL 1993a)

- DOE Order 5700.6C, *Quality Assurance* (DOE 1991)

- DOE Order 5820.2A, *Radioactive Waste Management* (DOE 1988b)

- DOE-RL Implementing Directive 5820.2A, *Radioactive Waste Management* (DOE-RL 1993b)

- *National Emission Standards for Hazardous Airborne Pollutants*, Title 40, Code of Federal Regulations, Part 61 (40 CFR 61), as amended, U.S. Environmental Protection Agency, Washington, D.C. (EPA 1988b)

- *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*, 40 CFR 264, Subpart J, as amended, U.S. Environmental Protection Agency, Washington, D.C. (EPA 1986b)

- WAC 173-303, *Dangerous Waste Regulation* (Ecology 1991a)

- WAC 246-247, *Radiation Protection - Air Emissions* (Ecology 1991b)

- WHC-CM-1-3, *Management Requirements and Procedures* (WHC 1991)

- WHC-CM-4-2, *Quality Assurance Manual* (WHC 1988a)

- WHC-CM-4-3, *Industrial Safety Manual* (WHC 1988b)
- WHC-CM-4-11, *ALARA Program Manual* (WHC 1988c)
- WHC-CM-4-41, *Fire Protection Program Manual*, (WHC 1992a)
- WHC-CM-4-46, *Non-reactor Facility Safety Manual* (WHC 1988d)
- WHC-CM-6-1, *Standard Engineering Practices* (WHC 1988e)
- WHC-CM-6-2, *Project Management* (WHC 1988f)
- WHC-CM-7-5, *Environmental Compliance* (WHC 1988g)
- WHC-CM-8-7, *Operations Support Services*, especially Sections 720, 721, 724, 731, and 906 (WHC 1992b)
- WHC-EP-0063, *Hanford Radioactive Solid Waste Packaging Storage and Disposal Requirements* (WHC 1988h)

In addition to the above standards, applicable "National Consensus" codes and standards and pertinent state and local codes and standards shall be used. The latest edition/revision of all codes, standards, and manuals shall be used.

7.0 REFERENCES

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DOE 1986b, *Environment, Safety, and Health Program for Department of Energy Operations*, DOE Order 5480.1B, U.S. Department of Energy, Washington, D.C., September 23, 1986.

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DOE 1992b, *Nuclear Safety Analysis Reports*, DOE Order 5480.23, U.S. Department of Energy, Washington, D.C., April 10, 1992.

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DOE 1993, *Fire Protection*, DOE Order 5480.7A, U.S. Department of Energy, Washington, D.C., February 17, 1993.

DOE 1994, *Radiation Protection of Public and Environment*, DOE Order 5400.5, U.S. Department of Energy, Washington, D.C., July 20, 1994.

DOE-RL 1983, *Safety Analysis and Review System*, DOE-RL Order 5481.1, U.S. Department of Energy-Richland Operations Office, Richland, Washington, October 5, 1983.

DOE-RL 1987, *Implementation of the National Environmental Policy Act at the Richland Operations Office*, DOE-RL Order 5440.1A, U.S. Department of Energy-Richland Operations Office, Richland, Washington, February 3, 1987.

DOE-RL 1988, *Environment, Safety, and Health Program for DOE-RL Operations*, DOE-RL Order 5480.1A, U.S. Department of Energy-Richland Operations Office, Richland, Washington, September 7, 1988.

DOE-RL 1990a, *Hanford Plant Standards (HPS) Program*, DOE-RL Directive 6430.1C, U.S. Department of Energy-Richland Operations Office, Richland, Washington, March 5, 1990. Note: copies of any HPS can be obtained through Unclassified Document Control (509) 376-6831.

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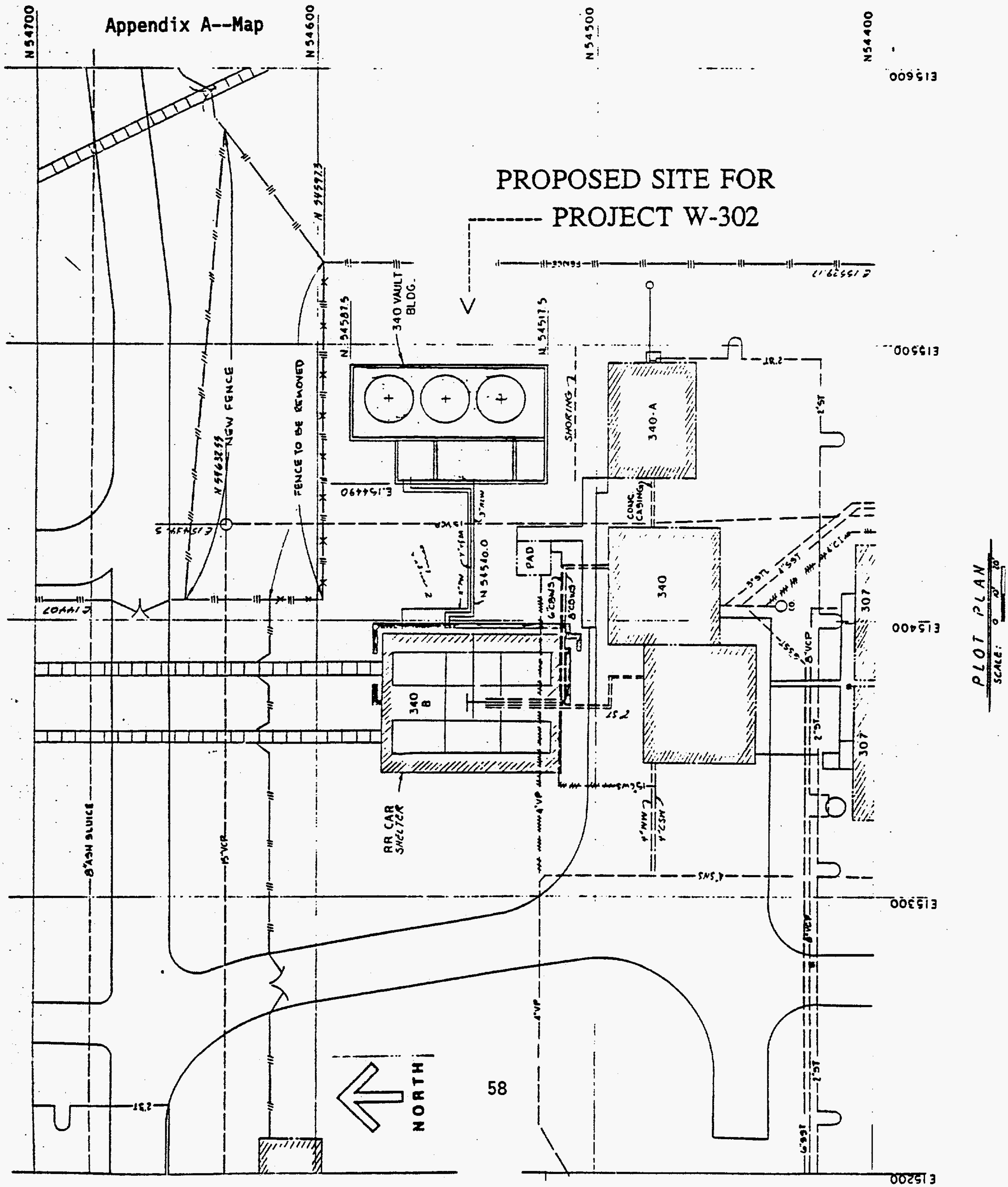
Note that sometimes the latest issuance dates are not listed for many documents (such as federal laws, company control manuals), and that they receive continual revision. The latest revisions in effect during definitive design shall apply. Note also that some of these references are not called out in the body (e.g., PNL 1994c and WHC 1993d), and are for information only.

APPENDIX A -- SITE MAP

"THIS APPENDIX IS FOR ARCHITECT-ENGINEER INFORMATION ONLY"

The map on the following page is from a sketch done in 1977 by Vitro Engineering (SK-3-18844, "Plot Plan 340 Vault Bldg.") for a 340 Facility upgrade evaluated at that time. Even though the "footprint" and scope of the currently proposed Project W-302 structure differs, the preferred site is basically the same area selected in 1977. It might be noted that the capacity proposed under Project W-302 is only 56% of that proposed by this 1977 replacement plan (i.e., three 25,000 gal.--95,000L--tanks for a total of 284 kL, versus the 159 kL held by Project W-302's four smaller tanks.). While little documentation remains from the 1977 Vitro effort [apparently it did not proceed due to budget constraints], the 300 Area activities are known to have since changed sufficiently to diminish concern over this comparison.

Appendix A--Map



APPENDIX B -- Possible concept sketch

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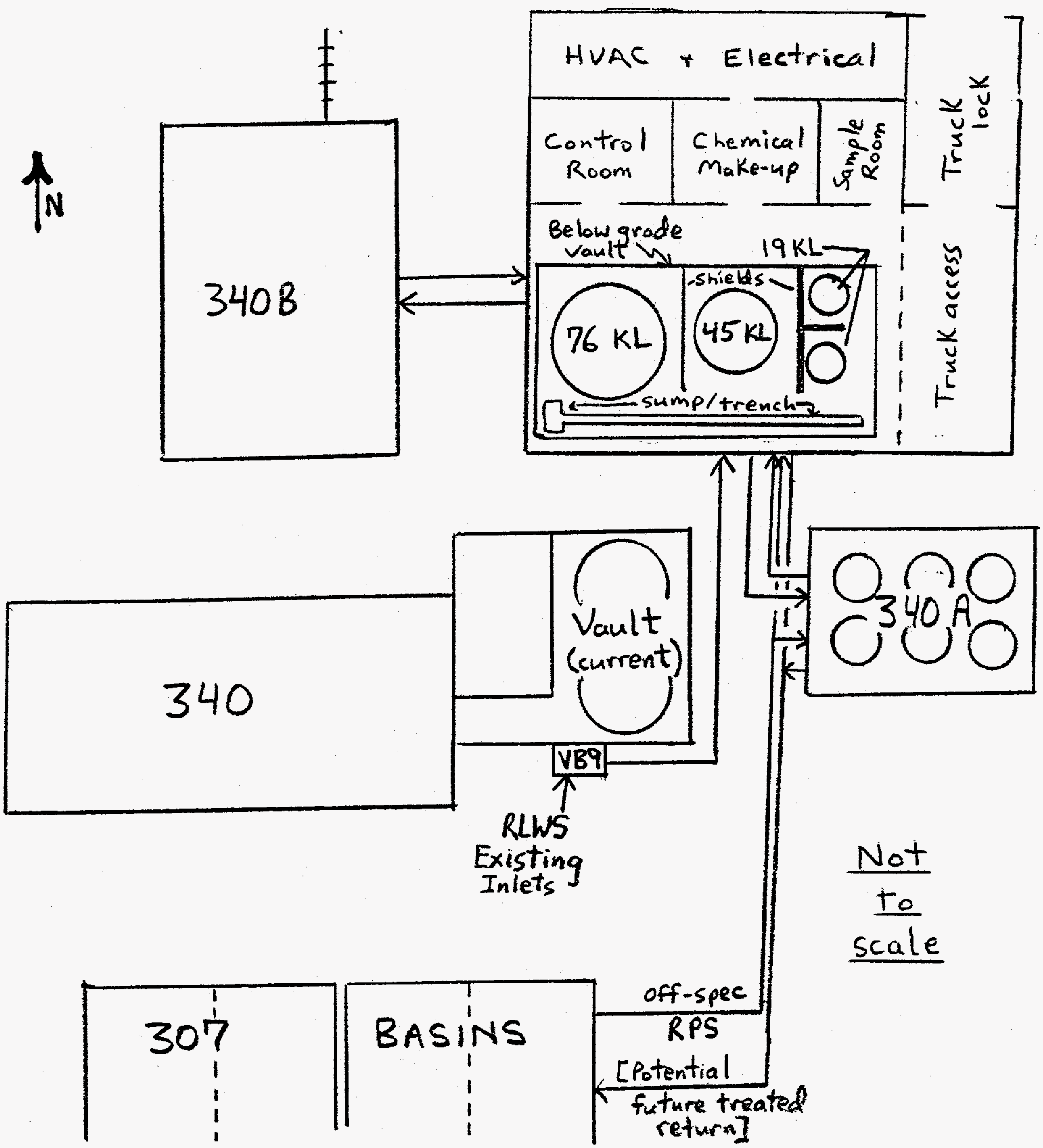

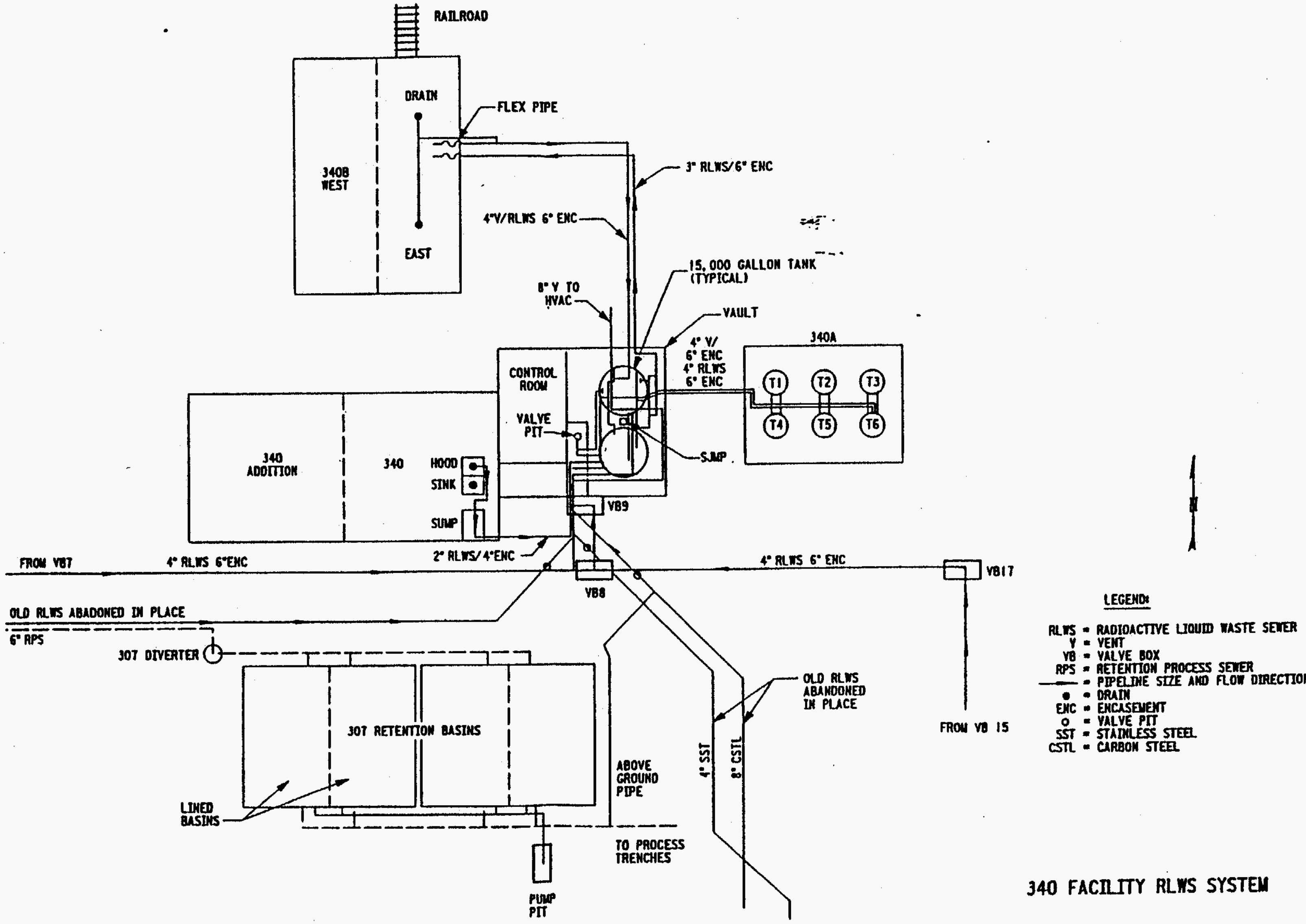

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