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DOE/RL-90-25
Revision 1
UC-630, 721

105-DR Large Sodium Fire Facility Closure Plan

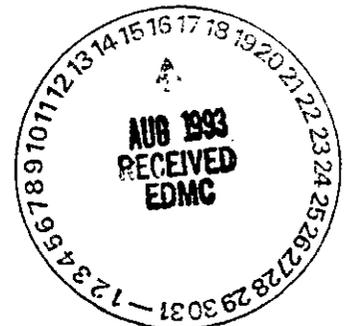
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United States
Department of Energy

P.O. Box 550
Richland, Washington 99352



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STATE ENVIRONMENTAL POLICY ACT
ENVIRONMENTAL CHECKLIST FORMS

FOR

105-DR LARGE SODIUM FIRE FACILITY CLOSURE

REVISION 1

May, 1993

WASHINGTON ADMINISTRATIVE CODE
ENVIRONMENTAL CHECKLIST FORMS
[WAC 197-11-960]

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A. BACKGROUND

1. Name of proposed project, if applicable:

Closure of the 105-DR Large Sodium Fire Facility (LSFF). Information contained in this State Environmental Policy Act (SEPA) Checklist pertains only to the portion of the Hanford Site 100-D area which contains the 105-DR LSFF. In the context of the document, "site" refers only to the area covered by the physical structure of the 105-DR LSFF and associated facilities discussed in the answer to Checklist Question A.11, whereas "Site" refers to the Hanford Site.

2. Name of applicants:

U.S. Department of Energy, Richland Operations Office (DOE-RL) and Westinghouse Hanford Company (Westinghouse Hanford).

3. Address and phone number of applicants and contact persons:

U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Contact:

J. E. Rasmussen, Acting Program Manager
Office of Environmental Assurance,
Permits, and Policy
(509) 376-2247

R. E. Lerch, Deputy Director
Restoration and Remediation
(509) 376-5556

4. Date checklist prepared:

May 10, 1993

5. Agency requesting the checklist:

Washington State
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

6. Proposed timing or schedule: (including phasing, if applicable):

Final closure activities will be completed and certified in accordance with the closure plan. Soil and sediment sampling will be conducted during closure activities. If the sampling results indicate that clean closure is not possible, closure (decontamination) will be coordinated with decontamination of the 105-DR Reactor, which is located in the Resource conservation and Recovery Act (RCRA) Practice Operable Unit 100-DR-2. Decommissioning activities will be conducted in accordance

1 with the records of decision for the 100-DR-2 Operable Unit and for the
2 Environmental Impact Statement (EIS), Decommissioning of Eight Surplus
3 Production Reactors at the Hanford Site.
4

- 5 7. Do you have any plans for future additions, expansion, or further
6 activity related to or connected with this proposal? If yes, explain.
7

8 The LSFF is located within Operable Units 100-DR-2 (source) and 100-HR-3
9 (groundwater), as designated in the Hanford federal Facility Agreement
10 and Consent Order (HFFACO). Clean closure is proposed, and once any
11 dangerous waste associated with the LSFF is removed, the entire reactor
12 will remain for future decontamination and decommissioning as discussed
13 in the final surplus production reactor decommissioning EIS (DOE 1992; pp
14 1.7 - 1.13). Any remedial action with respect to either contaminants not
15 associated with the LSFF, or associated with the LSFF not yet cleaned to
16 action levels under this closure plan, will be deferred to the reactor
17 decommissioning EIS record of decision or the RCRA facility
18 Investigation/Corrective Measures Study (RFI/CMS) process.
19

- 20 8. List any environmental information you know about that has been prepared,
21 or will be prepared, directly related to this proposal.
22

23 This SEPA Checklist is being submitted to the Washington state Department
24 of Ecology (Ecology) and the U.S. Environmental Protection agency (EPA)
25 concurrently with the RCRA closure Plan for the 105-DR LSFF. The RCRA
26 Part A and Part B permit applications were submitted to Ecology in
27 November 1985. A revised Part A permit application was submitted to
28 ecology in November 1987.
29

30 Final Environmental Impact Statement - *Decommissioning of Eight Surplus*
31 *Production Reactors at the Hanford Site*, Richland, Washington DOE/EIS-
32 0119D, U.S. Department of Energy, 1992, Washington, D.C.
33

34 General information concerning the Hanford Facility environment can be
35 found in the *Hanford Site National Environmental Policy Act (NEPA)*
36 *Characterization*, PNL-6415, Revision 5, December 1992. This document is
37 updated annually by Pacific Northwest Laboratory, and provides current
38 information concerning climate and meteorology; ecology; history and
39 archeology; socioeconomic; land use and noise levels; and geology and
40 hydrology. This baseline data for the Hanford Site and its past
41 activities are useful for evaluating proposed activities and their
42 potential environmental impacts.
43

- 44 9. Do you know whether applications are pending for government approvals of
45 other proposals directly affecting the property covered by your proposal?
46 if yes, explain.
47

48 No applications to government agencies are known to be pending.
49

- 50 10. List any government approvals or permits that will be needed for your
51 proposal, if known.
52

1 Ecology is the lead regulatory agency authorized to approve the closure
2 plan for the 105-DR LSFF pursuant to the requirements of the Washington
3 Administrative Code, (WAC) 173-303-610. The closure plan must also
4 receive approval from the EPA. No other permits are known to be required
5 at this time.
6

- 7 11. Give brief, complete description of your proposal, including the proposed
8 uses and the size of the project and site. There are several questions
9 later in this checklist that ask you to describe certain aspects of your
10 proposal. You do not need to repeat those answers on this page.
11

12 The proposed project is the final closure of the 105-DR Large Sodium Fire
13 Facility. Clean closure is proposed as the condition for final closure
14 of the facility. Clean closure is contingent on verification that all
15 wastes and contaminants are removed to accepted action levels and that
16 all equipment, structures, liners, soils and/or other materials
17 containing dangerous wastes or residues associated with the LSFF are
18 removed from the site.
19

20 The facility consists of three fire rooms, a Sodium Handling Room, the
21 Supply fan room, an exhaust gravel scrubber, and office space directly
22 connected to the 105-DR Reactor.
23

24 All equipment and fixtures will be decontaminated, removed, and
25 appropriately disposed of. The buildings and floors will be
26 decontaminated to appropriate action levels with one or more of the
27 following methods:
28

- 29 ● Damp wipe downs
 - 30 ● Vacuum assisted mechanical removal
 - 31 ● Sandblasting
 - 32 ● High-pressure steam/water and suction
- 33

34 The buildings, floors, soil and gravel will be sampled to determine the
35 levels of remaining contamination and the requirements for additional
36 decontamination. Clean closure will be achieved when sampling shows that
37 the remaining contamination is below acceptable action levels as defined
38 in the closure plan. Eventually the concrete will be disposed of with
39 the rest of the 105-DR reactor under the decommissioning program.
40

- 41 12. Location of the proposal. Give sufficient information for a person to
42 understand the precise location of your proposed project, including a
43 street address, if any, and section, township, and range, if known. If a
44 proposal would occur over a range of area, provide the range or
45 boundaries of the site(s). Provide a legal description, site plan,
46 vicinity map, and topographic map, if reasonably available. While you
47 should submit any plans required by the agency, you are not required to
48 duplicate maps or detailed plans submitted with any permit applications
49 related to this checklist.
50

51 The 105-DR LSFF is located in the northwest portion of the Hanford Site
52 100-D Area approximately 35 miles northwest of the city of Richland. The

1 105-DR LSFF is connected to the 105-DR Reactor. It is in the W 1/2, NW
2 1/4, section T14N, R26E. A location map and site plans are included in
3 the closure plan.
4

5
6 TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR
AGENCY USE ONLY

7
8 B. ENVIRONMENTAL ELEMENTS

9
10 1. Earth

11
12 a. General description of the site (circle one):
13 Flat, rolling, hilly, steep slopes, mountainous,
14 other _____.

15
16 Flat.

17
18 b. What is the steepest slope on the site
19 (approximate percent slope)?

20
21 The approximate slope of the land is less than
22 2 percent.

23
24 c. What general types of soils are found on the
25 site? (for example, clay, sandy gravel, peat,
26 muck)? If you know the classification of
27 agricultural soils, specify them and note any
28 prime farmland.

29
30 Soil types consist mainly of eolian and fluvial
31 sands and gravel. More detailed information
32 concerning specific soil classifications can be
33 found in the *Hanford Site National Environmental*
34 *Policy Act (NEPA) Characterization*, PNL-6415,
35 Revision 5, December 1992. Farming is not
36 permitted on the Hanford Facility.
37

38 d. Are there surface indications or history of
39 unstable soils in the immediate vicinity? If so,
40 describe.

41
42 No.

43
44 e. Describe the purpose, type, and approximate
45 quantities of any filling or grading proposed.
46 Indicate source of fill.

47
48 No filling or grading is required.

49
50 f. Could erosion occur as a result of clearing,
51 construction, or use? If so, generally describe.
52

93130231692

1 No.

- 2
3 g. About what percent of the site will be covered
4 with impervious surfaces after project
5 construction (for example, asphalt or buildings)?

6
7 Not applicable. No construction would occur.

- 8
9 h. Proposed measures to reduce or control erosion,
10 or other impacts to the earth, if any:

11
12 Not applicable. Earth would not be disturbed.

13
14 2. Air

- 15
16 a. What types of emissions to the air would result
17 from the proposal (i.e., dust, automobile, odors,
18 industrial wood smoke) during construction and
19 when the project is completed? If any, generally
20 describe and give approximate quantities, if
21 known.

22
23 Minor amounts of exhaust would be generated by
24 vehicles used to gain access to the site. Small
25 quantities of dust could be generated by
26 decontamination and sampling activities.

- 27
28 b. Are there any off-site sources of emissions or
29 odors that may affect your proposal? If so,
30 generally describe.

31
32 No.

- 33
34 c. Proposed measures to reduce or control emissions
35 or other impacts to the air, if any?

36
37 Good engineering practices would be followed, and
38 actions would comply with onsite procedures
39 designed to protect the environment and worker
40 safety and health.

41
42 3. Water

43
44 a. Surface

- 45
46 1) Is there any surface water body on or in the
47 immediate vicinity of the site (including
48 year-round and seasonal streams, saltwater,
49 lakes, ponds, wetlands)? If yes, describe
50 type and provide names. If appropriate,
51 state what stream or river it flows into.
52

1 There is no surface water body on or in the
2 immediate vicinity of the 105-DR LSFF.
3 However, the Columbia River is approximately
4 0.75 mile (1.2 kilometer) away. No perennial
5 streams originate within the Columbia
6 Plateau.
7

- 8 2) Will the project require any work over, in,
9 or adjacent to (within 200 feet) the
10 described waters? If yes, please describe and
11 attach available plans.

12
13 The work would not require any activity in or
14 near the described waters.

- 15
16 3) Estimate the amount of fill and dredge
17 material that would be placed in or removed
18 from surface water or wetlands and indicate
19 the area of the site that would be affected.
20 Indicate the source of fill material.

21
22 None. There would be no dredging or filling.

- 23
24 4) Will the proposal require surface water
25 withdrawals or diversions? Give general
26 description, purpose, and approximate
27 quantities if known.

28
29 The water supply for the 100-D Area is pumped
30 from the Columbia River. The 105-DR LSFF
31 closure activities would use insignificant
32 amounts of this overall withdrawal.

- 33
34 5) Does the proposal lie within a 100-year
35 floodplain? If so, note location on the site
36 plan.

37
38 The 105-DR LSFF is not within the 100 year
39 floodplain (*Hanford Site National*
40 *Environmental Policy Act (NEPA)*
41 *Characterization*, PNL-6415, Revision 5,
42 December 1992).

- 43
44 6) Does the proposal involve any discharges of
45 waste materials to surface waters? If so,
46 describe the type of waste and anticipated
47 volume of discharge.

48
49 No.

50
51 b. Ground
52

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- 1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No groundwater would be withdrawn in support of this project, and water would not be discharged to the aquifer.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Sanitary waste from the 105-DR LSFF is discharged to the 105-D Area sanitary trench. Closure of the 105-DR LSFF will not impact the existing sanitary waste sewer system.

c. Water Run-off (including storm water)

- 1) Describe the source of run-off (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

The Hanford Facility receives only 6 to 7 inches (15.2 to 17.8 centimeters) of annual precipitation. Precipitation runs off the existing buildings and seeps into the soil on and near the buildings. This precipitation does not reach the groundwater or surface waters.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.

Waste materials would not enter ground or surface waters. All waste materials would be contained.

d. Proposed measures to reduce or control surface, ground, and run-off water impacts, if any:

1 No surface, ground, or run-off water impacts are
2 expected.
3

4 4. Plants

5
6 a. Check or circle the types of vegetation found on
7 the site.

- 8
9 deciduous tree: alder, maple, aspen, other
10 evergreen tree: fir, cedar, pine, other
11 shrubs
12 grass
13 pasture
14 crop or grain
15 wet soil plants: cattail, buttercup,
16 bulrush, skunk cabbage, other
17 water plants: water lily, eelgrass, milfoil,
18 other
19 other types of vegetation

20
21 The most common vegetation community in the 100-D
22 Area is the sagebrush/cheatgrass or Sandberg's
23 bluegrass. Native vegetation in the immediate
24 vicinity of the 105-DR LSFF has been eradicated.

25
26 b. What kind and amount of vegetation will be
27 removed or altered?

28
29 No native vegetation alteration would occur.

30
31 c. List threatened or endangered species known to be
32 on or near the site.

33
34 The 105-DR LSFF is located within a previously
35 disturbed area that has been heavily
36 industrialized since the mid 1940's, and
37 biological survey personnel indicate that no
38 sensitive species occur in the general vicinity.
39

40 d. Proposed landscaping, use of native plants, or
41 other measures to preserve or enhance vegetation
42 on the site, if any:

43
44 Not applicable.
45

46 5. Animals

47
48 a. Indicate (by underlining) any birds and animals
49 which have been observed on or near the site or
50 are known to be on or near the site:

51
52 birds: hawk, heron, eagle, songbirds,

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other:.....
mammals: deer, bear, elk, beaver,
other:.....
fish: bass, salmon, trout, herring, shellfish,
other:.....

Raptors (burrowing owls, ferruginous, redtail, and Swainson's hawks) are rarely seen in the 100-D Area Area. Small passerines (sparrows, finches) are present in the general vicinity of the 105-DR LSFF. Rabbits and coyotes occasionally are seen in the general area.

- b. List any threatened or endangered species known to be on or near the site.

Two federal and state listed threatened or endangered species have been identified on the Hanford Site along the Columbia River; the bald eagle and peregrine falcon. In addition, the state listed white pelican, sandhill crane, and ferruginous hawk also occur on or migrate through the Hanford Site. Of these five species, none is likely to use the shrub-steppe habitat of the 100-D Area.

- c. Is the site part of a migration route? If so, explain.

The Hanford Site is a part of the broad Pacific Flyway.

- d. Proposed measures to preserve or enhance wildlife, if any:

This project contains no specific measures to preserve or enhance wildlife.

6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Electricity is used at the 105-DR LSFF for heating, lighting, and other power needs.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

1 No.

- 2
3 c. What kinds of energy conservation features are
4 included in the plans of this proposal? List
5 other proposed measures to reduce or control
6 energy impacts, if any:

7
8 Energy consumption is not anticipated to be
9 significant, and energy conservation features are
10 not easily applicable to the 105-DR LSFF closure.

11
12 7. Environmental Health

- 13
14 a. Are there any environmental health hazards,
15 including exposure to toxic chemicals, risk of
16 fire and explosion, spill, or hazardous waste,
17 that could occur as a result of this proposal?
18 If so, describe.

19
20 Possible environmental health hazards to workers
21 could arise from activities at the 105-DR LSFF.
22 The hazard could come from exposure to dangerous,
23 radioactive, and/or mixed waste. Stringent
24 administrative controls and engineered barriers
25 are employed to minimize the probability of even
26 a minor incident and/or accident. A chemical
27 spill, release, fire, or explosion could occur
28 only as a result of a simultaneous breakdown in
29 multiple barriers or a catastrophic natural
30 forces event.

- 31
32 1) Describe special emergency services that
33 might be required.

34
35 Hanford Site security, fire response, and
36 ambulance services are on call at all times
37 in the event of an onsite emergency. Hanford
38 Site emergency services personnel are
39 specially trained to manage a variety of
40 circumstances involving chemical and/or
41 radioactive constituents and situations.

- 42
43 2) Proposed measures to reduce or control
44 environmental health hazards, if any:

45
46 All personnel are trained to follow proper
47 procedures during the storage and treatment
48 operations to minimize potential exposure.
49 The 105-DR LSFF has systems for ventilation,
50 fire protection, and alarm capability.
51

1 Chemical safety hazards would be mitigated by
2 preventing direct contact with the residual
3 chemical constituents. Protective clothing,
4 appropriate training, and respiratory
5 protection would be used by onsite personnel
6 as necessary.
7

8 **b. Noise**
9

- 10 1) What type of noise exists in the area which
11 may affect your project (for example:
12 traffic, equipment, operation, other)?
13

14 Equipment noise in the vicinity, it is not
15 expected to affect personnel at the 105-DR
16 LSFF.
17

- 18 2) What types and levels of noise would be
19 created by or associated with the project on
20 a short-term or a long-term basis (for
21 example: traffic, construction, operation,
22 other)? Indicate what hours noise would come
23 from the site.
24

25 Noise from some operations (e.g., sand-
26 blasting) is expected.
27

- 28 3) Proposed measures to reduce or control noise
29 impacts, if any:
30

31 If Occupational Safety and Health
32 Administration noise standards are exceeded,
33 appropriate measures to protect workers would
34 be employed.
35

36 **8. Land and Shoreline Use**
37

- 38 **a. What is the current use of the site and adjacent**
39 **properties?**
40

41 The Hanford Site houses reactors, chemical
42 separation systems, waste management facilities,
43 and related facilities that have been used for
44 the production of special nuclear materials.
45 Other scientific and engineering programs are
46 also carried out. Lands north and east of the
47 Columbia River are public lands, including river
48 lands, and wildlife preserves or are used for
49 farming. Some lands contiguous to or surrounded
50 by the Hanford Site are owned by the Bonneville
51 Power Administration, or leased to the Washington

930231700

1 Public Power Supply System, or are owned by or
2 leased to the state of Washington.

3
4 b. Has the site been used for agriculture? If so,
5 describe.

6
7 No portion of the 100-D Area Area has been used
8 for agricultural purposes since 1943, if ever.

9
10 c. Describe any structures on the site.

11 The facility consists of three fire rooms, a
12 Sodium Handling Room, the Supply fan room, the
13 gravel scrubber, and the office space directly
14 connected to the 105-DR Reactor.

15
16
17 d. Will any structures be demolished? If so, what?

18 No.

19
20
21 e. What is the current zoning classification of the
22 site?

23 The Hanford Site is zoned as an Unclassified Use
24 (U) district by Benton County.

25
26
27 f. What is the current comprehensive plan
28 designation of the site?

29 The 1985 Benton County Comprehensive Land Use
30 Plan designates the Hanford Site as the "Hanford
31 Reservation". Under this designation, land on
32 the Hanford Site may be used for "activities
33 nuclear in nature". Nonnuclear activities are
34 authorized "if and when DOE approval for such
35 activities is obtained".

36
37
38 g. If applicable, what is the current shoreline
39 master program designation of the site?

40 Does not apply.

41
42
43 h. Has any part of the site been classified as an
44 "environmentally sensitive" area? If so,
45 specify.

46 The entire Hanford Site was designated a National
47 Environmental Research Park in 1977, for use as
48 an outdoor laboratory for ecological research.
49 However, the 100-D Area is fenced and is a
50
51

1 previously disturbed industrial area with little
2 or no environmental significance.

- 3
4 i. Approximately how many people would reside or
5 work in the completed project?

6
7 Approximately 10 people would work at the 105-DR
8 LSFF closure.

- 9
10 j. Approximately how many people would the completed
11 project displace?

12
13 None.

- 14
15 k. Proposed measures to avoid or reduce displacement
16 impacts, if any:

17
18 Does not apply.

- 19
20 l. Proposed measures to ensure the proposal is
21 compatible with existing and projected land uses
22 and plans, if any:

23
24 Does not apply.

25
26 9. Housing

- 27
28 a. Approximately how many units would be provided,
29 if any? Indicate whether high, middle, or low-
30 income housing.

31
32 None.

- 33
34 b. Approximately how many units, if any, would be
35 eliminated? Indicate whether high, middle, or
36 low-income housing.

37
38 None.

- 39
40 c. Proposed measures to reduce or control housing
41 impacts, if any:

42
43 None.

44
45 10. Aesthetics

- 46
47 a. What is the tallest height of any proposed
48 structure(s), not including antennas; what is the
49 principal exterior building material(s) proposed?

50
51 No construction would take place.
52

1 b. What views in the immediate vicinity would be
2 altered or obstructed?

3
4 None.

5
6 c. Proposed measures to reduce or control aesthetic
7 impacts, if any:

8
9 None.

10
11 11. Light and Glare

12
13 a. What type of light or glare will the proposal
14 produce? What time of day would it mainly occur?

15
16 Not applicable.

17
18 b. Could light or glare from the finished project be
19 a safety hazard or interfere with views?

20
21 No.

22
23 c. What existing off-site sources of light or glare
24 may affect your proposal?

25
26 None.

27
28 d. Proposed measures to reduce or control light and
29 glare impacts, if any:

30
31 None.

32
33 12. Recreation

34
35 a. What designated and informal recreational
36 opportunities are in the immediate vicinity?

37
38 None.

39
40 b. Would the proposed project displace any existing
41 recreational uses? If so, describe.

42
43 No.

44
45 c. Proposed measures to reduce or control impacts on
46 recreation, including recreation opportunities to
47 be provided by the project or applicant, if any?

48
49 None.
50

9 3 1 3 0 2 3 1 7 0 2

1 13. Historic and Cultural Preservation

- 2
3 a. Are there any places or objects listed on, or
4 proposed for, national, state, or local
5 preservation registers known to be on or next to
6 the site? If so, generally describe.

7
8 The White Bluffs road is considered eligible for
9 the National Register of Historic Places. This
10 road is about 5 miles (8 kilometers) from the
11 105-DR LSFF. Additional information concerning
12 Hanford Site cultural resources can be found in
13 *Hanford Site National Environmental Policy Act*
14 *(NEPA) Characterization*, PNL-6415, Revision 5,
15 December 1992.

- 16
17 b. Generally describe any landmarks or evidence of
18 historic, archaeological, scientific, or cultural
19 importance known to be on or next to the site.

20
21 There are no known landmarks or evidence of
22 historic, archaeological, scientific, or cultural
23 importance at the 105-DR LSFF.

- 24
25 c. Proposed measures to reduce or control impacts,
26 if any:

27
28 Where appropriate, a cultural resource review
29 would provide the vehicle for necessary approvals
30 required under the *National Historic Preservation*
31 *Act of 1966*.

32
33 14. Transportation

- 34
35 a. Identify public streets and highways serving the
36 site, and describe proposed access to the
37 existing street system. Show on site plans, if
38 any.

39
40 Not applicable to the proposed project.

- 41
42 b. Is site currently served by public transit? If
43 not, what is the approximate distance to the
44 nearest transit stop?

45
46 The 105-DR LSFF is not accessible to the public
47 and is not served by public transit.

- 48
49 c. How many parking spaces would the completed
50 project have? How many would the project
51 eliminate?
52

1 Not applicable to the proposed project.
2

- 3 d. Will the proposal require any new roads or
4 streets, or improvements to existing roads or
5 streets, not including driveways? If so,
6 generally describe (indicate whether public or
7 private).
8

9 No.

- 10
11 e. Will the project use (or occur in the immediate
12 vicinity of) water, rail, or air transportation?
13 If so, generally describe.
14

15 No.

- 16
17 f. How many vehicular trips per day would be
18 generated by the completed project? If known,
19 indicate when peak volumes would occur.
20

21 Traffic and parking would not change from
22 existing traffic patterns.
23

- 24 g. Proposed measures to reduce or control
25 transportation impacts, if any:
26

27 Not necessary.
28

29 15. Public Services
30

- 31 a. Would the project result in an increased need for
32 public services (for example: fire protection,
33 police protection, health care, schools, other)?
34 If so, generally describe.
35

36 Not applicable to the proposed project.
37

- 38 b. Proposed measures to reduce or control direct
39 impacts on public services, if any:
40

41 Not applicable to the proposed project.
42

43 16. Utilities
44

- 45 a. Circle utilities currently available at the site:
46 electricity, natural gas, water, refuse service,
47 telephone, sanitary sewer, septic system, other:
48

49 Electricity, potable water, steam, refuse
50 service, telephone, and a septic system are
51 available in the 100-D Area.
52

- 1 b. Describe the utilities that are proposed for the
- 2 project, the utility providing the service, and
- 3 the general construction activities on the site
- 4 or in the immediate vicinity which might be
- 5 needed.
- 6
- 7 No new utilities proposed. No construction.
- 8

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1 SIGNATURES

2
3 The above answers are true and complete to the best of my knowledge. We
4 understand that the lead agency is relying on them to make its decision.
5
6
7

8
9 James E. Rasmussen 6/24/93
10 James E. Rasmussen, Acting Program Manager Date
11 Office of Environmental Assurance,
12 Permits, and Policy
13 U.S. Department of Energy
14 Richland Operations Office
15 Richland, Washington
16 (509) 376-2247
17

18
19 Ronald E. Lerch 6-22-93
20 R. E. Lerch, Deputy Director Date
21 Restoration and Remediation
22 Westinghouse Hanford Company
23 Richland, Washington
24 (509) 376-5556
25
26

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105-DR LARGE SODIUM FIRE FACILITY CLOSURE PLAN

FOREWORD

The Hanford Site is owned by the U.S. Government and operated by the U.S. Department of Energy, Richland Operations Office. The Hanford Site produces and manages dangerous waste and mixed waste (containing both radioactive and dangerous components). The dangerous waste is regulated in accordance with the *Resource Conservation and Recovery Act of 1976* and the *State of Washington Hazardous Waste Management Act of 1976* (as administered through the Washington State Department of Ecology *Dangerous Waste Regulations*, Washington Administrative Code 173-303). The radioactive component of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; the nonradioactive dangerous component of mixed waste is interpreted to be regulated under the *Resource Conservation and Recovery Act* and Washington Administrative Code 173-303.

For purposes of the *Resource Conservation and Recovery Act* and the Washington State Department of Ecology *Dangerous Waste Regulations*, the Hanford Site is considered to be a single facility. The single dangerous waste permit identification number issued to the Hanford Facility by the U.S. Environmental Protection Agency and the Washington State Department of Ecology is U.S. Environmental Protection Agency/State Identification Number WA7890008967. This identification number encompasses over 60 treatment, storage, and/or disposal units within the Hanford Facility.

Westinghouse Hanford Company is a major contractor to the U.S. Department of Energy, Richland Operations Office and serves as co-operator of the 105-DR Large Sodium Fire Facility, the unit addressed in this closure plan.

Westinghouse Hanford Company is identified in the closure plan as a 'co-operator' and signs in that capacity. Any identification of Westinghouse Hanford Company as an 'operator' elsewhere in this closure plan is not meant to conflict with Westinghouse Hanford Company's designation as a co-operator but rather is based on Westinghouse Hanford Company's contractual status (i.e., as an operations and engineering contractor) for the U.S. Department of Energy.

The *105-DR Large Sodium Fire Facility Closure Plan* consists of a Part A Permit Application (Revision 2) and a closure plan. The closure plan consists of nine chapters and five appendices.

This submittal contains information current as of May 28, 1993.

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39 VALIDATION SAMPLING AT THE LARGE SODIUM FIRE FACILITY

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ACRONYMS AND ABBREVIATIONS

1		
2		
3		
4	DOE	U.S. Department of Energy
5	DOE-RL	U.S. Department of Energy-Richland Operations Office
6	DW	dangerous waste
7		
8	Ecology	Washington State Department of Ecology
9	EHW	extremely hazardous waste
10	EII	Environmental Investigations Instructions
11	EIS	Environmental Impact Statement
12	EPA	U.S. Environmental Protection Agency
13		
14	FY	fiscal year
15		
16	HEPA	High-Efficiency Particulate Air (Filter)
17		
18	LD ₅₀	lethal dose
19	LMFBR	liquid metal fast breeder reactor
20	LOQ	limit of quantitation
21	LSFF	Large Sodium Fire Facility
22		
23	MSDS	Material Safety Data Sheet
24		
25	QA/QC	quality assurance/quality control
26	QAPI	Quality Assurance Program Index
27	QAPP	Quality Assurance Project Plan
28	QI	Quality Instructions
29	QR	Quality Requirements
30		
31	RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
32	RCRA/CERCLA	<i>Resource Conservation and Recovery Act/Comprehensive</i>
33		<i>Environmental Response Compensation and Liability Act</i>
34	RI/FS	remedial investigation/feasibility study
35	RFI/CMS	RCRA Facility Investigation/Corrective Measures Study
36	ROD	Record of Decision
37	RPD	relative percent difference
38		
39	TAL	target analyte list
40	TCLP	Toxicity Characteristic Leaching Procedure
41	Tri-Party	
42	Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
43	TSD	treatment, storage, and/or disposal
44		
45	WAC	Washington Administrative Code
46	Westinghouse	
47	Hanford	Westinghouse Hanford Company
48		

GLOSSARY

1
2
3
4 **Accuracy:** For the purposes of closure activities, accuracy is interpreted as
5 the measure of the bias in a system. Analytical accuracy is normally assessed
6 through the evaluation of matrix spiked samples and reference samples.
7

8 **Audit:** For the purposes of closure activities, audits are considered to be
9 systematic checks to verify the quality of operation of one or more elements
10 of the total measurement system. In this sense, audits may be of two types:
11 (1) performance audits, in which quantitative data are independently obtained
12 for comparison with data routinely obtained in a measurement system, or
13 (2) system audits, involving a qualitative onsite evaluation of laboratories
14 or other organizational elements of the measurement system for compliance with
15 established quality assurance program and procedure requirements. For
16 environmental investigations at the Hanford Site, performance audit
17 requirements are fulfilled by periodic submittal of blind samples to the
18 primary laboratory, or the analysis of split samples by an independent
19 laboratory. System audit requirements are implemented through the use of
20 standard surveillance procedures.
21

22 **Blind Sample:** A blind sample refers to any type of sample routed to the
23 primary laboratory for purposes of auditing performance relative to a
24 particular sample matrix and analytical method. Blind samples are not
25 specifically identified as such to the laboratory; they may be made from
26 traceable standards, or may consist of sample material spiked with a known
27 concentration of a known compound. See the glossary entry for audit above.
28

29 **Comparability:** For the purposes of closure activities, comparability is an
30 expression of the relative confidence with which one data set may be compared
31 with another.
32

33 **Completeness:** For the purposes of closure activities, completeness may be
34 interpreted as a qualitative parameter expressing the percentage of
35 measurements judged to be valid.
36

37 **Deviation:** For the purpose of closure activities, deviation refers to a
38 planned departure from established criteria that may be required as a result
39 of unforeseen field situations or that may be required to correct ambiguities
40 in procedures that may arise in practical applications.
41

42 **Equipment Blanks:** Equipment blanks consist of pure deionized, distilled water
43 washed through decontaminated sampling equipment and placed in containers
44 identical to those used for actual field samples; they are used to verify the
45 adequacy of sampling equipment decontamination procedures, and are normally
46 collected at the same frequency as field duplicate samples.
47

48 **Facility:** Dependent on context, the term 'facility', as used in this permit
49 application portion, could refer to:

- 50
- 51 • The Hanford Facility. (refer to definition)
- 52

- 1 • Building nomenclature commonly used at the Hanford Facility. In
2 this context, the term 'facility' remains as part of the title for
3 various TSD units (e.g., 616 Nonradioactive Dangerous Waste Storage
4 Facility, Grout Treatment Facility).
5

6 Field Blanks: Field blanks consist of pure deionized, distilled water,
7 transferred to a sample container at the site and preserved with the reagent
8 specified for the analytes of interest; they are used to check for possible
9 contamination originating with the reagent or the sampling environment, and
10 are normally collected at the same frequency as field duplicate samples.
11

12 Field Duplicate Sample: Field duplicate samples are samples retrieved from
13 the same sampling location using the same equipment and sampling technique,
14 placed in separate identically prepared and preserved containers, and analyzed
15 independently. Field duplicate samples are generally used to verify the
16 repeatability or reproducibility of analytical data, and are normally analyzed
17 with each analytical batch or every 20 samples, whichever is greater.
18

19 Hanford Facility: A single RCRA facility identified by the EPA/State
20 Identification Number WA7890008967 that consists of over 60 TSD units
21 conducting dangerous waste management activities. These TSD units are
22 included in the *Hanford Facility Dangerous Waste Part A Permit Application*
23 (DOE-RL 1988b). The Hanford Facility consists of the contiguous portion of
24 the Hanford Site that contains these TSD units and, for the purposes of RCRA,
25 is owned by the U.S. Government and operated by the U.S. Department of Energy,
26 Richland Operations Office (excluding lands north and east of the Columbia
27 River, river islands, lands owned or used by the Bonneville Power
28 Administration, lands leased to the Washington Public Power Supply System, and
29 lands owned by or leased to the state of Washington). The physical
30 description of the property (including structures, appurtenances, and
31 improvements) is set forth in Appendix 2A. The legal description of the
32 Hanford Facility is set forth in Appendix 2B.
33

34 Matrix Spiked Samples: Matrix spiked samples are a type of laboratory quality
35 control sample; they are prepared by splitting a sample received from the
36 field into two homogenous aliquots (i.e., replicate samples), and adding a
37 known quantity of a representative analyte of interest to one aliquot in order
38 to calculate percentage of recovery.
39

40 Nonconformance: A nonconformance is a deficiency in characteristic,
41 documentation, or procedure that renders the quality of material, equipment,
42 services, or activities unacceptable or indeterminate. When the deficiency is
43 of a minor nature, does not effect a permanent or significant change in
44 quality if it is not corrected, and can be brought into conformance with
45 immediate corrective action, it shall not be categorized as a nonconformance.
46 However, if the nature of the condition is such that it cannot be immediately
47 and satisfactorily corrected, it shall be documented in compliance with
48 approved procedures and brought to the attention of management for disposition
49 and appropriate corrective action.

1 Precision: Precision is a measure of the repeatability or reproducibility of
2 specific measurements under a given set of conditions. Specifically, it is a
3 quantitative measure of the variability of a group of measurements compared to
4 their average value. Precision is normally expressed in terms of standard
5 deviation, but may also be expressed as the coefficient of variation (i.e.,
6 relative standard deviation) and range (i.e., maximum value minus minimum
7 value). Precision is assessed by means of duplicate/replicate sample
8 analysis.
9

10 Quality Assurance: For the purposes of closure activities, QA refers to the
11 total integrated quality planning, quality control, quality assessment, and
12 corrective action activities that collectively ensure that the data from
13 monitoring and analysis meets all end user requirements and/or the intended
14 end use of the data.
15

16 Quality Assurance Project Plan: The QAPP is an orderly assembly of management
17 policies, project objectives, methods, and procedures that defines how data of
18 known quality will be produced for a particular project.
19

20 Quality Control: For the purposes of closure activities, QC refers to the
21 routine application of procedures and defined methods to the performance of
22 sampling, measurement, and analytical processes.
23

24 Reference Samples: Reference samples are a type of laboratory quality control
25 sample prepared from an independent, traceable standard at a concentration
26 other than that used for analytical equipment calibration, but within the
27 calibration range. Such reference samples are required for every analytical
28 batch or every 20 samples, whichever is greater.
29

30 Replicate Sample: Replicate samples are two aliquots removed from the same
31 sample container in the laboratory and analyzed independently.
32

33 Representativeness: For the purposes of closure activities,
34 representativeness may be interpreted as the degree to which data accurately
35 and precisely represent a characteristic of a population parameter, variations
36 at a sampling point, or an environmental condition. Representativeness is a
37 qualitative parameter which is most concerned with the proper design of a
38 sampling program.
39

40 Split Sample: A split sample is produced through homogenizing a field sample
41 and separating the sample material into two equal aliquots. Field split
42 samples are usually routed to separate laboratories for independent analysis,
43 generally for purposes of auditing the performance of the primary laboratory
44 relative to a particular sample matrix and analytical method. See the
45 glossary entry for audit above. In the laboratory, samples are generally
46 split to create matrix spiked samples; see the glossary entry above.
47

48 Validation: For the purposes of closure activities, validation refers to a
49 systematic process of reviewing a body of data against a set of criteria to
50 provide assurance that the data are acceptable for their intended use.
51 Validation methods may include review of verification activities, editing,
52 screening, cross-checking, or technical review.

1 Verification: For the purposes of closure activities, verification refers to
2 the process of determining whether procedures, processes, data, or
3 documentation conform to specified requirements. Verification activities may
4 include inspections, audits, surveillances, or technical review.

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PART A

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III. PROCESSES (continued)

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESS (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

S01, T04

The 105-DR Large Sodium Fire Facility is a research laboratory located in the 105-DR building in the 100-D Area of the Hanford Site. The facility is used to conduct experiments for studying the behavior of molten alkali metals and alkali metal fires. This facility is also used for the treatment of alkali metal dangerous wastes. Treatment consists of heating the waste to the point of oxidation. Up to 100 liters per day of dangerous wastes can be treated in the facility in a system equipped with an off-gas system. The 105-DR facility is also used to store up to 20,000 liters of dangerous wastes.

IV. DESCRIPTION OF DANGEROUS WASTES

- A. **DANGEROUS WASTE NUMBER** — Enter the four digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.
- B. **ESTIMATED ANNUAL QUANTITY** — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.
- C. **UNIT OF MEASURE** — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed dangerous wastes: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of the IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER — Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

EXAMPLE FOR COMPLETING SECTION IV (shown in line numbers X-1, X-2, X-3, and X-4 below) — A facility will treat and dispose of an estimated 900 pounds per year of chrome sludge from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. DANGEROUS WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES	
				1. PROCESS CODES (enter)	2. PROCESS DESCRIPTION (If a code is not entered in D(1))
X-1	K 0 5 4	900	P	T 0 3 D 8 0	
X-2	D 0 0 2	400	P	T 0 3 D 8 0	
X-3	D 0 0 1	100	P	T 0 3 D 8 0	
X-4	D 0 0 2			T 0 3 D 8 0	included with above

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Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 20 wastes to list.

IV. DESCRIPTION OF DANGEROUS WASTES (continued)										
L I N E N O .	A. DANGEROUS WASTE NO. (owner code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEA- SURE (owner code)	D. PROCESSES						
				1. PROCESS CODES (owner)				2. PROCESS DESCRIPTION (If a code is not entered in D(1))		
	LD. NUMBER (enter from page 1)									
	W A 7 8 9 0 0 0 8 9 6 7									
1	0 0 0 3	20,000	K	S	0	1	T	0	4	Thermal treatment
2										
3										
4										
5										
6										
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IV. DESCRIPTION OF DANGEROUS WASTES (continued)

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM SECTION D(1) ON PAGE 3.

The 105-DR Large Sodium Fire Facility is used for the treatment and storage of alkali metal wastes. These wastes consists of sodium, lithium, and sodium-potassium alloy. Approximately 20,000 kilograms are managed at this facility each year. These wastes are not radioactive.

V. FACILITY DRAWING

All existing facilities must include in the specs provided on page 5 a scale drawing of the facility (see instructions for more details).

VI. PHOTOGRAPHS

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more details).

VII. FACILITY GEOGRAPHIC LOCATION *This information appears on the attached drawing and photograph

LATITUDE (degrees, minutes, & seconds)

LONGITUDE (degrees, minutes, & seconds)

VIII. FACILITY OWNER

A. If the facility owner is also the facility operator as listed in Section VI on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VI on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER

2. PHONE NO. (area code & no.)

3. STREET OR P.O. BOX

4. CITY OR TOWN

5. ST.

6. ZIP CODE

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME (print or type) Michael J. Lawrence Manager, Richland Operations United States Department of Energy	SIGNATURE <i>Michael J. Lawrence</i>	DATE SIGNED November 16, 1987
---	---	----------------------------------

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME (print or type) SEE ATTACHMENT	SIGNATURE	DATE SIGNED
--	-----------	-------------

935023722

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

Michael J. Lawrence

Michael J. Lawrence
Manager, Richland Operations
United States Department of Energy

11-16-87

Date

W.M. Jacobi

William M. Jacobi
President
Westinghouse Hanford Company

11/16/87

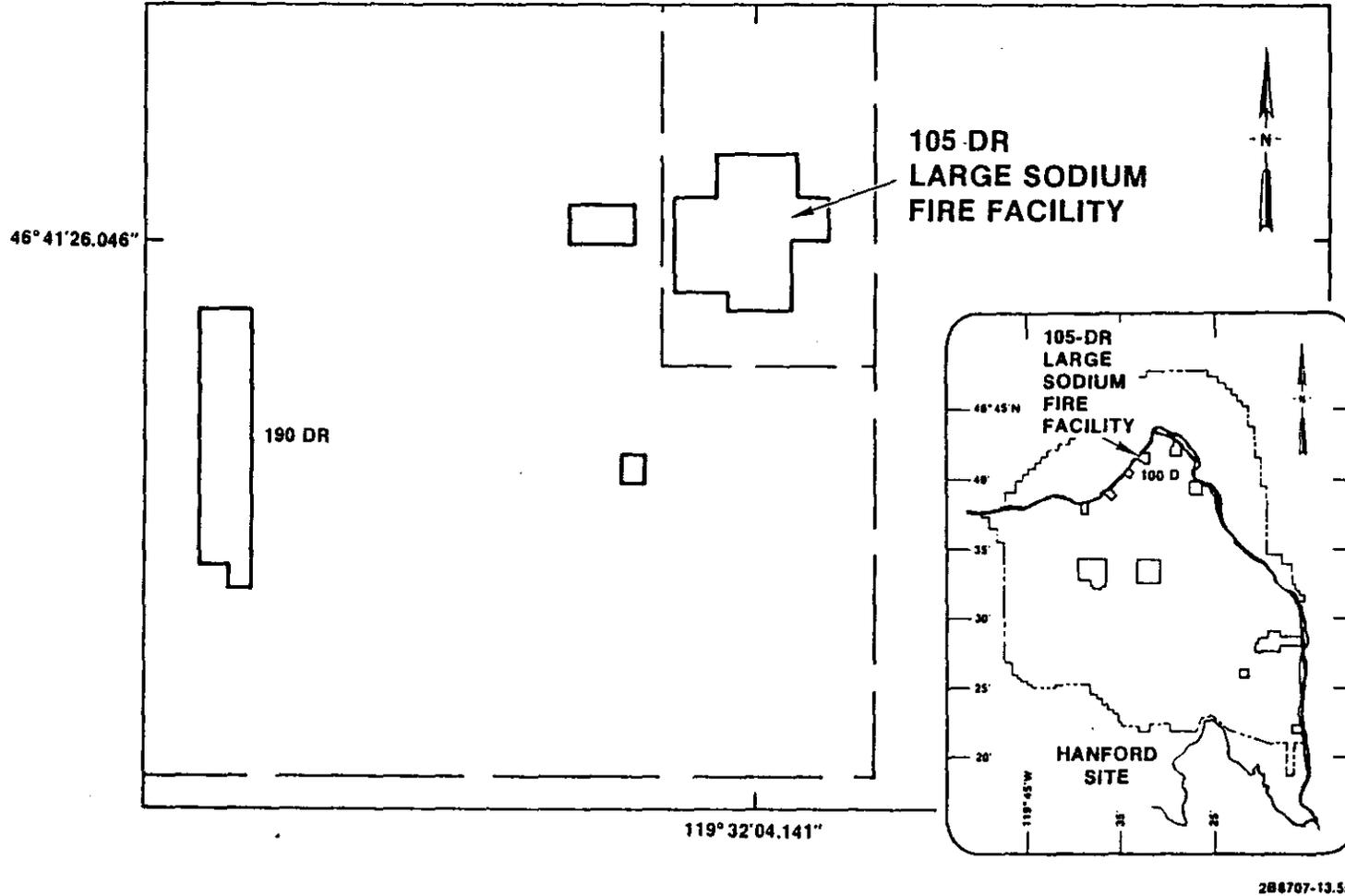
Date

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105-DR/100-D AREA LARGE SODIUM FIRE FACILITY

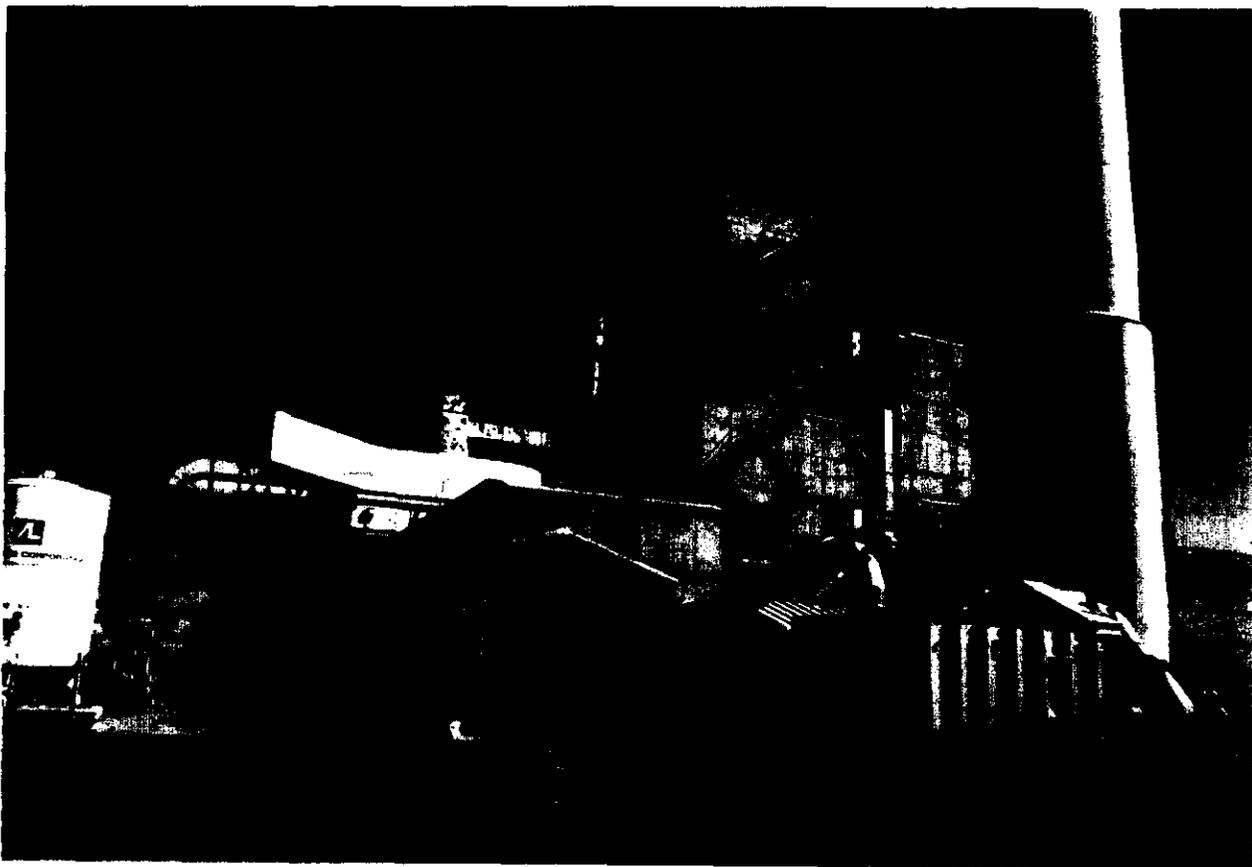
WA7890008967



DOE/RL 8
105-DR Facility
Rev. 2, 11/16/8,
Page 6 of 6

LARGE SODIUM FIRE FACILITY 105-DR/100-DR AREA

93130.31725



46°41'26.046"
119°32'04.141"

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(PHOTO TAKEN 1985)

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1.0 INTRODUCTION

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3
4 The Hanford Site, located northwest of the city of Richland, Washington,
5 houses reactors, chemical-separation systems, and related facilities used for
6 the production of special nuclear materials, and activities associated with
7 nuclear energy development. The 105-DR Large Sodium Fire Facility (LSFF),
8 which was in operation from about 1972 to 1986, was a research laboratory that
9 occupied the former ventilation supply room on the southwest side of the
10 105-DR Reactor facility. The LSFF was established to provide a means of
11 investigating fire and safety aspects associated with large sodium or other
12 metal alkali fires in the liquid metal fast breeder reactor (LMFBR)
13 facilities. The 105-DR Reactor facility was designed and built in the 1950's
14 and is located in the 100-D Area of the Hanford Site. The building housed the
15 105-DR defense reactor, which was shut down in 1964.

16
17 The LSFF was initially used only for engineering-scale alkali metal
18 reaction studies. In addition, the Fusion Safety Support Studies program
19 sponsored intermediate-size safety reaction tests in the LSFF with lithium and
20 lithium lead compounds. The facility has also been used to store and treat
21 alkali metal waste, therefore the LSFF is subject to the regulatory
22 requirements for the storage and treatment of dangerous waste. Closure will
23 be conducted pursuant to the requirements of the Washington Administrative
24 Code (WAC) 173-303-610.

25
26 This closure plan presents a description of the facility, the history of
27 waste managed, and the procedures that will be followed to close the LSFF as
28 an Alkali Metal Treatment Facility. No future use of the LSFF is expected.
29 The LSFF is located within the 100-DR-2 (source) and 100-HR-3 (groundwater)
30 operable units as designated in the *Hanford Federal Facility Agreement and*
31 *Consent Order* (Ecology et al. 1992) referred to as the Tri-Party Agreement.
32 These operable units will be addressed through the *Resource Conservation and*
33 *Recovery Act of 1976* (RCRA) facility investigation/corrective measures study
34 (RFI/CMS) process. The 100-DR-2 operable unit is expected to begin
35 Geophysical work in fiscal year (FY) 1993; characterization work at
36 100-HR-3 began in FY 1991 and is expected to continue through FY 1993.

37
38 Consistent with the Tri-Party Agreement (Ecology et al. 1992, p. 6-4),
39 once any dangerous waste associated with the LSFF is removed, the entire
40 reactor will remain for future decontamination and decommissioning as
41 discussed in the *Decommissioning of Eight Surplus Production Reactors at the*
42 *Hanford Site, Richland, Washington, Environmental Impact Statement* (EIS)
43 (DOE 1992, pp 1.7 through 1.13).

44
45 Any remedial action with respect to contaminants either not associated
46 with the LSFF or associated with the LSFF but not cleaned to action levels
47 under this closure plan will be deferred to the reactor decommissioning EIS
48 record of decision (ROD) or the RFI/CMS process.
49

1 **1.1 PERMITTING HISTORY**
2

3 As a result of storage and treatment of dangerous waste, RCRA Part A and
4 Part B (Alkali Metal Treatment and Storage Facilities) permit applications
5 were submitted to the Washington State Department of Ecology (Ecology) in
6 November 1985. Revision 2 of the Part A permit application was submitted in
7 November 1987. The Part A permit application was submitted under the single
8 Dangerous Waste Permit Identification Number, WA7890008967, issued to the
9 Hanford Facility by the U.S. Environmental Protection Agency (EPA) and
10 Ecology. The Part A permit application designates the LSFF as a thermal
11 treatment facility, subject to RCRA regulations for treatment, storage, and/or
12 disposal (TSD) units. This initial closure plan is being submitted to provide
13 site characterization information and a closure strategy for the LSFF.
14
15

16 **1.2 105-DR LARGE SODIUM FIRE FACILITY CLOSURE PLAN CONTENTS**
17

18 The LSFF closure plan consists of nine chapters.
19

- 20 • Introduction (Chapter 1.0)
- 21 • Facility Description (Chapter 2.0)
- 22 • Process Information (Chapter 3.0)
- 23 • Waste Characteristics (Chapter 4.0)
- 24 • Groundwater Monitoring (Chapter 5.0)
- 25 • Closure Performance Standards (Chapter 6.0)
- 26 • Closure Activities (Chapter 7.0)
- 27 • Postclosure Plan (Chapter 8.0)
- 28 • References (Chapter 9.0)

29 A brief description of each chapter is provided in the following
30 sections.
31

32
33
34 **1.2.1 Facility Description (Chapter 2.0)**
35

36 This chapter provides a brief description of the Hanford Site and the
37 location and description of the LSFF. Information on Hanford Site security
38 also is provided.
39

40
41 **1.2.2 Process Information (Chapter 3.0)**
42

43 This chapter describes how the LSFF processed material and explains the
44 overall waste treatment system.
45

46
47 **1.2.3 Waste Characteristics (Chapter 4.0)**
48

49 This chapter discusses the waste inventory and the characteristics of the
50 waste that was treated at the LSFF.
51
52

1 **1.2.4 Groundwater Monitoring (Chapter 5.0)**
2

3 This chapter indicates groundwater will not be included in this closure
4 plan.
5

6
7 **1.2.5 Closure Performance Standards (Chapter 6.0)**
8

9 This chapter discusses the closure strategy, performance standards for
10 protection of health and the environment, and closure activities.
11

12
13 **1.2.6 Closure Activities (Chapter 7.0)**
14

15 This chapter discusses sampling and analysis activities for closure.
16 A closure schedule and a certification are included.
17

18
19 **1.2.7 Postclosure Plan (Chapter 8.0)**
20

21 This chapter outlines provisions for postclosure care if required.
22

23
24 **1.2.8 References (Chapter 9.0)**
25

26 References used throughout this closure plan are listed in this chapter.
27 All references listed here, which are not available from other sources, will
28 be made available for review, upon request, to any regulatory agency or public
29 commentor. References can be obtained by contacting the following.
30

31 Administrative Records Specialist
32 Public Access Room H6-08
33 Westinghouse Hanford Company
34 P.O. Box 1970
35 Richland, Washington 99352
36

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2.0 FACILITY DESCRIPTION

2.1 GENERAL HANFORD SITE DESCRIPTION

In early 1943, the U.S. Army Corps of Engineers selected the Hanford Site as the location for reactor and chemical-separation facilities for the production and purification of plutonium. The Hanford Site (Figure 2-1) is a 560-square miles tract of semiarid land that is owned by the U.S. Government and operated by the U.S. Department of Energy (DOE).

2.2 FACILITY DESCRIPTION AND OPERATIONS

The 105-DR Reactor facility was designed and built in the 1950's and is located in the 100-D Area of the Hanford Site, as shown in Figures 2-1 and 2-2. A schematic of the 105-DR Reactor building (including the LSFF) is shown in Figure 2-3. The 105-DR Reactor building is a nonairtight industrial structure built of reinforced concrete in the lower portions and concrete block in the upper portions. The roof is constructed of reinforced concrete or precast concrete roof tile, depending on the specific roof area. The LSFF occupies the former supply fan room of the reactor, and covers approximately 15,000 square feet (1,400 square meters) of floor space.

Alkali metal tests were conducted in three different rooms: the large fire room, the small fire room, and the exhaust fan room (Figure 2-3). Each room is 20.5 feet (6.2 meters) wide, 27 feet (8.2 meters) long, and 21 feet (6.4 meters) high. The large fire room houses the Large Test Cell, which is a steel cubicle 3,743 square feet (106 square meters) in area. There are two 10-inch (25-centimeter) square, 1/4-inch (0.6-centimeter) thick Pyrex glass observation windows located in the large fire room doors. These windows are protected by the use of safety glass.

The small fire room contains one steel cylindrical pressure vessel with a dished top. This vessel has a volume of approximately 498 square feet (14 square meters), and is pressure rated at 138 pounds per square inch (9.70 kilograms per square centimeters), absolute. Both the Large Test Cell and the pressure vessel in the small fire room could be purged with nitrogen or argon to maintain a controlled atmosphere.

In the exhaust fan room, alkali metal reactions were conducted at atmospheric pressure. Waste alkali metals from various sources, including residuals from tests, failed equipment and drum heels, were reacted in the exhaust fan room. The burn pans and equipment were cleaned periodically, using water as the cleaning solution. The rinsate from cleaning was collected in the sump. The liquid effluent from the cleaning operations was drained to the sump, which is a 22-inch (56-centimeter) deep catch basin with an 18 inch by 18 inch (46 centimeter by 46 centimeter) opening fed by a trough 10 feet (3 meters) long, 7 inches (18 centimeters) deep, and 9 inches (23 centimeters)

*Pyrex is a trademark of Corning Glass Works.

1 wide (see lower right portion of Appendix D, Figure D-2). During unit
2 operations, a sump pump was placed in the sump and the wash water was pumped
3 through a hose into the sloped tunnel area that drains directly to the seal
4 pit. The pH of the rinsate was monitored and neutralized to a pH of less than
5 12.5 before it was discharged to the 116-DR-8 Crib (Figure 2-3). The
6 collected liquid was neutralized with acetic acid in the 1970's; in the 1980's
7 the pH of the liquid rarely, if ever, exceeded 12 and, therefore,
8 neutralization was usually not necessary.
9

10 Adjacent to the large fire room is the sodium handling room that serviced
11 the large fire room with a 3,400-liter (900-gallon) Type-304 stainless-steel
12 sodium batch tank and drum melters. The tank was resupplied from sodium drums
13 that were heated to liquify the sodium, which was then discharged into the
14 batch tank with inert gas. Other rooms provided space for office work and
15 storage of nondangerous material. Storage areas contained primarily new
16 materials including stainless steel tubing, small-diameter piping made of
17 stainless and carbon steel, electrical supplies (wiring, extension cords,
18 heaters, etc.), new process equipment, fans, blowers, metal sheeting, new
19 light bulbs, lighting equipment, portable lights, new containers, various fire
20 extinguishing materials, lubricating grease, and lubricating oil. The office
21 area contained only papers, operating records, a few tools, and some small
22 portable monitoring instruments.
23

24 The LSFF was equipped with an offgas treatment system that served the
25 test vessels and the exhaust fan room. The overall exhaust system is shown in
26 Figure 2-3. The exhaust route travels from the lower tunnel through the upper
27 tunnel to underground concrete tunnels via a 10-inch (25-centimeter) duct with
28 a 10,000-cubic feet per minute blower and test filters. Steel barricades at
29 the north end of the tunnels block air flow to and from the reactor. The
30 system consists of a 100,000-cubic feet (2,800 cubic meters) per minute
31 capacity filter building, a gravel bed exhaust scrubber (120-gallon per
32 minute), high-efficiency particulate air (HEPA) filters, and a 200-foot
33 (60-meter) stack [9-foot, 6-inch (2.7-meter) internal diameter] located next
34 to the 105-DR Building (Figures 2-3 through 2-5). Test room ventilation rates
35 were 0 to 10,000-cubic feet (280-cubic meters) per minute. Only the submerged
36 gravel bed exhaust scrubber and the ducts connecting the LSFF and the scrubber
37 were constructed for the LSFF.
38

39 The 117-DR Filter Building (Figure 2-5) houses the exhaust air filters,
40 while the exhaust air tunnel just upstream from the filter building contains
41 the smoke scrubber. The building is about 59 feet (18 meters) long, 39 feet
42 (12 meters) wide, and 35 feet (11 meters) high. The scrubber circulating pump
43 and the waste discharge pump are located in the filter building. The
44 117-DR Filter Building is below-grade and constructed from reinforced
45 concrete. The Filter Building is located about 100 feet (30 meters) from the
46 105-DR exhaust duct system and the 116-DR exhaust stack and is connected by
47 underground concrete ductwork. The filter building contains the HEPA filters,
48 which are installed in four filter frames (24 filters per frame) with two
49 frames in Cell A and two frames in Cell B.
50

51 In 1972, the original HEPA filters were replaced before LSFF operations
52 began. From 1972 to 1982, the exhaust traveled from the LSFF through

1 underground 7-foot by 7-foot (2-meter by 2-meter) concrete tunnels
2 (Figure 2-5) to a spray scrubber and the HEPA filters before exiting through
3 the stack. As part of a filter development program in 1982, a submerged
4 gravel scrubber was added (instead of the underground HEPA filters) to vent
5 the exhaust. As a result of the new gravel scrubber construction, at the
6 completion of tests or waste burning, the 117-DR HEPA filter building can be
7 bypassed. The scrubber water effluent pH level was confirmed to be between
8 2.0 and 12.5 before discharge to the 116-DR-8 Crib. The exhaust system now
9 allows the use of either the HEPA filter system and ventilation scrubber or
10 the submerged water scrubber, but not both.

11
12 About 5,000 gallons (19,000 liters) of sodium, weighing 39,000 pounds
13 (18,000 kilograms), that was procured for testing construction materials is
14 stored in a tank housed in a locked metal building (1720-DR) near the LSFF.
15 The sodium and sodium tank have never been used in the LSFF. This sodium will
16 be removed through a project separate from the closure plan.

17
18 Miscellaneous alkali metal handling equipment used to facilitate the
19 testing program included sodium test spill tanks with capacities of
20 900 gallons (3,400 liters) at a maximum holding temperature of 1200 °F
21 (650 °C), 10 gallons (38 liters) at a maximum holding temperature of 1600 °F
22 (870 °C), and 55 gallons (210 liters) at a maximum holding temperature of
23 400 °F (200 °C). The early spill tanks were made from thick carbon steel
24 piping, and the later tanks from stainless steel. These tanks were completely
25 airtight, so there was no possibility for alkali metal to escape into the work
26 rooms. Sodium test spill rates are up to 300 gallons (1,100 liters) per
27 minute, while lithium test spill rates are up to 5 gallons (20 liters) per
28 minute.

29
30 Testing area capabilities for the LSFF included the following:

- 31 • Alkali metal spills up to 5,000 pounds (2,000 kilograms) at 1600 °F
32 (870 °C) and up to 300 square foot (28 square meters) of pool
33 surface
- 34 • Demonstration of various fire extinguishing concepts
- 35 • Study of small- and large-scale effects of chemical reactivity of
36 alkali metals under accidental spill conditions
- 37 • Sodium-concrete reaction tests
- 38 • Cell liner test design
- 39 • Post-accident cleanup development
- 40 • Lithium fire and reaction testing.

41
42 The Part A permit application allowed for the treatment and storage of up
43 to 5,300 gallons (20,000 liters) of nonradioactive sodium, lithium, and
44 sodium-potassium metal waste each year. The Part A permit described the
45 treatment of up to 26 gallons (100 liters) per day of alkali metal dangerous
46
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50
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52

1 waste. Treatment consisted of heating the waste to the point of oxidation in
2 the exhaust fan room. Emissions were then routed to an off-gas treatment
3 system. The facility was used to treat alkali metal waste as needed during
4 the operation of the testing program from 1972 to 1986.

5 6 7 **2.3 SECURITY INFORMATION**

8
9 The following sections describe the 24-hour surveillance system, warning
10 signs, and barriers used to provide security and controlled access to the
11 Hanford Facility.

12
13 The entire Hanford Facility is a controlled access area. The Hanford
14 Facility maintains around-the-clock surveillance for protection of government
15 property, classified information, and special nuclear materials. The Hanford
16 Patrol maintains a continuous presence of armed guards to provide additional
17 security.

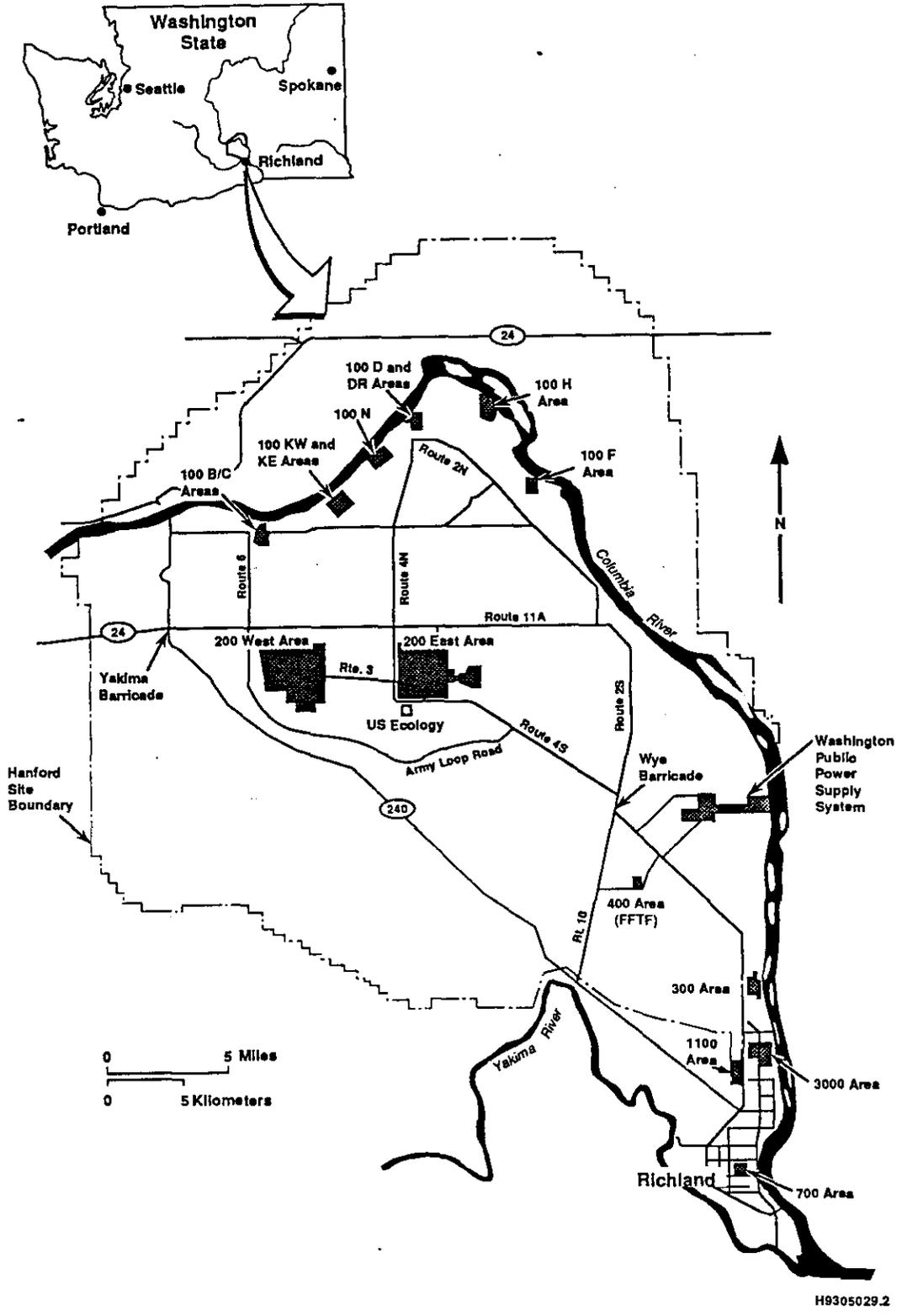
18
19 Manned barricades are maintained around the clock at checkpoints on
20 vehicular access roads leading to these areas (Yakima and Wye Barricades,
21 Figure 2-1). All personnel accessing the Hanford Site areas must have a
22 U.S. Department of Energy-issued security identification badge indicating the
23 appropriate authorization. Personnel also might be subject to a random search
24 of items carried into or out of the Hanford Site.

25
26 Signs are, or will be, posted at area boundaries within the Hanford Site
27 stating "NO TRESPASSING. SECURITY BADGES REQUIRED BEYOND THIS POINT.
28 VEHICLES ONLY. PUBLIC ACCESS PROHIBITED" (or an equivalent legend).

29
30 In addition, warning signs stating "DANGER--UNAUTHORIZED PERSONNEL KEEP
31 OUT" (or an equivalent legend) are, or will be, posed at TSD units within the
32 Hanford Facility. These signs are, or will be, written in English, legible
33 from a distance of 25 feet (7.6 meters), and visible from all angles of
34 approach.

35
36 LSFF is locked around the clock and only authorized plant operations
37 personnel have access. A 30-inch (76-centimeter)-thick concrete wall
38 separates the front face work area of the 105-DR Reactor from the nearest
39 portion of the LSFF and sodium handling room. A 5-foot (1.5-meter)-wide by
40 8-foot (2.4-meter)-high doorway through this wall is closed by an existing
41 locked steel door and a new wall of 8-inch (20-centimeter) concrete blocks.
42 Two other entries to the reactor portion of 105-DR have been sealed by
43 concrete blocks. One entry area through steel panels is sealed by a steel
44 plate welded over the opening.

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Figure 2-1. Hanford Site.

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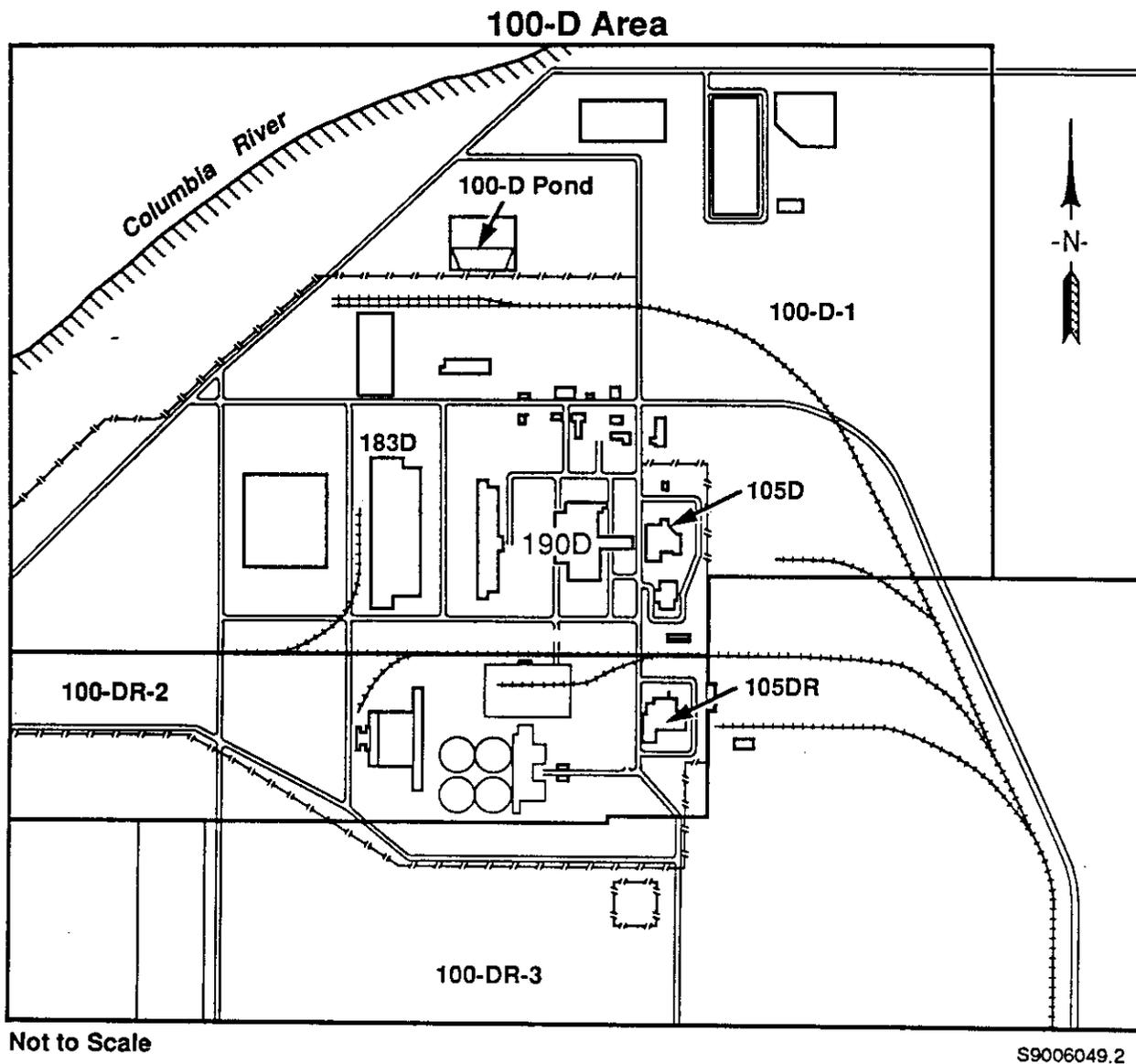
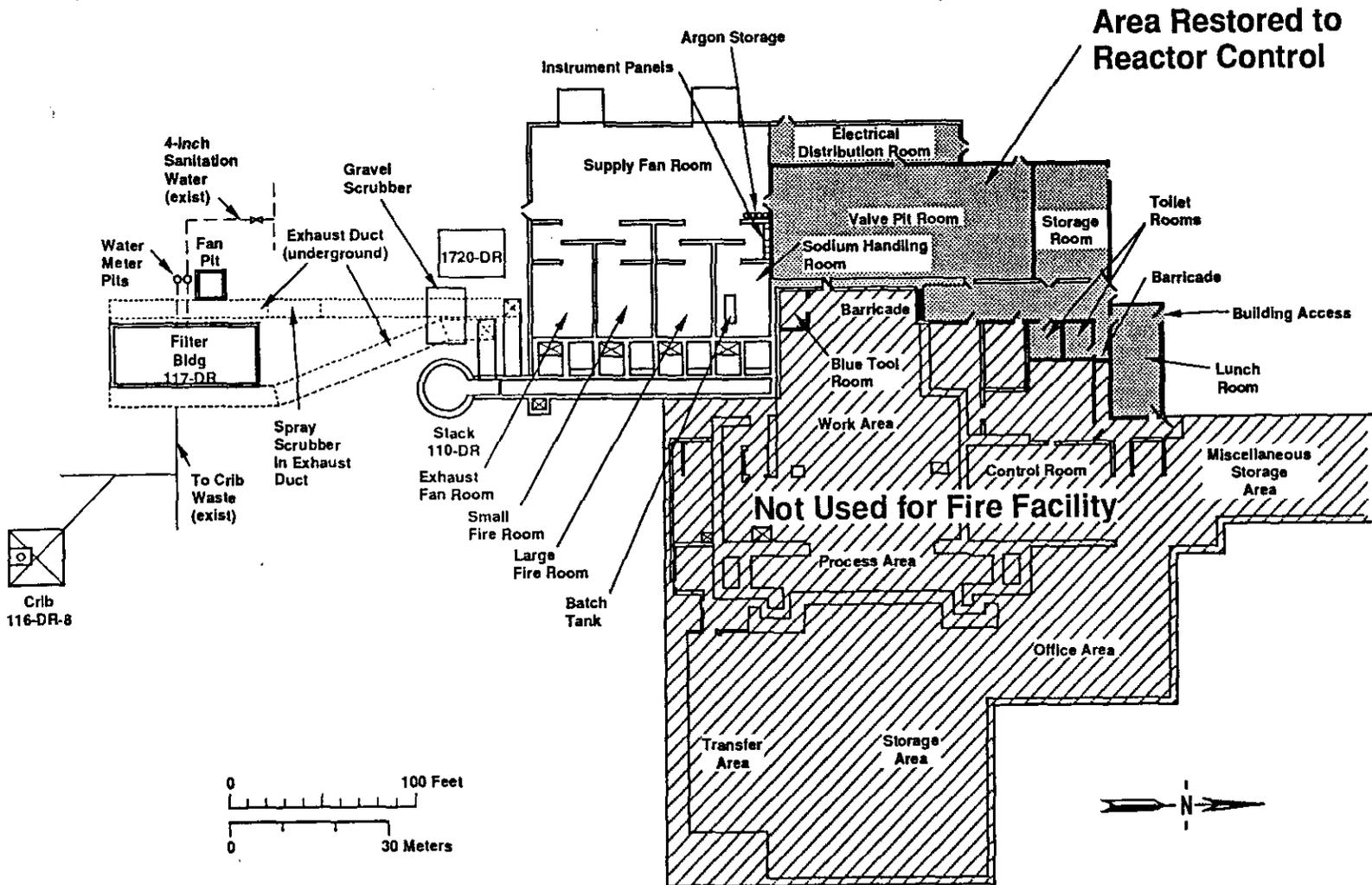


Figure 2-2. The 100-D Area of the Hanford Site.

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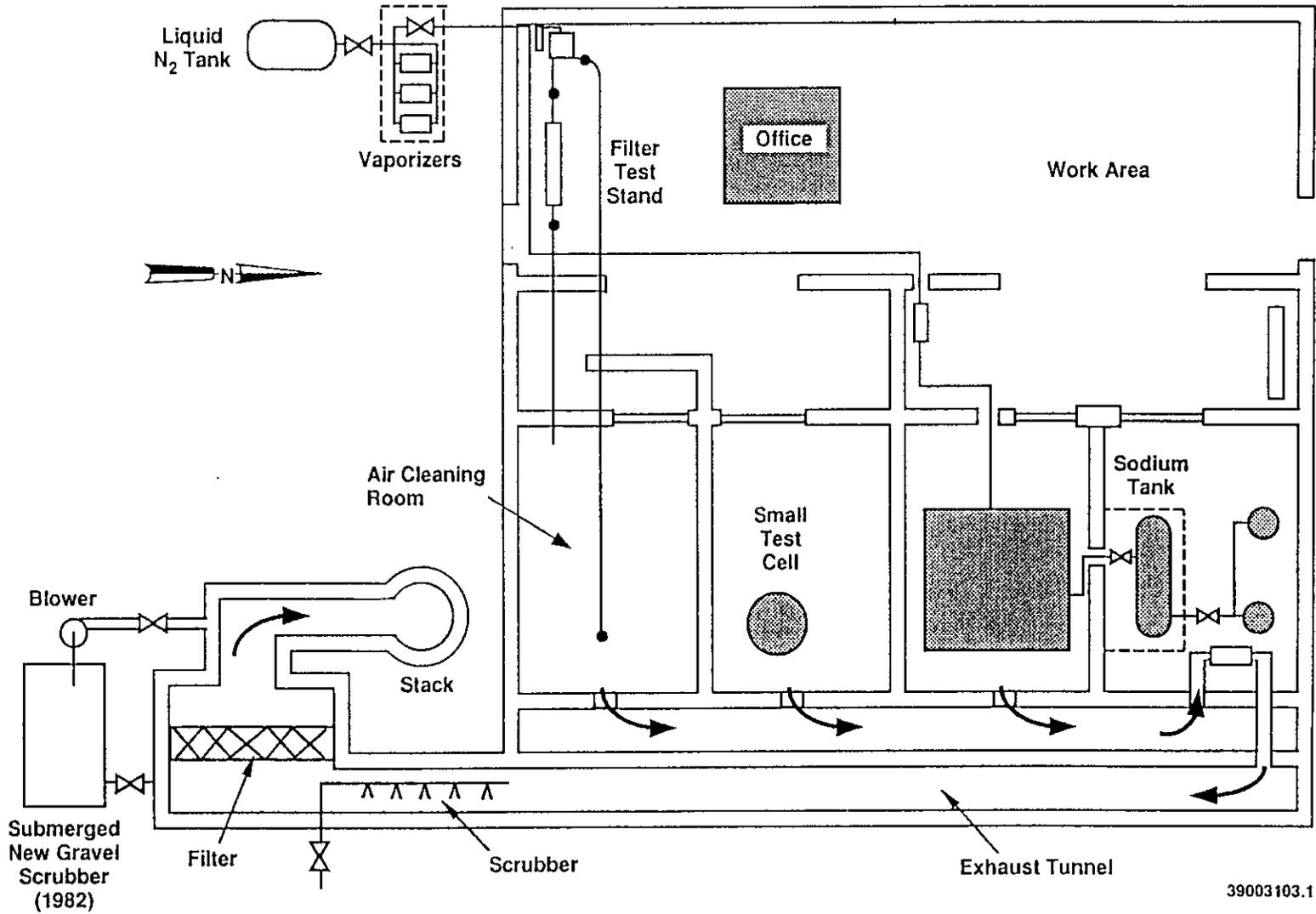
Figure 2-3. A Schematic of 105-DR Reactor Building Including the Large Sodium Fire Facility.



F2-3

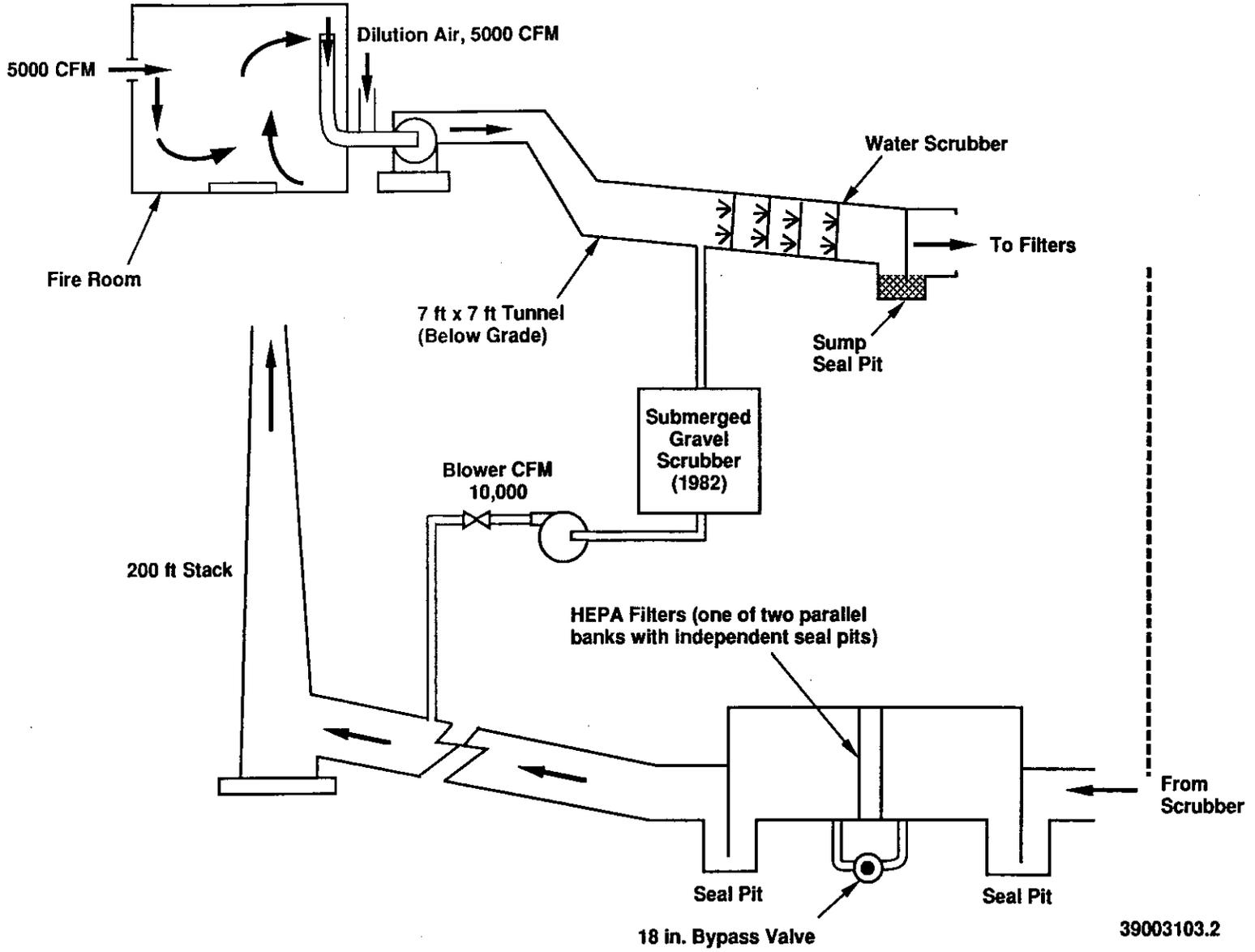
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Figure 2-4. A Schematic of the Overall Large Sodium Fire Facility Exhaust System.



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1 Figure 2-5. A Schematic of the 117-DR Filter Building Exhaust System.



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3.0 PROCESS INFORMATION 3-1

TABLE

3-1. Radioactivity in Waste Samples T3-1

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3.0 PROCESS INFORMATION

The LSFF has been used primarily to conduct experiments for studying the behavior of molten alkali metals, sodium and lithium, and alkali metal fires. The waste generated at the facility includes alkali metal oxides, hydroxides, silicates, and carbonates, and residual alkali metal waste [RCRA Part B Permit Application, Alkali Metal Treatment and Storage Facilities, D-2, 1985 (DOE 1985)] associated with the tests. The sodium carbonate was formed from the reaction of the oxides and hydroxides with air. Similarly, both purchased and waste lithium also were burned at the site, producing lithium carbonate, oxide, hydroxide, and silicate as aerosol by-products.

The laboratory tests conducted at the LSFF can be grouped into the following general types by the test purpose as follows:

- Formation of alkali metal aerosols in air, steam, nitrogen, or carbon dioxide atmospheres for the purpose of determining aerosol properties and release ratios, using both pool and spray fires
- Reaction of an alkali metal with concrete and insulation (Kaylo^{*} heat insulation and Super-X block^{**} insulation, both fiberglass) to study corrosion rates and to determine the reaction products formed
- Generation of aerosols to be used for testing and measurement of air-cleaning filter and scrubber performance and for evaluating hydrogen ignition characteristics
- Production of fire and smoke to test alkali metal fire extinguishing methods and equipment, testing of protective equipment, and for training in equipment use
- Testing of purchased lithium-lead alloy reaction rates and aerosol formation in various atmospheres
- Development tests using cesium and zinc metal to demonstrate aerosol generation techniques
- Thermal treatment of sodium residue (sodium waste) generated in other facilities.

The lithium-lead alloy was tested by its reaction with air and steam (not by burning) in the small fire room (Jeppson 1978). In these tests, the surface lithium converted to a gray coating of lithium carbonate (air reaction) and lithium hydroxide (water reaction). The reactions were limited because less than stoichiometric amounts of steam were used in the tests. The dangerous waste shipment records indicate that the lithium-lead alloy was

*Kaylo is a trademark of Owens Corning.

**Super-X block is a trademark of John Mansfield.

1 disposed of in two 440 pound (200 kilogram) masses and placed in steel drums
2 and sent for offsite disposal through the 340 Facility, which was the central
3 waste accumulation area for the operating contractor. In 1986, the test
4 equipment for the lithium-lead test was relocated to the 221-T Facility, where
5 the testing program continued.
6

7 A secondary mission of the LSFF was to burn alkali metal waste generated
8 at the LSFF, the 221-T Containment Systems Test Facility, and 300 Area sodium
9 and lithium facilities. When the LSFF was being used to treat alkali metal
10 waste, the waste was burned until the reaction was not sustainable. The
11 residues were then reacted with water. The waste products from this process
12 were also alkali metal oxides, hydroxides, and carbonates. None of the waste
13 treated in the facility was radioactive.
14

15 Only the exhaust fan room was used to burn waste sodium and lithium. The
16 exhaust fan room and small fire room were both used for the metal reaction
17 tests. The sodium handling room was used for mixing and transferring sodium
18 for the tests. The large fire room was used for burning sodium associated
19 with the testing program.
20

21 While burning, waste metal was stirred to ensure a complete burn, and the
22 scrubber system controls were monitored. At the completion of a burn, the
23 equipment was checked for unburned metal, washed down, and inspected again to
24 ensure that no residual unreacted metal remained (DOE 1985, pp D-20 and F-11).
25 Wash water from the cleanup was monitored for corrosivity (kept below a pH
26 level of 12.5) and collected in the sump. The sump was pumped via a sump pump
27 and hose to the tunnel bed which drains directly to the seal pit. The water
28 was collected in the seal pit, monitored for pH, neutralized if needed, and
29 then pumped from the seal pit to the 116-DR-8 Crib.
30

31 In 1987, samples of the residues were collected from the lower exhaust
32 tunnel wall and analyzed. Locations of the sampling points are shown in
33 Appendix A. While the sample results for lithium and carbonates were
34 expected, the lead content in some of the samples was high (the highest, from
35 a concrete scraping, was 1,300 parts per million). The lithium-lead alloy was
36 reacted in the small fire room; inside a closed containment pressure vessel.
37 The lead content in the samples from different locations [low content in the
38 small fire room; higher content in the exhaust fan room upwind of the tests;
39 very low content in the tunnel immediately downwind of the tests; and the
40 highest content in scrapings near the wall constructed between the tunnel and
41 rest of the reactor (see Appendix A)] indicates that the lead may be from a
42 lead-based primer used to paint the tunnel rather than associated with the
43 testing. The analysis performed also reflects total lead content and not the
44 results of an extraction procedure toxicity test. According to information
45 from former reactor workers currently employed in the surplus facilities
46 decommissioning program, the tunnels had been painted to minimize the
47 possibility of radioactivity penetrating into the porous concrete. Paints
48 used during that era (1947 to 1964) commonly contained lead. Thus, it can be
49 assumed that the high level of lead found in the concrete scrape sample is
50 from the lead-based paints used during reactor operations. No radioactivity
51 is expected in the work areas of the LSFF because there was no exchange of air
52 with the reactor. However, contaminated air was previously carried from the

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1 reactor, through the exhaust tunnels, through the underground 117-DR HEPA
2 filter building, and to the stack. When the reactor first began operations,
3 reactor exhaust went directly from the tunnels to the stack. The extent of
4 decontamination activity performed in the mid-1970's to support the
5 establishment of the LSFF is not known.
6

7 In 1987, four of the seven samples from the lower tunnel in the
8 105-DR Reactor tested for reaction by-products were also tested for
9 radioactivity (see Appendix A). Only one sample showed radioactivity above
10 detectable levels (Table 3-1).
11

12 The upper exhaust tunnel was not sampled in 1987 because of
13 inaccessibility.
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Table 3-1. Radioactivity in Waste Samples.

Sample	Alpha	Beta	Gamma		
			¹³⁷ Cs	⁶⁰ Co	¹⁵² Eu
2	< 6	330	70	50	48
4	<13	<30	<14		
6	<19	<47	<18		
7	<14	<35	<10		

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4.1 ESTIMATE OF MAXIMUM INVENTORY OF WASTE 4-1
4.2 WASTE STORED AT THE FACILITY 4-1

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4.0 WASTE CHARACTERISTICS

4.1 ESTIMATE OF MAXIMUM INVENTORY OF WASTE

The estimated maximum inventory (based on facility operating information) of sodium and lithium wastes stored at the 105-DR LSFF was approximately 1,000 pounds (450 kilograms) stored during December 1982 and January 1983.

4.2 WASTE STORED AT THE FACILITY

Sodium has been designated as a dangerous waste because of its ignitable and reactive characteristics. The sodium handled in the LSFF was either purchased for the tests or was waste from other Hanford Site operations. At least 95 percent of all the waste materials are residues of sodium, which is now sodium carbonate (see Appendix A for a partial analysis of waste). Approximately 4 percent of the waste is other alkali metal carbonates, including lithium carbonate, residual lithium nitride, and cesium carbonate. Approximately 1 percent or less are sodium and lithium silicates and miscellaneous materials described elsewhere in this chapter.

The material was treated by burning, which produces sodium oxide (Na_2O), sodium hydroxide (NaOH), and sodium carbonate (Na_2CO_3). Sodium oxide and hydroxide are strong alkalis, but readily absorb carbon dioxide from the atmosphere and convert to sodium carbonate. Sodium carbonate is typically called soda ash and is found naturally. Similarly, both purchased and waste lithium were also burned at the site, with lithium carbonate as the main final product. Lithium nitride was also produced, however, and records show that it was drummed and sent to the 340 Building (300 Area) for eventual disposal.

Two cesium and zinc aerosol tests were conducted at the LSFF in the Small Fire Room steel vessel. During these tests, a total of approximately 2 pounds (1 kilogram) of cesium metal and about 0.25 pounds (110 grams) of zinc metal were used; about half of the metal was consumed during the tests. Most of the test residues were collected and disposed of at that time. There have been two small cesium burns in the Exhaust Fan Room, but no zinc was involved in those tests. Compared with the other materials burned, the quantity of cesium released is very small, much less than 1 percent. Cesium is readily oxidized and any unreacted cesium is now an oxide and/or complexed with other materials, such as hydroxides and silicates, which would be codeposited with the sodium carbonate matrix. In the unlikely event that any zinc was released, it would also be codeposited within the sodium carbonate matrix.

Because the sodium and lithium burn tests were conducted on concrete (conventional and magnetite concrete), reaction by-products of the concrete constituents were also produced. The by-products of the reaction were silicon dioxide, sodium and lithium silicates, aluminum oxide, magnesium oxide, and iron oxides. Other trace inorganic compounds may also have been produced because of impurities in the concrete.

1 The lithium-lead alloy test was conducted only once. This test was
2 performed in the Small Fire Room inside the steel burn vessel. The waste has
3 been cleaned and removed.

4
5 The overwhelming majority of the residues, both sodium and lithium
6 carbonate, is characteristic category D (least toxic) dangerous waste. The
7 lethal dose (LD₅₀) for oral exposure to rats of sodium carbonate is
8 4,090 parts per million (see MSDS); for lithium carbonate, the same LD₅₀ is
9 525 parts per million. Compounds with LD₅₀s at concentrations of from 500 to
10 5,000 parts per million are category D dangerous waste as established by
11 WAC 173-303-101. Levels of lead in waste extract greater than 500 milligrams
12 per liter are considered to be an extremely hazardous waste (EHW); and levels
13 of lead from 5 to 500 milligrams per liter are considered to be a dangerous
14 waste (DW) (WAC 173-303-090). The MSDSs for lead, sodium carbonate, and
15 lithium carbonate have been included in Appendix C.

16
17 The LSFF ventilation tunnels contain mostly deposits of sodium carbonate
18 that formed from sodium oxides and hydroxides reacting with air. Other
19 deposits include lithium carbonate, lithium nitride, and sodium and lithium
20 silicates.
21

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5.0 GROUNDWATER 5-1

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Groundwater protection regulations established in WAC 173-303-645 only pertain to land treatment units (i.e., surface impoundments, waste piles, land treatment units, or landfills). Also, in accordance with the Tri-Party Agreement (Ecology et al. 1992), groundwater in the 100-D Area will be included in the 100-HR-3 operable unit and investigated under the RFI/CMS process. Therefore, groundwater is not included as part of the LSFF closure plan. The RFI/CMS draft work plan (DOE/RL 1989) is currently under review by Ecology.

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1 *Integrated Risk Information System* (IRIS) (EPA 1991), a database that
2 periodically is updated by the EPA. Health-based levels will be based on
3 values that are current at the time of approval of this closure plan.
4

5 Action levels will not be applied to contaminated equipment. Equipment
6 that has contacted LSFF dangerous waste will be decontaminated (Bracken 1991;
7 or other appropriate procedure) or disposed of in compliance with applicable
8 regulations.
9

10 11 6.1.2 Analytes of Concern

12
13 The principal analytes of concern for decisions of remediation are sodium
14 carbonate, alkali metal carbonates including lithium carbonate, residual
15 lithium nitride, and cesium carbonate. Approximately 1% or less are sodium
16 and lithium silicates and miscellaneous materials described later in this
17 section.
18

19 The test burns produced sodium oxide (Na_2O), sodium hydroxide (NaOH), and
20 sodium carbonate (Na_2CO_3). Lithium carbonate reaction by-products of the
21 concrete constituents were produced, including silicone dioxide, sodium and
22 lithium silicates, aluminum oxide, magnesium oxide, and iron oxides.
23

24 Analysis of lead, lithium, and sodium will be performed. Other Target
25 Analyte List (TAL) inorganics are listed in Table 6-1:
26

27 These analysis are discussed in Chapter 7.0, Section 7.3.
28

29 30 6.2 CLOSURE PERFORMANCE STANDARDS

31
32 Washington State Department of Ecology closure performance standards
33 [WAC 173-303-610 (2)(a)] require that the owner/operator close a facility in a
34 manner that does the following:
35

- 36 • Minimizes the need for further maintenance
- 37
- 38 • Controls, minimizes or eliminates, to the extent necessary to
39 protect human health and the environment, postclosure escape of
40 dangerous waste and dangerous constituents, leachate, contaminated
41 run-off, or dangerous waste decomposition products to the ground,
42 surface water, groundwater, or the atmosphere
- 43
- 44 • Returns the land to the appearance and use of surrounding land areas
45 to the degree possible given the nature of the previous dangerous
46 waste activity.
47

1 However, Federal Regulations in 40 CFR 265.381 ("Thermal Treatment
2 Facility Closure," p. 685) state the following:

3
4 "At closure, the owner or operator must remove all hazardous waste and
5 hazardous waste residues (including, but not limited to, ash) from the
6 thermal treatment process or equipment."
7

8 9 **6.2.1 Minimizing the Need for Future Maintenance**

10 The closure performance standard in WAC 173-303-610(2)(a)(i) requires the
11 owner or operator of a TSD unit to close the site in a manner that minimizes
12 the need for further maintenance. Closure of the LSFF by removing or
13 decontaminating equipment (to proposed action levels) and, as necessary, the
14 surrounding soils, will eliminate the need for further maintenance.
15 Regardless of closure actions associated with the LSFF, however, general
16 maintenance of the 105-DR Reactor structure will continue until final
17 decommissioning.
18

19 20 21 **6.2.2 Protection of Human Health and the Environment**

22 WAC 173-303-610(2)(a)(ii) requires a closure plan to provide for the
23 protection of human health and the environment. As discussed previously, the
24 LSFF will be closed by removing or decontaminating, to proposed action levels,
25 all dangerous waste and waste residues and any contaminated soils to protect
26 human health and the environment.
27

28 29 30 **6.2.3 Return of the Land to the Appearance and Use of Surrounding Land**

31 In accordance with WAC 173-303-610(2)(a)(iii), the owner or operator of a
32 TSD unit is required to close the unit in a manner that returns the land to
33 the appearance and use of surrounding land areas to the degree possible given
34 the nature of the previous dangerous waste activity. Following clean closure,
35 the 105-DR Reactor will have been restored to the condition of the other
36 closed production reactors of the same age (e.g., 105-H, 105-F, 105-C).
37
38

39 40 **6.2.4 Waste Alkali Metals**

41 No waste sodium or lithium remains at the site.
42

43 44 45 **6.2.5 Remaining Sodium**

46 About 5,000 gallons (19,000 liters) of sodium weighing 39,000 pounds
47 (18,000 kilograms) procured for tests of construction materials are stored in
48 a tank that is located in a locked metal building (1720-D) near the LSFF.
49 This sodium will be removed for other use or excessed for sale through a
50 project separate from this closure plan.
51

1 **6.2.6 Other Materials**

2
3 Other materials associated with the LSFF and remaining on the site are
4 electrical equipment (mostly wires and conduit, but no transformers or
5 polychlorinated biphenyls), burn pans from sodium fires, metal burn cells, and
6 an empty liquid nitrogen tank (vendor owned). These materials will be cleaned
7 as appropriate (see Chapter 7.0, Section 7.4.5) and disposed of as surplus
8 property or placed in the appropriate landfill.
9

10
11 **6.3 CLOSURE ACTIVITIES**

12
13 The LSFF will be closed in a manner consistent with Washington State
14 guidelines and regulations. The general closure procedures are shown in
15 Figure 6-1 and listed below (see Chapter 7.0 for complete explanation of
16 procedures).
17

18 The following closure activities will be implemented if the activities
19 are consistent with, and do not duplicate the efforts of, integrated
20 regulatory cleanup or stabilization of the 100-DR Area, including the LSFF as
21 follows:
22

- 23 • Sample the areas of the facility to:
 - 24 - Determine reaction by-product deposit composition
 - 25 - Determine if the source of previously detected lead contamination
 - 26 is from paint used to seal the reactor tunnel walls and not from
 - 27 LSFF waste treatment-related activities
 - 28 - Determine if all contamination has been removed (for soils, see
 - 29 Chapter 7.0, Section 7.3.1).
 - 30
- 31 • Decontaminate the structures as specified.
- 32 • Verify cleanup and certify that all closure activities were
- 33 completed in accordance with the approved plan.
34

35
36 All equipment used in performing closure activities will be
37 decontaminated or disposed of at a RCRA-compliant facility.
38

39
40 Closure activities will be monitored by an independent registered
41 professional engineer who will certify that closure activities are
42 accomplished in accordance with the specifications of the approved closure
43 plan. The certification will be sent by registered mail or an equivalent
44 delivery service.
45

46 Two official copies of this closure plan will be located at the following
47 office: U.S. Department of Energy, Richland Operations Office, Federal
48 Building, 825 Jadwin Avenue, P.O. Box 550, Richland, Washington 99352. The
49 DOE-RL will be responsible for amending this plan as amendments become
50 necessary, according to the amendment procedure identified in WAC 173-303-610.
51 The plan will be kept at DOE-RL until closure is completed and certified.
52

1 **6.4 COORDINATION WITH OTHER PROJECTS**

2
3 The LSFF is located within the 100-DR-2 (source) and 100-HR-3
4 (groundwater) operable units designated in the Tri-Party Agreement
5 (Ecology et al. 1992). These operable units will be addressed through the
6 RFI/CMS process. The 100-DR-2 operable unit is expected to begin geophysical
7 characterization work in FY 1993; the 100-HR-3 operable unit began
8 characterization work in FY 1991 and is expected to continue through FY 1993.
9

10 In addition, consistent with the Tri-Party Agreement (Ecology et al.
11 1992, page 6-4), once any dangerous waste associated with the LSFF is removed,
12 the entire reactor will remain for future decontamination and decommissioning
13 [also see the draft EIS for decommissioning eight surplus production reactors
14 (DOE-RL 1989, pp 1.7 through 1.13)].
15

16 Thus, remedial action with respect to contaminants not associated with
17 the LSFF, or associated with the LSFF and not covered under this closure plan,
18 will be deferred to the reactor decommissioning EIS (the 105-DR Reactor
19 building, stack, and 117-DR filter building) or the RCRA process
20 (116-DR-8 Crib and soil).
21

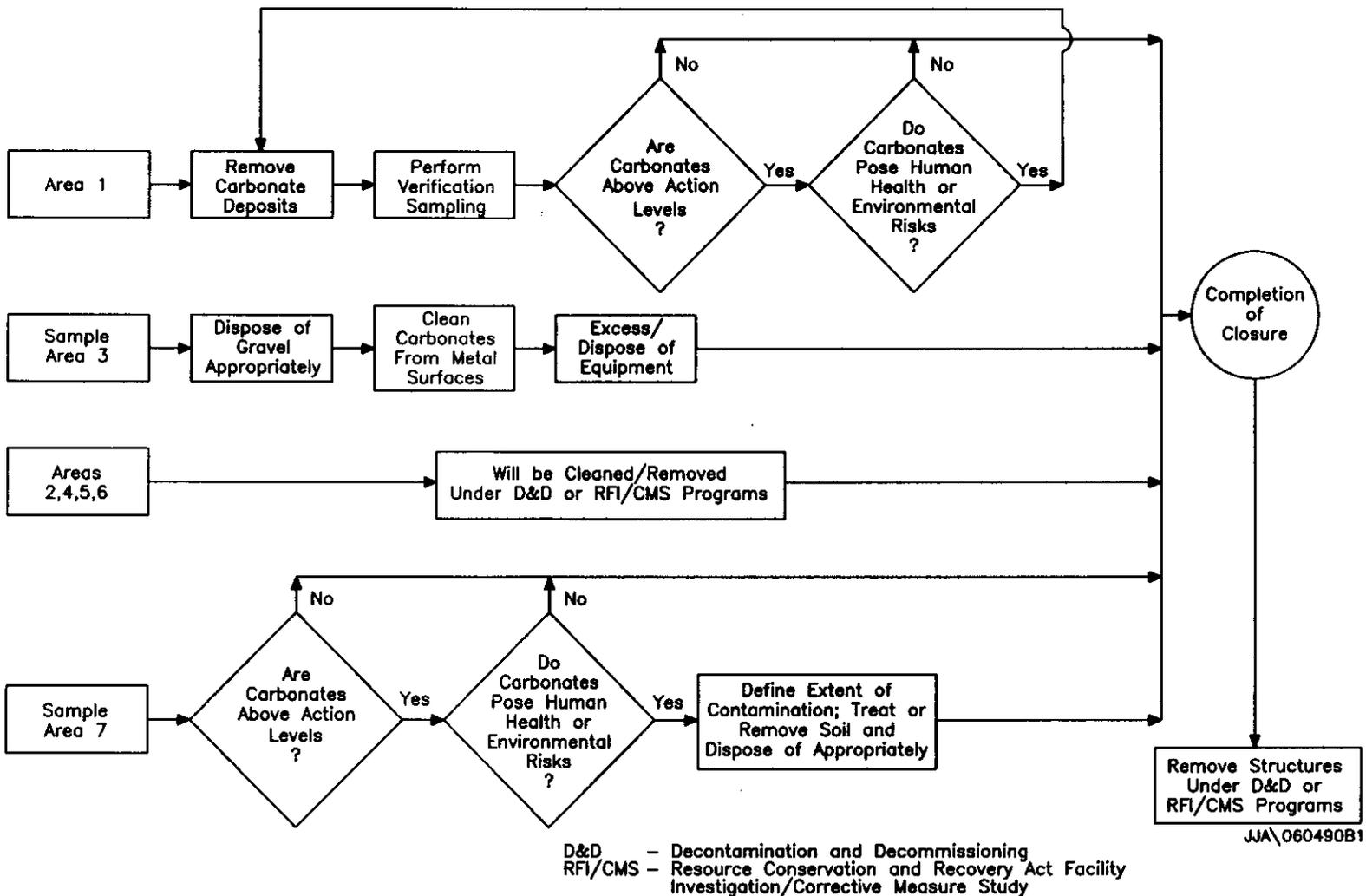
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1 Figure 6-1. Closure Flowchart for the 105-DR Large Sodium Fire Facility,
2 (see Section 7.3 for a Description of Areas 1 through 7).



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Table 6-1. Other Target Analyte List Inorganics to be Reported.

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Cesium	Thallium
Chromium	Vanadium
Cobalt	Zinc
Copper	Cyanide
Iron	

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7.0 CLOSURE ACTIVITIES

7.1 INTRODUCTION

The strategy for closure of the LSFF is clean closure. The following steps are needed to perform clean closure.

1. Clean or remove the structures and equipment as specified and dispose of residues in accordance with applicable regulations as determined by sampling.
2. Sample concrete walls to verify that the embedded carbonates are below dangerous waste levels.
3. Evaluate the data for QA/QC reliability and significant contamination levels in comparison with background data and/or action levels.
4. Conduct additional decontamination of LSFF, as required.
5. Certify that closure activities were completed in accordance with the approved closure plan.

7.2 REMOVAL OF DANGEROUS WASTE INVENTORY

No unreacted waste metals are now at the site. Removal of waste residues from the LSFF cleanup operations is described in Section 7.5.

7.3 FACILITY SAMPLING

This waste sampling and analysis plan has been prepared to evaluate contamination associated with the parts of the LSFF that treated (burned) waste sodium and lithium metals or that received residue from these burns. This plan is primarily based on the history of the processes associated with the LSFF (Chapters 2.0, 3.0, and 4.0).

The LSFF can be logically divided into seven areas according to use and deposition of reaction by-products; therefore, these areas will be considered separately. Separate sampling schemes will allow for more definitive data for determining what focused cleanup measures must be taken to ensure that the specific closure requirements are achieved in an efficient and cost-effective manner.

The seven areas of the LSFF are: the exhaust fan room, and two other fire rooms, sodium handling room, and offices (Area 1); the interior reactor exhaust tunnels (upper and lower), underground tunnel to the HEPA filter, and duct to gravel scrubber (Area 2); the gravel scrubber and downgradient duct

1 (Area 3); the HEPA filters and filter pit (Area 4); the reactor exhaust stack
2 (Area 5); the 116-DR-8 Crib (Area 6); and the soil between the LSFF entrance
3 and the filter pit (Area 7) (see Figure 2-4).
4

5 Areas 2, 4, and 5 are to be deferred to reactor decontamination and
6 decommissioning activities of the 105-DR Reactor. The tunnels, ducts, and
7 stack contained in these areas would be difficult to access in the safety
8 equipment necessary to work in these areas. Cleaning activities in these
9 areas would prevent a safety hazard and for these reasons will be deferred.
10 Area 6, the 116-DR-8 Crib, is part of the 100-DR-2 operable unit and the
11 100-HR-3 groundwater operable unit and will be remediated separately from
12 105-DR LSFF.
13

14 Before sampling begins, all areas will be surveyed for radioactivity
15 according to established procedures [Environmental Investigations Instructions
16 (EII) 2.3 (WHC 1988)]. See Section 7.3.6 for specific equipment and
17 procedures for dangerous waste sampling, and Table 7-2 for the location of
18 sampling points.
19

20 Area 1: Area 1 consists of the exhaust fan room, two fire rooms, the
21 sodium handling room, and an office area. The sump in the exhaust fan room
22 contains about 1 gallon (4 liters) of crusty powder and reaction by-products
23 from past burns. Old burn pans stored in this room still have residues.
24 A composite sample of the deposits in the burn pans and a sample of the
25 deposits in the sump will be taken and analyzed to determine the corrosivity
26 of the deposits and the concentrations of lithium, sodium, and lead. Target
27 analyte list inorganics will also be reported for use in determining residue
28 disposal.
29

30 The exhaust fan room, the only room used to burn waste sodium and
31 lithium, has visible, mostly thin layers [less than 1/16 inch
32 (1.6 millimeters)] of reaction by-products in a few places. These deposits
33 are evident as a white film on sections of the walls.
34

35 The sump in the exhaust fan room will be thoroughly cleaned and inspected
36 for penetrative cracks. If cracks are found on or near the floor of the sump,
37 a characterization sampling program will be carried out that will involve
38 drilling through the cracked area and sampling of the soil underneath. At
39 least one concrete core from the drilling effort will also be analyzed. After
40 soil has been sampled, the hole in the sump will be filled with concrete to
41 prevent any material from entering the exposed soil.
42

43 Samples will be obtained from several locations in Area 1. Two samples
44 will be taken in the office area. One authoritative sample and one random
45 sample on the floor outside the exhaust fan room will be taken. In the
46 exhaust fan room itself, one random sample will be taken from the floor, one
47 from the ceiling, and one from the walls. In each of the two fire rooms, two
48 samples will be taken: one from above the tank position, and one below the
49 tank. One sample will be obtained from below the tank in the sodium supply
50 room.
51

1 Area 2: Area 2 consists of the upper and lower exhaust tunnel, the
2 blower that moved LSFF exhaust from the lower to the upper tunnel, the
3 exterior underground tunnel to the 117-DR HEPA filter building (south of the
4 LSFF), and the ducts to the submerged gravel scrubber. This tunnel had low
5 but measurable radioactivity when sampled in 1987 (Appendix A).
6

7 Area 3: Area 3 consists of the gravel scrubber and ducts, which were
8 installed in 1982, 16 years after the 105-DR Reactor ceased operations;
9 consequently, no radioactivity is expected. The scrubber and duct walls are
10 metal; thus the carbonates will not have penetrated the wall surfaces. One
11 random sample of the gravel in the 2-foot (60-centimeter)-thick gravel bed
12 will be crushed and analyzed for the percent soluble alkalinity (as a measure
13 of carbonates) and lead. If the gravel is found to be uncontaminated, it will
14 be disposed of in the Hanford Solid Waste Landfill. If the gravel is
15 designated as a dangerous waste, it will be shipped offsite to a RCRA-
16 permitted landfill.
17

18 Area 4: Area 4 consists of the 117-DR HEPA filter building and the
19 downstream tunnel to the reactor stack. The original HEPA filters from the
20 DR Reactor were reportedly replaced for the LSFF. However, remnant
21 radioactivity from the exhaust tunnels or filter holders has probably been
22 picked up by the new filters.
23

24 Area 5: Area 5 consists of the reactor exhaust stack. Over the life of
25 the LSFF facility, there were two routes for the exhaust to take before
26 entering the reactor exhaust stack. Before 1982, the exhaust traveled from
27 the LSFF through underground concrete tunnels to a spray scrubber and HEPA
28 filters before exiting through the stack. The HEPA filters have a
29 99.95 percent efficiency rating; thus, no measurable amounts of reaction
30 by-products are expected in the stack from this route. In 1982, a submerged
31 gravel scrubber with an efficiency rating of approximately 99 percent was used
32 to vent the exhaust instead of the underground HEPA filters. Similarly, no
33 measurable deposits are expected from this route. The stack will be
34 decontaminated and decommissioned under the surplus facilities decommissioning
35 program.
36

37 Area 6: Area 6 consists of the 116-DR-8 Crib. The 116-DR-8 Crib was
38 originally used from 1960 to 1964 to percolate low-level waste drainage from
39 the 117-DR Building seal pits. When used for the LSFF, the 116-DR-8 Crib
40 received only water reported not to have been corrosive (the pH level was less
41 than 12.5). In these tests, it was the lithium that was depleted by the
42 moisture; the lead had little participation in the reaction or loss to the
43 crib. Because of this, and the treatment of the crib under the
44 100-HR-3 RFI/CMS (Ecology et al. 1992, p. C-7), it will not be sampled or
45 treated under this closure plan.
46

47 Area 7: Area 7 consists of the area to the north and west of the
48 117-DR HEPA filter building. The burn pans used in the alkali metal fires
49 were sometimes stored in this area. However, because of; (1) the passage of
50 time, (2) low levels of carbonates that may have drained to the soil,
51 (3) dissolving effects of rain, and (4) natural levels of carbonates in the
52 soil, no significant concentrations levels above background are expected. One

9 3 1 3 0 3 1 7 7 2

1 random soil sample will be taken from this area and analyzed for percent of
2 soluble alkalinity. The soil will be sampled at a depth of 6 to 12 inches.
3
4

5 7.3.1 Verification Sampling 6

7 Verification sampling is used to determine that cleanup was completed to
8 the required levels. In areas with metal surfaces, cleanup is the removal of
9 all surface carbonates because carbonates will not have penetrated the metal
10 surfaces. The only reliable information that could be obtained from wipe-
11 sample verification of these metal surfaces is the presence or absence of a
12 material and not the relative quantity with which to determine dangerous waste
13 equivalent concentrations. Because these carbonates are dangerous only in
14 large quantities and concentrations (see Chapter 4.0, Section 4.2 and the
15 applicable MSDS in Appendix C), and the concentrations will be extremely small
16 relative to the bulk and weight of the waste metal, removal of surface
17 deposits will ensure safe decontamination of the surfaces.
18

19 Small pieces of equipment will be washed with water to remove surface
20 contamination. The water will be analyzed to determine it's designation
21 status. If it is found to be dangerous waste, it will be handled according to
22 (WAC 173-303-084).
23

24 While the action level for the concrete walls is all surface carbonate
25 deposits, unlike the metal walls, the possibility exists that the carbonates
26 have penetrated and embedded in the concrete. Thus, verification is necessary
27 to ensure that any carbonates remaining within the concrete are below the
28 levels listed by the state for dangerous waste mixtures (WAC 173-303-084).
29 Random cores of the concrete will be taken: 6 in the exhaust fan room (the
30 only place waste metals were burned); and 3 baseline samples from outside the
31 exhaust fan room. A concrete coring device will cut the core [approximately 3
32 inches (8 centimeters) wide] from the wall; the top 1-inch depth of this core
33 will be crushed and analyzed for percent of soluble alkalinity and
34 concentrations of sodium and lithium to determine the concentrations of sodium
35 and lithium carbonates. If the concentrations of carbonates in the concrete
36 are below or equal to dangerous waste levels for mixtures or background levels
37 (whichever is greater), the facility will be considered to be clean.
38

39 7.3.2 Reporting 40

41 After completion of the sampling effort, verification documents will be
42 provided for actual sample locations, number of samples, and specific methods
43 used for collection, if different from those provided in this closure plan.
44 Data received from the laboratory will be reviewed, interpreted, and
45 summarized statistically.
46
47

1 **7.3.3 Quality Assurance/Quality Control Procedures**
2

3 All procedures will be performed in accordance with the attached Quality
4 Assurance Project Plan (Appendix E), *Environmental Investigations and Site*
5 *Characterization Manual* (WHC 1988), *Quality Assurance Manual* (WHC 1989a),
6 *Environmental Compliance Manual* (WHC 1989b), and pertinent EPA guidance [e.g.,
7 SW-846 (EPA 1990, p. 1-11)] and WAC 173-303-110(2).
8
9

10 **7.3.4 Sample Quality Assurance and Quality Control**
11

12 A detailed quality assurance project plan for this project is given in
13 Appendix E.
14

15 Quality assurance and quality control of sample analysis and results will
16 be ensured by concomitant field and laboratory procedures. Procurement and/or
17 coordination of laboratory services will be the responsibility of a sample
18 management organization, which will ensure that contractor laboratories meet
19 minimum QA/QC requirements. To expedite closure, reporting requirements,
20 and/or site cleanup, sample analysis data will be provided to the cognizant
21 engineer for immediate review. The sample management organization also will
22 be responsible for the review of all laboratory QA/QC programs.
23

24 **7.3.4.1 Field Quality Assurance and Quality Control.** Field QA/QC will
25 require the collection of at least one duplicate sample for every 20 samples
26 collected. Duplicate samples will only be identified as such in the field
27 logbook. A transport (trip) blank also will be included for each sampled
28 matrix.
29

30 When samples have been collected, the samples will be controlled
31 according to the requirements outlined in EII 5.2 "Soil and Sediment Sampling"
32 (WHC-CM-7-7). All samples will be labeled, sealed, and placed in a container
33 for preservation on ice or other appropriate cooling medium. Holding times
34 specified in SW-846 (EPA 1990) will be used as goals.
35

36 **7.3.4.2 Field Logbooks.** All field activities will be recorded in a field
37 logbook according to the protocols outlined in EII 1.5, "Field Logbooks"
38 (WHC-CM-7-7). All entries will be made in ink, signed, and dated.
39 Photographs should be taken of each sampling location and of any unusual
40 circumstances encountered during the investigation.
41

42 **7.3.4.3 Chain of Custody.** Chain-of-custody records will be kept to meet the
43 requirements of EII 5.1, "Chain of Custody" (WHC-CM-7-7). The chain-of-
44 custody form will establish the documentation necessary to ensure the
45 traceability of the sample from time of collection to disposal.
46

47 **7.3.4.4 Sample Analysis Request.** A sample management organization-approved
48 laboratory will be selected to conduct all analyses. The request for
49 appropriate analyses will be included on the sample analysis request form as
50 provided in EII 5.2 (WHC-CM-7-7). Laboratory-specific forms could be used in
51 lieu of the sample analysis request form and will be made available by the
52 sample management organization.

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1 7.3.5 Parameters and Analysis Methods
2

3 Because only one organic compound may have been used for waste treatment
4 at the LSFF, and because of the heat of reaction [sodium and lithium burn
5 greater than 1300 °F (700 °C)], no organics are reasonably expected to be in
6 the facility. The one organic that may have been used is Saran (vinylidene,
7 chloride acrylonitrile copolymer), an ingredient (7 percent) in the Met-L-X*
8 fire extinguisher, used to extinguish alkali fires. However, the waste burns
9 in the fire facility were allowed to burn themselves to completion. The only
10 MSDS-listed dangerous decomposition product of Met-L-X is "possibly traces of
11 HCl." [The other ingredients in Met-L-X are sodium chloride (85 percent),
12 magnesium aluminum silicate (greater than 10 percent) and magnesium stearate
13 (greater than 1 percent).]
14

15 The samples to be collected from the structures will be analyzed for
16 sodium and lithium carbonates. These compounds are the dangerous waste reaction
17 by-products of sodium and lithium burns. Lead content will also be analyzed
18 because of the effect it may have on residue disposal. Lead and sodium will
19 be analyzed in these deposits and in the crushed gravel using atomic
20 absorption and/or direct aspiration [SW-846, method 1310/6010, (EPA 1990)].
21 Levels of other TAL inorganics (see Table 7-1) will also be reported with the
22 results for all samples analyzed per SW-846 methods (EPA 1990). These
23 elements, however, are not by-products of waste burns at the LSFF and will not
24 directly affect closure activities. The lithium will be analyzed in
25 accordance with WAC-173-303-110.
26

27 The percent of soluble alkalinity (a measure of the carbonates) of the
28 deposits, crushed gravel, and soil will be determined according to
29 WAC 173-303-090 (6)(a)(iii). Equivalent weights of water and the media will
30 be mixed and the pH of the solution will be tested. A pH of 12.5 or greater
31 or 2 or less according to WAC 173-303-090(6)(a)(i) and (iii), will classify
32 the deposits, gravel, or soil as corrosive and a dangerous waste for use in
33 developing a health and safety plan and for determining proper disposal. The
34 corrosivity of liquid cleanup residue will be analyzed using SW-846 method
35 9041 (EPA 1990).
36

37 Concrete cores will be crushed and analyzed for percent of soluble
38 alkalinity and sodium and lithium concentrations to measure the equivalent
39 concentrations of carbonates. The cores will be analyzed using the following
40 methodology.
41

- 42 • Perform Total Metal Analysis (SW-846 Method 6010, EPA 1990) using
43 Hot Acid Leach (SW-846 Method 3050, EPA 1990) to determine if
44 dangerous waste species are present.
45

46 If any species exceeds 20 times the Toxicity Characteristic Leaching
47 Procedure (TCLP) detection limits, then a Total Metals Analysis
48 using TCLP is required to demonstrate that the material is
49 nondangerous.

50 *Met-L-X is a trademark of Ansul.

- Perform Total Metal Analysis (SW-846 Method 6010, EPA 1990) using TCLP (Title 40 Code of Federal Regulations Part 261, Appendix II) to determine if dangerous waste species are present.

If any species exceeds the TCLP detection levels, then a bioassay is required to demonstrate that the material is nondangerous.

- Perform Rat Bioassay and Fish Bioassay to determine if the material is or is not a dangerous waste.

Moving from one analysis to the next is optional. It is necessary only to prove that a material is a nondangerous waste. For example, if Total Metal Analysis/TCLP show a material is a dangerous waste, then performing bioassays is necessary only to prove that the material is nondangerous.

Background samples of concrete will not be taken due to potential variability in the background constituents due to aggregate composition and size, cement composition and additives.

Scans for radiation will be made according to established Westinghouse Hanford procedures [EII 2.3, "Administration of Radiation Surveys to Support Environmental Characterization Work on the Hanford Site," (WHC-CM-7-7)] in all areas for worker protection and facility characterization. In areas where scans show measurable radioactivity, the samples collected and residue removed will also be surveyed for radiation.

7.3.5.1 Data Reliability. Data reliability will be assessed by evaluating the sample handling and analysis quality control according to procedures in EII 1.11 "Control and Transmittal of Laboratory Analytical Data" (WHC-CM-7-7). Sample-handling quality control will be evaluated by reviewing field documentation and results of quality assurance samples to establish that sampling error was minimized. The review will be conducted to verify that decontaminated equipment was used, that cross-contamination was minimized, that samples were preserved properly, and that the chain of custody of the samples was not broken.

7.3.6 Sampling Equipment and Procedures

Sampling equipment will be appropriate to the media sampled, which are crusted powder (carbonates), concrete surfaces (wiped and scraped), concrete cores, and soils. All samples (except concrete cores) will be collected in 2.0 ounce (60-milliliter) precleaned bottles; reusable sampling equipment

1 (stainless steel) will be decontaminated and wrapped to ensure cleanliness
2 before each use. The following are examples of some of the other sampling
3 equipment to be used to sample the media.
4

5	6 Powder	7 Wipe samples 8 of concrete	9 Concrete 10 scrapes	11 Soils
12	13 Stainless- 14 steel spoon	15 Filter paper	16 Stainless- 17 steel putty 18 knife	19 Stainless- 20 steel shovel 21 and spoons

22 Wipe samples will be collected according to standard sampling techniques
23 (EPA 1987a) using Whatman* No. 42 filter paper. The papers will be
24 laboratory prepared with dilute (1:100) nitric acid solution. One filter
25 paper will be used to wipe down the wall surface from a 6-inch by 6-inch
26 (15-centimeter by 15-centimeter) section over the carbonate deposit. The
27 36-inch (230-centimeter) square area, covered with a disposable template, will
28 be carefully wiped, using vertical strokes, starting at the top left corner
29 and progressing to the bottom right corner. The filter paper will be held
30 with clean gloves to prevent contamination. A new pair of gloves will be used
31 for each wipe sample. Care will be taken to wipe the surface only once
32 throughout the sampling effort. After the area is wiped, the filter paper
33 will be folded with the exposed side in and folded again to form a 90-degree
34 angle in the center of the paper.

35 Concrete cores will be collected with an approximately 3-inch
36 (8-centimeter)-diameter diamond bit coring device, penetrating at least
37 2 inches (5 centimeters) into the concrete. Distilled water will be used as a
38 cutting lubricant to minimize dust generation. The top 1 inch
39 (2.5 centimeter) of the core will be removed with a concrete saw and placed in
40 a decontaminated container for crushing and analysis.

41 To collect soil samples, a cleaned stainless-steel shovel will be used to
42 remove the top 6 inches (15 centimeters) of soil; then a clean, stainless-
43 steel sampling spoon will be used to fill a 2.0-ounce (60-milliliter) glass
44 jar with soil from a depth of 6 to 12 inches (15 to 30 centimeters).
45

46 All equipment will be decontaminated between samples in accordance with
47 procedures outlined in EII 5.5 "Decontamination of Equipment for *Resource
48 Conservation and Recovery Act/Comprehensive Environmental Response
49 Compensation and Liability Act (RCRA/CERCLA) Sampling*" (WHC 1988).
50

*Whatman is a trademark of Whatman Incorporated.

1 **7.3.7 Summary of Sampling Effort**
2

3 Table 7-2 shows the number of samples to be collected and analyzed for
4 LSFF characterization and validation. QA/QC samples will be collected once
5 each sampling day.
6

7
8 **7.3.8 Modifications to the Sampling Plan**
9

10 The optimal aspects of sample design are sometimes not achievable because
11 of unanticipated situations or changing condition. Factors adversely
12 influencing sampling efforts can include equipment malfunction or breakdown,
13 physical barriers to accessing sampling locations, and an overly optimistic
14 evaluation of other physical conditions at the site. When modifications to
15 the sampling plan are necessary, they will be recorded in the field logbook
16 along with the circumstances requiring the modification. The field logbook
17 will be reviewed and signed by the project engineer daily. This will provide
18 an accurate record of modifications and Westinghouse Hanford approval, while
19 allowing sampling to proceed safely and maintaining efficient manpower and
20 equipment usage. When modifications to an established procedure are needed,
21 procedures outlined in EII 1.4 "Deviations from Environmental Investigations
22 Instructions" (WHC-CM-7-7) will be followed. Copies of the field logbook will
23 be made available to Ecology upon request.
24

25
26 **7.4 SITE SAFETY**
27

28 A dangerous waste operations plan is required for all dangerous waste
29 sampling sites. It is intended to specify information pertinent to field
30 assignments and serves as a guide in unusual situations or emergencies.
31 A site-specific version of the general RCRA/CERCLA investigation health and
32 safety manual will be developed for use in sampling at the LSFF. The site-
33 specific Health and Safety Plan will be prepared in accordance with EII 2.1,
34 "Preparation of Hazardous Waste Operations Permits" (WHC-CM-7-7).
35

36
37 **7.5 REMOVAL OF REGULATED MATERIAL AND WASTE RESIDUE**
38

39 The methods of residue removal will include high-pressure steam, water
40 washes, and acid washes (5 percent acetic acid in water). The rinsate will be
41 caught using durable plastic liners. All regulated materials packaged for
42 shipment offsite will be in U.S. Department of Transportation-approved
43 containers that are compatible with the waste contents [e.g., 55-gallon
44 (210-liter) drums]. All containers will be labeled and shipped under manifest
45 as necessary according to WAC 173-303-075 (Figure 7-1). All dangerous waste
46 generated by the clean-up will be handled in accordance with WAC-173-303.
47 Activities conducted within the Hanford Facility that only involve the
48 management of radioactive waste are not regulated under RCRA or WAC-173-303
49 regulations. References to such activities are included for informational
50 purposes only.

1 **7.5.1 Buildings**
2

3 The reaction by-product deposits will be removed from the walls,
4 ceilings, and floors of the experiment rooms and tunnels. Cleaning methods
5 may include acid and/or water washes or high-pressure steam. The residue
6 will be drummed; sampled for corrosivity, lead, and radioactivity (as
7 indicated by the initial surveys); and disposed of appropriately.
8

9
10 **7.5.2 Soil**
11

12 If sampling proves that the percent of soluble alkalinity in the soil is
13 above background or the action level described in Chapter 6.0, Section 6.2,
14 additional sampling will be used to determine the extent of contamination and
15 levels (if any) of radioactivity. The affected soil will then be drummed and
16 disposed of offsite in accordance with the site disposal contract that is in
17 place at the time of removal if sampling proves it to be dangerous but
18 uncontaminated by radioactivity. If the soil has low-level radioactivity, it
19 will be held onsite until a permitted TSD facility is available.
20

21
22 **7.5.3 Equipment**
23

24 The equipment used for the LSFF and in contact with waste sodium or
25 lithium burn exhaust gases, and equipment used during the closure activities,
26 will be cleaned based on "Equipment Decontamination (Bracken 1989). The
27 cleaning will be accomplished by high-pressure steam cleaning, water washing,
28 or acid washing. The acid wash will use a 5 percent solution of acetic acid
29 in water. The cleaning will be performed over a solid sheet of durable
30 plastic either .008 inch (0.2 millimeter) or 0.012 inch (0.3 millimeter)
31 thick, depending on the equipment and amount of potential abrasion resulting
32 from cleaning activities. The rinsate will be collected in 55-gallon
33 (210-liter) steel drums, sampled for corrosivity, and disposed of
34 appropriately. After cleaning, all equipment and materials originating from
35 the LSFF will be disposed of or surplused.
36

37
38 **7.6 OTHER ACTIVITIES REQUIRED FOR CLOSURE**
39

40 No other activities are required for clean closure.
41

42
43 **7.7 SCHEDULE FOR CLOSURE**
44

45 Closure activities will begin within 30 days after notification by
46 Ecology that this closure plan has been approved. Closure will proceed
47 according to the schedule in Figure 7-2.
48
49

1 **7.8 AMENDMENT OF PLAN**
2

3 The LSFF closure plan will be amended whenever changes in operating plans
4 affect the closure or if, when conducting final closure activities, unexpected
5 events require a modification of the closure plan. This plan may be amended
6 any time before certification of final closure of the LSFF. If amendment to
7 the approved plan is required, DOE-RL will submit a written request to Ecology
8 to authorize the change.
9

10
11 **7.9 CERTIFICATION OF CLOSURE AND SURVEY PLAT**
12

13 Within 60 days of closure of the LSFF, DOE-RL will submit to the Benton
14 County Auditor and the lead regulatory agency a certification of closure and a
15 duly certified survey plat. The certification of closure will be signed by
16 both DOE-RL and a registered independent professional engineer, stating that
17 the unit has been closed in accordance with the approved closure plan. The
18 certification will be submitted by registered mail or an equivalent delivery
19 service.
20

21 The DOE-RL and the independent professional engineer will certify with a
22 document similar to Figure 7-3.
23

24 If clean closure is not attained, the owner or operator will submit to
25 the local zoning authority or to the authority with jurisdiction over local
26 land use, a survey plat indicating the location and dimensions of the LSFF.
27 The EPA will also be provided with a survey plat. The plat will show the
28 facility location with respect to permanently surveyed benchmarks and will be
29 prepared and certified by a professional land surveyor. The plat will also
30 contain a note, prominently displayed, stating the owner's obligation to
31 restrict disturbance of the surveyed area.

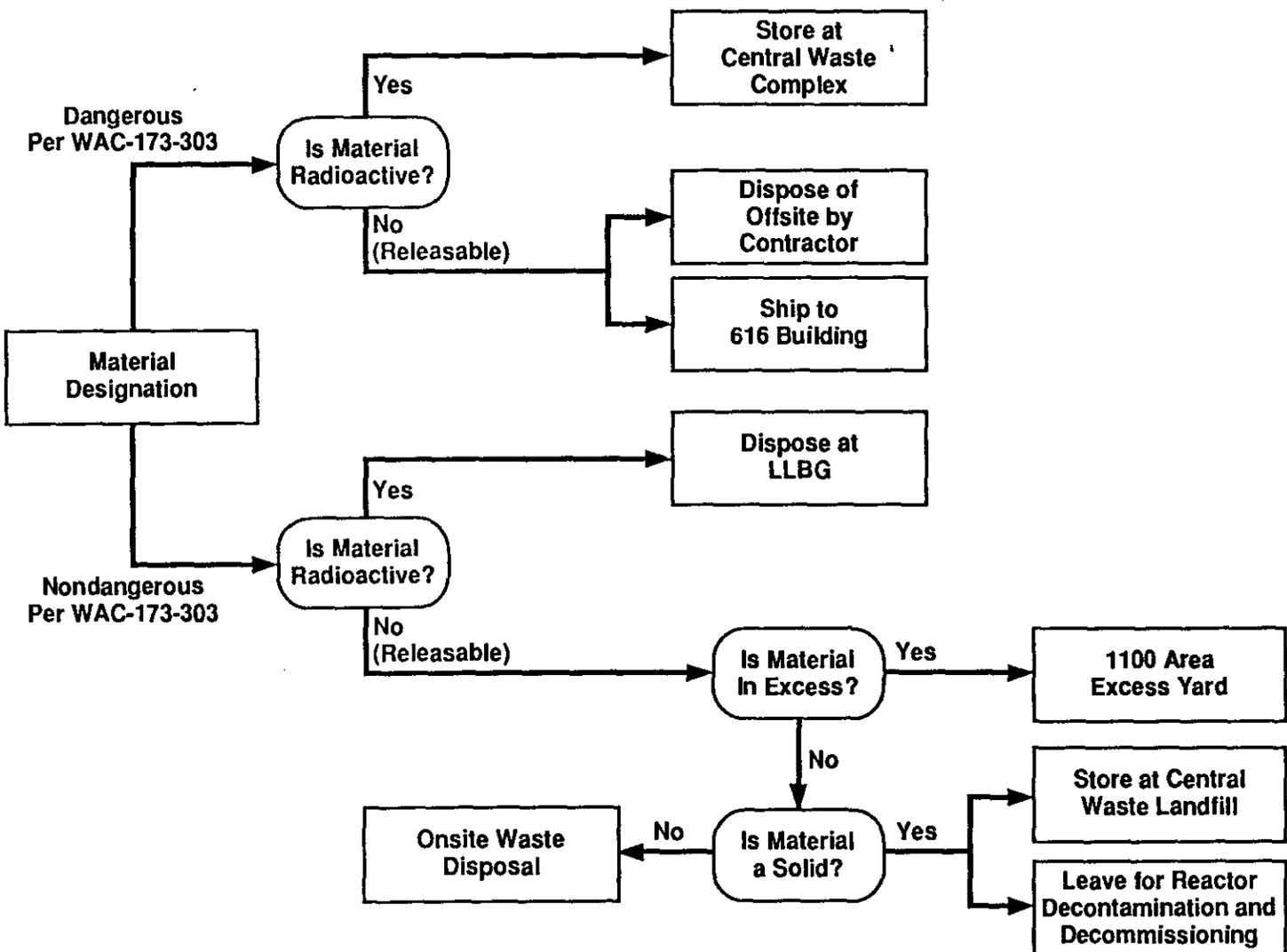
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Figure 7-1. Flowchart for Removal of Contaminated Material and Waste Residue.



LLBG = Low-Level Burial Ground

H9305029.3

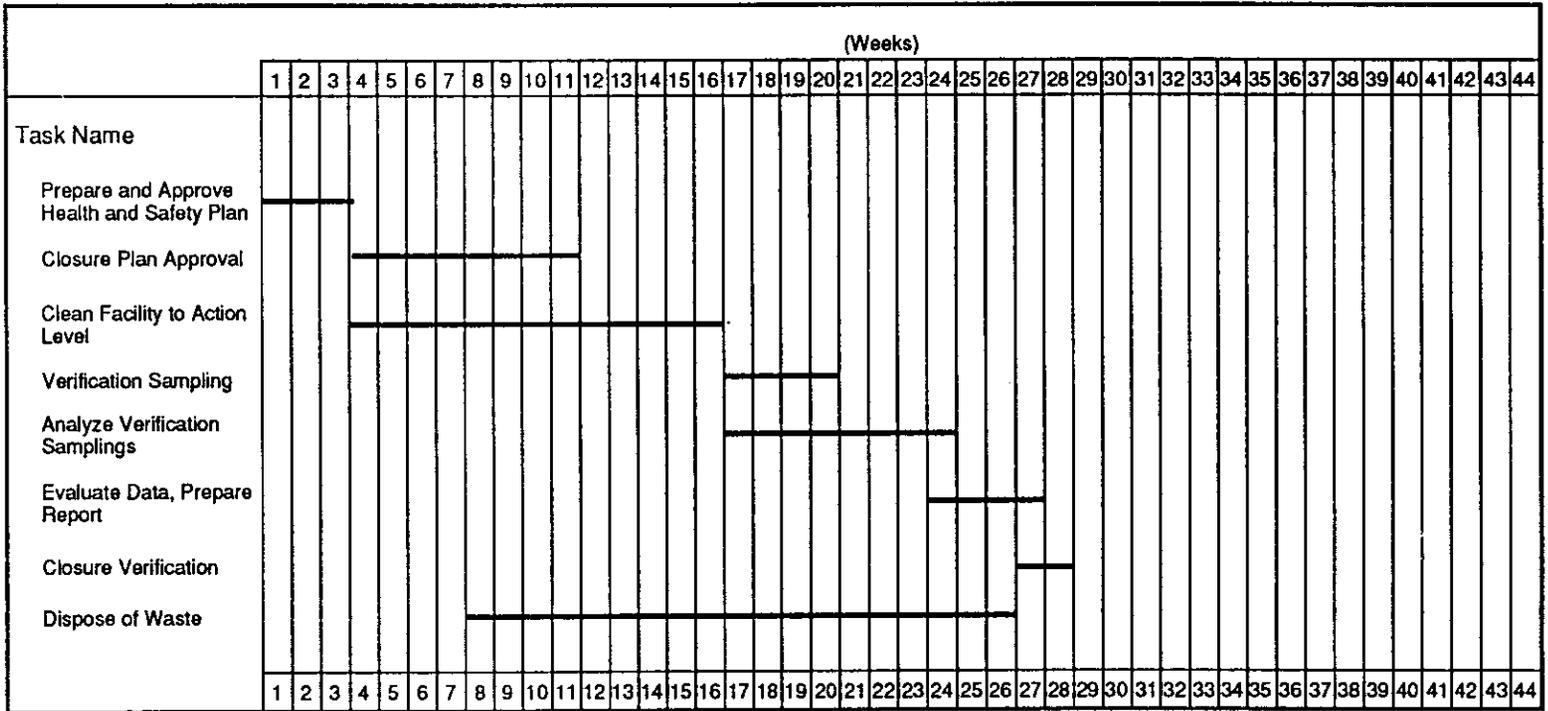
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Figure 7-2. Large Sodium Fire Facility Closure Schedule.



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F7-2

DOE/RL-90-25, Rev. 1
06/28/93

**CLOSURE CERTIFICATION
FOR**

Hanford Site
U.S. Department of Energy, Richland Operations Office

We, the undersigned, hereby certify that all _____
_____ closure activities were performed in accordance
with the specifications in the approved closure plan.

Owner/Operator Signature DOE-RL Representative Date
(Typed Name)

P.E.# _____ State _____
Signature Independent Registered Professional Engineer Date
(Typed Name, Professional Engineer license number, state of issuance, and date
of signature)

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1 Figure 7-3. Closure Certification for the Large Sodium Fire Facility.

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Table 7-1. Other Target Analyte List Inorganics to be Reported.

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Cesium	Thallium
Chromium	Vanadium
Cobalt	Zinc
Copper	Cyanide
Iron	

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Table 7-2. Minimum Number and Location of Samples.

General sample location	Minimum number of samples to be collected
Office Area	2
Floor Outside Exhaust Fan Room	2
Exhaust Fan Room Floor	1
Exhaust Fan Room Wall	1
Exhaust Fan Room Ceiling	1
Small Fire Room	2
Large Fire Room	2
Sodium Supply Room	1
Gravel Scrubber	1
Soil Outside LSFF	1
Quality assurance/quality control samples	1 per sampling day

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8.0 POSTCLOSURE

8.1 NOTICE IN DEED BOOK

This closure plan is proposing clean closure of the 105-DR Large Sodium Fire Facility. However, if clean closure cannot be obtained, the following action will be taken in accordance with WAC 173-303-610 (1)(b). Within 60 days of the certification of closure, DOE-RL will sign, notarize, and file for recording the notice indicated below. The notice will be concurrently sent to Ecology and the Auditor of Benton County, P.O. Box 470, Prosser, Washington, with instructions to record this notice in the deed book.

TO WHOM IT MAY CONCERN

The United States Department of Energy-Richland Operations Office, an operations office of the United States Department of Energy, which is a department of the United States government, the undersigned, whose local address is the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby gives the following notice as required by 40 CFR 265.120 and WAC 173-303-610(10) (whichever is applicable):

- (a) The United States of America is, and since April 1943, has been in possession in fee simple of the following described lands: (legal description of 105-DR Large Sodium Fire Facility).
- (b) The United States Department of Energy-Richland Operations Office, by operation of the 105-DR Large Sodium Fire Facility, has disposed of hazardous and/or dangerous waste under the terms of regulations promulgated by the United States Environmental Protection Agency and Washington Department of Ecology (whichever is applicable) at the above described land.
- (c) The future use of the above described land is restricted under terms of 40 CFR 264.117(c) and WAC 173-303-610(7)(d) (whichever is applicable).
- (d) Any and all future purchasers of this land should inform themselves of the requirements of the regulations and ascertain the amount and nature of waste disposed of on the above described property.
- (e) The United States Department of Energy-Richland Operations Office has filed a survey plat with the Benton County Planning Department and with the United States Environmental Protection Agency, Region 10, and the Washington Department of Ecology (whichever are applicable) showing the location and dimensions of the 105-DR Large Sodium Fire Facility and a record of the type, location, and quantity of waste treated.

1 **8.2 POSTCLOSURE CARE**
2

3 Postclosure care is generally required when a waste management facility
4 cannot attain a clean closure. If the LSFF cannot attain clean closure under
5 this plan, closure may be deferred until the reactor building, underground
6 tunnels, filter building, stack, and crib characterization and disposal are
7 addressed under concurrent and future programs.
8

9 If it is determined that the LSFF cannot be remediated under these
10 programs, a postclosure plan will be prepared for the facility at that time.
11 The postclosure plan will include the following:
12

- 13 • Inspection plan
 - 14 • Monitoring plan
 - 15 • Maintenance plan
 - 16 • Personnel training
 - 17 • Postclosure contact
 - 18 • Provisions to amend the postclosure plan
 - 19 • Provisions to certify the postclosure plan.
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17 **9.4 REVISED CODE OF WASHINGTON AND WASHINGTON ADMINISTRATIVE CODE**

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APPENDIX A
1987 SAMPLING ACTIVITIES

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Battelle

Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 376-3564
Telex 15-2874

September 17, 1987

J. W. Biglin
221T/23/200W
Westinghouse Hanford Company
P. O. Box 1970
Richland, WA 99352

Dear Mr. Biglin:

RADIOACTIVITY IN WASTE SAMPLES

Sample	Alpha	Beta	d/m/g		
			Cs-137	Gamma Co-60	Eu-152
#2	< 6	330	70	50	48
#4	< 13	< 30	< 14		
#6	< 19	< 47	< 18		
Pit	< 14	< 35	< 10		

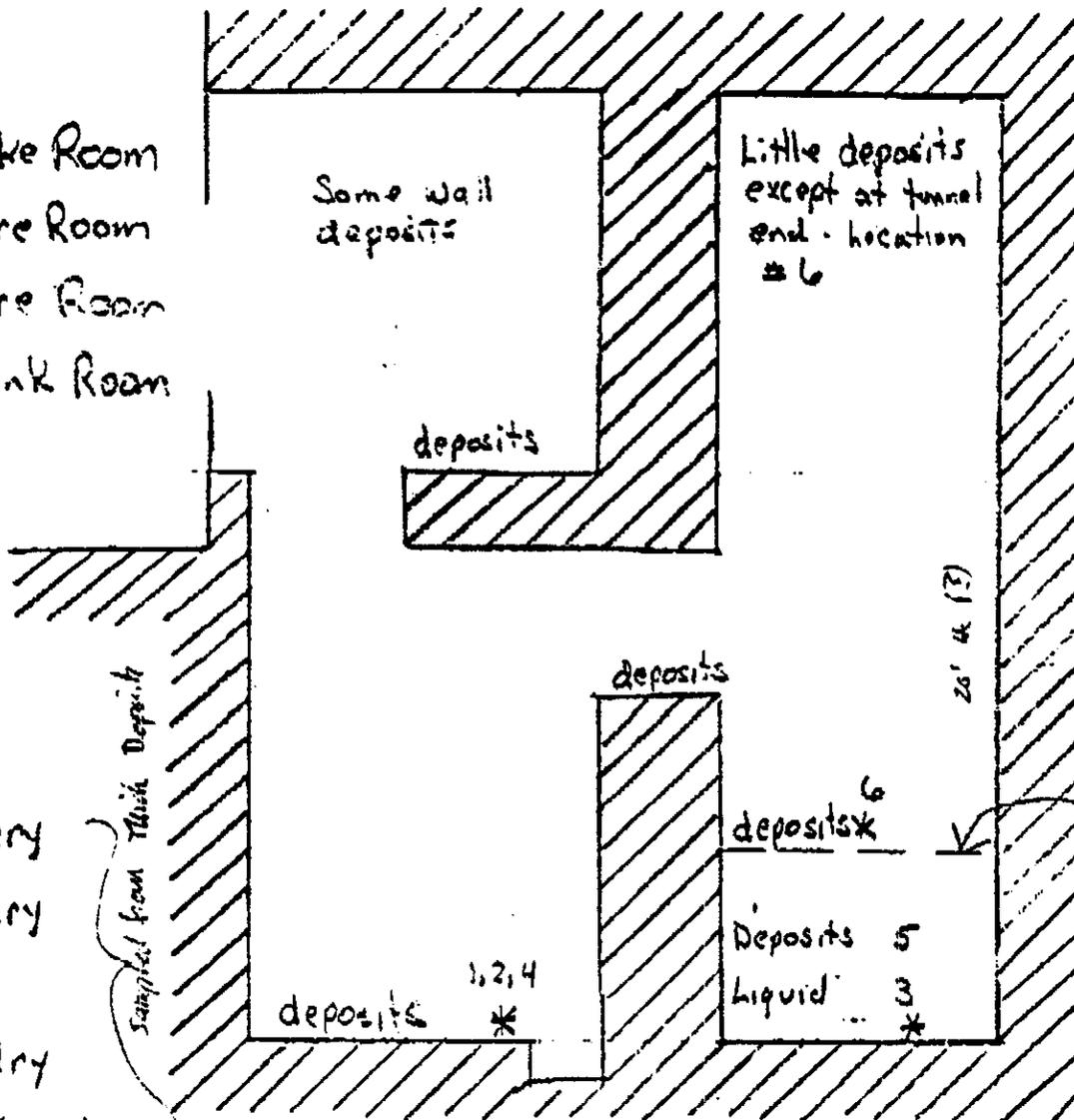
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R. F. Keough

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Smoke Room
Small Fire Room
Large Fire Room
Butch Tank Room

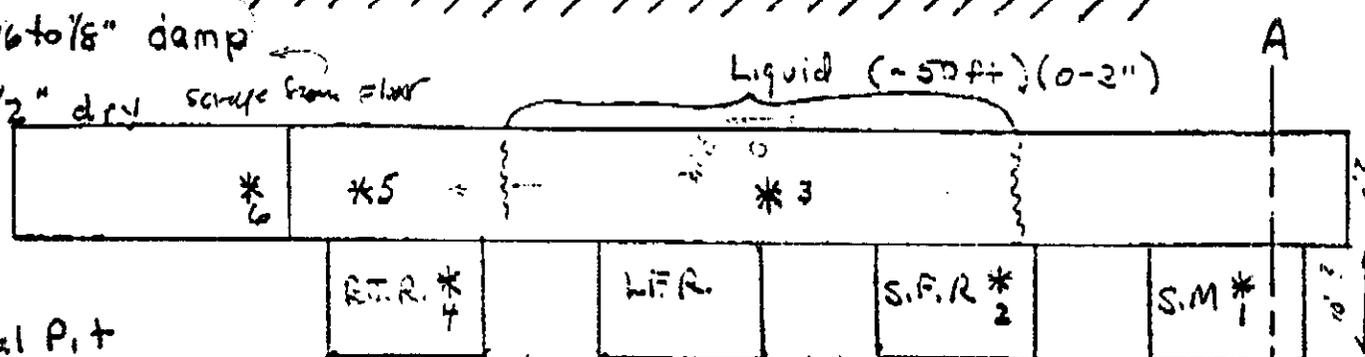


31803

Sampled from Thick Deposit

Raised Floor

- S#1 - 1" dry
- S#2 - 1/2" dry
- S#3 - liquid
- S#4 - 1/2" dry
- S#5 - 1/16 to 1/8" damp
- S#6 - 1/2" dry scrape from floor



S#7 - Seal Pit (sludge)

* Sample locations

6-10 test location

Typical

DW Biglin

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APPENDIX B
SAMPLING LOCATIONS

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105-DR LARGE SODIUM FIRE FACILITY
RANDOM NUMBER GENERATOR

GRAVEL BED SAMPLING POINTS Figure C4

1 Sample for Bottom (5X6) Grid
X-coordinate Y-coordinate
 1 0

1 Sample for Top (5X6) Grid
X-coordinate Y-coordinate
 0 2

1 Sample for Middle (5X6) Grid
X-coordinate Y-coordinate
 1 0

SOIL SAMPLING POINTS Figure C3

Section A (3X10) Grid
X-coordinate Y-coordinate
 1 5

Section B (12X9) Grid
X-coordinate Y-coordinate
 7 7

Section C (15X9) Grid
X-coordinate Y-coordinate
 9 7
 0 5

EXHAUST FAN ROOM SAMPLING POINTS Figure C1

NORTH WALL (9X7) GRID		CEILING (9X7) GRID	
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
6	6	0	6

SOUTH WALL (9X7) GRID		FLOOR (9X7) GRID	
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
5	2	7	3

EAST WALL (7X7) GRID		WEST WALL (7X7) GRID	
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
3	5	0	2

B-1

BASELINE SOIL SAMPLING POINTS FROM (12X9) GRID
Figure C2

X-coordinate	Y-coordinate
9	6
X-coordinate	Y-coordinate
6	4
X-coordinate	Y-coordinate
4	2

CONCRETE BASELINE SAMPLING POINTS Figure C2
(3X5) GRID (3 wipe samples, 3 core)

Wipe Samples		Core Samples	
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
2	4	1	2
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
0	0	0	4
X-coordinate	Y-coordinate	X-coordinate	Y-coordinate
0	1	2	2

105-DR LARGE SODIUM FIRE FACILITY
EXHAUST TUNNELS RANDOM NUMBER GENERATOR

LOWER TUNNEL (3 SAMPLES)

RANDOM WALL (1 or 2)	RANDOM HEIGHT (0-20 FT.)	RANDOM LENGTH (0-100 FT.)
2	2	75
1	17	58
2	4	44

Alternate Samples

2	18	19
2	19	84
1	9	57

B-2

UPPER TUNNEL (3 SAMPLES)

RANDOM WALL (1 or 2)	RANDOM HEIGHT (0-7 FT.)	RANDOM LENGTH (0-100 FT.)
2	1	23
2	2	3
2	1	93

Alternate Samples

2	6	90
2	6	66
1	0	97

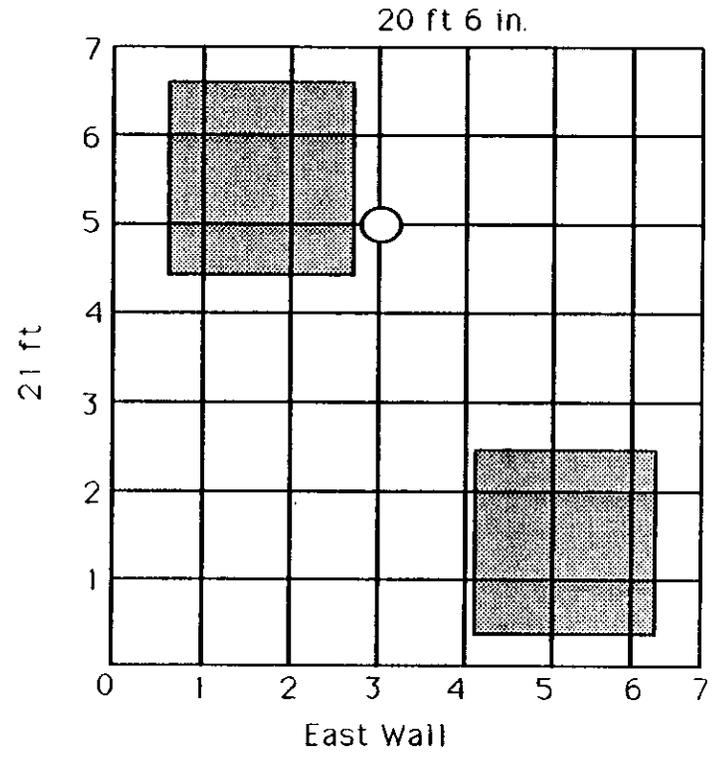
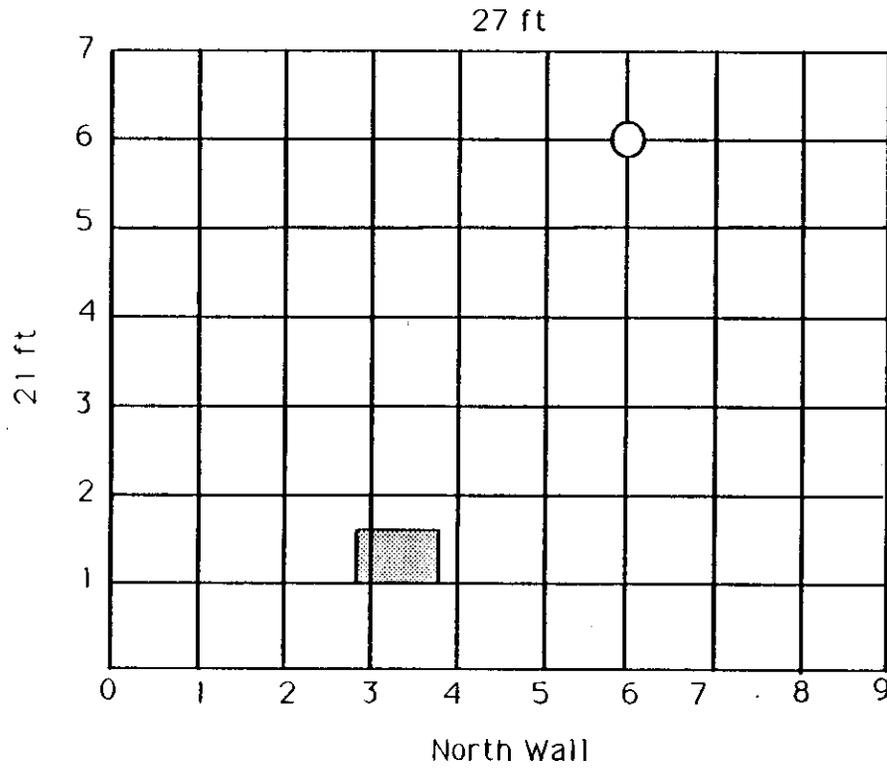
UNDERGROUND TUNNEL TO FILTER BUILDING (3 SAMPLES)

RANDOM WALL (1 or 2)	RANDOM HEIGHT (0-7 FT.)	RANDOM LENGTH (0-100 FT.)
2	2	31
1	4	92
1	0	45

Alternate Samples

1	4	15
2	6	29
2	0	85

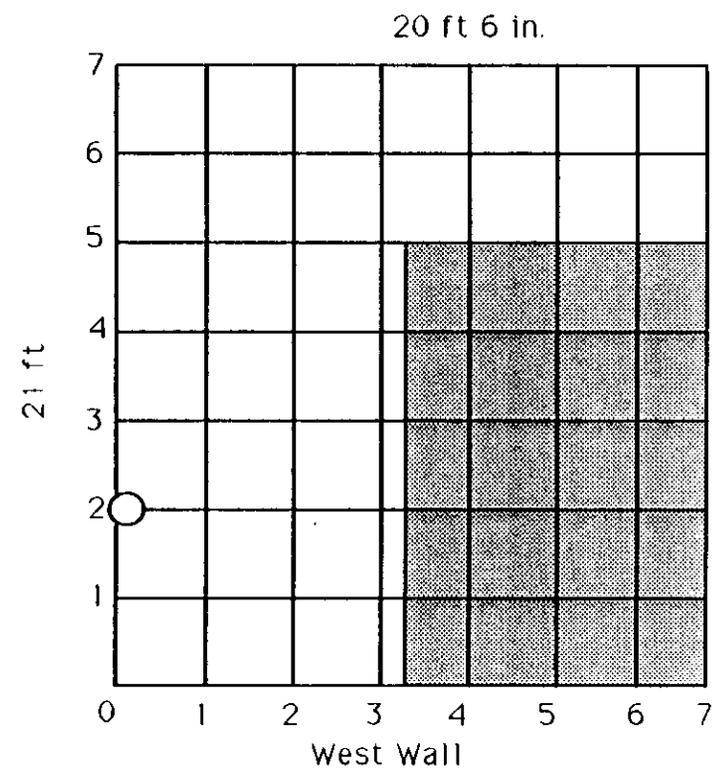
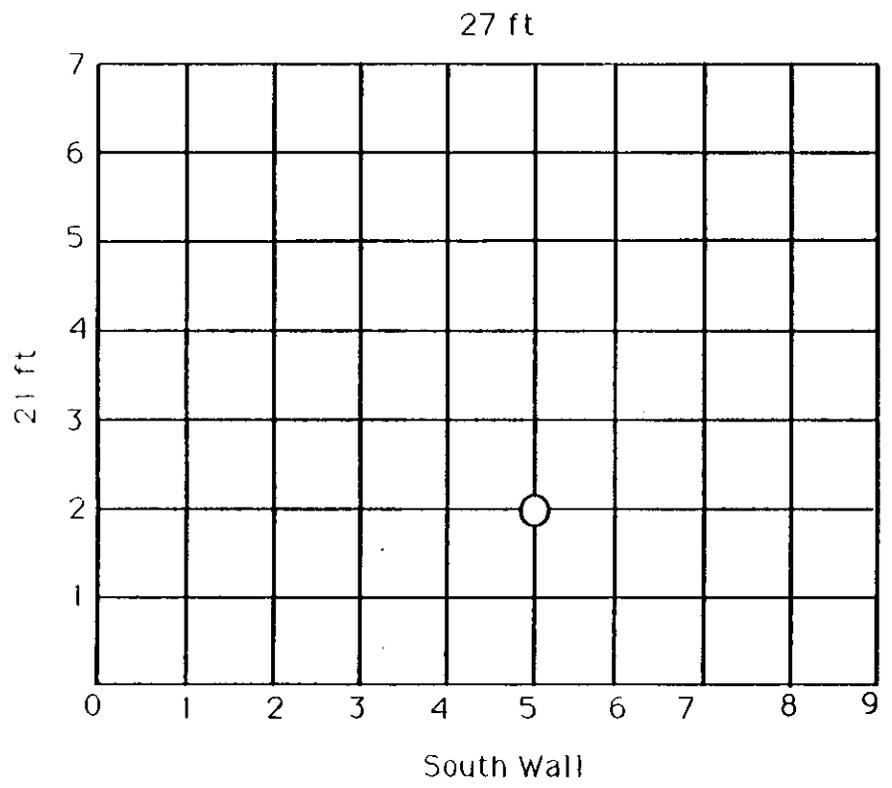
B-8



■ Shading Indicates Areas Without Concrete
 ○ Denotes Sample Location

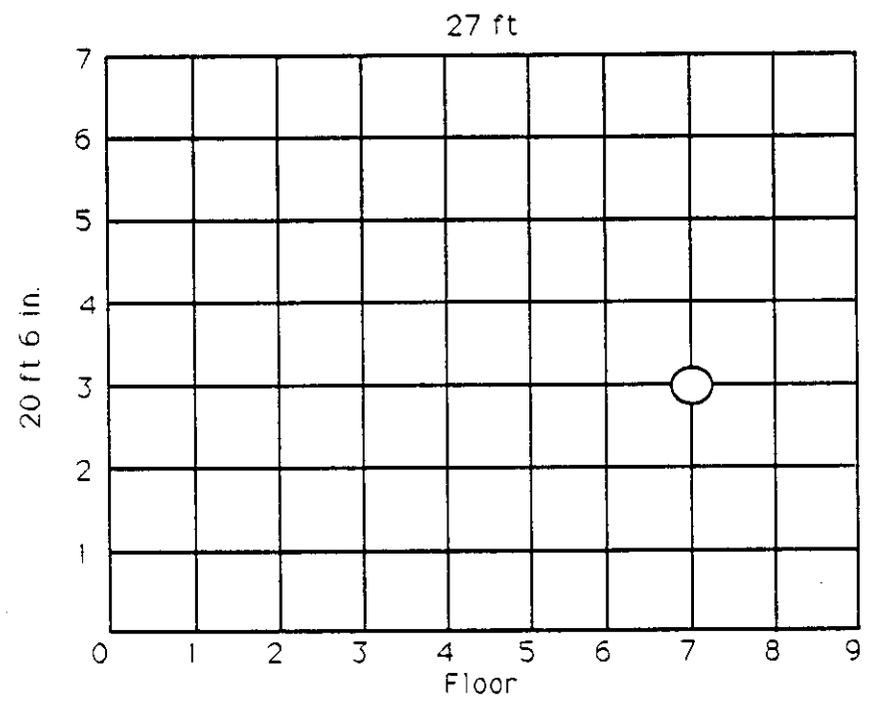
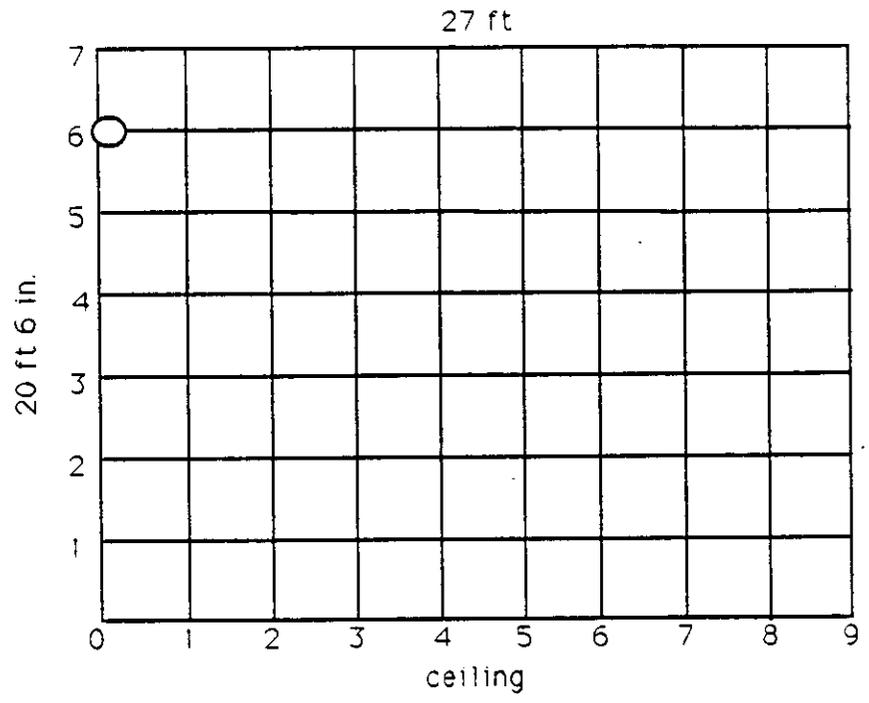
1 Figure C-1. Area 1 Exhaust Fan Room Verification Concrete Core Samples. (sheet 1 of 3)

B-4



 Shading Indicates Areas Without Concrete
 Denotes Sample Location

1 Figure C-1. Area 1 Exhaust Fan Room Verification Concrete Core Samples. (sheet 2 of 3)

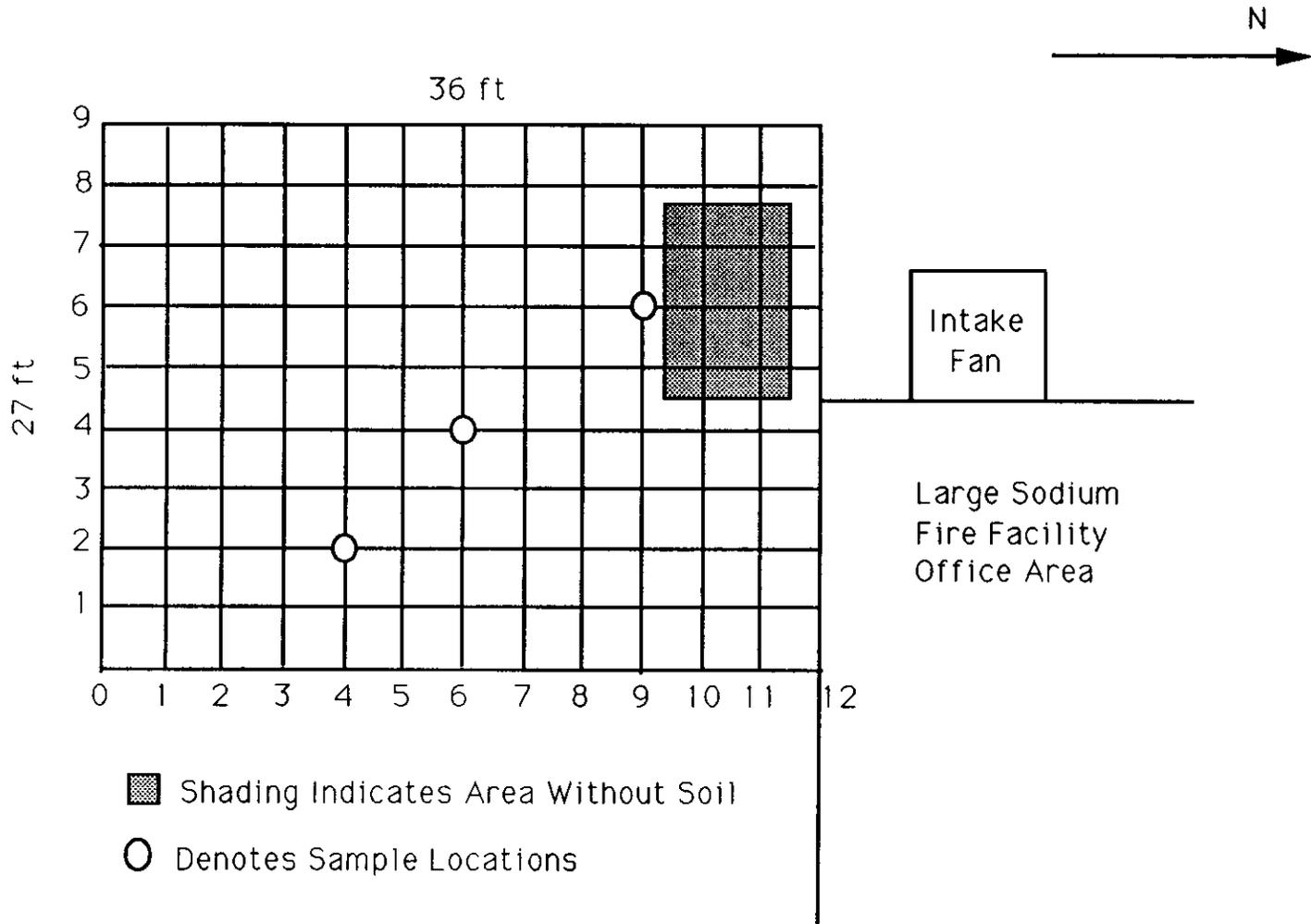


○ Denotes Sample Location

Figure C-1. Area 1 Exhaust Fan Room Verification
Concrete Core Samples. (sheet 3 of 3)

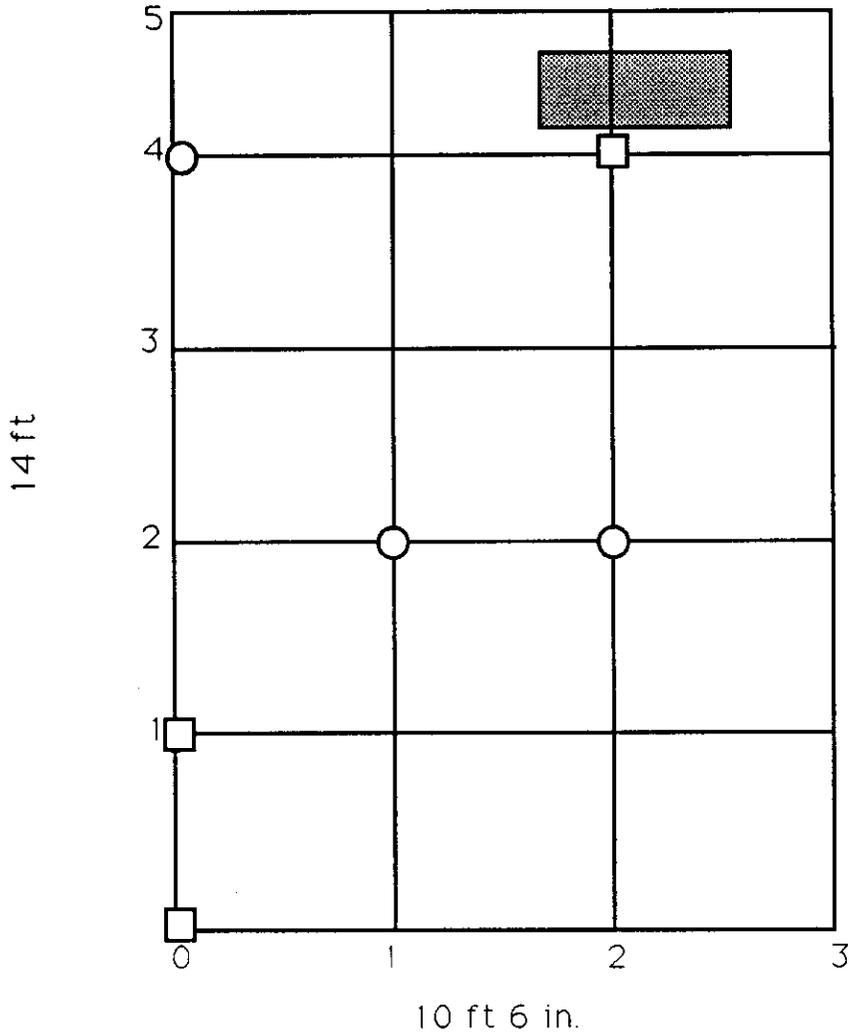
9 3 1 3 0 3 1 8 1 1

1
2



B-6

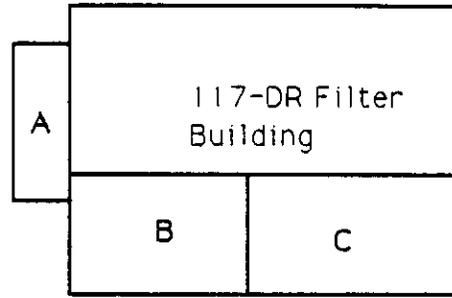
Figure C-2. Baseline Soil Locations for Area 7. (sheet 1 of 2)



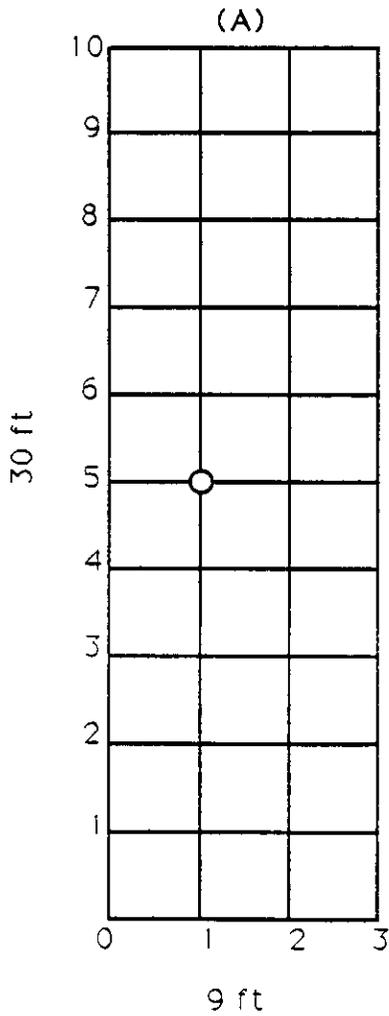
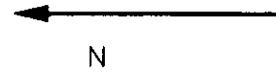
-  Shading Indicates Area Without Concrete
-  Denotes Concrete Core Sample Location
-  Denotes Concrete Wipe Sample Location

Figure C-2. Baseline Concrete Locations for Area 7. (sheet 2 of 2)

1
2



Key for Figure

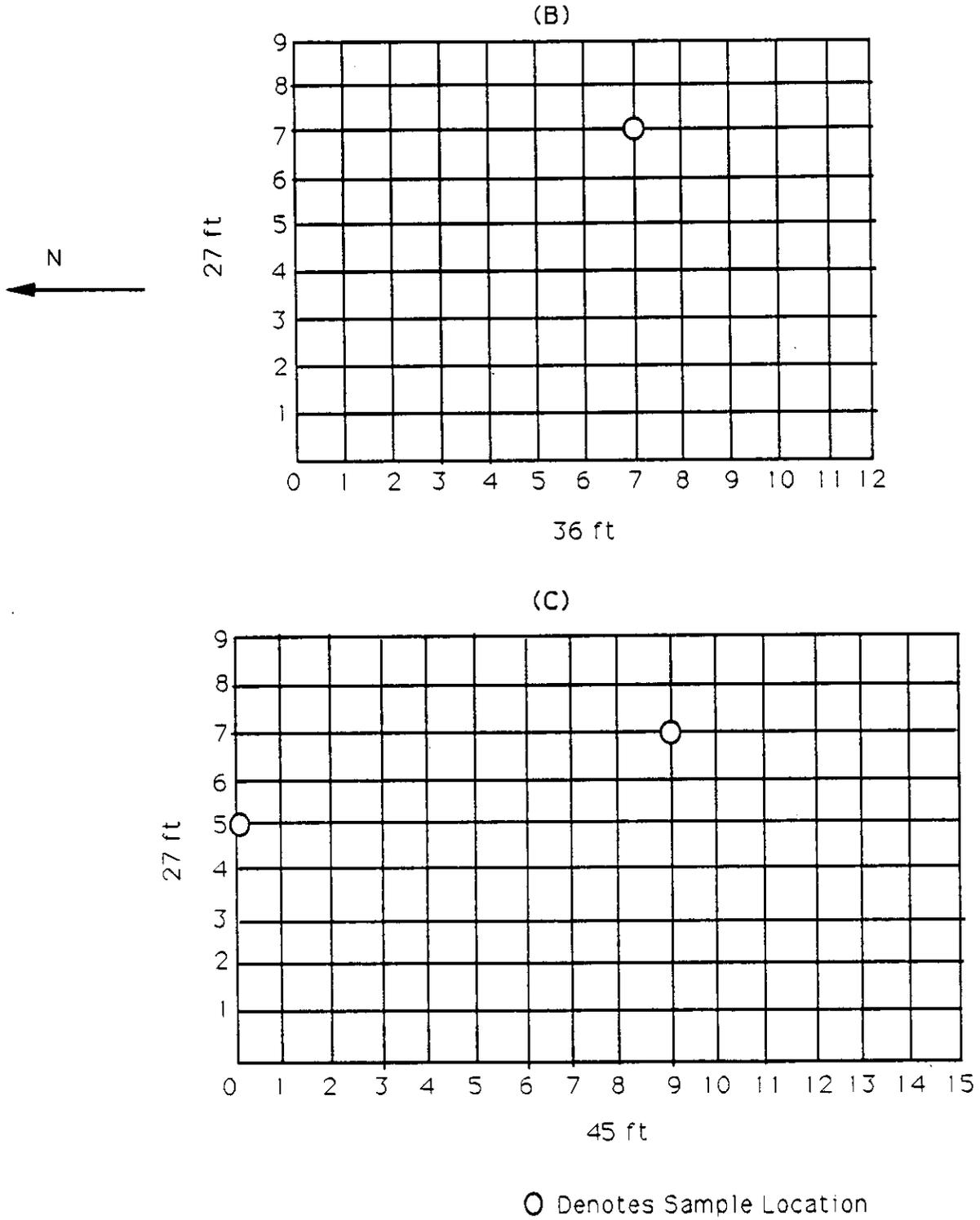


○ Denotes Sample Location

1 Figure C-3. Area 4 Soil Sampling Locations. (sheet 1 of 2)

9 5 1 8 0 2 3 1 0 1 4

9 6 1 3 0 3 1 8 1 5



1 Figure C-3. Area 4 Soil Sampling Locations. (sheet 2 of 2)

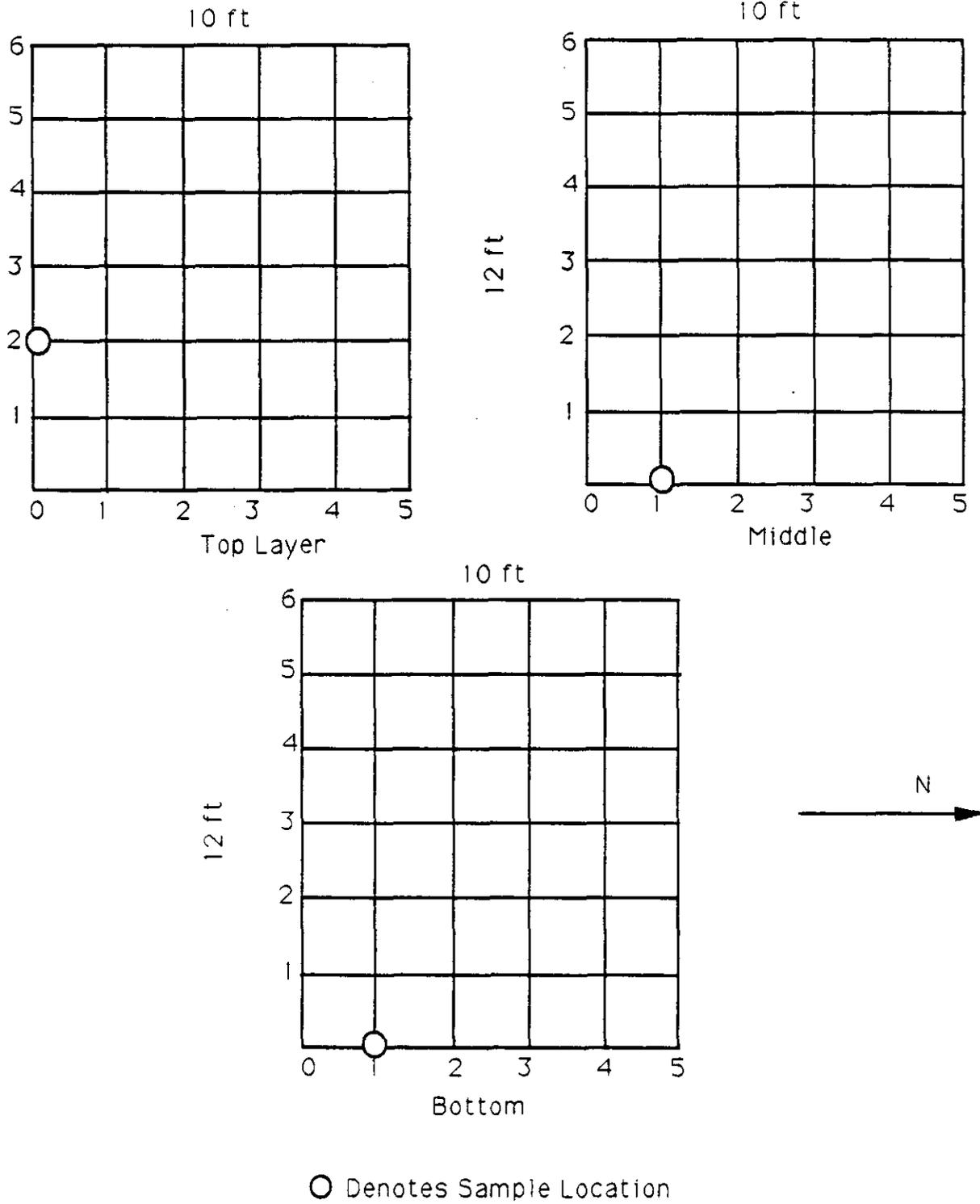


Figure C-4. Area 3 Gravel Bed Sampling Points.

1

9 3 1 3 0 2 3 1 6 1 6

1

APPENDIX C

SELECTED MATERIAL SAFETY DATA SHEETS

2
3

9 3 1 3 0 3 1 8 1 7

1
2
3
4
5

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9 3 1 5 0 2 3 1 6 1 0

MATERIAL SAFETY DATA SHEET

MSDS # 1288
OHS12510

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

MSDS # 1288

CAS-NUMBER 7439-92-1
RTEC-NUMBER OF7525000

SUBSTANCE: LEAD

TRADE NAMES/SYNONYMS:

C.I. PIGMENT METAL 4: C.I. 77575: LEAD FLAKE: KS-4: LEAD S 2: SI:
SO: PLUMBUM: SO: PB-S 100: LEAD ELEMENT: L-18: L-24: L-29:
L-27: T-134: PB: OHS12510

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: PB MOLECULAR WEIGHT: 207.19

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: LEAD PERCENT: 99.8

OTHER CONTAMINANTS: BISMUTH, COPPER, ARSENIC, ANTIMONY, TIN, IRON, SILVER,
ZINC

EXPOSURE LIMIT:

LEAD, INORGANIC FUMES AND DUST (AS PB):
50 UG(PB)/M3 OSHA 8 HOUR TWA
30 UG(PB)/M3 OSHA 8 HOUR TWA ACTION LEVEL
IF AN EMPLOYEE IS EXPOSED TO LEAD FOR MORE THAN 8 HOURS PER DAY THE
FOLLOWING FORMULA IS USED:
MAXIMUM PERMISSIBLE LIMIT (IN UG/M3) = 400 DIVIDED BY HOURS WORKED IN THE DAY
0.15 MG(PB)/M3 ACGIH TWA
<0.10 MG(PB)/M3 NIOSH RECOMMENDED 10 HOUR TWA

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY
WARNING AND RELEASE REQUIRMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: BLUISH-WHITE, SILVERY GRAY, HEAVY, MALLEABLE METAL
BOILING POINT: 3164 F (1740 C) MELTING POINT: 622 F (328 C)
SPECIFIC GRAVITY: 11.3 SOLUBILITY IN WATER: INSOLUBLE

MSDS # 1288

VAPOR PRESSURE: 1.3 MMHG @ 970 C

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN NITRIC ACID, HOT CONCENTRATED SULFURIC ACID

OTHER PHYSICAL DATA
HARDNESS: 1.5 MOHS

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, POSSIBLE FIRE AND EXPLOSION HAZARD IN DUST FORM WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
NO ACUTE HAZARD. MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. AVOID BREATHING VAPORS OR DUSTS; KEEP UPWIND.

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TOXICITY

LEAD:
450 MG/KG/6 YEAR ORAL-WOMAN TDLO; 10 UG/M3 INHALATION-HUMAN TCLO; 1000 MG/KG INTRAPERITONEAL-RAT LDLO; 160 MG/KG ORAL-PIGEON LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B FOR INORGANIC LEAD COMPOUNDS). RENAL TUMORS WERE PRODUCED IN ANIMALS BY LEAD ACETATE, SUBACETATE AND PHOSPHATE GIVEN ORALLY, SUBCUTANEOUSLY OR INTRAPERITONEALLY. NO EVALUATION COULD BE MADE OF THE CARCINOGENICITY OF POWDERED LEAD.

LEAD IS A NEUROTOXIN, NEPHROTOXIN, TERATOGEN, AND A CUMULATIVE POISON WHICH MAY ALSO AFFECT THE BLOOD, HEART, ENDOCRINE, AND IMMUNE SYSTEMS. PERSONS WITH NERVOUS SYSTEM OR GASTROINTESTINAL DISORDERS, ANEMIA, OR CHRONIC BRONCHITIS MAY BE AT AN INCREASED RISK FROM EXPOSURE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
LEAD:

MSDS # 1288

NEUROTOXIN/NEPHROTOXIN/TERATOGEN.

ACUTE EXPOSURE- INHALATION OF LARGE AMOUNTS OF LEAD MAY CAUSE A METALLIC TASTE, THIRST, A BURNING SENSATION IN THE MOUTH AND THROAT, SALIVATION, ABDOMINAL PAIN WITH SEVERE COLIC, VOMITING, BLOODY DIARRHEA, CONSTIPATION, FATIGUE, SLEEP DISTURBANCES, DULLNESS, RESTLESSNESS, IRRITABILITY, MEMORY LOSS, LOSS OF CONCENTRATION, DELIRIUM, OLIGURIA OFTEN WITH HEMATURIA AND ALBUMINURIA, ENCEPHALOPATHY WITH VISUAL FAILURE, PARESTHESIAS, MUSCLE PAIN AND WEAKNESS, CONVULSIONS, AND PARALYSIS. DEATH MAY RESULT FROM CARDIORESPIRATORY ARREST OR SHOCK. SURVIVORS OF ACUTE EXPOSURE MAY EXPERIENCE THE ONSET OF CHRONIC INTOXICATION. LIVER EFFECTS MAY INCLUDE ENLARGEMENT AND TENDERNESS AND JAUNDICE. THE FATAL DOSE OF ABSORBED LEAD IS APPROXIMATELY 0.5 GRAMS. PATHOLOGICAL FINDINGS INCLUDE GASTROINTESTINAL INFLAMMATION AND RENAL TUBULAR DEGENERATION. METAL FUME FEVER, AN INFLUENZA-LIKE ILLNESS, MAY OCCUR DUE TO THE INHALATION OF FRESHLY FORMED METAL OXIDE PARTICLES SIZED BELOW 1.5 MICRONS AND USUALLY BETWEEN 0.02-0.05 MICRONS. SYMPTOMS MAY BE DELAYED 4-12 HOURS AND BEGIN WITH A SUDDEN ONSET OF THIRST AND A SWEET, METALLIC OR FOUL TASTE IN THE MOUTH. OTHER SYMPTOMS MAY INCLUDE UPPER RESPIRATORY TRACT IRRITATION ACCOMPANIED BY COUGHING AND A DRYNESS OF THE MUCOUS MEMBRANES, LASSITUDE AND A GENERALIZED FEELING OF MALAISE. FEVER, CHILLS, MUSCULAR PAIN, MILD TO SEVERE HEADACHE, NAUSEA, OCCASIONAL VOMITING, EXAGGERATED MENTAL ACTIVITY, PROFUSE SWEATING, EXCESSIVE URINATION, DIARRHEA, AND PROSTRATION MAY ALSO OCCUR. TOLERANCE TO FUMES DEVELOPS RAPIDLY, BUT IS QUICKLY LOST. ALL SYMPTOMS USUALLY SUBSIDE WITHIN 24-36 HOURS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO LOW LEVELS OF LEAD MAY RESULT IN AN ACCUMULATION IN BODY TISSUES AND EXERT ADVERSE EFFECTS ON THE BLOOD, NERVOUS SYSTEMS, HEART, ENDOCRINE AND IMMUNE SYSTEMS, KIDNEYS, AND REPRODUCTION. EARLY STAGES OF LEAD POISONING, "PLUMBISM", MAY BE EVIDENCED BY PALLOR, ANOREXIA, WEIGHT LOSS, CONSTIPATION, APATHY OR IRRITABILITY, OCCASIONAL VOMITING, FATIGUE, HEADACHE, WEAKNESS, METALLIC TASTE IN THE MOUTH, GINGIVAL LEAD LINE IN PERSONS WITH POOR DENTAL HYGIENE, AND ANEMIA. LOSS OF RECENTLY DEVELOPED MOTOR SKILLS IS GENERALLY OBSERVED ONLY IN CHILDREN. MORE ADVANCED STAGES OF POISONING MAY BE CHARACTERIZED BY INTERMITTENT VOMITING, IRRITABILITY AND NERVOUSNESS, MYALGIA OF THE ARMS, LEGS, JOINTS, AND ABDOMEN, PARALYSIS OF THE EXTENSOR MUSCLES OF THE ARMS AND LEGS WITH WRIST AND/OR FOOT DROP, AND INTESTINAL SPASMS WHICH CAUSE SEVERE ABDOMINAL PAIN. SEVERE "PLUMBISM" MAY RESULT IN PERSISTENT VOMITING, ATAXIA, PERIODS OF STUPOR OR LETHARGY, ENCEPHALOPATHY WITH VISUAL DISTURBANCES WHICH MAY PROGRESS TO OPTIC NEURITIS AND ATROPHY, HYPERTENSION, PAPPILLEDEMA, CRANIAL NERVE PARALYSIS, DELIRIUM, CONVULSIONS, AND COMA. NEUROLOGIC SEQUELAE MAY INCLUDE MENTAL RETARDATION, SEIZURES, CEREBRAL PALSY, AND DYSTONIA MUSCULORUM DEFORMANS. IRREVERSIBLE KIDNEY DAMAGE HAS BEEN ASSOCIATED WITH INDUSTRIAL EXPOSURE. REPRODUCTIVE EFFECTS HAVE BEEN EXHIBITED IN BOTH MALES AND FEMALES. PATERNAL EFFECTS MAY INCLUDE DECREASED SEX DRIVE, IMPOTENCE, STERILITY, AND ADVERSE EFFECTS ON THE SPERM WHICH MAY INCREASE THE RISK OF BIRTH DEFECTS. MATERNAL EFFECTS MAY INCLUDE MISCARRIAGE AND STILLBIRTHS IN EXPOSED WOMEN OR WOMEN WHOSE HUSBANDS WERE EXPOSED, ABORTION, STERILITY OR DECREASED FERTILITY, AND ABNORMAL MENSTRUAL CYCLES. LEAD CROSSES THE PLACENTA AND MAY AFFECT THE FETUS CAUSING BIRTH DEFECTS, MENTAL RETARDATION, BEHAVIORAL DISORDERS, AND DEATH DURING THE FIRST YEAR OF CHILDHOOD. ANIMAL STUDIES INDICATE THAT REPRODUCTIVE EFFECTS MAY BE ADDITIVE IF BOTH PARENTS ARE EXPOSED TO LEAD.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

MSDS # 1288

LEAD:

ACUTE EXPOSURE- DIRECT CONTACT WITH LEAD POWDERS OR DUST MAY CAUSE IRRITATION. LEAD IS NOT ABSORBED THROUGH THE SKIN, BUT MAY BE TRANSFERRED TO THE MOUTH INADVERTENTLY BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO THE POWDER OR DUST MAY RESULT IN DERMATITIS. SYSTEMIC TOXICITY MAY DEVELOP IF LEAD IS TRANSFERRED TO THE MOUTH BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

LEAD:

ACUTE EXPOSURE- LEAD DUST OR POWDERS MAY CAUSE IRRITATION. METALLIC LEAD PARTICLES MAY CAUSE AN INFLAMMATORY FOREIGN BODY REACTION; INJURY IS GENERALLY THOUGHT TO BE MECHANICAL AND NOT TOXIC.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

LEAD:

NEUROTOXIN/NEPHROTOXIN/TERATOGEN.

ACUTE EXPOSURE- ABSORPTION OF LARGE AMOUNTS OF LEAD FROM THE INTESTINAL TRACT MAY CAUSE SYSTEMIC EFFECTS AS DETAILED IN ACUTE INHALATION. THE FATAL DOSE OF ABSORBED LEAD IS APPROXIMATELY 0.5 GRAMS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO LOW LEVELS OF LEAD MAY RESULT IN AN ACCUMULATION IN BODY TISSUES AND ADVERSE EFFECTS ON THE KIDNEYS, HEART, AND BLOOD, AND ON THE NERVOUS, REPRODUCTIVE, ENDOCRINE, AND IMMUNE SYSTEMS AS DETAILED IN CHRONIC INHALATION.

FIRST AID- DO NOT INDUCE VOMITING. QUALIFIED MEDICAL PERSONNEL SHOULD REMOVE CHEMICAL BY GASTRIC LAVAGE OR CATHARSIS. ACTIVATED CHARCOAL IS USEFUL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:

THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

FOR LEAD POISONING:

INITIATE URINE FLOW FIRST. GIVE 10% DEXTROSE IN WATER INTRAVENOUSLY, 10-20 ML/KG BODY WEIGHT, OVER A PERIOD OF 1-2 HOURS. IF URINE FLOW DOES NOT START, GIVE MANNITOL, 20% SOLUTION, 5-10 ML/KG BODY WEIGHT INTRAVENOUSLY OVER 20 MINUTES. FLUID MUST BE LIMITED TO REQUIREMENTS AND CATHETERIZATION MAY BE NECESSARY IN COMA. DAILY URINE OUTPUT SHOULD BE 350-500 ML/M²/24 HOURS. EXCESSIVE FLUIDS FURTHER INCREASE CEREBRAL EDEMA.

FOR ADULTS WITH ACUTE ENCEPHALOPATHY, GIVE DIMERCAPROL, 4 MG/KG, INTRAMUSCULARLY EVERY 4 HOURS FOR 30 DOSES. BEGINNING 4 HOURS LATER, GIVE CALCIUM DISODIUM EDETATE AT A SEPERATE INJECTION SITE, 12.5 MG/KG INTRAMUSCULARLY EVERY 4 HOURS AS A 20% SOLUTION, WITH 0.5% PROCAINE ADDED FOR A TOTAL OF 30 DOSES. IF SIGNIFICANT IMPROVEMENT HAS NOT OCCURRED BY THE FOURTH DAY, INCREASE THE NUMBER OF INJECTIONS BY 10 FOR EACH DRUG.

FOR SYMPTOMATIC ADULTS, THE COURSE OF DIMERCAPROL AND CALCIUM DISODIUM EDETATE CAN BE SHORTENED OR CALCIUM DISODIUM EDETATE ONLY CAN BE GIVEN IN

MSDS # 1288

DOSAGE OF 50 MG/KG INTRAVENOUSLY AS 0.5% SOLUTION IN 5% DEXTROSE IN WATER
NORMAL SALINE BY INFUSION OVER NOT LESS THAN 8 HOURS FOR NOT MORE THAN
5 DAYS. FOLLOW WITH PENICILLAMINE, 500-750 MG/DAY, ORALLY FOR 1-2 MONTHS OR
UNTIL URINE LEAD LEVELS DROPS BELOW 0.3 MG/24 HOURS (DREISBACH, HANDBOOK OF
POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL
PERSONNEL.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

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INCOMPATIBILITIES:

LEAD:
AMMONIUM NITRATE: VIOLENT OR EXPLOSIVE REACTION.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
DISODIUM ACETYLIDE: TRITURATION IN MORTAR MAY BE VIOLENT AND LIBERATE
CARBON.
HYDROGEN PEROXIDE (5% OR GREATER): VIOLENT DECOMPOSITION.
HYDROGEN PEROXIDE (6% SOLUTION) AND TRIOXANE: SPONTANEOUSLY DETONABLE.
METALS (ACTIVE): INCOMPATIBLE.
NITRIC ACID: LEAD-CONTAINING RUBBER MAY IGNITE.
OXIDIZERS (STRONG): INCOMPATIBLE.
SODIUM AZIDE: FORMS LEAD AZIDE AND COPPER AZIDE IN COPPER PIPE.
SODIUM CARBIDE: VIGOROUS REACTION.
SULFURIC ACID (HOT): REACTS.
ZIRCONIUM-LEAD ALLOYS: IGNITION ON IMPACT.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS ARE TOXIC OXIDES OF LEAD.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL
TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING
OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE
ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY.

MSDS # 1288

SPILLS AND LEAKS

WATER-SPILL:

THE CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) PROHIBITS CONTAMINATING ANY KNOWN SOURCE OF DRINKING WATER WITH SUBSTANCES KNOWN TO CAUSE CANCER AND/OR REPRODUCTIVE TOXICITY.

OCCUPATIONAL-SPILL:

DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

REPORTABLE QUANTITY (RQ): 1 POUND

THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):

VENTILATION SHOULD MEET THE REQUIREMENTS IN 29CFR1910.1025(E).

RESPIRATOR:

THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29 CFR 1910, SUBPART Z.

RESPIRATORY PROTECTION FOR LEAD AEROSOLS

**AIRBORNE CONCENTRATION OF LEAD OR
CONDITION OF USE**

REQUIRED RESPIRATOR

NOT IN EXCESS OF 0.5 MG/M3 (10X PEL)

HALF-MASK, AIR PURIFYING
RESPIRATOR EQUIPPED WITH
HIGH-EFFICIENCY FILTERS.

NOT IN EXCESS OF 2.5 MG/M3 (50X PEL)

FULL FACEPIECE, AIR-PURIFYING
RESPIRATOR WITH HIGH EFFICIENCY
FILTERS.

NOT IN EXCESS OF 50 MG/M3 (1000X PEL)

ANY POWERED AIR-PURIFYING
RESPIRATOR WITH HIGH EFFICIENCY
FILTERS;

OR

HALF-MASK SUPPLIED-AIR RESPIRATOR
OPERATED IN POSITIVE-PRESSURE
MODE.

MSDS # 1288

NOT IN EXCESS OF 100 MG/M3

SUPPLIED-AIR RESPIRATORS WITH
FULL FACEPIECE, HOOD OR HELMET OF
SUIT, OPERATED IN POSITIVE
PRESSURE MODE.

GREATER THAN 100 MG/M3, UNKNOWN
CONCENTRATIONS OR FIREFIGHTING

FULL FACEPIECE, SELF-CONTAINED
BREATHING APPARATUS OPERATED IN
POSITIVE-PRESSURE MODE.

(RESPIRATORS SPECIFIED FOR HIGHER CONCENTRATIONS CAN BE USED AT LOWER
CONCENTRATIONS OF LEAD).

(FULL FACEPIECE IS REQUIRED IF THE LEAD AEROSOLS CAUSE EYE OR SKIN IRRITATION
AT THE USE CONCENTRATIONS.)

(A HIGH EFFICIENCY PARTICULATE FILTER MEANS 99.97% EFFICIENT AGAINST 0.3
MICRON PARTICLES.)

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS
BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO
CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS.

THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND
AT THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF
OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

LEAD, INORGANIC FUMES AND DUSTS (AS PB):

10.50 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR.

ANY AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY
PARTICULATE FILTER.

ANY SELF-CONTAINED BREATHING APPARATUS.

2.25 MG(PB)/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY
PARTICULATE FILTER.

ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW
MODE.

2.50 MG(PB)/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A
HIGH-EFFICIENCY PARTICULATE FILTER.

ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING
FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.

ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL
FACEPIECE.

ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

ANY SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING FACEPIECE
OPERATED IN A CONTINUOUS FLOW MODE.

50.0 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A HALF-MASK AND OPERATED IN
A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

1.0 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND
OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE
MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A

MSDS # 1288

HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING
APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITION.
SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE
DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND
OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY
SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER
POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):
PROTECTIVE CLOTHING SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING
AND EQUIPMENT IN 29 CFR 1910.1025(G).

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS
SUBSTANCE.

LEAD (ELEMENTAL, INORGANIC & SOAPS):
PROTECTIVE GLOVES SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING
AND EQUIPMENT IN 29 CFR 1910.1025(G).

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT
EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY
BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH
FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):
PROTECTIVE EYE EQUIPMENT SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK
CLOTHING AND EQUIPMENT IN 29 CFR 1910.1025(G).

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 12/10/84

REVISION DATE: 10/13/89

MATERIAL SAFETY DATA SHEET OHS21080

OCCUPATIONAL HEALTH SERVICES, INC. EMERGENCY CONTACT:
SEVENTH AVENUE, SUITE 2407 JOHN S. BRANSFORD, JR. (615) 292-1180
YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

SUBSTANCE IDENTIFICATION

CAS-NUMBER 497-19-8
RTEC-NUMBER VZ4050000

SUBSTANCE: SODIUM CARBONATE

TRADE NAMES/SYNONYMS:

CARBONIC ACID, DISODIUM SALT: BISODIUM CARBONATE: CALCINED SODA:
CARBONIC ACID SODIUM SALT: CARBONIC ACID SODIUM SALT (1:2): DISODIUM
CARBONATE: NA-X: SODA: SODA ASH: OHS21080

CHEMICAL FAMILY:
INORGANIC SALT

MOLECULAR FORMULA: C-03.2NA MOLECULAR WEIGHT: 105.99

CERCLA RATINGS (SCALE 0-3): HEALTH=2 FIRE=0 REACTIVITY=1 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=0 REACTIVITY=1

COMPONENTS AND CONTAMINANTS

COMPONENT: SODIUM CARBONATE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:

NO OCCUPATIONAL EXPOSURE LIMITS ESTABLISHED BY OSHA, ACGIH, OR NIOSH.

PHYSICAL DATA

DESCRIPTION: ODORLESS, COLORLESS TO WHITE, HYGROSCOPIC CRYSTALLINE POWDER,
SMALL CRYSTALS, OR GRANULES WITH AN ALKALINE TASTE.

BOILING POINT: DECOMPOSES MELTING POINT: 1564 F (851 C)

SPECIFIC GRAVITY: 2.536 SOLUBILITY IN WATER: 7.1% @ 0 C

PH: 11.5 @ 1% AQ SOLN

OTHER SOLVENTS (SOLVENT - SOLUBILITY):

SOLUBLE IN GLYCEROL; INSOLUBLE IN ALCOHOL, ACETONE

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD

NEGLECTIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:

DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:

NO ACUTE HAZARD. MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. AVOID BREATHING VAPORS OR DUSTS; KEEP UPWIND.

TOXICITY

SODIUM CARBONATE:

ANHYDROUS: 500 MG/24 HOURS SKIN-RABBIT MILD IRRITATION; 100 MG/24 HOURS EYE-RABBIT MODERATE IRRITATION; 100 MG RINSED EYE-RABBIT MILD IRRITATION; 4090 MG/KG ORAL-RAT LD50; 2300 MG/M3/2 HOURS INHALATION-RAT LC50; 1200 MG/M3/2 HOURS INHALATION-MOUSE LC50; 2210 MG/KG SUBCUTANEOUS-MOUSE LD50; 117 MG/KG INTRAPERITONEAL-MOUSE LD50; 800 MG/M3/2 HOURS INHALATION-GUINEA PIG LC50; REPRODUCTIVE EFFECTS DATA (RTECS).

MONOHYDRATE: NO DATA AVAILABLE.

DECAHYDRATE: NO DATA AVAILABLE.

CARCINOGEN STATUS: NONE.

SODIUM CARBONATE IS TOXIC AND A SEVERE EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT.

HEALTH EFFECTS AND FIRST AID

INHALATION:

SODIUM CARBONATE:

IRRITANT/TOXIC.

ACUTE EXPOSURE- DUSTS OR VAPORS MAY CAUSE MUCOUS MEMBRANE IRRITATION WITH COUGHING, SHORTNESS OF BREATH, AND GASTROINTESTINAL CHANGES. EXPOSURE TO 1200 MG/M3/2 HOURS WAS THE LETHAL CONCENTRATION IN MICE TESTED.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE PERFORATION OF THE NASAL SEPTUM. EXPOSURE TO A CONCENTRATION OF 10 TO 20 MG/M3 OF A 2% AQUEOUS SOLUTION OF SODIUM CARBONATE FOR 4 HOURS/DAY, 5 DAYS/WEEK, FOR 3 AND A HALF MONTHS CAUSED NO PRONOUNCED EFFECTS IN MALE MICE. HOWEVER, AT HIGHER CONCENTRATIONS, A DECREASE IN WEIGHT GAIN WAS RECORDED.

HISTOLOGICAL EXAMINATIONS SHOWED THICKENING OF THE INTRA-ALVEOLAR WALLS, HYPEREMIA, LYMPHOID INFILTRATION, AND DESQUAMATION OF THE LUNGS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

SODIUM CARBONATE:

IRRITANT.

ACUTE EXPOSURE- CONTACT MAY CAUSE IRRITATION AND REDNESS. CONCENTRATED

SOLUTIONS MAY CAUSE ERYTHEMA, BLISTERING AND SKIN NECROSIS. 500 MG APPLIED TO RABBIT SKIN FOR 24 HOURS PRODUCED MILD IRRITATION. A SINGLE APPLICATION OF A 50% WEIGHT BY VOLUME AQUEOUS SOLUTION OF SODIUM CARBONATE TO INTACT SKIN OF RABBITS, GUINEA PIGS, AND HUMANS SHOWED NO ERYTHEMA, EDEMA, OR CORROSION. HOWEVER, WHEN APPLIED TO ABRADED SKIN, MODERATE ERYTHEMA AND EDEMA RESULTED IN RABBITS AND HUMANS, WITH NEGLIGIBLE EFFECTS IN GUINEA PIGS. IN ONE-THIRD OF THE HUMAN VOLUNTEERS, TISSUE DESTRUCTION WAS SEEN AT THE ABRADED SITES.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE DERMATITIS AND POSSIBLE "SODA ULCERS" OF THE HANDS AND WRISTS. SENSITIVITY REACTIONS MAY OCCUR FROM REPEATED EXPOSURES.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

SODIUM CARBONATE:
IRRITANT.

ACUTE EXPOSURE- CONTACT WITH DUSTS MAY CAUSE SEVERE IRRITATION WITH REDNESS, PAIN, AND BLURRED VISION. APPLICATION OF 100 MG TO RABBIT EYES AND THEN RINSED CAUSED ONLY MILD IRRITATION. IN SOLUTION, SODIUM CARBONATE IS SUFFICIENTLY ALKALINE TO DAMAGE THE CORNEAL EPITHELIUM, BUT IF PROMPTLY WASHED FROM THE EYES WITH WATER IT IS UNLIKELY TO CAUSE PERMANENT DAMAGE TO THE CORNEAL STROMA. AN APPLICATION OF SEVERAL DROPS OF A 10% SOLUTION (PH 10.7) TO A RABBIT'S EYE FOLLOWED BY IRRIGATION WITH WATER FOR 30 SECONDS CAUSED NO DETECTABLE INJURY. CONCENTRATED SOLUTIONS MAY CAUSE NECROSIS OF THE EYE.

CHRONIC EXPOSURE- DEPENDING UPON CONCENTRATION AND DURATION, SYMPTOMS MAY BE THOSE AS FOR ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH WAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

SODIUM CARBONATE:
CORROSIVE.

ACUTE EXPOSURE- INGESTION MAY CAUSE CORROSION OF THE GASTRIC MUCOSA WITH SORE THROAT AND PAIN. IT MAY CAUSE GASTROINTESTINAL DISTURBANCES SUCH AS NAUSEA, VOMITING, ABDOMINAL PAIN, AND DIARRHEA. DEATH IS GENERALLY DUE TO CIRCULATORY COLLAPSE. THE ESTIMATED LETHAL HUMAN DOSE IS APPROXIMATELY 30 GRAMS.

CHRONIC EXPOSURE- SODIUM CARBONATE IS USED AS A GENERAL PURPOSE FOOD ADDITIVE. NO ADVERSE EFFECTS HAVE BEEN REPORTED FROM EXPOSURE TO SMALL AMOUNTS.

FIRST AID- DILUTE THE ALKALI BY GIVING WATER OR MILK IMMEDIATELY AND ALLOW VOMITING TO OCCUR. AVOID GASTRIC LAVAGE OR EMETICS. ESOPHAGOSCOPY IS THE ONLY WAY TO EXCLUDE THE POSSIBILITY OF CORROSION IN THE UPPER GASTROINTESTINAL TRACT; IF CORROSION IS SUSPECTED, ESOPHAGOSCOPY SHOULD USUALLY BE PERFORMED WITHIN 24 HOURS (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). MAINTAIN AIRWAY AND TREAT SHOCK. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:

SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:

REACTS WITH WATER WITH THE EVOLUTION OF HEAT.

INCOMPATIBILITIES:

SODIUM CARBONATE:

ACIDS (STRONG): MAY REACT VIOLENTLY.

ALUMINUM (HOT): EXPLOSIVE REACTION.

AMMONIA + SILVER NITRATE: EXPLOSIVE REACTION UPON HEATING.

AN AROMATIC AMINE + A CHLORONITRO COMPOUND: EXOTHERMIC REACTION.

2,4-DINITROTOLUENE: INCREASES EXPLOSIVENESS.

FLUORINE: VIOLENT IGNITION.

LITHIUM (BURNING): RELEASES REACTIVE SODIUM.

PHOSPHORUS PENTOXIDE: HIGHLY EXOTHERMIC REACTION.

SODIUM SULFIDE (HOT): EXPLOSIVE REACTION ON CONTACT WITH WATER.

SULFURIC ACID: VIOLENT ERUPTION.

2,4,6-TRINITROTOLUENE: REDUCED EXPLOSION TEMPERATURE.

ZINC: CORROSIVE.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC SODIUM OXIDE AND TOXIC OXIDES OF CARBON.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

NONE REPORTED.

SPIILLS AND LEAKS

OCCUPATIONAL-SPILL:

SWEEP UP AND PLACE IN SUITABLE (FIBERBOARD) CONTAINERS FOR RECLAMATION OR LATER DISPOSAL.

PROTECTIVE EQUIPMENT SECTION

VENTILATION:

PROVIDE LOCAL EXHAUST OR GENERAL DILUTION VENTILATION SYSTEM.

RESPIRATOR:

THE FOLLOWING RESPIRATORS ARE RECOMMENDED BASED ON INFORMATION FOUND IN THE PHYSICAL DATA, TOXICITY AND HEALTH EFFECTS SECTIONS. THEY ARE RANKED IN ORDER FROM MINIMUM TO MAXIMUM RESPIRATORY PROTECTION.

THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

DUST AND MIST RESPIRATOR WITH A FULL FACEPIECE.

AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND HIGH-EFFICIENCY PARTICULATE FILTER.

TYPE 'C' SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINUOUS-FLOW MODE.

SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 12/19/84

REVISION DATE: 10/13/89

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MATERIAL SAFETY DATA SHEET

OHS12880

OCCUPATIONAL HEALTH SERVICES, INC.
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NEW YORK, NEW YORK 10123
(212) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 554-13-2
RTEC-NUMBER QJ5800000

SUBSTANCE: LITHIUM CARBONATE

TRADE NAMES/SYNONYMS:

CARBONIC ACID, DILITHIUM SALT: DILITHIUM CARBONATE: CARBONIC ACID,
LITHIUM SALT: LITHIUM CARBONATE (LI₂CO₃): CARBOLITH: ESKALITH:
HYPNOREX: LITHONATE: LITHOTABS: PLENUR: L-119: CL1203: OHS12880

CHEMICAL FAMILY:
INORGANIC SALT

MOLECULAR FORMULA: LI₂-C-O₃ MOLECULAR WEIGHT: 73.89

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=U FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: LITHIUM CARBONATE PERCENT: 100

EXPOSURE LIMIT:

NO OCCUPATIONAL EXPOSURE LIMITS ESTABLISHED BY OSHA, ACGIH, OR NIOSH.

PHYSICAL DATA

DESCRIPTION: WHITE CRYSTALLINE POWDER.

BOILING POINT: 2390 F (1310 C)
(DECOMPOSES)

MELTING POINT: 1333 F (723 C)

SPECIFIC GRAVITY: 2.11

SOLUBILITY IN WATER: 1.54% @ 0 C

PH: 11.2 @ 1% SOLUTION

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
INSOLUBLE IN ALCOHOL, ACETONE, AMMONIA.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD

NEGLECTIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
EXTINGUISH USING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE.

DOE/RL-90-25
Rev. 1

FIREFIGHTING:
NO ACUTE HAZARD. MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. AVOID BREATHING VAPORS OR DUSTS; KEEP UPWIND.

TOXICITY

LITHIUM CARBONATE:

4111 MG/KG ORAL-HUMAN TDLO; 54 MG/KG ORAL-MAN TDLO; 8 MG/KG ORAL-MAN TDLO;
1080 MG/KG/13 WEEKS INTERMITTENT ORAL-MAN TDLO; 120 MG/KG/10 DAYS INTERMITTENT
ORAL-WOMAN TDLO; 525 MG/KG ORAL-RAT LD50; 531 MG/KG ORAL-MOUSE LD50;
556 MG/KG/32 DAYS UNREPORTED-WOMAN TDLO; 500 MG/KG ORAL-DOG LD50; 156 MG/KG
INTRAPERITONEAL-RAT LD50; 241 MG/KG INTRAVENOUS-RAT LD50; 434 MG/KG
SUBCUTANEOUS-RAT LD50; 236 MG/KG INTRAPERITONEAL-MOUSE LD50; 497 MG/KG
INTRAVENOUS-MOUSE LD50; 413 MG/KG SUBCUTANEOUS-MOUSE LD50; MUTAGENIC DATA
(RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.

LITHIUM CARBONATE IS AN EYE IRRITANT AND MAY IRRITATE THE SKIN AND
MUCOUS MEMBRANES. POISONING MAY AFFECT THE NERVOUS SYSTEM, KIDNEYS AND
THYROID. PERSONS AT INCREASED RISK FROM EXPOSURE MAY INCLUDE INDIVIDUALS
WITH SIGNIFICANT CARDIOVASCULAR OR RENAL DISEASE; SODIUM AND WATER
IMBALANCE; AND PREEXISTING HYPOTHYROIDISM. TASKS REQUIRING ALERTNESS
MAY BE IMPAIRED.

HEALTH EFFECTS AND FIRST AID

INHALATION:

LITHIUM CARBONATE:

ACUTE EXPOSURE- INHALATION MAY CAUSE COUGHING, SORE THROAT AND IRRITATION.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST.
TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

LITHIUM CARBONATE:

ACUTE EXPOSURE- APPLICATION OF 0.5 GRAMS TO RABBIT SKIN UNDER OCCLUSIVE
WRAP FOR 4 HOURS PRODUCED MINIMAL IRRITATION. A GRADE OF 0.3 ON
A SCALE OF 0 TO 8 WAS REPORTED FOLLOWING A 30 MINUTE INTERVAL AFTER
THE SKIN WAS RINSED. ONE RABBIT IN THE STUDY HAD SLIGHT ERYTHEMA
ON DAYS 1-4 FOLLOWING THE EXPOSURE.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED
AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO
EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL
ATTENTION IMMEDIATELY.

EYE CONTACT:

LITHIUM CARBONATE:
IRRITANT.

ACUTE EXPOSURE- INSTILLATION OF 0.10 GRAMS INTO RABBIT EYES PRODUCED MODERATE IRRITATION. SLIGHT TO MILD CORNEAL OPACITIES, IRITIS, SLIGHT TO MODERATE CONJUNCTIVITIS, HEMORRHAGES AND WHITE AREAS IN THE CONJUNCTIVA WERE NOTED. A GRADE OF 41 ON A SCALE OF 0-110 WAS REPORTED AFTER 24 HOURS. NO EFFECTS WERE NOTED BY DAY 7 OF THE STUDY. WASHING THE EYES WITH TAP WATER SHORTLY AFTER EXPOSURE DECREASED BOTH THE SEVERITY AND DURATION OF EFFECTS WITH RECOVERY OCCURRING IN 4 DAYS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

LITHIUM CARBONATE:

ACUTE EXPOSURE- INGESTION OF A LARGE DOSE MAY CAUSE SEVERE GASTROENTERITIS AND EFFECTS ON THE CENTRAL NERVOUS SYSTEM, RENAL FUNCTION AND FLUID AND ELECTROLYTE BALANCE. SYMPTOMS, POSSIBLY DELAYED, MAY INCLUDE NAUSEA, VOMITING, THIRST, ANOREXIA, DIARRHEA, BLURRED VISION, DROWSINESS, WEAKNESS, TREMOR, STAGGERING, BRADYCARDIA AND CCMA. MORE UNUSUAL REACTIONS MAY INCLUDE DELIRIUM WITH EEG CHANGES, ACTION MYOCLONUS, RHABDOMYOLYSIS, ECG CHANGES, GLYCOSURIA, AND ALLERGIC ERYTHEMA.

A PAINFUL DISCOLORATION OF THE FINGERS AND TOES AND COLDNESS OF THE EXTREMITIES WITHIN 1 DAY OF THERAPEUTIC USE HAS BEEN REPORTED. IN SEVERE CASES, DEATH MAY OCCUR DUE TO RENAL FAILURE OR CARDIAC OR PULMONARY COMPLICATIONS. SOME SURVIVORS MAY HAVE LONG-LASTING OR PERMANENT SEQUELAE, MOSTLY OF CEREBELLAR NATURE BUT, SOMETIMES WITH PERIPHERAL NEUROPATHY OR PARKINSONISM.

CHRONIC EXPOSURE- REPEATED OR PROLONGED INGESTION MAY CAUSE SYMPTOMS AS DETAILED IN ACUTE INGESTION. IN ADDITION, A METALLIC TASTE, DRY MOUTH, EXCESSIVE THIRST, ABDOMINAL PAIN AND INCONTINENCE OF URINE AND FECES MAY OCCUR. NERVOUS SYSTEM EFFECTS MAY INCLUDE A DAZED FEELING, CONFUSION, GIDDINESS, MENTAL LAPSES, DYSPRAXIA, DROWSINESS, VERTIGO, HEADACHE, APATHY, RESTLESSNESS, ANXIETY, SOME SUPPRESSION OF THE REM PHASES OF SLEEP, POSITIVE ROMBERG SIGN, BLACKOUT SPELLS, STUPOR, TINNITUS, AND UNCONSCIOUSNESS. NEUROLOGIC ASYMMETRY, PSYCHOMOTOR RETARDATION, SLURRED SPEECH, NYSTAGMUS AND EPILEPTIFORM SEIZURES MAY OCCUR. PSEUDOTUMOR CEREBRI (INCREASED INTRACRANIAL PRESSURE AND PAPPILLEDEMA) HAS BEEN REPORTED AND MAY POSSIBLY RESULT IN ENLARGEMENT OF THE BLIND SPOT, CONSTRICTION OF VISUAL FIELDS AND EVENTUAL BLINDNESS DUE TO OPTIC ATROPHY. PHOTOPHOBIA HAS BEEN REPORTED. MUSCULAR EFFECTS MAY INCLUDE TREMORS, ATAXIA, MUSCULAR AND REFLEX HYPERIRRITABILITY WITH FASCICULATIONS, TWITCHING AND SPASTIC OR CHOREO-ATHETOTIC MOVEMENTS, COGWHEEL RIGIDITY, PARKINSONISM AND DYSTONIA. TWO CASES INVOLVING SEVERE GENERALIZED SENSORIMOTOR PERIPHERAL NEUROPATHY HAVE BEEN REPORTED. CARDIAC ARRHYTHMIAS, HYPOTENSION, PERIPHERAL CIRCULATORY COLLAPSE, AND INTERSTITIAL MYOCARDITIS ARE POSSIBLE. LEUKOCYTOSIS IS FAIRLY COMMON.

ENDOCRINE EFFECTS MAY INCLUDE DISTURBED IODINE METABOLISM, STIMULATION OF ANTITHYROIDAL AUTO-ANTIBODIES, HYPOTHYROIDISM WITH MYXEDEMA, OR RARELY HYPERTHYROIDISM. OSTEOPOROSIS, AN INCREASE IN SERUM TOTAL CALCIUM, IONIZED CALCIUM AND PARATHYROID HORMONE AND INDEPENDENTLY FUNCTIONING PARATHYROID ADENOMAS HAVE BEEN REPORTED. TRANSITORY NEPHROTIC SYNDROME AND ACQUIRED NEPHROGENIC DIABETES INSIPIDUS MAY OCCUR. TRANSIENT HYPERGLYCEMIA, LOWERED URINARY CONCENTRATING ABILITY LEADING TO HYPERNATREMIA AND HYPEROSMOLALITY, SODIUM DEPLETION, POLYURIA,

GLYCOSURIA, OLIGURIA, ANURIA, AND AZOTEMIA ARE POSSIBLE. MORPHOLOGIC CHANGES WITH GLOMERULAR AND INTERSTITIAL FIBROSIS AND NEPHRON ATROPHY HAVE BEEN REPORTED. HOWEVER, A CAUSAL RELATIONSHIP HAS NOT BEEN ESTABLISHED. DERMATOLOGIC EFFECTS MAY INCLUDE CUTANEOUS HYPERALGESIA OR ANESTHESIA, XEROSIS CUTIS, CHRONIC FOLLICULITIS, GENERALIZED PRURITUS WITH OR WITHOUT RASH, DEVELOPMENT OR EXACERBATION OF ACNE OR PSORIASIS, CUTANEOUS ULCERS AND ALOPECIA. HYPER- OR HYPOTHERMIA, WEIGHT GAIN, EDEMA OF THE ANKLES AND WRISTS, AND SEXUAL DYSFUNCTION HAVE BEEN REPORTED. DEATH MAY OCCUR DUE TO RENAL FAILURE, BRAIN DAMAGE OR PULMONARY COMPLICATIONS. LITHIUM READILY CROSSES THE PLACENTAL BARRIER AND IS EXCRETED IN BREAST MILK. THE USE OF LITHIUM IN PREGNANCY HAS BEEN ASSOCIATED WITH NEONATAL GOITER, CARDIAC ANOMALIES, ESPECIALLY EBSTEIN'S, CENTRAL NERVOUS SYSTEM DEPRESSION AND HYPOTONIA. MARKED FUNCTIONAL AND STRUCTURAL CHANGES IN THE KIDNEYS OF NEWBORN RATS EXPOSED TO LITHIUM VIA THEIR MOTHER'S MILK HAVE BEEN REPORTED. ADVERSE EFFECTS ON NIDATION IN RATS AND EMBRYO VIABILITY IN MICE HAVE BEEN ATTRIBUTED TO LITHIUM, AS HAVE TERATOGENICITY IN SUBMAMMALIAN SPECIES AND CLEFT PALATES IN MICE. HOWEVER, OTHER STUDIES IN RATS, RABBITS AND MONKEYS HAVE SHOWN NO EVIDENCE OF LITHIUM-INDUCED DEVELOPMENTAL DEFECTS. LEUKEMIA HAS BEEN REPORTED DURING LITHIUM TREATMENT. HOWEVER, AN EPIDEMIOLOGIC STUDY INVOLVING A POPULATION OF 173,000 PERSONS YIELDED NEGATIVE RESULTS.

FIRST AID- IF VICTIM IS CONSCIOUS AND PRODUCTIVE VOMITING HAS NOT ALREADY OCCURRED, REMOVE POISON BY IPECAC EMESIS OR GASTRIC LAVAGE. (GOSSELIN, SMITH AND HODGE, CLINICAL TOXICOLOGY OF COMMERCIAL PRODUCTS, 5TH EDITION) MAINTAIN AIRWAY, RESPIRATION AND BLOOD PRESSURE. GET MEDICAL ATTENTION. ADMINISTRATION OF GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:

NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:

LITHIUM CARBONATE:

ACIDS (DILUTE): DECOMPOSES.

ACIDS (STRONG): MAY REACT VIOLENTLY.

FLUORINE: DECOMPOSES WITH INCANDESCENCE.

METALS: MAY BE CORROSIVE IN THE PRESCENCE OF MOISTURE.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

****STORAGE****

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

PREVENT DISPERSION OF DUST IN AIR.

SPILLS AND LEAKS

OCCUPATIONAL-SPILL:

FOR LARGE SPILLS, SWEEP UP WITH A MINIMUM OF DUSTING AND PLACE INTO SUITABLE CLEAN, DRY CONTAINERS FOR RECLAMATION OR LATER DISPOSAL.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

PROTECTIVE EQUIPMENT SECTION

VENTILATION:

PROVIDE LOCAL EXHAUST OR GENERAL DILUTION VENTILATION SYSTEM.

RESPIRATOR:

THE FOLLOWING RESPIRATORS ARE RECOMMENDED BASED ON INFORMATION FOUND IN THE PHYSICAL DATA, TOXICITY AND HEALTH EFFECTS SECTIONS. THEY ARE RANKED IN ORDER FROM MINIMUM TO MAXIMUM RESPIRATORY PROTECTION.

THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

DUST AND MIST RESPIRATOR.

AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER.

POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

TYPE 'C' SUPPLIED-AIR RESPIRATOR OPERATED IN THE PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS-FLOW MODE.

SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:

PROTECTIVE CLOTHING NOT REQUIRED. AVOID REPEATED OR PROLONGED CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/23/84

REVISION DATE: 09/07/89

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APPENDIX D
PHOTOGRAPHS

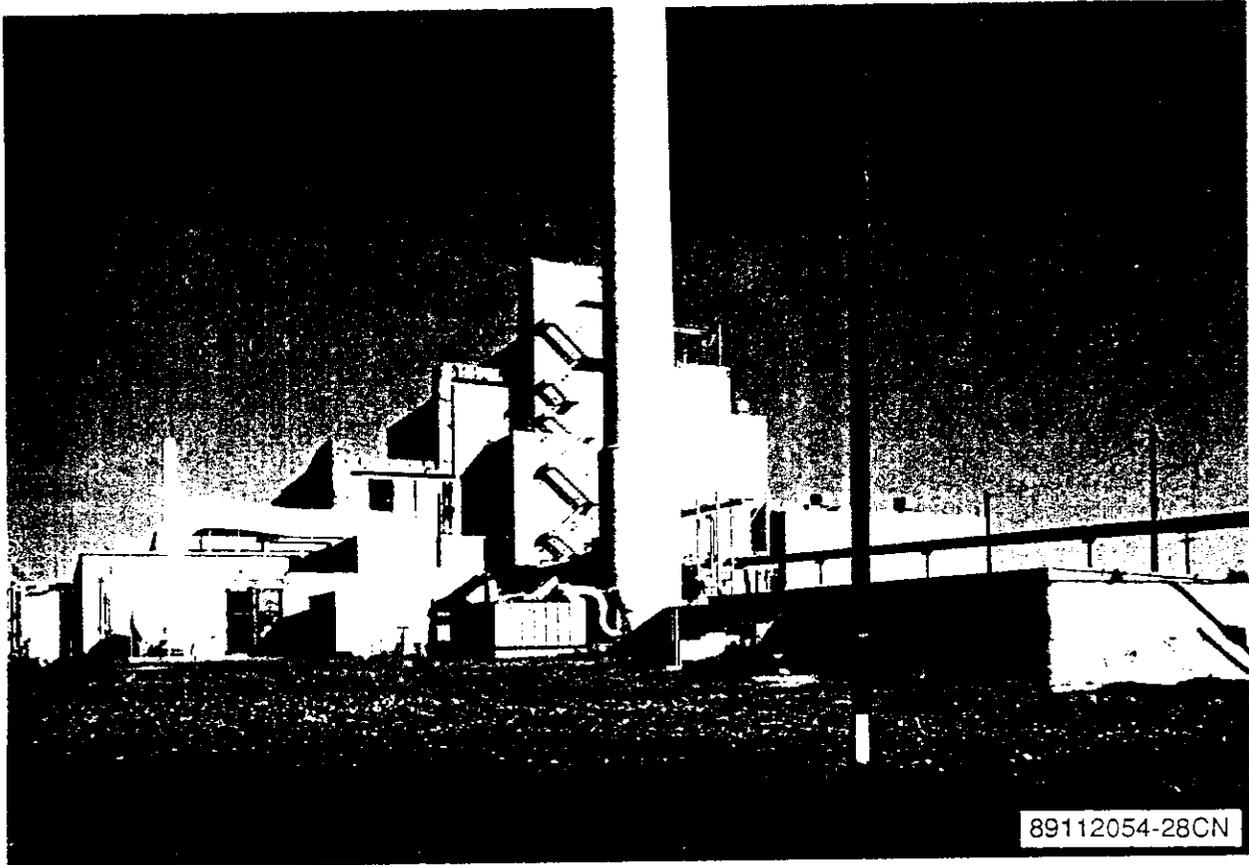
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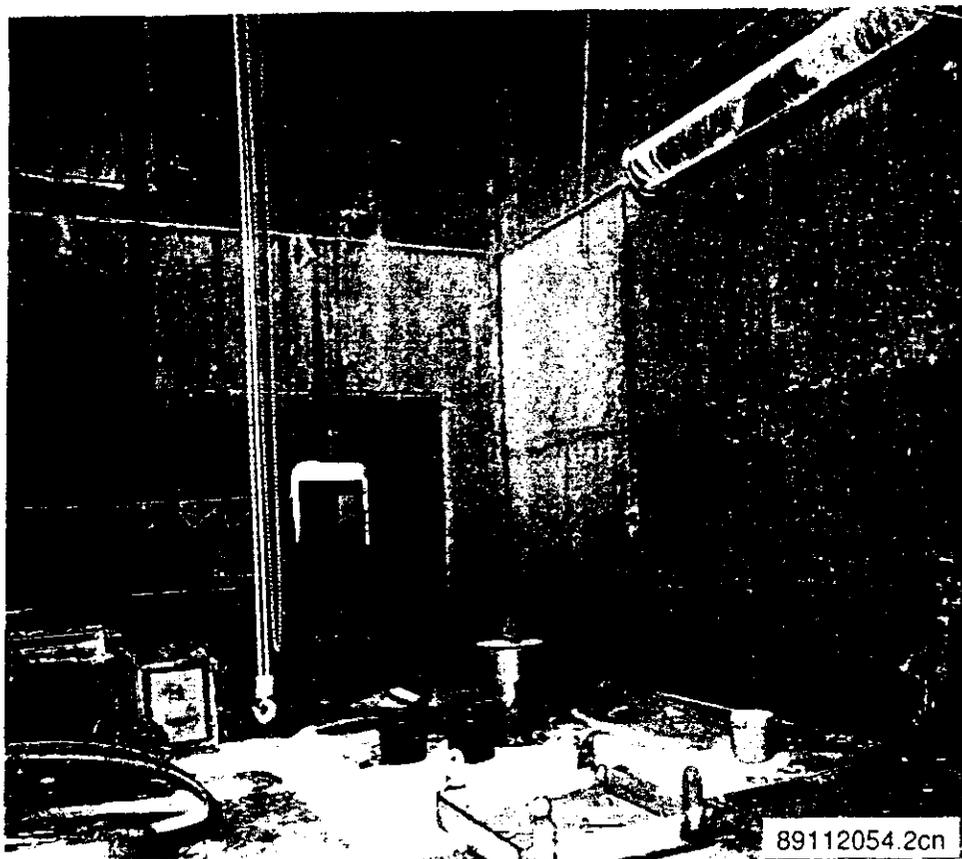
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Figure D-1. A View of 105-DR Reactor Building
from the LSFF (Fan Room) Side.

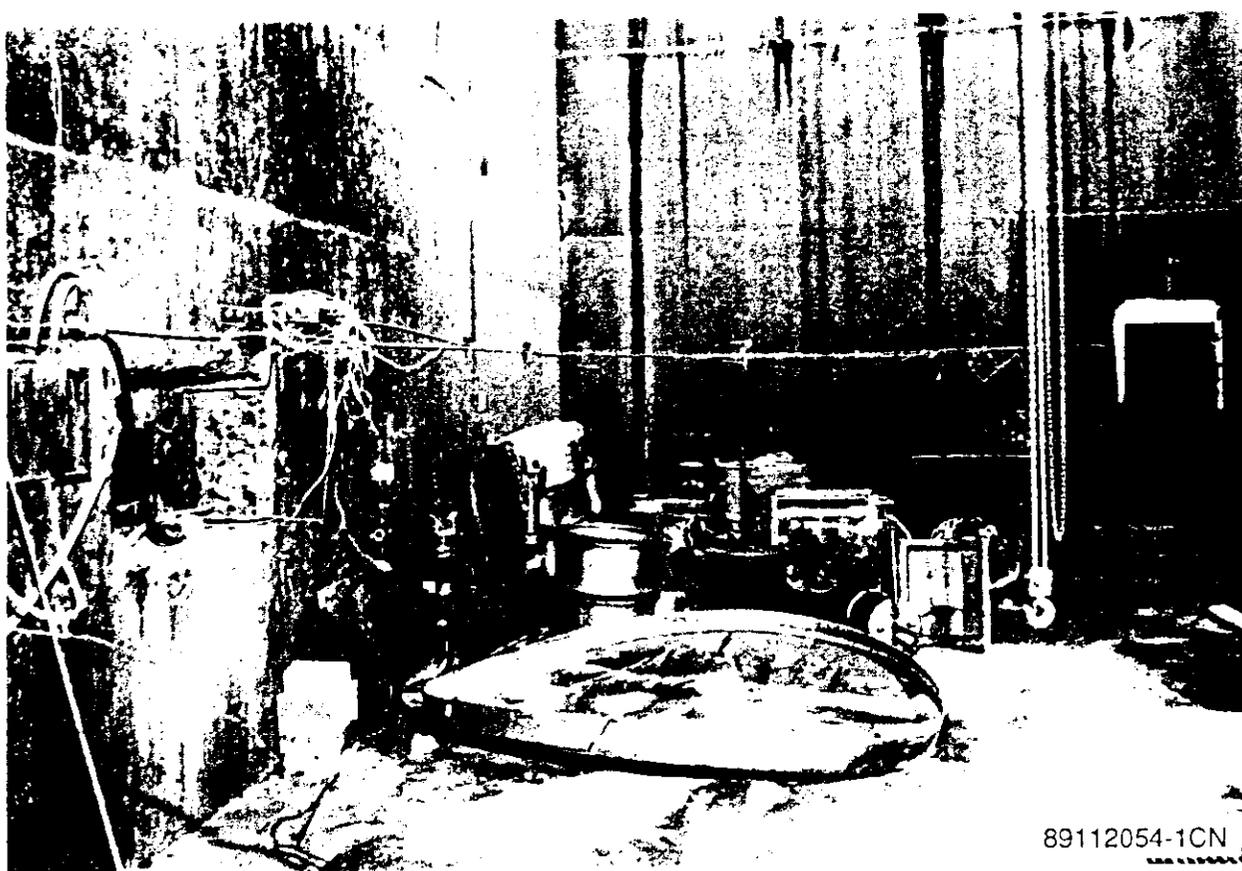
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Figure D-2. The Exhaust Fan Room of the LSFF.

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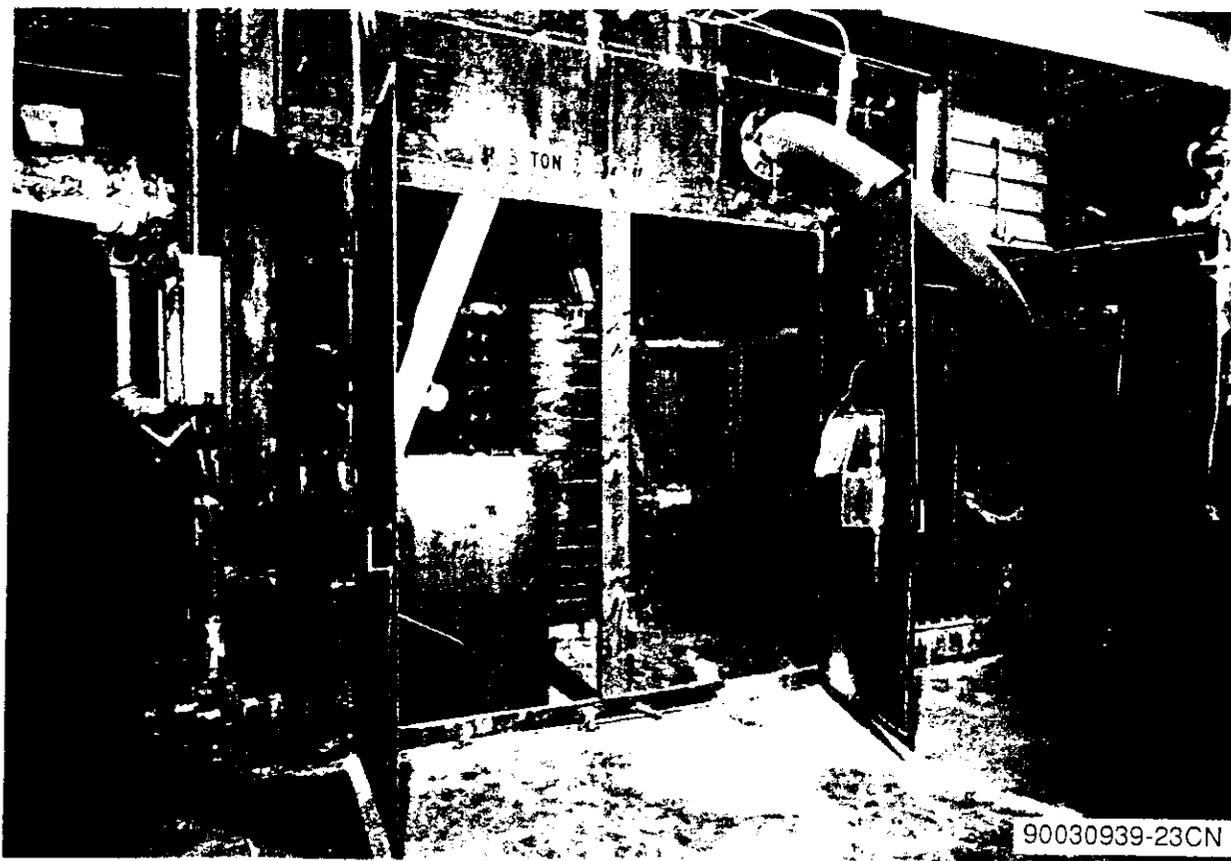


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Figure D-3. The Exhaust Fan Room of the LSFF.
(Looking at the Southeast Corner)

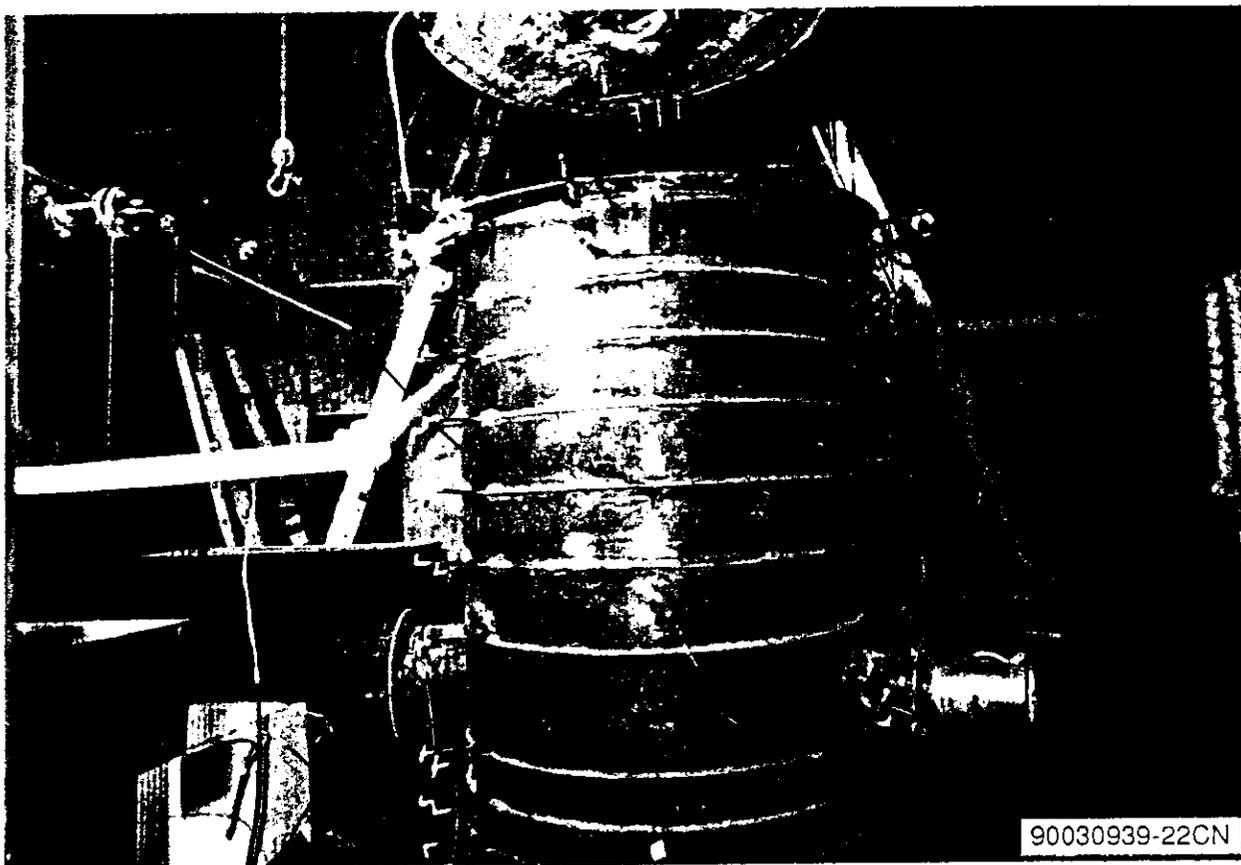
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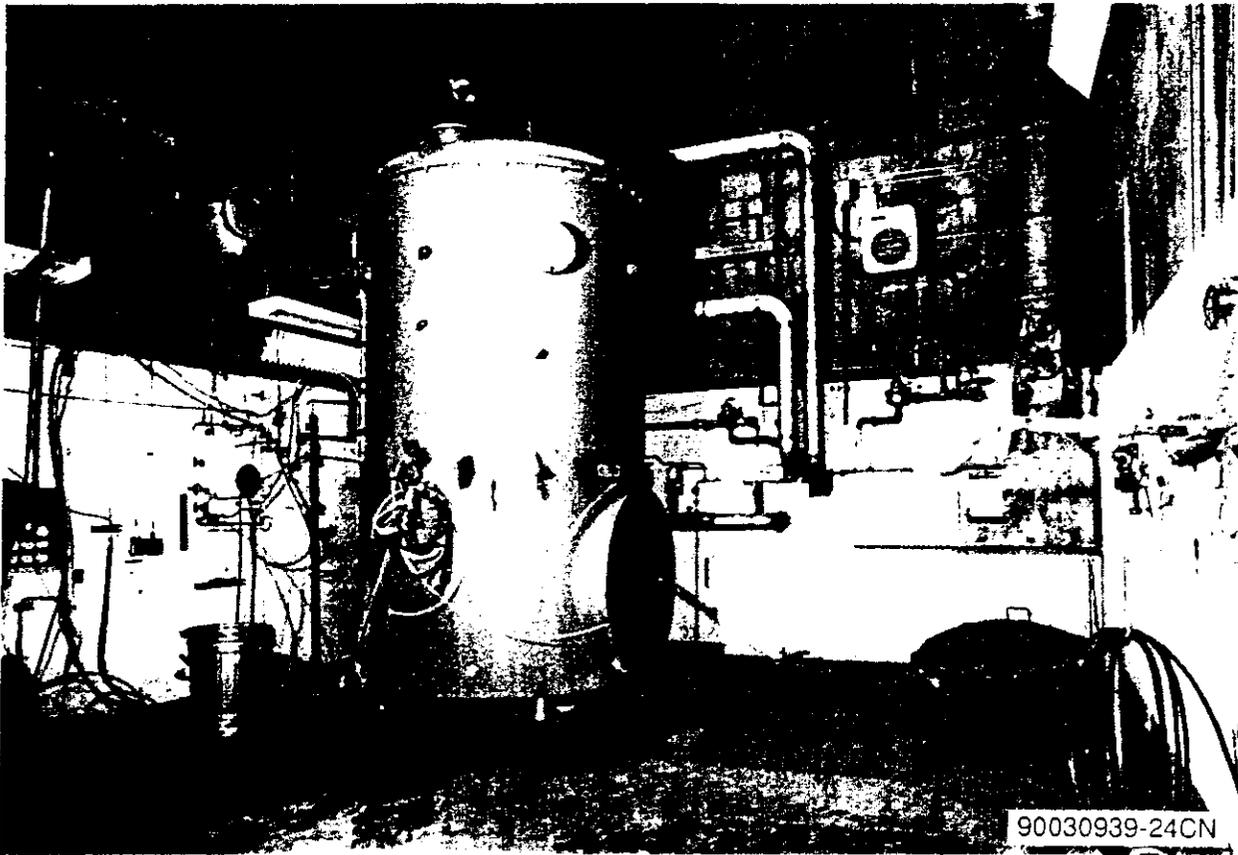
Figure D-4. The Large Fire Test Room of the LSFF.

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1 Figure D-5. The Large Fire Test Room and Apparatus of the LSFF.

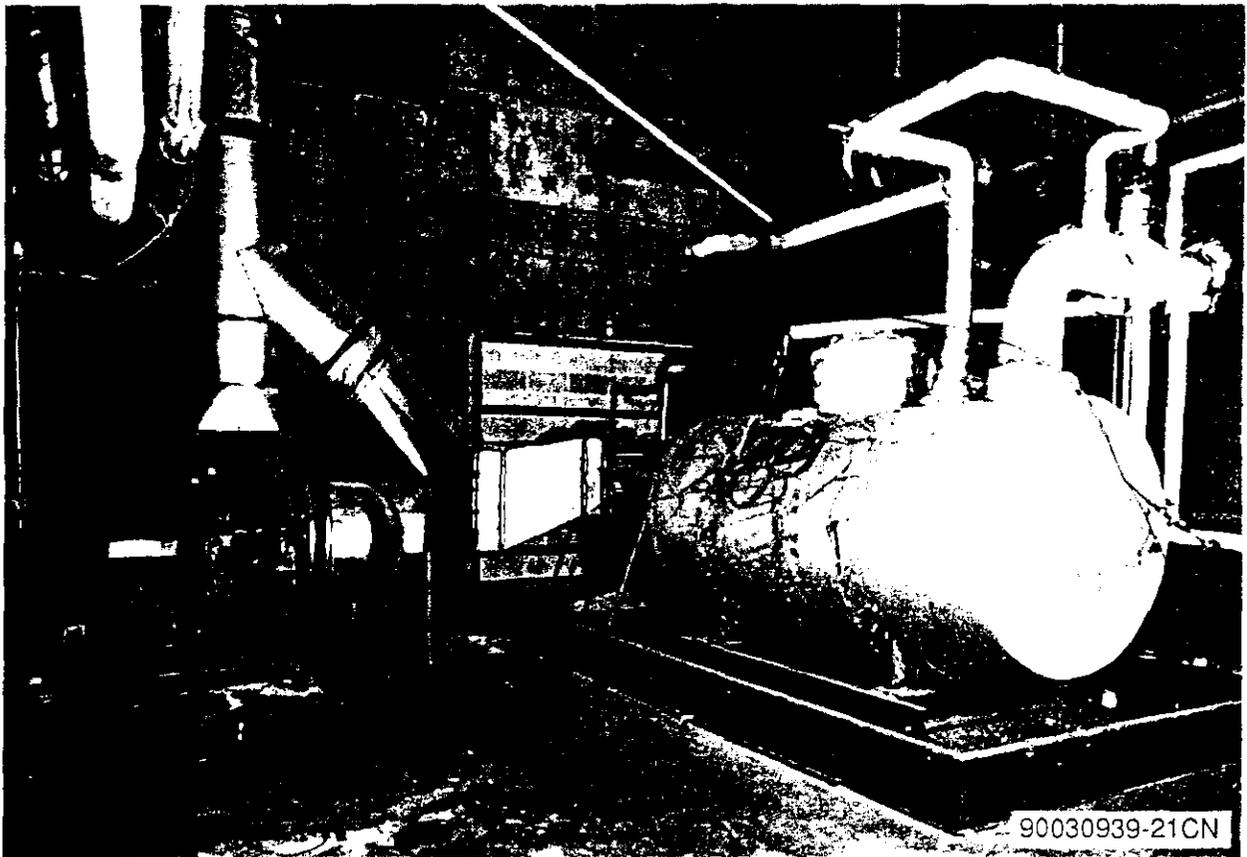
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Figure D-6. The Small Fire Test Room of the LSFF.

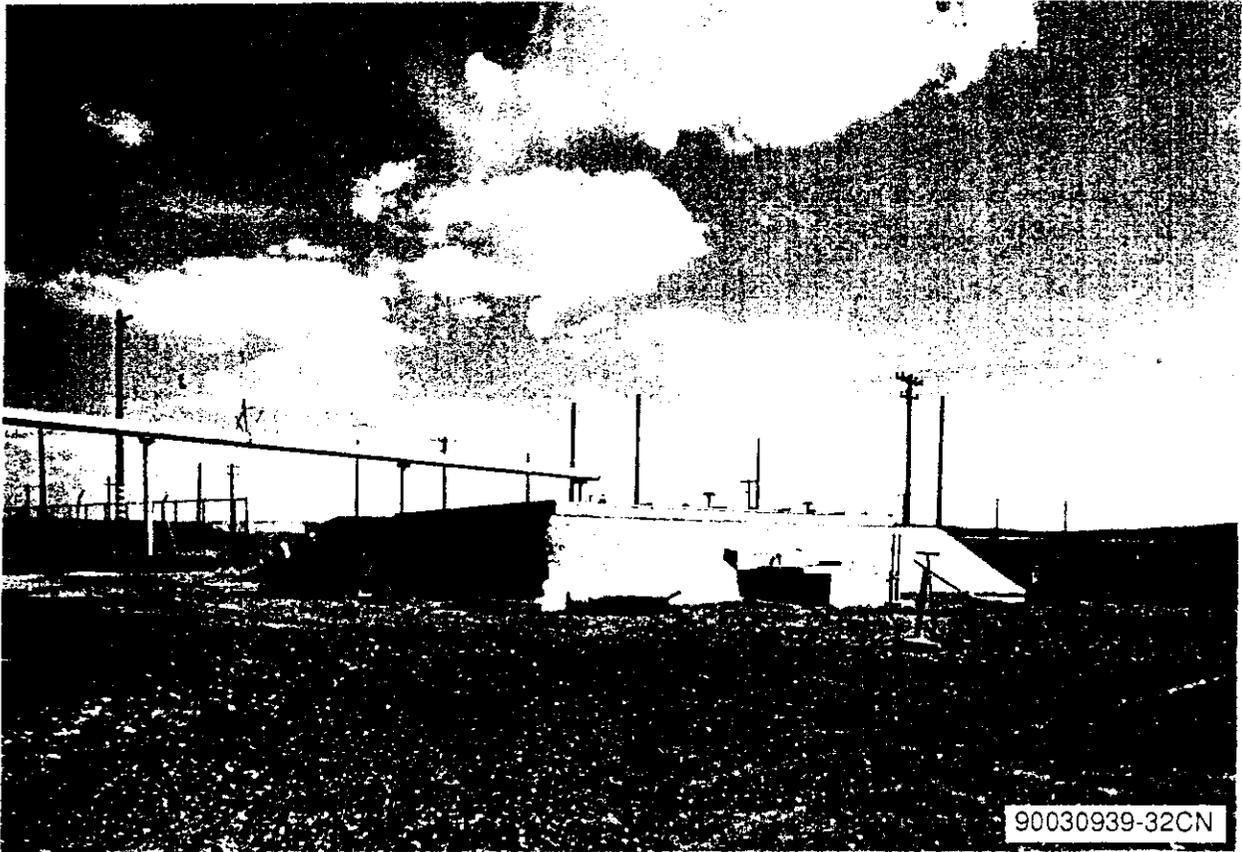
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Figure D-7. The Sodium Handling Room of the LSFF.

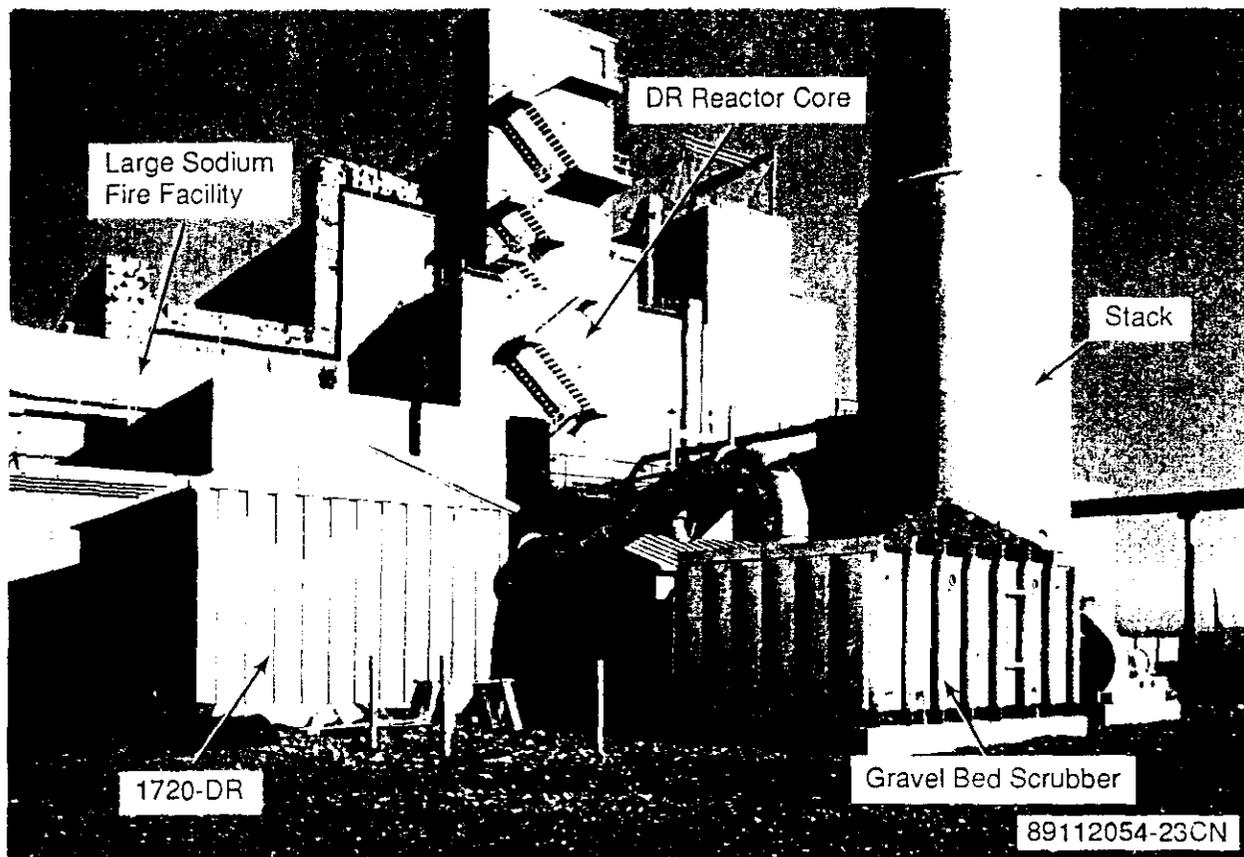
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Figure D-8. Filter Building (117-DR) Used to Clean up the LSFF Exhaust Before 1983.

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Figure D-9. The Gravel Scrubber (Installed in 1982) is the Metal Building to the Right. The 1720-DR Building is the Metal Storage Building to the Left.

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Figure D-10. The Office Area of the LSFF.

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APPENDIX E

**QUALITY ASSURANCE PROJECT PLAN
FOR CHARACTERIZATION AND VALIDATION
SAMPLING AT THE LARGE SODIUM FIRE FACILITY**

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E1.0 PROJECT DESCRIPTION

E1.1 PROJECT OBJECTIVE

The purpose of characterization and validation sampling at the LSFF will be to ensure that performance standards for closure of the facility are satisfied.

E1.2 BACKGROUND INFORMATION

The location of the LSFF and general background information are provided in the closure plan developed for the facility.

**E1.3 QUALITY ASSURANCE PROJECT PLAN APPLICABILITY
AND RELATIONSHIP TO THE OPERATIONS CONTRACTOR
QUALITY ASSURANCE PROGRAM**

This Quality Assurance Project Plan (QAPP) applies specifically to the field activities and laboratory analyses performed as part of sampling and testing investigations supporting the closure of the LSFF at the Hanford Site. It is designed to be implemented in conjunction with the specific requirements of the LSFF Closure Plan. The QAPP is prepared in compliance with the operations contractor QA program plan for CERCLA RI/FS activities. This plan describes the means selected to implement the overall QA program requirements defined by the *Westinghouse Hanford Company Quality Assurance Manual* (WHC-CM-4-2), as applicable to CERCLA RI/FS closure activities, while accommodating the specific requirements for project plan format and content agreed upon in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1992). Although specific to CERCLA RI/FS activities, the implementing procedures, plans, and instructions invoked by CERCLA RI/FS in the QA program plan are appropriate for the control of investigations requiring compliance with RCRA guidelines. The program plan contains a matrix of procedural resources [from WHC-CM-4-2 and from the *Westinghouse Hanford Closure Activities and Site Characterization Manual* (WHC-CM-7-7)] that have been drawn upon to support this QAPP. This QAPP is subject to mandatory review and revision prior to use on subsequent phases of the investigation. Distribution and revision control of this plan shall be in compliance with procedures QR 6.0, "Document Control," and QI 6.1, "Quality Assurance Document Control," all from WHC-CM-4-2). The QAPP distribution shall routinely include all review/approval personnel indicated on the title page of the document and all other individuals designated by the operations contractor Technical Lead. All plans and procedures referenced in the QAPP are available for regulatory review on request by the direction of the Technical Lead.

1 **E1.4 SAMPLING AND TESTING ACTIVITIES**
2

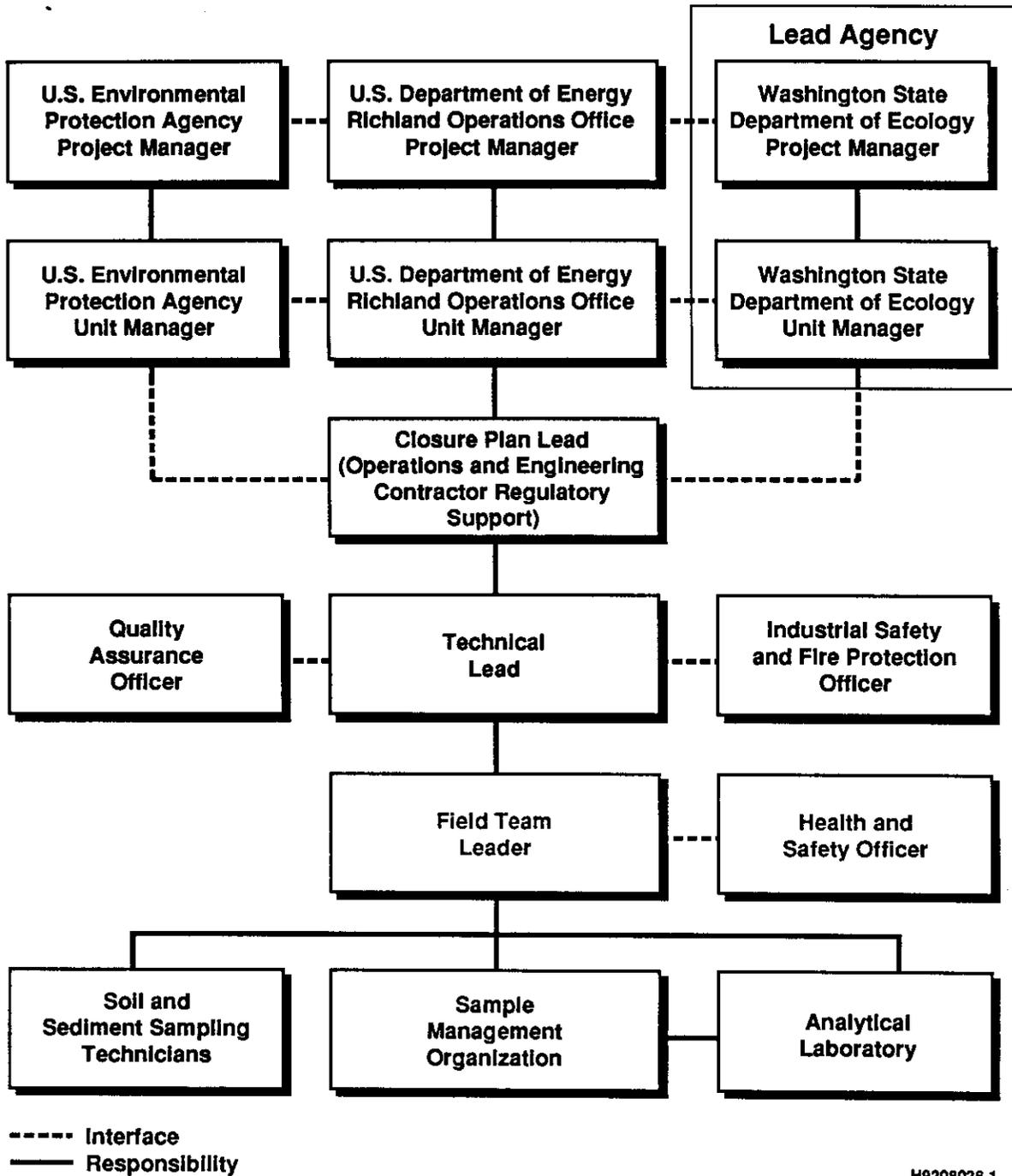
3 Field sampling activities include characterization of the LSFF waste-
4 burn-related deposits, soil and concrete verification sampling, and cleanup-
5 residue sampling for material disposal. A complete description of all test
6 activities is provided in Section 7.0 of the LSFF Closure Plan.
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10 **E2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**
11

12
13 **E2.1 PROJECT MANAGEMENT RESPONSIBILITIES**
14

15 The Environmental Engineering and Technology Function of the operations
16 contractor has primary responsibilities for conducting the sampling and
17 analysis for the LSFF (see Figure E-1 for the organizational chart).
18 Responsibilities of key personnel and organizations are described below:
19

- 20 • **Closure Plan Lead (Regulatory Permitting/National Environmental**
21 **Policy Act (NEPA) Group).** The Closure Plan Lead is responsible for
22 overall project organization and interface with regulatory agencies
23 and DOE.
24
- 25 • **Technical Lead.** The Technical Lead will be responsible for overall
26 direction of sampling and testing activities; responsibilities
27 include the planning and authorization of all work and management of
28 any subcontracted activities, as well as overall technical schedule
29 and budgetary performance.
30
- 31 • **Quality Assurance Officer.** The Quality Assurance Officer is
32 responsible for oversight of performance to the QAPP requirements by
33 means of internal auditing and surveillance techniques. The Quality
34 Assurance Officer retains the necessary organizational independence
35 and authority to identify conditions adverse to quality and to
36 inform the Technical Lead of needed corrective action.
37
- 38 • **Health and Safety Officer (Environmental Division/Environmental**
39 **Field Services).** The Health and Safety Officer is responsible for
40 determining potential health and safety hazards from radioactive,
41 volatile, and/or toxic compounds during sample handling and sampling
42 decontamination activities and has the responsibility and authority
43 to halt field activities due to unacceptable health and safety
44 hazards.
45
- 46 • **Field Team Leader.** The Field Team Leader is responsible for onsite
47 direction of sampling technicians in compliance with the
48 requirements of the closure plan, this QAPP, and all implementing
49 EIIs.
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Figure E-1. Project Organization, Vadose Zone Testing and Sampling at the Large Sodium Fire Facility.

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- **Hanford Analytical Services Management (HASM).** The operations contractor HASM is responsible for coordinating sample shipments between the field team and the analytical laboratory, resolution of any chain-of-custody issues, and for validation of all analytical data as discussed in Section E8.0.

E2.2 ANALYTICAL LABORATORIES

Soil samples shall be routed to an approved operations contractor, participant contractor, or subcontractor laboratory, which shall be responsible for performing the analyses identified in this plan in compliance with work order or contractual requirements and operations contractor-approved procedures; see Section E4.1.2. At the Technical Lead's option, services of alternate qualified laboratories may be procured for the performance of split sample analyses for performance audit purposes, or for confirmatory analysis of duplicate soil gas samples. If such an option is selected, the QA plan and applicable analytical procedures from the alternate laboratory shall also be approved by operations contractor prior to their use in compliance with Section E4.1.2 requirements. All analytical laboratory work shall be subject to the surveillance controls invoked by QI 7.3, "Source Surveillance and Inspection" (WHC-CM-4-2).

E2.3 OTHER SUPPORT CONTRACTORS

Procurements of other support contractors may be assigned project responsibilities at the direction of the Technical Lead. Such services shall be in compliance with standard operations contractor procurement procedures requirements as discussed in Section E4.1.2. All work shall be performed in compliance with operations contractor-approved QA plans and/or procedures, subject to controls of QI 7.3, "Source Surveillance and Inspection" (WHC-CM-4-2). All work performed by other support contractors will follow the guidelines contained in this closure plan and all applicable regulations.

E3.0 OBJECTIVES FOR MEASUREMENTS

The purposes of the sampling activities are to determine reaction by-product deposit composition, determine if the lead discovered (in the 1987 sampling activities) is from paint used to seal reactor tunnel walls, and determine if any contamination remaining is below action levels.

As noted in Section 4.6 of *Data Quality Objectives for Remedial Response Activities: Volume I, Development Process* (EPA 1987), universal goals for precision, accuracy, representativeness, completeness, and comparability cannot be practically established at the outset of an investigation. Data are available, however from previously negotiated analytical contracts for Hanford Site investigations, the Data Quality Objectives guidance document cited above (EPA 1987), and from typical capabilities currently expected for laboratories

1 involved in environmental analyses, that may be used as minimum guidelines for
2 the selection of analytical methods appropriate for this investigation.
3 Table E-1 provides preliminary target values for detection limits, precision,
4 and accuracy that are intended for use in initial procurement negotiations
5 with the analytical laboratory that will routinely perform chemical analyses
6 for this investigation. After an individual laboratory statement of work is
7 negotiated, and procedures are developed and approved as noted in Section 4.1,
8 Table F-1 and this section shall be revised to reference approved detection
9 limit, precision, and accuracy criteria as project requirements. All internal
10 Quality Assurance documents will be available for regulatory review. All
11 laboratory work will follow the requirements of WAC-173-303-110. If any
12 deviation from these requirements is found necessary, approval from Ecology
13 and EPA would be requested.
14

15 Goals for data representativeness are addressed qualitatively by the
16 specification of sampling locations and intervals within Section 7.0 of the
17 closure plan. Objectives for completeness for this investigation shall
18 require that contractually or procedurally established requirements for
19 precision and accuracy be met for at least 90 percent of the total number of
20 requested determinations. Failure to meet this criterion shall be documented
21 in data summary reports as described in Section E8.1 of this QAPP, and shall
22 be considered in the validation process discussed in Section E8.2. Corrective
23 action measures shall be initiated by the Technical Lead as appropriate, as
24 noted in Section E13.0. Approved analytical procedures shall require the use
25 of the reporting techniques and units consistent with the EPA reference
26 methods listed in Table E-1 in order to facilitate the comparability of data
27 sets in terms of precision and accuracy.
28
29
30

31 E4.0 SAMPLING PROCEDURES

32 E4.1 PROCEDURE APPROVALS AND CONTROL

33 E4.1.1 Operations Contractor Procedures

34 The operations contractor procedures that will be used to support the
35 closure plan have been selected from the Quality Assurance Program Index
36 (QAPI) included in the operations contractor QAPP for CERCLA RI/FS activities.
37 Selected procedures include closure activities Instructions (EIIs) from the
38 *Environmental Investigations and Site Characterization Manual* (WHC-CM-7-7),
39 and Quality Requirements (QRs) and Quality Instructions (QIs), from the
40 *Westinghouse Hanford Quality Assurance Manual* (WHC-CM-4-2).
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Table E-1. Analytes of Interest and Analytical Methods
for 105-DR Large Sodium Fire Facility Sampling.^{b,d}

Analytical category	Analyte of interest	Standard reference method	Minimum detection limit ^c	Precision ^c	Accuracy ^c
Inorganics	Sodium	7770 ^a	0.002 mg/L	± 25% RPD	± 25%
	Lithium	6010 ^a	5 mg/L ^e		± 25%
	Lead	7421 ^a	1.0 mg/kg	± 25% RPD	± 25%
	Zinc	6010 ^a	.002 mg/L	± 25% RPD	± 25%
	Cesium	3500 ^f	.02 mg/L		

^aMethods specified are from *Test Methods for Evaluating Solid Waste* (SW-846) (EPA 1990).

^bAnalytical methods shall be in compliance with approved operations contractor or operations contractor-approved participant contractor or subcontractor procedures. All procedures shall be reviewed and approved in compliance with requirements specified in the operations contractor quality assurance program plan for CERCLA RI/FS activities.

^cMinimum requirements for method detection levels, precision, and accuracy will be method-specific, and shall be negotiated and established in the procedure review and approval process. Target values are indicated where appropriate; precision is expressed in terms of relative percent difference (RPD) and accuracy is expressed as percentage recovery.

^dAnalyses shall be performed by an approved participant contractor or subcontractor laboratory.

^eEstimated instrumental detection limit. Actual method detection limits are sample and matrix dependent and may vary.

^fMethods specified are from *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, 1989).

1 Procedure approval, revision, and distribution control requirements
2 applicable to EIIs are addressed in EII 1.2, "Preparation and Revision of
3 Environmental Investigation Instructions" (WHC-CM-7-7); requirements
4 applicable to QIs and QRs are addressed in QR 5.0, "Instructions, Procedures,
5 and Drawings;" QI 5.1, "Preparation of Quality Assurance Documents;" QR 6.0,
6 "Document Control;" and QI 6.1, "Quality Assurance Document Control"
7 (WHC-CM-4-2). Other procedures applicable to the preparation, review,
8 approval, and revision of HASM and other Hanford Site analytical laboratory
9 procedures shall be as defined in the various procedures and manuals
10 identified in the QA program plan for CERCLA RI/FS activities under criteria
11 5.00 and 6.00. All procedures are available for regulatory review on request.
12
13

14 E4.1.2 Participant Contractor/Subcontractor Procedures

15
16 As noted in Section E2.1, participant contractor and/or subcontractor
17 services may be procured at the direction of the Technical Lead. All such
18 procurements shall be subject to the applicable requirements of QR 4.0,
19 "Procurement Document Control;" QI 4.1, "Procurement Document Control;"
20 QI 4.2, "External Services Control;" QR 7.0, "Control of Purchased Items and
21 Services;" QI 7.1, "Procurement Planning and Control;" and/or QI 7.2,
22 "Supplier Evaluation" (WHC-CM-4-2). Whenever such services require procedural
23 controls, requirements for use of operations contractor procedures, or for
24 submittal of contractor procedures for operations contractor review and
25 approval prior to use, shall be included in the procurement document or work
26 order, as applicable. In addition to the submittal of analytical procedures,
27 analytical laboratories shall be required to submit the current version of
28 their internal QA program plans. All analytical laboratory plans and
29 procedures shall be reviewed and approved prior to use by qualified personnel
30 from the HASM, operations contractor analytical laboratories organizations, or
31 other qualified personnel. All reviewers shall be qualified under the
32 requirements of EII 1.7, "Indoctrination, Training, and Qualification"
33 (WHC-CM-7-7). All participant contractor or subcontractor procedures, plans,
34 and/or manuals shall be retained as project quality records in compliance with
35 EII 1.6, "Records Management" (WHC-CM-7-7); QR 17.0, "Quality Assurance
36 Records;" and QI 17.1, "Quality Assurance Records Control" (WHC-CM-4-2). All
37 such documents are available for regulatory review on request.
38
39

40 E4.2 SAMPLING AND INVESTIGATIVE PROCEDURES

41
42 All sampling activities shall be performed in compliance with EII 5.2,
43 "Soil and Sediment Sampling" and EII 5.13, "Drum Sampling" (WHC-CM-7-7).
44 Samples shall routinely be routed to offsite analytical laboratories for
45 chemical analyses. Additional EIIs that have been selected to support the
46 test activity are identified in Table E-2. Sample identification requirements
47 and container type, preparation, and preservation requirements shall be as
48 specified in EII 5.2. All sampling equipment decontamination shall be in
49 compliance with EII 5.5, "Decontamination of Equipment for RCRA/CERCLA
50 Sampling" (WHC-CM-7-7). Other procedures required to support characterization
51 and verification activities and data interpretation will be incorporated as
52 addenda to this QAPP, or as additional EIIs, as necessary to support the

1 detailed requirements of the LSFF Closure Plan. All activities performed
2 under these EIIs will comply with applicable regulations.
3
4

5 E4.3 PROCEDURE ADDITIONS AND CHANGES 6

7 Additional EIIs or EII updates that may be required as a consequence of
8 the LSFF Closure Plan requirements shall be developed in compliance with
9 EII 1.2, "Preparation and Revision of Closure activities Instructions"
10 (WHC-CM-7-7). Should deviations from established EIIs be required to
11 accommodate unforeseen field situations, they may be authorized by the Field
12 Team Leader in accordance with the requirements of EII 1.4, "Deviation from
13 Closure Activities Instructions" (WHC-CM-7-7). Documentation, review, and
14 disposition of instruction change authorization forms are defined within
15 EII 1.4. Other types of document change requests shall be completed as
16 required by the operations contractor procedures governing their preparation
17 and revision. All work performed by other support contractors will follow the
18 guidelines contained in this closure plan and all applicable regulations. Any
19 deviations will comply with all applicable regulations, including approval
20 from the regulatory agencies, if necessary.
21
22
23

24 E5.0 SAMPLE CUSTODY 25 26

27 All samples obtained during the implementation of the sampling and
28 analysis plan shall be controlled as required by EII 5.1 "Chain of Custody,"
29 (WHC 1989) from the point of origin to the analytical laboratory. Laboratory
30 chain-of-custody procedures shall be reviewed and approved as required by
31 operations contractor procurement control procedures as noted in Section E4.1,
32 and shall ensure the maintenance of sample integrity and identification
33 throughout the analytical process. At the direction of the Technical Lead,
34 requirements for return of residual sample materials after completion of
35 analysis shall be defined in maintenance of sample integrity and
36 identification throughout the analytical process. At the direction of the
37 Technical Lead, requirements for return of residual sample materials after
38 completion of analysis shall be defined in accordance with those procedures
39 defined in the procurement documentation to subcontractor or participant
40 contractor laboratories. Chain-of-custody forms shall be initiated for
41 returned residual samples as required by the approved procedures applicable
42 within the participating laboratory. Results of analyses shall be traceable
43 to original samples through a unique code or identifier documented in the
44 field logbook. All results of analyses shall be controlled as permanent
45 project quality records as required by QR 17.0, "Quality Assurance Records"
46 (WHC-CM-4-2) and EII 1.6, "Records Management" (WHC-CM-7-7).
47
48

Table E-2. Investigative Procedures for the 105-DR LSFF Sampling.

Procedure	Title ^a	Wipe sampling	Powder sampling	Soil/gravel sampling	Core sampling
EII 1.2	Preparation and Revision of Environmental Investigation Instructions	X	X	X	X
EII 1.4	Deviation from Environmental Investigation Instructions	X	X	X	X
EII 1.5	Field Logbooks	X	X	X	X
EII 1.6	Records Management	X	X	X	X
EII 1.7	Indoctrination, Training, and Qualification	X	X	X	X
EII 1.11	Control and Transmittal of Laboratory Analytical Data	X	X	X	X
EII 2.1	Preparation of Health and Safety Plans	X	X	X	X
EII 2.3	Administration of Radiation Surveys to Support Environmental Characterization Work on the Hanford Site	X	X	X	X
EII 3.1	User Calibration of Health and Safety M&TE	X	X	X	X
EII 5.0	Sample Identification and Entry Into the HEIS	X	X	X	X
EII 5.1	Chain of Custody	X	X	X	X
EII 5.2	Soil and Sediment Sampling			X	
EII 5.5	Decontamination of Equipment for RCRA/CERCLA		X	X	X
EII 5.11	Sample Packaging and Shipping	X	X	X	X
EII 5.13	Drum Sampling	X	X	X	X
TBD	Concrete/Asphalt Core Sampling				X
TBD	Wipe Sampling		X		

Procedures are Westinghouse Hanford Closure Activities Instructions (EIIs) selected from the latest approved version of WHC-CM-7-7, *Closure Activities and Site Characterization Manual*.

E6.0 CALIBRATION PROCEDURES

1
2
3
4 Calibration of all operations contractor measuring and test equipment,
5 whether in existing inventory or purchased for this investigation, shall be
6 controlled as required by QR 12.0, "Control of Measuring and Test Equipment;"
7 QI 12.1, "Acquisition and Calibration of Portable Measuring and Test
8 Equipment" (WHC-CM-4-2); QI 12.2, "Measuring and Test Equipment Calibration by
9 User" (WHC-CM-4-2); and/or EII 3.1, "User Calibration of Health and Safety
10 Measuring and Test Equipment" (WHC-CM-7-7). Routine operational checks for
11 operations contractor field equipment shall be as defined within applicable
12 EIIs or procedures; similar information shall be provided in operations
13 contractor-approved participant contractor or subcontractor procedures.
14

15 Calibration of operations contractor, participant contractor, or
16 subcontractor laboratory analytical equipment shall be as defined by
17 applicable standard analytical methods, subject to operations contractor
18 review and approval.
19

E7.0 ANALYTICAL PROCEDURES

20
21
22
23
24
25 Analytical methods or procedures, based on the reference methods
26 identified in Table E-1 and Section E3.0, shall be selected or developed and
27 approved before use in compliance with appropriate operations contractor
28 procedure and/or procurement control requirements as noted in Section E4.1.
29

E8.0 DATA REDUCTION, VALIDATION, AND REPORTING

E8.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

30
31
32
33
34
35
36
37 All analytical laboratories shall be responsible for preparing a report
38 summarizing the results of analysis and for preparing a detailed data package
39 that includes all information necessary to perform data validation to the
40 extent indicated by the minimum requirements of Section E8.2. Data summary
41 report format and data package content shall be defined in procurement
42 documentation subject to operations contractor review and approval as noted in
43 Section E4.1. At a minimum, laboratory data packages shall include the
44 following:
45

- 46 • Sample receipt and tracking documentation, including identification
47 of the organization and individuals performing the analysis, the
48 names and signatures of the responsible analysts, sample holding
49 time requirements, references to applicable chain-of-custody
50 procedures, and the dates of sample receipt, extraction, and
51 analysis
52

- 1 • Instrument calibration documentation, including equipment type and
2 model, with continuing calibration data for the time period in which
3 the analysis was performed
- 4
- 5 • Quality control data, as appropriate for the methods used, including
6 matrix spike/matrix spike duplicate data, recovery percentages,
7 precision data, laboratory blank data, and identification of any
8 nonconformances that may have affected the laboratory's measurement
9 system during the time period in which the analysis was performed
- 10
- 11 • The analytical results or data deliverables, including reduced data,
12 reduction formulas or algorithms, and identification of data
13 outliers or deficiencies.
- 14

15 Other supporting information, such as initial calibration data,
16 reconstructed ion chromatographs, spectrograms, traffic reports, and raw data,
17 need not be included in the submittal of individual data packages unless
18 specifically requested. All sample data, however, shall be retained by the
19 analytical laboratory and made available for systems or program audit purposes
20 upon request by operations contractor, DOE-RL, or regulatory agency
21 representatives; see Section E10.0. Such data shall be retained by the
22 analytical laboratory through the duration of their contractual statement of
23 work, at which point it shall be turned over to operations contractor for
24 archiving.

25
26 The completed data package shall be reviewed and approved by the
27 analytical laboratory's QA Manager prior to submittal to HASM for validation
28 as discussed in Section E8.2. The requirements of this section shall be
29 included in procurement documentation or work orders, as appropriate, in
30 compliance with the standard operations contractor procurement control
31 procedures referenced in Section E4.1.

32 33 34 **E8.2 VALIDATION**

35
36 Validation of the completed data package shall be performed by qualified
37 operations contractor HASM personnel. Validation requirements will be defined
38 within approved HASM data validation procedures, but at a minimum will include
39 the requirements defined within this section.

40
41 For inorganic analyses, validation reports shall be prepared documenting
42 overchecks of the following areas, as recommended in *Laboratory Data*
43 *Validation Functional Guidelines for Evaluating Inorganics Analyses*
44 (EPA 1988d):

- 45
- 46 • Data summary narrative
- 47
- 48 • Sample holding times
- 49
- 50 • Continuing calibration requirements
- 51
- 52 • Method blank sample requirements

- 1 • Interference check sample requirements
- 2
- 3 • Laboratory control sample requirements
- 4
- 5 • Duplicate sample analysis
- 6
- 7 • Matrix spike sample requirements
- 8
- 9 • Atomic absorption quality control requirements
- 10
- 11 • Inductively coupled plasma serial dilution requirements
- 12
- 13 • Overall data assessment requirements.
- 14
- 15

16 **E8.3 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS**

17
18 All validation reports and supporting analytical data packages shall be
19 subjected to a final technical review by a qualified reviewer prior to
20 submittal to regulatory agencies or inclusion in reports or technical
21 memoranda. All validation reports, data packages, and review comments shall
22 be retained as permanent project quality records in compliance with EII 1.6,
23 "Records Management" (WHC-CM-7-7) and QA 17.0, "Quality Assurance Records"
24 (WHC-CM-4-2).
25
26
27

28 **E9.0 INTERNAL QUALITY CONTROL**

29
30
31 All analytical samples shall be subject to in-process QC measures in both
32 the field and laboratory. Unless superseded by specific directions provided
33 in Section 7.0 of the closure plan, the following minimum field QC
34 requirements apply. These requirements are adapted from "*Test Methods for*
35 *Evaluating Solid Waste*" (SW-846) (EPA 1990), as modified by the proposed rule
36 changes included in the "*Federal Register*," Volume 54, No. 13.
37

- 38 • Field duplicate samples. For each shift of sampling activity under
39 an individual sampling subtask, a minimum of 5 percent of the total
40 collected samples shall be duplicated, or one duplicate shall be
41 collected for every 20 samples, whichever is greater. Duplicate
42 samples shall be retrieved from the same sampling location using the
43 same equipment and sampling technique, and shall be placed into two
44 identically prepared and preserved containers. All field duplicates
45 shall be analyzed independently as an indication of gross errors in
46 sampling techniques.
47
- 48 • Split samples. At the Technical Lead's direction, field or field
49 duplicate samples may be split in the field and sent to an
50 alternative laboratory as a performance audit of the primary
51 laboratory. Frequency shall meet the minimum schedule requirements
52 of Section E10.0.

- 1 • Blind samples. At the Technical Lead's direction, blind reference
2 samples may be introduced into any sampling round as a performance
3 and audit of the primary laboratory. Blind sample type shall be as
4 directed by the Technical Lead.
- 5
- 6 • Field blanks. Field blanks shall consist of pure deionized
7 distilled water, transferred into a sample container at the site and
8 preserved with the reagent specified for the analytes of interest.
9 Field blanks are used as a check on reagent and environmental
10 contamination, and shall be collected at the same frequency as field
11 duplicate samples.
- 12
- 13 • Equipment blanks. Equipment blanks shall consist of pure deionized
14 distilled water washed through decontaminated sampling equipment and
15 placed in containers identical to those used for actual field
16 samples. Equipment blanks are used to verify the adequacy of
17 sampling equipment decontamination procedures, and shall be
18 collected at the same frequency as field duplicate samples.
- 19

20 The internal QC checks performed by analytical laboratories laboratory
21 analyses shall meet the following minimum requirements:

- 22
- 23 • Matrix spiked and matrix spiked duplicate samples. Matrix spiked
24 and matrix spiked duplicate samples require the addition of a known
25 quantity of a representative analyte of interest to the sample as a
26 measure of recovery percentage. The spike shall be made in a
27 replicate of a field sample. Replicate samples are separate
28 aliquots removed from the same sample container in the laboratory.
29 Spike compound selection, quantities, and concentrations shall be
30 described in the laboratory's analytical procedures. One sample
31 shall be spiked per analytical batch, or once every 20 samples,
32 whichever is greater.
- 33
- 34 • Quality control reference samples. A QC reference sample shall be
35 prepared from an independent standard at a concentration other than
36 that used for calibration, but within the calibration range.
37 Reference samples are required as an independent check on analytical
38 technique and methodology, and shall be run with every analytical
39 batch, or every 20 samples, whichever is greater.
- 40

41 Other requirements specific to laboratory analytical equipment
42 calibration are included in Section E6.0. The minimum requirements of this
43 section shall be invoked in procurement documents or work orders in compliance
44 with standard operations contractor procedures as noted in Section E4.1.

45 46 47 48 **E10.0 PERFORMANCE AND SYSTEM AUDITS** 49

50
51 Performance and system audit requirements are implemented in accordance
52 with standard operating procedure QI 10.4, "Surveillance" (WHC 1989).

1 Surveillances will be performed regularly throughout the course of the work
2 plan activities. Additional performance and system 'surveillances' may be
3 scheduled as a consequence of corrective action requirements, or may be
4 performed upon request. All quality-affecting activities are subject to
5 surveillance.
6

7 All aspects of interoperable unit activities also will be evaluated as
8 part of routine environmental restoration program-wide QA audits under the
9 standard operating procedural requirements of WHC-CM-4-2. Program audits
10 shall be conducted in accordance with QR 18.0. "Audits"; QI 18.1, "Audit
11 Programming and Scheduling"; and QI 18.2, "Planning, Performing, Reporting,
12 and Follow-up of Quality Audits" by auditors qualified in accordance with QI
13 2.5, "Qualification of Quality Assurance Audit Personnel" (WHC 1989).
14
15

16 **E11.0 PREVENTIVE MAINTENANCE**

17
18
19
20 All measurement and testing equipment used in the field and laboratory
21 that directly affects the quality of the analytical data shall be subject to
22 preventive maintenance measures that ensure minimization of measurement system
23 downtime. Field equipment maintenance instructions shall be as defined by the
24 approved procedures governing their use. Laboratories shall be responsible
25 for performing or managing the maintenance of their analytical equipment;
26 maintenance requirements, spare parts lists, and instructions shall be
27 included in individual methods or in laboratory QA plans, subject to
28 operations contractor review and approval. When samples are analyzed using
29 EPA reference methods, the requirements for preventive maintenance of
30 laboratory analytical equipment as defined by the reference method shall
31 apply.
32
33

34 **E12.0 DATA ASSESSMENT PROCEDURES**

35
36
37
38 Test data from this investigation will be assessed as required by
39 Section 7.0 of the closure plan. Analytical data shall first be compiled and
40 summarized by the laboratory and validated in compliance with approved HASM
41 procedures meeting all minimum requirements of Section E8.0.
42
43

44 **E13.0 CORRECTIVE ACTION**

45
46
47
48 Corrective action requests required as a result of surveillance reports,
49 nonconformance reports, or audit activity shall be documented and
50 dispositioned as required by QR 16.0, "Corrective Action;" QI 16.1, "Trending/
51 Trend Analysis;" and QI 16.2, "Corrective Action Reporting," (WHC-CM-4-2).
52 Primary responsibilities for corrective action resolution are assigned to the

1 Technical Lead and the QA Coordinator. Other measurement systems, procedures,
2 or plan corrections that may be required as a result of routine review
3 processes shall be resolved as required by governing procedures or shall be
4 referred to the Technical Lead for resolution. Copies of all surveillance,
5 nonconformance, audit, and corrective action documentation shall be routed to
6 the project QA records upon completion or closure.
7
8
9

10 E14.0 QUALITY ASSURANCE REPORTS

11
12
13 As previously stated in Sections E10.0 and E13.0, project activities
14 shall be regularly assessed by auditing and surveillance processes.
15 Surveillance, nonconformance, audit, and corrective action documentation shall
16 be routed to the project quality records upon completion or closure of the
17 activity. A report summarizing all audit, surveillance, and instruction
18 change authorization activity (see Section E4.4), as well as any associated
19 corrective actions, shall be prepared by the QA Coordinator at the completion
20 of the activity or annually beginning 1 year after approval of the closure
21 plan, whichever is sooner. The report(s) shall be submitted to the Technical
22 Lead for incorporation into the final report prepared at the end of the
23 closure activities. The final report shall include an assessment of the
24 overall adequacy of the total measurement system with regard to the data
25 quality objectives of the investigation.
26
27
28
29
30
31
32

33 E15.0 REFERENCES

- 34 WHC, 1989, *Westinghouse Hanford Company Quality Assurance Manual*, WHC-CM-4-2,
35 Westinghouse Hanford Company, Richland, Washington.
- 36 Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent*
37 *Order*, Washington State Department of Ecology, U.S. Environmental
38 Protection Agency, U.S. Department of Energy, Olympia, Washington.
39
- 40 WHC, 1989, *Westinghouse Hanford Closure activities and Site Characterization*
41 *Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.
42
- 43 EPA, 1987, *Data Quality Objectives for Remedial Response Activities-*
44 *Development Process*, EPA/540/6-87/003, OSWER Directive 9335.3-01, Office
45 of Emergency and Remedial Response and Office of Waste Programs
46 Enforcement, U.S. Environmental Protection Agency, Washington, D.C.
47
- 48 EPA, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating*
49 *Organics Analyses*, Hazardous Site Evaluation Division, U.S. Environmental
50 Protection Agency, Washington, D.C.
51

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- 2 *Inorganics Analyses*, Hazardous Site Evaluation Division,
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- 5 EPA, 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical*
- 6 *Methods*, SW-846, 3rd Edition, U.S. Environmental Protection Agency,
- 7 Office of Solid Waste and Emergency Response, Washington, D.C.
- 8
- 9 EPA, 1983, *Interim Guidelines and Specifications for Preparing Quality*
- 10 *Assurance Project Plans*, QAMS-005/80, EPA-600/4-83/004,
- 11 U.S. Environmental Protection Agency, Washington, D.C.

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