



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION IV

611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

December 20, 1996

Phillips Petroleum Company
ATTN: Larry G. McCraw
Radiation Safety Officer
87-D Phillips Research Center
Bartlesville, Oklahoma 74004

SUBJECT: OPEN MEETING TO DISCUSS DECOMMISSIONING OF THE RESEARCH
CENTER RADIATION LABORATORY

This refers to the meeting conducted in the Region IV office on December 17, 1996. This meeting related to the decommissioning of an accelerator target storage vault within the Phillips Research Center Radiation Laboratory contaminated with tritium. The licensee's representatives presented information about the history and current status of the Radiation Laboratory. They described the recent clean-up efforts and the current radiological condition of the facility, including site characterization procedures and some representative data. The characterization results indicate tritium migration in the concrete structure in some areas in excess of NRC's acceptable release limits. The licensee plans to submit a decommissioning plan which includes the characterization data and an ALARA analysis in support of a request for an exception to NRC's clean-up criteria for tritium.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

A handwritten signature in dark ink, appearing to read "Ross A. Scarano", is written over a horizontal line.

Ross A. Scarano, Director
Division of Nuclear Materials Safety

Enclosures:

1. Attendance List
2. Licensee Presentation

Docket No.: 030-05897
License No.: 35-00313-03

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ENCLOSURE 1
ATTENDANCE LIST

NAME	ORGANIZATION	POSITION TITLE
Larry McCraw	Phillips Petroleum Company	Radiation Safety Officer
Joe Cross	Phillips Petroleum Company	Senior Research Associate
Art Palmer	Chase Environmental Group, Inc.	Corporate Radiation Safety Officer
Blair Spitzberg	NRC, Region IV	Chief, Nuclear Materials Licensing Branch
David Fauver (participant by phone)	NRC, Office of Nuclear Material Safety and Safeguards	Senior Project Manager, Low-Level Waste and Decommissioning Projects Branch
Christi Hernandez	NRC, Region IV	Radiation Specialist, Nuclear Materials Licensing Branch
Vivian Campbell	NRC, Region IV	Senior Radiation Specialist, Nuclear Materials Licensing Branch

1 ☐ US-NRC / Phillips Petroleum Company

December 17, 1996

Discussion on Radiation Building
at the Phillips Research Center,
Bartlesville, Ok 74004

2 ☐ Phillips Representatives

- Larry McCraw - Radiation Safety Officer / Industrial Hygienist, Risk Management Team, Phillips Research Center, Phillips Petroleum Company.
- Joe Cross - Senior Research Associate, Analytical Sciences Groups, Phillips Research Center, Phillips Petroleum Company.
- Art Palmer - Corporate Radiation Safety Officer, Chase Environmental Group, Inc.. (Consultant to Phillips Petroleum Company).

3 ☐ Phillips Research Center

- Home of Phillips Corporate Technology
- CT Mission

Deliver technology which enables business units to meet
Corporate goals:

- Health, Safety and Environment / community excellence;
- Technical Innovation;
- Growth;
- Cost Effectiveness;
- Customer / Employee success.

4 ☐ Purpose of Visit

- Describe history and current status of the Radiation Laboratory at the PRC.
- Describe the current radiological condition of the facility.
- Convey our desires with respect to decommissioning facility.
- Gather NRC input and guidance with regard to submittals and project completion.

5 □ Facility History (Radiation Laboratory)

- Building was constructed in 1958 - 1959.
- Designed to house accelerators for Fast Neutron Activation Analysis and Research.
 - » FNAA: 400 Kev Cockroft - Walton / Positive Ion Accelerator
 - Used 1.25 Curie H^3 Targets
 - » Research: 10 Mev Electron Beam (Linac)
- Each accelerator housed in a separate vault.
- Vaults built with 7 to 10 ft thick concrete walls & 4 ft thick concrete ceilings.
- Ventilation designed to keep constant humidity.

6 □ Facility History (Radiation Laboratory)

- Linac operated very little and was removed in 1969, donated to Texas Tech University.
- FNAA accelerator operated from 1960, and was removed for disposal at the Richland Washington, US Ecology disposal site in 1995.

7 □ Facility History (Radiation Laboratory)

- Major activities conducted in building using radioisotopes:
 - » Fast Neutron Activation Analysis;
 - H^3 targets & activated samples
 - » Analysis for naturally occurring radionuclides;
 - uranium, thorium, radium, radon and their decay products
 - » Survey meter calibration checks;
 - » Mossbauer spectroscopy;
 - » Gamma spectroscopy.

8 □ Facility History (Radiation Laboratory)

- Recent clean up efforts at Phillips facility:
 - » Over past 10 years, have made extensive effort to dispose of sources that were not being used;
 - Calibration sources, gamma spectroscopy sources, etc.
 - » In 1995, removed and disposed of FNAA accelerator, H³ targets, and associated materials (pumps, pump oils, glove box, etc.);
 - » In 1996, determined that limited NORM analysis being performed did not support keeping entire building operating;
- At present, only residual H³ remains in building.

9 □ Licensing History

- First licensed in 1961 for H³ material possession:
 - » licensed to possess 500 curies total H³ ;
 - » plus byproduct material with atomic numbers 1 through 83, not to exceed 100 millicuries per radionuclide and 500 millicuries total;
 - » for atomic numbers 4 through 83, sealed sources were not to exceed 600 millicuries per source and 3 curies total;
 - » for natural uranium, not to exceed 46 kilograms;
 - » for americium-241, sealed sources were not to exceed one millicurie.

10 □ Licensing History

- License amendments total 59, including most recent on 2/26/96.
 - » In 1996 amendment we reduced our license from a broad scope to a specific and limited license.
 - » Decreased possession limits, as present work involves sealed sources for fixed gauging and analytical devices, and a few calibration reference sources.
- The following materials are listed on our current license:

» hydrogen-3	100 millicuries	americium-241	1 millicurie
» polonium-210	10 millicuries	lead-210	10 millicuries
» cadmium-109	600 millicuries	cesium-137	600 millicuries
» iron-55	600 millicuries	nickel-63	600 millicuries

11 □ Current Facility Conditions

- Laboratory equipment including hoods, cabinets, and floor and ceiling tiles have been removed in support of radiological characterization. No item removed unless surveyed and documented.
- Radiological characterization of building is complete.
- Structure is presently bare concrete walls, roof and floor. Materials removed were surveyed, contaminated items were grouped by contamination level and type of material and boxed pending ultimate disposition decision.
- There are some utilities, (i.e., fire enunciator and communications equipment) which remain to be relocated.

12 □ Radiological Characterization

Characterization studies have been done using the following techniques:

- Smear surveys for H^3 prior to, during, and after removing items (furniture, hoods, equipment, etc.) from building;
- Direct frisks for H^3 have been performed using windowless gas flow proportional counter;
- Core samples of concrete and roofing material have been taken and analyzed for H^3 ;
- Surveys and analysis of cores and extracted materials for other radioisotopes have been done as well (gamma, beta and alpha).

13 □ Radiological Characterization Results

- Smear results within the building:
 - » Average removable contamination levels in the areas throughout the facility range from less than 1000 to 10,000 dpm/100cm²;
 - » From 1 to 5% of smears taken have ranged from 10,000 to 100,000 dpm/100cm²;
 - » Only a few smears have had levels greater than 100,000 dpm/100cm².
- Fixed - direct readings:
 - » Relatively recent technology;
 - » Data difficult to interpret.

14 ☐ Radiological Characterization Results

Concrete core sample analysis (depth profile study)
for samples collected within the building:

Depth (Inches)	Core 1 (pCi/g)	Core 2 (pCi/g)	Core 3 (pCi/g)	Core 4 (pCi/g)
1/2"	0.70	10.63	7.13	2.06
1"	0.34	12.87	8.22	2.63
1 1/2"	0.44	3.42	8.03	2.92
2"	0.46	2.01	4.56	0.15
2 1/2"	0.36	3.24	5.31	2.96
3"	0.83	0.00	5.86	2.23
3 1/2"		4.06	4.03	2.28
4"		4.48	6.68	2.74
4 1/2"			3.36	1.24
5"			7.24	1.06
5 1/2"			6.22	2.34
6"			3.05	2.59
6 1/2"			3.17	2.28
7"			5.14	2.95
Avg	0.52	5.09	5.57	2.17

15 ☐ Radiological Characterization

Concrete core sample analysis (top layer-1/2 inch depth)

Core#	pCi/g	Core	pCi/g	Core	pCi/g	Core	pCi/g
1	0.70	6C	2.2	8A	2.8	9C	2.6
2	2.06	6D	3.2	8B	3.7	9D	2.4
3	7.13	6E	5.3	8C	1.8	9E	22.0
4	10.63	7A	35.0	8D	0.0	9F	7.6
5A	5.3	7B	3.7	8E	0.4	9G	0.6
5B	6.4	7C	100.0	8F	0.1	10	7.23
5C	1.7	7D	7.5	8G	0.0	11	4.45
6A	32.0	7E	1.1	9A	0.0	12	1.78
6B	2.8	7F	0.0	9B	0.4		

Building Average = 8.13 pCi/g

16 ☐ Decommissioning Objectives

- Relocate Utilities and Communications
- Demolish Building and Dispose Off-site
- Remove Foundations / Slabs
- Remove / Cap Drains
- Backfill to Greenfield

17 ☐ Waste Disposal

- Waste volume estimated at 40,000 ft³
 - » Includes walls, ceiling/roof, floors
 - » Sub soil not included
- Estimated cost for disposal as rad-waste is \$2.5 million (soils not included)
- Estimated activity of building is < 10 pCi/g H³
 - » Translates to <25 mCi total H³ activity

18 ☐ Activity Comparisons

- EPA drinking water standard:
 - » 20,000 pCi/L (20 pCi/g)
- NRC effluent concentration:
 - » 1000 pCi/ml
- Tritium dial watch:
 - » 25 mCi/watch
- Dose impact
 - » << 1 mR/yr

19 ☐ Project Alternatives

- Tear down and dispose as Rad-Waste
 - » High cost versus no measurable benefit
- Decon and Re-survey
 - » Estimated costs are equal to disposing as Rad-Waste
- Increase unrestricted release limit / decon areas not meeting new limit.
 - » Technically valid solution
 - » Precedence set in power reactor decommissioning

20 ☐ Limit Review

- Reg. Guide 1.86
 - » Loose: 1,000 dpm/100cm²
 - » Total : 5,000 dpm/100cm²
- NUREG 5849
- Fort Saint Vrain Limit Revision (total activity)
 - » Loose: 40,000 dpm/100cm²
 - » Total 200,000 dpm/100cm²
 - » Material also contained Fe⁵⁵
- Would like to pursue similar amendment

21 ☐ Decommissioning Plan

- Planned decommissioning activities:
 - » Some material will be treated as rad-waste (e.g. areas of roof tar);
 - » Some material currently boxed may be surveyed for release;
 - » Would like to demolish remainder of building and dispose of as industrial waste;
 - » Then complete characterization of soils (adjacent to and beneath building) and drain lines;
 - treat similarly to building materials.

22 ☐ NRC Input Sought

- Thoughts on Fort St. Vrain decommissioning approach.
- Insight on pursuing this alternative.
- Time estimates for getting plan approved.