U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

REGION III

EXPANDED FIELD NOTES

CO Inspection Report No.: 72-01

Subject: ATLANTIC RICHFIELD CO.

License No.(s) 12-140-4

Location: 400 EAST SIBLEY BLVD.
HARVEY, ILLINOIS 60426

Priority II

Category E(1-A)

Type of Licensee: INDUSTRIAL R.& D.

Type of Inspection: RE. #9 (UNANNOUNCED)

Date(s) of Inspection: 2-4-72

Date(s) of Previous Inspection: 7-7-70

Principal Inspector: W. H. SCHULTZ

Accompanying Inspector(s): NONE

Other Accompanying Personnel: NONE

Report Prepared By: W. H. Schultz 2-10-72 (Date)

Report Reviewed By: [signature] 2-16-72 (Date)

Proprietary Information: NONE

List of Documents Attached: NONE

B/5

REPORT COMPILED SHEET

Identifying Information

Type Report (circle) 591 592

1. Licensee Atlantic Richfield Company
2. Address 400 East Sibley Boulevard
   Harvey, Illinois 60426
3. License No(s) 12-00140-04
4. Date of Inspection February 4, 1972
5. Inspector W. H. Schultz
6. Status of Compliance Noncompliance

Items of Noncompliance

7. Section of Regulation or License Condition	Details Paragraph
A. 10 CFR 20.201(b)	A. 20
B. 10 CFR 20.201(b)	B. 21
C.	C.
D.	D.
E.	E.
F.	F.
G.	G.

Classified Information

8. This report contains classified or business confidential information.
   Yes (No)

W. H. Schultz — Inspector — 2-10-72 — Date

E. J. Hanrahan — Reviewer — 2-16-72 — Date

GENERAL INFORMATION

9. This was an unannounced reinspection which was conducted on February 4, 1972.

10. Due to last minute scheduling of this inspection, the Illinois State Health Department was not notified of this inspection and the AEC representative was not accompanied.

11. All information in this report was furnished by the following licensee personnel:

Dr. A. I. Snow, Chairman of the Isotope Committee and RSO
Mr. L. A. Baillie, Senior Research Chemist
Mr. G. A. Uhl, Research Chemical Engineer

INSPECTION HISTORY

12. The last previous reinspection (Reinspection No. 8) of License No. 12-00140-04 was conducted on July 7, 1970. During that inspection, no items of noncompliance were noted and a Form AEC-591 was issued.

PROGRAM

13. This license authorizes the use of any byproduct material with Atomic Nos. between 3 and 83, inclusive. It also authorizes the use of up to 100 curies of hydrogen 3 in any chemical and/or physical form. The principle use of radioactive materials procured under this license is for the preparation of various tagged compounds which are then transported by licensee personnel to various facilities of Atlantic Richfield Company throughout the United States. In those instances where short half life byproduct materials are used, the radioactive materials are shipped directly from the supplier to the refinery and the various tagged organic compounds are prepared at the field locations (not at the Harvey, Illinois research facility). Uses of byproduct material are as authorized by this license.

14. Since the last reinspection, there has been a significant increase in the use of byproduct materials. The byproduct materials received since the last reinspection include 25 shipments of gold 198 (100-400 millicuries per shipment), two shipments of iodine 131 (total 15 millicuries), ~~for~~ FOUR shipments of carbon 14 (15 millicuries total) and two shipments of scandium 46 (125 millicuries total). The licensee also

used 1460 millicuries of hydrogen 3 contained in various organic compounds for various tests. The hydrogen 3 was taken from the licensee's existing inventory of byproduct material and has not been purchased since the last reinspection. A complete inventory of all isotopes on hand in June 1971 is attached to this report as Exhibit A. A review of the licensee's procurement and utilization records showed the licensee is complying with possession limits, forms, and specific radioisotopes.

ORGANIZATION AND ADMINISTRATIVE CONTROL

15. There has been no change in the organization or administrative control since the last reinspection. The membership of the Radioisotope Committee is as follows: Dr. Snow and Messrs. Baillie and Uhl. Dr. Snow supervises all uses of radioactive materials on a daily basis. Dr. Snow reports to George Masologites, Manager of Process Research.

FACILITIES AND EQUIPMENT

16. There has been no significant change in the facilities or equipment at the Harvey, Illinois research facility since the last reinspection. [Baillie] and [Uhl] stated most of the shipments of gold 198 which have been received since the last reinspection have been used at various

field locations throughout the United States. He stated the gold shipments ranging in strength from 100 to 400 millicuries are shipped directly from Union Carbide in Tuxedo, New York, to the field location where the gold will be used. The tagged material is then prepared by either [Baillie] or [Uhl] at the field location using concrete shielding blocks, remote handling devices such as 18 inch long tongs or 4 foot long stirring rods. [Uhl] stated a portable geiger type survey instrument is used in all cases to monitor the work area and to assure that levels in restricted areas are within permissible limits. [Uhl] stated that after the preparation and testing operation is completed, the empty containers, disposable gloves, and beakers are placed into a 5 gallon can which is treated as dry radioactive waste. Uhl stated the radioactive waste is either locked in a radioactive material storage safe or is locked in a small isolated building which is posted in accordance with the provisions of 10 CFR 20.203. [Uhl] stated that in all cases the leftover dry radioactive waste material is secured in such a manner that only authorized personnel have access to the area.

17. During the inspection the AEC representative inspected the licensee's research facility at Harvey, Illinois, and noted the licensee's instrumentation which now includes a liquid scintillation counting system, a well counter with a 2 inch sodium iodide crystal, and several portable survey instruments. The portable survey instruments include the following: a Baird Atomics Model 470 geiger counter, two Model CDV-700 geiger counters (range 0 - 50 mr/hr) and a Nuclear Chicago Model 2612 end window geiger counter. [Uhl] stated all radiation detection and measuring equipment is functioning properly.

PERSONNEL MONITORING

18. Film badge service is provided by Landauer on a bi-weekly basis. The film badge processor's report contains all information required by Form AEC-5 including the quarterly summaries. During the inspection, the AEC representative reviewed the film badge records for the third and fourth quarters of 1970 and for the entire year 1971. During this period, the maximum quarterly exposure received by [redacted] was 70 millirem and the maximum quarterly exposure received by [redacted] was 80 millirem. [Uhl] stated licensee personnel do not wear any personnel monitoring devices for measuring extremity exposures (ring or wrist badges). [Uhl] stated he and [Baillie] use 18 inch long tongs

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to open containers of radioactive material (gold 198) and use 4 foot long handling tools to stir the radioactive solutions and to transfer the solutions into various reaction vessels at refinerys. [Uhl] stated that the length of the handling tools in conjunction with very short handling periods, results in very low exposures to the extremities. [Uhl] stated he and [Baillie] use a geiger type survey instrument to measure the radiation levels in the vicinity of the containers of radioactive materials before such materials are handled.

RADIATION SURVEYS AND/OR EVALUATION

19. The licensee makes smear-type surveys of the Radioisotope Laboratory area at Harvey, Illinois, three times each year (in conjunction with leak tests of sealed sources). During the inspection, the AEC representative reviewed the smear surveys which were made since the last reinspection and noted all smears showed the presence of less than 5×10^{-5} microcuries of activity. In addition, at the same time the licensee also makes direct reading radiation surveys throughout the isotope laboratory area. The AEC representative observed that the licensee is keeping a written record of all surveys which are made at the Harvey, Illinois research facility. This includes both the direct reading and smear type radition surveys.

Mr. Uhl stated that since the last reinspection the licensee has received 25 shipments of gold 198 ranging from 100-400 millicuries per shipment. Most of this has been used at various field sites throughout the United States. Uhl stated he and/or Baillie routinely use a geiger type survey meter to measure radiation levels which working with the gold 198. However, smear type radiation surveys were not made at field locations to check for possible removable contamination. Uhl stated he felt any contamination of this nature would be detected when a direct reading radiation survey was made with a geiger type survey meter. However, when the licensee prepared a tagged compound using the 150 millicuries of gold 198 at Philadelphia, Pennsylvania, on December 22, 1971, removable contamination was found. During the December 22, 1971 use of gold 198, the test was monitored by a representative of the Philadelphia Department of Public Health. He made both direct reading and smear type radiation surveys and detected significant quantities of removable contamination in the work area, and on [redacted] The findings of the Philadelphia Department of Public Health will be discussed in greater detail in a subsequent paragraph (UNUSUAL OCCURRENCES). Uhl stated that if surveys had not been made by the Philadelphia Department of Public

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Health, he would not have been aware that removable contamination existed as a result of theuse of 150 millicuries of gold 198. [Uhl] also agreed that it was quite possible that similar contamination incidents could have occurred during the other 24 uses of gold 198 since the last reinspection. The AEC representative informed [Uhl] that the licensee's failure to adequately evaluate the hazards incident to the use of radioactive material at various field sites throughout the United States constitutes noncompliance with 10 CFR 20.201(b).

21. A review of the licensee's procurement and utilization records showed that since the last reinspection, the licensee has used significant quantities of hydrogen 3 in tagged compounds for various evaluations in reaction vessels. On December 22, 1970, the licensee used two 500 millicurie quantities of hydrogen 3 as a tagging material in an organic compound to check for contamination in diesel oil at East Chicago. On February 1, 1971, the licensee used 200 millicuries of hydrogen 3 in a tagged compound and on August 15, 1971, the licensee used 190 millicuries of hydrogen 3 in a tagged compound. [Uhl] stated the licensee has a procedure whereby bioassay samples are taken whenever

large amounts of hydrogen 3 are used for analytical purposes. However, he stated that on these three occasions between December 22, 1970 and August 15, 1970, no bioassay samples were taken or analyzed to check licensee personnel for possible uptake of hydrogen 3. Dr. Snow stated this is a routine testing procedure for the licensee and there is no reason why bioassay samples should not have been taken and analyzed. Therefore, the AEC representative informed the licensee this constitutes noncompliance with 10 CFR 20.201(b) for failing to evaluate the hazards incident to the use of up to 500 millicuries of hydrogen 3 in an uncontained form.

POSTING AND LABELLING

22. During this inspection the AEC representative observed posting and labelling at the Harvey, Illinois research facility was in accordance with applicable sections of 10 CFR 20.203. Also, the licensee had Form AEC-3, "Notice to Employees," posted in the research laboratory area.

23. Mr. [Uhl] stated all radioactive waste material, including empty containers and packing material, at the various field sites where radioactive materials was used was placed in suitable containers which were labelled with the conventional radiation caution symbol and the words "Caution Radioactive Material." [Uhl] stated the containers or isolated

buildings where this waste material was stored were also posted with the conventional radiation caution symbol and the words "Caution Radioactive Materials."

LEAK TESTS

24. Sealed sources are leak tested by the licensee three times each year. At the time of this inspection the inventory included three cesium 137 sealed sources with nominal strengths of 10 millicuries, 300 millicuries and 300 millicuries. The sealed sources are leak tested using the conventional smear technique, and the smears are then counted by either Uhl or Baillie. The most recent leak test was made on December 1, 1971 and showed less than 1×10^{-3} microcuries of removable contamination. The leak test records were reviewed during this inspection and it was noted all leak tests are being conducted at intervals of six months or less.

WASTE DISPOSAL

25. Since the last reinspection nearly all purchases of radioactive material have been gold 198. When a shipment of gold is received by the licensee, the entire shipment is used to prepare a tagged organic compound which is then injected into various reaction vessels or process equipment. The only waste generated consists of small

quantities of radioactive material which are not able to be removed from the shipping vials. These "empty" containers are held in storage by the licensee for decay to background levels.

UNUSUAL OCCURRENCES

26. In an inquiry report dated December 28, 1971, Region I, Compliance, notified Region III, Compliance, that the subject licensee had injected 150 millicuries of gold 198 into a refinery vessel for evaluation purposes. This injection of gold 198 and subsequent evaluation resulted in significant removable contamination of the work area and of [redacted]. This evaluation procedure was conducted on December 22, 1971 in Philadelphia, Pennsylvania. The licensee Exemption 6 notified the City of Philadelphia Department of Public Health of the proposed test which was conducted by Mr. George Hull on December 22, 1971. The Philadelphia Department of Public Health therefore sent Mr. Raymond McGrattan to observe the test procedure. At the conclusion of the test, McGrattan made a smear survey of the work area, of [redacted] car and the floor of the car trunk. The smears were then counted the next day using a 3 inch x 3 inch

crystal. Subsequent evaluation of the smears showed 600,000 cpm for the work area, 54,000 cpm on [redacted] and about 3000 cpm for wipes on the door of [redacted] car and on the floor of the car trunk. The inquiry report did not specify the area which was smeared by McGrattan. The report stated McGrattan noted all did not wear gloves and did not monitor for air activity or contamination.

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27. The procedure which results in contamination at Philadelphia on December 22, 1971, was reviewed with [Uhl] during the February 4, 1972 reinspection. [Uhl] substantiated the statements contained in the December 28, 1971 inquiry report and stated he had made direct reading radiation surveys but had not made smear surveys to check for possible contamination of the work area or of [redacted] hands. [Uhl] stated the licensee has adopted a new policy effective January 1, 1972, and in the future personnel who conduct tests using significant quantities of radioactive material will wear gloves at all times while preparing tagged compounds and while conducting the tests. Personnel will also use direct reading radiation survey instruments and will make adequate direct reading and smear type radiation surveys to check for the possibility of removable contamination on work surfaces, hands,

clothing, and transporting vehicles. [Uhl] stated the results of the direct reading and smear type surveys would be documented at all future tests. Exemption 6

RECORDS

28. The licensee maintains records showing the receipt and use of radioactive material, transfer of byproduct material, results of direct reading and smear type radiation surveys (at the Harvey, Illinois research facility only), personnel exposure information, and leak test results. During the inspection, the AEC representative reviewed the various records which are maintained by the licensee and no deficiencies were noted.

LICENSE CONDITIONS

29. During the inspection all license conditions were reviewed with Messrs. Baillie and Uhl and no deficiencies were noted.

MANAGEMENT DISCUSSION

30. At the conclusion of this inspection, the AEC representative met with Messrs. Snow, Uhl and Masologites. They were informed that two items of noncompliance were noted as a result of this inspection. Both

items related to the licensee's failure to make adequate evaluations of the hazards incident to the use of radioactive materials. One deficiency related to the licensee's failure to make smear type radiation surveys while using 150 millicuries of gold 198 at Philadelphia, Pennsylvania, on December 22, 1971. Surveys were made by a representative of the Philadelphia Department of Public Health and a smear survey showed 600,000 cpm of removable contamination in the work area and 54,000 cpm [redacted] hands. The second deficiency resulted from the licensee's failure to make bio-assay evaluations to check for the possible uptake of hydrogen 3. Since the last reinspection, the licensee used quantities of hydrogen 3 ranging from 190 millicuries up to 500 millicuries on three separate occasions. The tritium was in an uncontained form in an organic compound and was used for tracer studies.

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31. Dr. Snow stated he was in complete agreement with the deficiencies and stated Uhl and Baillie should have routinely made the necessary evaluations to check for removable contamination in work areas and to check for the uptake of hydrogen 3 by personnel handling significant quantities of hydrogen 3. Dr. Snow stated both evaluation procedures

would be implemented immediately and in all future uses of gold 198 or significant quantities of hydrogen 3, appropriate surveys and evaluations would be made.

ISOTOPE INVENTORY
June, 1971

C^{14}

$BaCO_3$	20 mc
n-octane	4.5 mc
dotriacontane	5.6 mc
Na-acetate	0.5 mc
Ethylene	0.5 mc
2-propanol	0.2 mc
Isobutane	0.1 mc
propylene	0.05 mc
propane	0.05 mc
naphthalene	0.05 mc
cetane	0.06 mc
heneicosane	0.05 mc
ethyl iodide	0.1 mc
t-butyl alcohol	0.05 mc
benzoic acid	0.0025 mc
indole	0.0025 mc
butene-1	0.1 mc
toluene	0.35 mc
Methylcyclopentane	0.5 mc
n-heptane	0.9 mc

H^3

H_2O	7.9 curies
Ethylcyclohexane	1.6 curies
Ethylbenzene	5.9 curies
H_2	1.69 curies
Anisole	2870 mc
n-butane	370 mc
butene	84 mc
propane	84 mc
propylene	84 mc
benzene	43 mc
p-xylene	1 mc
pentamethyl benzene	2.8 mc
durene	8.0 mc
n-hexane	8.0 mc
lube stocks	192 mc

Other Sources

	½ Life	
Co-60		3500 curies (sealed source)
Cs-137	30 yr	414 mc (3 sealed sources)
Cs-60		288 mc (solution)
Kr-85		17 curies
Ni-63	85 yrs	10 mc
Cl-36	300,000 yrs	0.9 mc
Co-60		3.8 mc (solution)
Zn-65	250 days	6.1 mc
Sc (Ceramic Balls)		8.6 mc
Sc-46		16.8 mc

EXHIBIT A