

U. S. ATOMIC ENERGY COMMISSION  
BYPRODUCT MATERIAL LICENSE

Page 1 of 2 Pages

Supplementary Sheet

License Number 11-00197-09

Amendment No. 01

University of Idaho  
College of Forestry, Wildlife  
and Range Sciences  
Moscow, Idaho 83843

In accordance with letters dated February 13, 1968 and April 1, 1968,  
License Number 11-00197-09 is amended as follows:

To add:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
C. Tantalum 182	C. Metallic Wire	C. 10 millicuries

9. Authorized use

C. Tagging gophers to trace their underground activities on fenced  
field plots.

A14

U. S. ATOMIC ENERGY COMMISSION  
BYPRODUCT MATERIAL LICENSE  
Supplementary Sheet

Page 2 of 2 Pages

License Number 11-00197-09

Continued from Page 1

Amendment No. 01

Condition 13. is amended to read:

13. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in:
- A. Application dated July 20, 1966 and letter dated September 13, 1966, signed by Howard Loewenstein.
  - B. Letters dated February 13, 1968 and April 1, 1968, signed by Howard Loewenstein; and letter dated March 27, 1968, signed by George H. Rauch, Vice President of Lands and Forestry, Potlatch Forests, Inc.

Date APR 18 1968

For the U. S. Atomic Energy Commission

Original Signed by *JEB*

John E. Bowyer

by Isotopes Branch

*4-18-68*

Division of Materials Licensing  
Washington, D. C. 20545

*CRU*

*JPU/eng*

U. S. ATOMIC ENERGY COMMISSION  
BYPRODUCT MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 32, 33, 34, and 35, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

<p align="center"><b>Licensee</b></p> <p>1. Name <b>University of Idaho</b> <b>College of Forestry, Wildlife</b> <b>and Range Sciences</b> 2. Address <b>Moscow, Idaho 83843</b></p>		<p>3. License number <b>11-00197-09</b></p> <p>4. Expiration date <b>October 31, 1968</b></p> <p>5. Reference No.</p>
<p>6. Byproduct material (element and mass number)</p> <p>A. Phosphorus 32 B. Scandium 46</p>	<p>7. Chemical and/or physical form</p> <p>A. Any B. Any</p>	<p>8. Maximum amount of radioac- tivity which licensee may pos- sess at any one time</p> <p>A. 300 millicuries B. 30 millicuries</p>

**9. Authorized use**

**A. & B. Laboratory research and field studies.**

**CONDITIONS**

10. Byproduct material may only be used at the licensee's address stated in Item 2 above.
11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation."
12. Byproduct material shall be used by, or under the supervision of, Howard Loewenstein.
13. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in application dated July 20, 1966, and letter dated September 13, 1966, signed by Howard Loewenstein.
14. Foodstuffs containing radioactive materials shall not be used for human consumption.

Date OCT 21 1968

For the U. S. Atomic Energy Commission

Original Signed By *[Signature]*

John E. Bowyer

by Isotopes Branch

Division of Materials Licensing  
Washington, D. C. 20545

*RQA/EC RJA*

# UNIVERSITY OF IDAHO

MOSCOW, IDAHO 83843



*10918- JPV*  
0918  
College of Forestry,  
Wildlife and Range Sciences

April 1, 1968

John E. Bowyer  
Isotopes Branch  
Division of Materials Licensing  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

Dear Mr. Bowyer:

Listed below are answers to the questions asked by you in your letter of March 11 concerning our request that Tantalum 182 be added to our license.

1. The plot area is in an area remote from human traffic. Typical plots are 80 x 80 feet, one of which is shown in the enclosed photograph. Although the chance of anyone wandering into the area is slight, adequate warning signs will be placed around all plots. In addition, most of the time a research worker will be present on the area. Since the home range of individual gophers has been shown by other studies to be very small (less than 100 feet in diameter), there is no danger that the tagged animals will leave the area.
2. Statement from property owner - see enclosure.
3. Gophers will be tagged with Tantalum 182 of an initial activity of 180 uc. To maintain a running inventory, each tagged animal will be periodically located with the aid of detection equipment. At the end of a particular experimental period (approximately 3 months), each tagged gopher will be retrapped and the Tantalum 182 recovered. As stated in No. 1 above, the home range of gophers is small, so retrapping will present no problem. Should any animal die during the experiment, it can be located underground with the detection equipment after which the Tantalum associated with it can be recovered.
4. Tantalum 182 has a relatively short half-life (115 days). Because of this we plan to dispose of it after use by the method described in our original license. This simply means storing the recovered material until decay has eliminated any radioactivity. Storage area is described in No. 15 of our license application.
5. The radiation protection program involves first of all, film badge service for all personnel working with Tantalum 182. These badges are evaluated on a monthly basis. Dosimeters will also be used. When handling the material,

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- 2 -

personnel wear plastic gloves. These gloves are kept in the storage facility described under No. 15 until free of radiation. The laboratory area where material is prepared is surveyed for radioactivity during and immediately after use by means of one of two N/C survey meters. These same meters are used to survey clothing, soles of shoes, hands, etc. of personnel handling the isotope, whether in the laboratory or in the field. The laboratory and the storage facility for contaminated equipment and any excess or recovered Tantalum 182 are clearly marked with standard warning signs. The field plots will be clearly marked with warning signs. On the field plots, no radiation above background will be detectable until the meter is within two feet of a gopher which is underground.

I trust that the information supplied is satisfactory and that our request can now be processed.

Yours truly,



Howard Loewenstein  
Associate Professor  
Forestry

HL:jg  
Encl.

6918 JPV

# POTLATCH FORESTS, INC.

®

GROWERS AND MANUFACTURERS OF FOREST PRODUCTS

AREA CODE 208  
PHONE 799-0123

GENERAL OFFICES · LEWISTON, IDAHO 83501

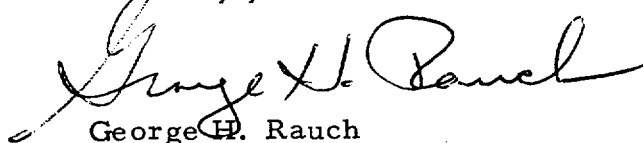
March 27, 1968

United States  
Atomic Energy Commission  
Washington, D. C. 20545

Dear Sirs:

In support of Dr. Howard Loewenstein's request for a license to use tantalum 182 to mark pocket gophers, I am authorizing the use of Potlatch Forests, Inc. land 11 miles east of Headquarters, Idaho, for this purpose. This proposed study area is an area of limited accessibility and should offer no danger to human health or safety.

Sincerely yours,



George H. Rauch  
Vice President  
Lands and Forestry

GHR:mj



DML:IB:JPV (00390)

MAR 11 1968

University of Idaho  
College of Forestry  
Wildlife and Range Sciences  
Moscow, Idaho 83843

Attention: Mr. Howard Leewenstein

Gentlemen:

This is in response to your letter dated February 13, 1968, regarding the use of tantalum 182 in field studies.

In support of your request, you should submit the following information:

1. A description of the "fenced field plots" where the studies will take place.
2. A signed statement from the owner of the area where you will perform the field studies, authorizing you to conduct the field studies in accordance with the procedures which you have represented to the Commission.
3. A complete description of how a running inventory of the tantalum sources attached to gophers will be maintained and how the sources will be collected at the completion of the study.
4. A statement as to the ultimate disposal of tantalum sources after the field study has been completed.
5. A description of the control procedures which will be instituted throughout the study to minimize radiation exposure to humans to assure your compliance with Sections 20.103 through 20.106, 10 CFR 20.

Upon receipt of the additional information, we will be pleased to continue review of your request.

Sincerely yours,

bcc: CO, Region IV  
Standard Branch Dist.

OFFICE ▶	DML:IB <i>JPV</i>	DML:IB <i>JEB</i>	John E. Bowyer Isotopes Branch Division of Materials Licensing		
SURNAME ▶	JPVeerling/lap	JEBowyer			
DATE ▶	3-11-68	3-11-68			



UNIVERSITY OF IDAHO

MOSCOW, IDAHO 83843



612 John  
College of Forestry,  
Wildlife and Range Sciences

February 13, 1968

Isotopes Branch  
Division of Licensing and Regulation  
U.S. AEC  
Washington 25, D.C.

Gentlemen:

We should like our by-product material license, No. 11-00197-09,  
amended to include the following addition:

Tantalum 182. Form will be pure tantalum wire, 0.040 inch diameter  
by 5mm long and will weigh approximately 75 mg each.  
Each piece will initially contain 100 microcuries of  
activity. The maximum number of millicuries we will  
possess at any one time will be 10.

This material will be used to trace the underground activities  
of gophers on fenced field plots, one piece of wire to be attached  
to the leg of an individual gopher. Purpose of the study is to  
relate the habits of the gophers to the survival of tree seedlings.

Items pertaining to supervision, safety, disposal practices etc.,  
as given in our original license application also apply to the use  
of the Tantalum 182.

Yours truly,

Howard Loewenstein  
Assoc. Prof., Forestry

HL:lp

00380

61202 Feb

Form AEC-313* (5-58)	ATOMIC ENERGY COMMISSION <b>APPLICATION FOR BYPRODUCT MATERIAL LICENSE</b>		Form approved. Budget Bureau No. 38-R027.4.
<p><b>INSTRUCTIONS.</b>—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.</p>			
1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital, person, etc.) University of Idaho College of Forestry, Wildlife and Range Sciences Moscow, Idaho 83843		(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from 1 (a).)	
2. DEPARTMENT TO USE BYPRODUCT MATERIAL same as above		3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)	
4. INDIVIDUAL USER(S). (Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.) Howard Loewenstein		5. RADIATION PROTECTION OFFICER (Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.) G. A. McKean	
6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.) p32 Sc 46	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. (If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.) 300 mc 30 mc		
7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. (If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.) p32 - As a tracer in research concerning root growth of trees Sc 46 - As a tracer in research concerning fate of sown tree seed <div style="text-align: right;">70010</div>			

## TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Univ. of Wisconsin Univ. of Idaho	2½ yr	Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Univ. of Idaho	2½ yr.	Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity	Univ. of Idaho	2½ yr	Yes No	Yes No
d. Biological effects of radiation	Univ. of Idaho + Symposium-Hanford May, 1965	2½ yr	Yes No	Yes No

## 9. EXPERIENCE WITH RADIATION. (Actual use of radioisotopes or equivalent experience.)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
P <sup>32</sup>	300 mc	Univ. of Wisc., Univ. Ida.	2½ yr.	Tracer
Sc <sup>46</sup>	30 mc	Univ. of Idaho	1 yr.	Tracer

## 10. RADIATION DETECTION INSTRUMENTS. (Use supplemental sheets if necessary.)

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm <sup>2</sup> )	USE (Monitoring, surveying, measuring)
N/C Survey meter mod. 2652X	1	Beta, gamma	0-100	1.5 mg/cm <sup>2</sup>	monitoring, surveying
N/C Survey meter mod. 2612P	1	Beta, gamma	0-20	1.4/cm <sup>2</sup>	monitoring, surveying
N/C Automatic planchet counting system mod. 4340	1	Beta		150 mg/cm <sup>2</sup>	Measuring

## 11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

Survey meters calibrated every time used with radium check sources supplied with instruments. Every six months survey meters checked against cobalt<sup>60</sup> standard.

## 12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)

Film Badge Service - Nuclear Chicago Corp.

## INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes ☒ No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.

## CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

University of Idaho  
College of Forestry, Wildlife and Range Sciences  
Moscow, Idaho  
G. A. McKean, Rad. Safety Officer  
Date JUL 26 1966  
By: Kenneth A. Dick  
Financial Vice President  
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

ATTACHMENTS TO AEC FORM 313

University of Idaho  
College of Forestry, Wildlife, and Range Sciences

Procedures described under Numbers 13, 14 and 15 below were developed two years ago. Since that time the Department and Individual User have operated under the supervision of the Department of Agricultural Biochemistry and Soils, procuring isotopes through their license (No. 11-197-3 (G-67)).

13. A modern analytical laboratory located in the Forestry Building is utilized for work involving radioisotopes. In this facility concentrated solutions received from the supplier are diluted and made ready for field use. In the case of  $P^{32}$ , this field use involves injecting the isotope into the soil near tree seedlings, at a rate of 15uc/ml. In the case of  $Sc^{46}$ , the diluted material is dried on the outer coat of tree seeds, which are subsequently placed out on field plots. All laboratory work with the isotopes is performed over a large metal tray lined with absorbent paper. As soon as the work of preparing the material for field use is finished (usually within a day of shipment arrival) all contaminated glassware, tongs, etc., are moved out of the laboratory. Because of the relatively short half-lives of the isotopes being used, no cleaning of contaminated items is attempted. Rather, they are stored as indicated in Number 15 below until no radioactivity is detectable. Lead brick shielding is used in the laboratory during the short time between shipment arrivals and use of the material. As indicated in Number 6 above, no more than 300 mc of  $P^{32}$  or 30mc of  $Sc^{46}$  is ordered at any one time.

The only material returned from the field to the laboratory for analysis consists of foliage samples from the seedlings growing in soil injected with  $P^{32}$ . These samples consist of about 100 needles weekly for a period of several months. Radioactivity levels in each needle are determined with the N/C model 4340 planchet counting system. It has been calculated that no more than  $\frac{1}{2}$  uc of total radioactivity is brought into the laboratory weekly in the whole group of 100 needles. Even though the level of

Page 2.

activity in each needle is extremely low, they analyzed samples are stored for several months in the facility described under Number 15 below.

14. The radiation protection program involves first of all film badge service for all personnel working with the radioisotopes. These badges are evaluated on a monthly basis. When preparing solutions, injecting  $P^{32}$  into the soil or when handling  $Sc^{46}$  treated seeds personnel wear plastic gloves. These gloves are kept in the storage facility described under number 15 until free of radiation. The laboratory area where dilutions are made and seeds are treated is surveyed for radioactivity during and immediately after use by means of one of two N/C survey meters. These same meters are used to survey clothing, soles of shoes, hands, etc. of personnel handling the isotopes, whether in the laboratory or in the field. The laboratory and the storage facility for contaminated equipment and any excess solution are clearly marked with standard warning signs. Field plots are located on a forest owned by the University of Idaho. The plots are completely enclosed with three strand barbed wire fences, and also are clearly marked with warning signs. Actually, under the levels of isotope employed, no radiation on  $P^{32}$  plots can be detected above background, even when the survey meter is held at ground level directly above an injected spot. In the case of plots with  $Sc^{46}$  seeds, no radiation above background is detectable until the meter is within 2 feet of a seed lying on the ground. No seeds are placed within forty feet of the fence on these plots.

15. All contaminated equipment and unused radioactive solutions are moved immediately to a storage area on the grounds of the College of Forestry Tree Nursery on the University campus. This area occupies the entire loft of one building (an area about 15 x 30 feet). This loft is accessible only by ladder from the outside of the building, with entry through a padlocked door, plainly marked with a standard warning sign. The material stored is placed on a platform in the center of this loft. Periodic inspections are made and materials showing no more radiation are removed. No radiation

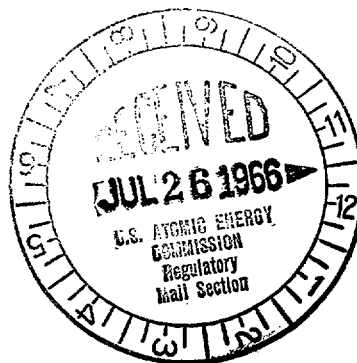
70016

Page 3.

above background can be detected outside the building at ground level or even immediately outside the entry to the loft. Similarly, no radiation above background can be detected inside the ground floor of the building, immediately under the loft radioactive material storage area. However, even this ground floor room, used for storage of unused tree nursery equipment, is kept padlocked.

As indicated in Number 13 above, because of the nature of the isotopes used and the small quantity of radiation involved, no waste service is employed. Method of disposal is simply to wait for decay to eliminate radioactivity while the materials are stored in the controlled area described above.

The quantity of radioactivity initially involved in stored solutions amounts to no more than about 5-6 mc of Scandium<sup>46</sup> and 10-15 mc of p<sup>32</sup>.



70016

# UNIVERSITY OF IDAHO

MOSCOW, IDAHO 83843



*10/1/66*  
*College of Forestry,  
Wildlife and Range Sciences*

September 13, 1966

2266

John E. Bowyer  
Isotopes Branch  
Division of Materials  
Licensing, USAEC  
Washington, D. C. 20545

Dear Mr. Bowyer:

In reference to your letter of September 6 (DML:IB:RJD (79016)), the following information is supplied:

1. The activity of Scandium<sup>46</sup> deposited on each seed is 2 to 3 uc. Level of activity used and method of application to seed are based on work of W. H. Lawrence and J. H. Rediske, as reported in Forest Science, Volume 8, Number 3, and in Proceedings of the American Society of Foresters, 1959.
2. At time of application, total activity of P<sup>32</sup> approximates 150 mc. This is distributed on a fenced plot about 10,000 square feet in size.

At time of application, total activity of Sc<sup>46</sup> on all seeds on a plot approximates 600 uc. Plots are 10-20,000 square feet in size, and no seeds are placed within 40 feet of the fence.

3. During transfer of solutions or treated seed to the field plots, vials and containers are kept sealed so no radioactivity is released to unrestricted areas. Vehicles used for transport are surveyed carefully after use.

On plots utilizing P<sup>32</sup>, injections of the material (15uc/ml) are made into the the soil, with no injections being made within 3 inches of the ground surface. Phosphorus added to the soil, whether radioactive or not, quickly becomes immobile. Soil samples taken from spots only 2 inches below injected soil have produced no measurable radioactivity, when analyzed at intervals after isotope placement.

As indicated above (No. 1), in experiments with Sc<sup>46</sup>, no seed carries an activity of more than 3uc. About 200 seeds have been used per plot. Each seed is traced regularly through the experimental period. In our experience, no more than about 5% of the seeds have been unaccounted for (10 seeds). Thus at the most, only about 30 uc of activity (figuring activity at the start of the experiment) is unaccounted for on a plot of 10-20,000 square feet. At the end of the experimental period, ungerminated seeds and seed hulls from germinated seeds are recovered and placed in the storage area indicated in item 15 of form 313. Thus while exact measurements is not possible, statistically it appears very unlikely that the 10 seeds (30uc activity) unaccounted for on a plot of the size used could possibly contaminate any nearby unrestricted area.

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FOR DIV. OF COMPLIANCE

John E. Bowyer - Page 2 - September 13, 1966

I hope I have answered your questions satisfactorily.

2266

Yours very truly,



Howard Loewenstein  
Associate Professor  
Forestry

HL:sjk





DML:IB:RJD (79016)

SEP 6 1966

University of Idaho  
College of Forestry, Wildlife  
& Range Sciences  
Moscow, Idaho 83843

Attention: Mr. Howard Loewenstein

Gentlemen:

In support of your application for field use of Phosphorus 32 and Scandium 46, please submit the following information:

1. Activity of Scandium 46 deposited on each seed.
2. Total activity of Scandium 46 and Phosphorus 32 per field plot and approximate area of plot.
3. An analysis indicating that the requirements of Section 20.106a, Title 10, Code of Federal Regulations, Part 20, will be met.

Sincerely yours,

John E. Bowyer  
Isotopes Branch  
Division of Materials  
Licensing

Enclosure:  
10 CFR 20

bcc: Compliance, Region IV  
Standard Branch Distribution

OFFICE ▶	DML:IB	DML:IB				
SURNAME ▶	RJDube/lap	JE Bowyer				
DATE ▶	9-6-66	9-6-66				