

L. Dubinski, Asst. Dir. for Materials
Division of Compliance

R. G. Page, Chief, Enforcement Branch
Division of Licensing and Regulation

COMPLIANCE INSPECTION REPORT FOR
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN
BYPRODUCT MATERIAL LICENSE NOS. 21-265-1 AND -2
SOURCE MATERIAL LICENSE NO. STB-527 (DOCKET NO.40-17)

LR:RGP

Attached for your concurrence is a notice of violation to the
subject licensee.

We have included a citation of noncompliance with 10 CFR 30.3
with respect to the licensee's use of byproduct material sources
for industrial radiography without a valid license. Accordingly,
we have not cited the licensee for noncompliance with 10 CFR 31
as recommended in the report. However, where appropriate, we
have called Dow's attention to those activities which were not
conducted in accordance with 10 CFR 31.

Also, we have not cited the licensee for noncompliance with
Condition No. 15 of License No. 21-265-2. According to para-
graph 77 of the report, the six-month leak test interval was
exceeded by only five days. Further, the license was amended
on June 28, 1963 to authorize the method of leak testing which
was employed prior to the inspection. We believe no useful pur-
pose would be served in citing the licensee for noncompliance
as recommended by Region III, with respect to this matter.

SIGNED CONCURRENCE COPY IN BYPRODUCT FILE

OFFICE ▶	LR:EB				
SURNAME ▶	RGP:lrn				
DATE ▶	9-6-63				

LR:JRR
21-265-1, -2
40-17

SEP 16 1963

The Dow Chemical Company
Midland, Michigan

Attention: Dr. W. H. Basmer
Assistant Laboratory Director

Gentlemen:

This refers to the inspection conducted on April 16, 17 and 18, 1963 of your activities authorized under AEC Byproduct Material License Nos. 21-265-1 and -2, and Source Material License No. STB-327.

It appears that certain of your activities were not conducted in full compliance with license conditions and the requirements of the AEC's "Standards for Protection Against Radiation," Part 20, and "Licensing of Byproduct Material," Part 30, Title 10, Code of Federal Regulations, in that:

1. Byproduct material was used for industrial radiography without a valid license, contrary to 10 CFR 30.3, "License requirements."

BYPRODUCT MATERIAL LICENSE NO. 21-265-1

2. The quantities of radiation existing in the unrestricted areas adjacent to Building 647, during use of two cesium 137 gauges, were such that an individual continuously present in the area could have received a radiation dose in excess of two millirems in any one hour and 100 millirems in any seven consecutive days, contrary to 10 CFR 20.105(b), "Permissible levels of radiation in unrestricted areas."

REGISTERED MAIL
RETURN RECEIPT REQUESTED

A/S

8507300220 YPP

SEP 16 1963

3. No records were maintained of surveys conducted during radiography to determine compliance with 10 CFR 20.103(b), contrary to 10 CFR 20.401(b), "Records of surveys, radiation monitoring and disposal."
4. A nominal 890 millicurie cobalt 60 sealed source, which was received on September 5, 1962 and had not been leak tested within thirty (30) days prior to its transfer to Dow, was not leak tested upon its receipt, contrary to License Condition No. 20(A).
5. Numerous byproduct material sealed sources were not tested for leakage and/or contamination at intervals of six months or less, contrary to License Condition No. 20(C).
6. The Commission was not notified within five days of the leak test of a 3 millicurie strontium 90 sealed source on January 17, 1962, which revealed the presence of 0.0119 microcuries of removable radioactive material, contrary to License Condition No. 20(E).

SOURCE MATERIAL LICENSE NO. STB-327

7. Your source material inventory included thorium compounds other than thorium metal, oxide or fluoride, contrary to License Condition No. 7.
8. The quantities of radiation existing in the unrestricted areas adjacent to the Waste Storage Area, where thorium fluoride was stored were such that an individual continuously present in the area could have received a radiation dose in excess of two millirems in any one hour and 100 millirems in any seven consecutive days, contrary to 10 CFR 20.103(b), "Permissible levels of radiation in unrestricted areas."

SEP 11 1963

This notice is sent to you pursuant to the provisions of Section 2.201 of the AEC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of which is enclosed. Section 2.201 requires you to submit to this office, within twenty (20) days of your receipt of this notice, a written statement or explanation in reply including (1) corrective steps which have been taken by you, and the results achieved; (2) corrective steps which will be taken; and (3) the date when full compliance will be achieved.

With respect to the alleged deficiency described in Item 7 above, we note that subsequent to the inspection you applied for and obtained Amendment No. 1 to Source Material License No. STB-527 on May 6, 1963, authorizing the possession and use of thorium compounds.

Regarding the alleged deficiency described in Item 8 above, we note that you filed an application on July 19, 1963, requesting that your radiography program be specifically licensed. Licensees who use byproduct material for radiography under a license issued by the Commission pursuant to 10 CFR 30 are required to comply with the provisions of the AEC's "Radiation Safety Requirements for Radiographic Operations," 10 CFR 31. During the April inspection it was noted that certain of your activities were conducted in variance with the requirements of 10 CFR 31, as follows:

- a. The radiation levels on the surface of the radiographic storage container, which held a nominal 890 millieuris cobalt 60 sealed source, exceeded the limits specified in 10 CFR 31.101, "Limits on levels of radiation for radiographic exposure devices and storage containers."
- b. The two cobalt 60 sealed sources used for radiography, which were not fastened to or contained in a radiographic exposure device, did not have attached to them durable tags as required by 10 CFR 31.105(e), "Leak testing, repair, tagging, opening, modification and replacement of sealed sources."

SEP 16 1963

- c. Individuals who were permitted to act as radiographers had not received copies of the AEC license as required by 10 CFR 31.201(a)(2), "Limitations."
- d. Radiographic operations were conducted while using survey instrumentation which had not been calibrated as required by 10 CFR 31.104, "Radiation survey instruments."

Very truly yours,

Eber R. Price
Assistant Director
Division of Licensing
and Regulation

Enclosures:

- 1. 10 CFR 20
- 2. 10 CFR 30
- 3. 10 CFR 31
- 4. 10 CFR 2

NOV 1963

LR:RBC
21-265-1, -2
40-17

The Dow Chemical Company
Midland, Michigan

Attention: Dr. W. E. Beamer, Chairman
Radiation Hazards Committee

Gentlemen:

Thank you for your letter of October 10, 1963, informing us of the steps taken by you to correct those deficiencies in your AEC licensed program which we brought to your attention in our notice of September 16, 1963. These matters will be reviewed during the next inspection of your facilities.

With respect to Item 1 of our notice of September 16, 1963, it is noted that you filed an application on July 19, 1963, requesting that your radiography program be specifically licensed. However, we note that you have not yet submitted the information needed to support this application as requested in our letter of August 8, 1963. Steps should be taken to assure that byproduct materials are used only as authorized by your licenses and that additional uses are not conducted without specific amendment to your licenses which will allow such uses.

With respect to Item 2 of our notice of September 16, 1963, steps should be taken to assure that excessive radiation levels are not permitted to exist in unrestricted areas. If radiation levels around a gauging device cannot be held within the unrestricted area limits specified in 10 CFR 20.105(b), the area must be maintained as a restricted area or an exception obtained pursuant to 10 CFR 20.105(a).

Based on your description of the area immediately adjacent to the Waste Storage Area in answer to Item 3 of our notice, it appears that the area is being maintained as a restricted area as defined in 10 CFR 20.3(a)(14).

A/S 2

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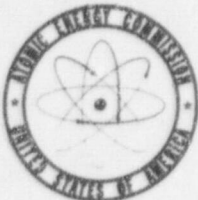
The Dow Chemical Company

- 2 -

Your cooperation with us is appreciated.

Very truly yours,

Eber H. Price
Assistant Director
Division of Licensing
and Regulation



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

IN REPLY REFER TO:
40-17

MAR 9 1965

The Dow Chemical Company
Midland, Michigan

SUBJECT: NOTICE OF LICENSE EXPIRATION

Gentlemen:

Notice is given that Source Material License Number STB-527 expires on April 30, 1965.

If you desire to continue your program using source material(s), an application for renewal of the license should be filed with this office. It is to your advantage to file such an application at least thirty (30) days before the expiration date of your existing license. The application should be submitted using Form AEC-2, enclosed, in accordance with the instructions provided with the form. Your program will then be covered by your existing license until action is taken on your application for license renewal. (Title 10, Code of Federal Regulations, Part 40, Section 40.43(b)). If an application is received less than 30 days prior to the expiration date of your license and cannot be processed before your existing license expires, this could result in your possessing source material without a valid license.

If you do not wish to renew your license, please complete the enclosed form "Certification of Status of Source Material Activities under United States Atomic Energy Commission Source Material License Number STB-527", and return it to this office.

If you have obtained an amendment which has extended the expiration date of the above license or if a new license has been issued which supersedes the above license, please disregard this notice.

This notice of your license expiration is sent for your convenience and it should not be interpreted that similar notices will be sent in the future. The responsibility for timely submission of an application for license renewal remains with the licensee.

DISTRIBUTION:

Suppl.
Doc. Room
Compliance, Region III

Enclosures:
10 CFR, 20 & 40
Form AEC-2
"Certification . . ."

Very truly yours,

Donald A. Nussbaumer

Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch
Division of Materials Licensing

[Handwritten initials and signatures]

AL 53

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DML:CHM
40-17

MAR 26 1965

The Dow Chemical Company
Midland, Michigan 48640

Attention: Mr. W. Otis Heath
Statistician

Gentlemen:

Enclosed is Source Material License No. STB-527, as renewed.

Very truly yours,

Robert L. Layfield
Source & Special Nuclear Materials Br.
Division of Materials Licensing

Enclosure:
STB-527, as renewed

DISTRIBUTION:
Doc. Room
Compliance Region III
Suppl.
N. Doulos, ML
State Health (lic. only)
Br. & Div. RFs

OFFICE ▶	DML	DML			
SURNAME ▶	CMacDonald:jb	RLayfield			
DATE ▶	3/25/65	3/25/65			

8507300148 1P

UNITED STATES
ATOMIC ENERGY COMMISSION

SOURCE MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954, and Title 10, Code of Federal Regulations, Chapter 1, Part 40, "Licensing of Source Material," and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, possess and import the source material designated below; to use such material for the purpose(s) and at the place(s) designated below; and to deliver or transfer such material to persons authorized to receive it in accordance with the regulations in said Part. 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, including Title 10, Code of Federal Regulations, Chapter 1, Part 20, "Standards for Protection Against Radiation," and to any conditions specified below.

II B, III R-4/65

Licensee		3. License No.
1. Name	The Dow Chemical Company	<u>STB-527, as renewed</u>
2. Address	Midland, Michigan	4. Expiration Date
		<u>March 31, 1968</u>
		5. Docket No.
		<u>40-17</u>
6. Source Material	7. Maximum quantity of source material which licensee may possess at any one time under this license One hundred thousand (100,000) pounds as metal, ten thousand (10,000) pounds as oxide or fluoride and 500 pounds as compounds.	
Thorium		

CONDITIONS

8. Authorized use (Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.)
For use in accordance with the *procedures* described in the licensee's application dated February 22, 1962 and supplements dated March 30, 1962 and March 11, 1965. *att*
9. Authorized places of use: The licensee's facilities at:
a. Bay City, Michigan
b. Midland, Michigan
c. Madison, Illinois
10. The licensee is hereby exempted from the requirements of subparagraphs 20.203(e)(2) and (f)(2), 10 CFR 20 insofar as these subparagraphs apply during the storage and fabrication of magnesium-thorium alloys containing not more than four per cent (4%) thorium.

For the U. S. ATOMIC ENERGY COMMISSION

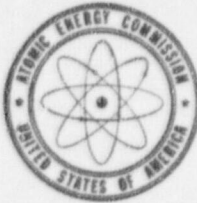
Date of issuance MAR 26 1965

U. S. GOVERNMENT PRINTING OFFICE

Robert L. Layfield
Division of Materials Licensing

APR - 8 1965

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

IN REPLY REFER TO:

D.G.:DFH

40-17

STB-527, Amendment No. 1

OCT 11 1966

E 11 11 1966

The Dow Chemical Company
Midland, Michigan

Attention: Mr. W. Otis Heath
Statistician

Gentlemen:

att

att

As requested in your application dated October 8, 1966, as supplemented October 4, 1966, Item 10 of AEC Source Material License No. STB-527, as renewed March 26, 1965, is hereby amended as follows:

- "10. The licensee is hereby exempt from the requirements of Section 20.203(e)(2) of 10 CFR 20 during the storage and fabrication of magnesium-thorium alloys containing not more than four per cent (4%) thorium."

FOR THE ATOMIC ENERGY COMMISSION

Don F. Jarmon
Source & Special Nuclear Materials
Branch
Division of Materials Licensing

DISTRIBUTION:
Document Room
Branch Reading File
Division Reading File
Suppl.
Compliance II *←*
D. Harmon, DML
N. Doules, DML (3)
State Health

OCT 13 1966

A/SS

850730057 1P



UNITED STATES
ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

Jan 26 1968

DELETED

IN REPLY REFER TO: 40-17

The Dow Chemical Company

Midland, Michigan 48640

SUBJECT: NOTICE OF LICENSE EXPIRATION

Gentlemen: **Attention:** Mr. W. Otis Heath

Notice is given that Source Material License Number 51B-527 expires on **March 31, 1968.**

If you desire to continue your program using source material(s), an application for renewal of the license should be filed with this office. It is to your advantage to file such an application at least thirty (30) days before the expiration date of your existing license. The application should be submitted using Form AEC-2, enclosed, in accordance with the instructions provided with the form. Your program will then be covered by your existing license until action is taken on your application for license renewal.

(Title 10, Code of Federal Regulations, Part 40, Section 40.43(b)). If an application is received less than 30 days prior to the expiration date of your license and cannot be processed before your existing license expires, this could result in your possessing source material without a valid license.

If you do not wish to renew your license, please complete the enclosed form "Certification of Status of Source Material Activities under United States Atomic Energy Commission Source Material License Number 51B-527", and return it to this office.

If you have obtained an amendment which has extended the expiration date of the above license or if a new license has been issued which supersedes the above license, please disregard this notice.

This notice of your license expiration is sent for your convenience and it should not be interpreted that similar notices will be sent in the future. The responsibility for timely submission of an application for license renewal remains with the licensee.

Supple

Enclosures:
10 CFR, 20 & 40
Form AEC-2

"Certification . . ." Dictator *[Signature]* 1/24/68

Very truly yours,

Donald A. Nussbaumer

Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch
Division of Materials Licensing

Approved -----

A/S6

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

February 23, 1968

BOOKED

40-17

Regulatory Control File Cj.

Mr. Donald A. Nussbaumer, Chief
Source and Special Nuclear Materials Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Nussbaumer:

Enclosed are four copies of Form AEC-2 application for
renewal of our AEC license No. STB-527.

We would appreciate the exemption under item 9 on our
License No. STB-527 included on the renewal also.

Very truly yours,

W. Otis Heath

W. Otis Heath
Statistician

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Enc.



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NJA

APR 22 1968

ADMINISTRATIVE

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UNIT

ARMY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. (Check one) <input type="checkbox"/> (a) New license <input type="checkbox"/> (b) Amendment to License No. _____ <input checked="" type="checkbox"/> (c) Renewal of License No. <u>STB-527</u> <input type="checkbox"/> (d) Previous License No. _____		2. NAME OF APPLICANT The Dow Chemical Company	
		3. PRINCIPAL BUSINESS ADDRESS Midland, Michigan 48640	
4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED Midland & Bay City, Michigan; Madison, Illinois			
5. BUSINESS OR OCCUPATION Chemical & Magnesium Prod'n		6. (a) IF APPLICANT IS AN INDIVIDUAL, STATE CITIZENSHIP (b) AGE	
7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED Manufacture of magnesium base-thorium alloys. Typical nominal thorium concentration is 3% in alloys prepared for structural purposes.			
8. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE			
(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (Including % U or Th.)	(d) MAXIMUM AMOUNT AT ANY ONE TIME (in pounds)
NATURAL URANIUM			
URANIUM DEPLETED IN THE U-235 ISOTOPE			
THORIUM (ISOTOPE)	Thorium Compounds Metal Oxide or fluoride	97% as pure pellets 3% as Mg alloy	500 lbs. 100,000 lbs. 10,000 lbs.
(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (in pounds) 110,500 Pounds			
9. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES Alloying in molten metal form of magnesium and thorium limited to a few hundred pounds of thorium per batch. As solid magnesium-thorium alloy, processing includes extrusion and rolling at temperatures well below the solidus. Standard metal working shop procedures followed in fabricating assemblies.			
10. DESCRIBE THE MINIMUM TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE THAT WILL BE REQUIRED OF APPLICANT'S SUPERVISORY PERSONNEL INCLUDING PERSON RESPONSIBLE FOR RADIATION SAFETY PROGRAM (OR OF APPLICANT IF APPLICANT IS AN INDIVIDUAL) Chemists and chemical engineers. Radiation safety program under the direction of H. R. Hoyle, Chemist, with 23 years' experience in safety, industrial hygiene and health physics.			
11. (a) DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate. The description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument). Health physics program includes use of film badges, survey instruments both ionization chamber and geiger tube, air sampling equipment and proportional counter. Equipment used to check working conditions insuring compliance with 10 CFR 20 and our own regulations. (b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE, INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier). Survey meters are calibrated with a radium source each six months. Film badge service is from R. S. Landauer, Jr. & Co.			

Water wash dust collectors designed for use with magnesium dust. Standard foundry operation with high ceiling and natural ventilation through monitors. Local exhaust for welding and chemical treatment operations where required to minimize airborne thorium and daughters.

12. DO NOT PROVIDE PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND DELAY THE PROCEEDINGS TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE (a) SAFETY FEATURES, AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSION, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREA.

Surveys indicate no need for change in standard magnesium operating procedures. The recommendations of the National Fire Protection Assn. No. 48 Standard for Magnesium are followed to avoid fire, explosion or other nonnuclear accident.

(b) EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL

Standard magnesium fire control procedures are followed, Thorium remains essentially in the ashes and is easily and safely cleaned up. Reference Dow Bulletin 141-179, Dow Radiation Protection Manual and report 11/29/60 Taylor Forge and Pipe Works. All are in your Radiation Safety Branch file.

(c) DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES

Equipment listed in 11(a) used for surveys under production conditions to insure compliance with 10 CFR 20 and in particular satisfy the requirements of 20.201 (b).

13. WASTE PRODUCTS: If none will be generated, state "None" opposite (a), below. If waste products will be generated, check here ☒ and explain on a supplemental sheet:

- (a) Quantity and type of radioactive waste that will be generated. See attached sheet.
(b) Detailed procedures for waste disposal.

14. IF PRODUCTS FOR DISTRIBUTION TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:

- (a) PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.
(b) PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.
(c) BETA AND BETA PLUS GAMMA RADIATION LEVELS (Specify instrument used, date of calibration and calibration technique used) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.
(d) METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

CERTIFICATE

(This item must be completed by applicant)

15. The applicant, and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

The Dow Chemical Company

(Applicant named in Item 2)

Dated February 23, 1968

BY:

W. Otis Heath
(Print or type name under signature)

W. Otis Heath

Statistician

(Title of certifying official authorized to act on behalf of the applicant)

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.

February 23, 1968

13. WASTE PRODUCTS

Limited thorium wastes are generally disposed of in compliance with 20.303 and 20.304. All possible material is returned to the production cycle for economic reasons. Some material which cannot be reclaimed and which is not suitable for disposal through release into sewerage systems or by burial is incinerated in a safe manner. In all cases, the material being incinerated has a maximum nominal concentration of only 3% thorium.

- A. Type of material--water wet chips or fines that are not suitable for reclamation.

Quantity: Bay City -- negligible amounts
 Midland -- none to 100 lbs. per month
 Madison -- 300 to 500 lbs. per month
 (for weight of thorium multiply by 0.03)

Chemical Form--Thorium is alloyed with magnesium, zirconium and manganese with a maximum nominal concentration of 3% thorium

- B. Measurements made during the burning of scrap chips are described in Dow Bulletin 141-179. The thorium remains in the residue.
- C. Since no thorium was found in the visible fumes, personnel are not exposed to airborne thorium. Values for daughter products are near or below the levels specified in 10 CFR 20 for 40 hour week exposure.
- D. Burning is accomplished on an open dump (not accessible to the public) at points 800 feet to a mile or more from the nearest plant building or habitation. An incinerator stack is not used.
- E. The normal care exercised in burning wet magnesium chips insures that the operator will not be excessively exposed to the fumes from the fire. Based on the tests conducted, direct inhalation of the smoke would not be injurious with respect to the radioactive material content.
- F. The ashes containing the thorium are left on the private dump where they are diluted by other ashes and buried.

REL:DPH
40-17

MAR 20 1968

The Dow Chemical Company
Midland, Michigan 48640

Attention: Mr. W. Otis Heath
Statistician

Gentlemen:

Enclosed is ABC Source Material License No. STE-527, as renewed.

Very truly yours,

Don F. Harmon
Source & Special Nuclear
Materials Branch
Division of Materials Licensing

Enclosure:
License STE-527

DISTRIBUTION:
Document Room, w/encl.
State Health (license only)
W. Doulos, DML, w/2 3cys. of encl.
Subject File, w/encl.
Br. Reading file, w/encl.
Div. Reading file, w/o encl.

Div 7 Compliance, Reg III

A/58

OFFICE ▶	DMEX	DME				
SURNAME ▶	HEATH	Harmon/mad				
DATE ▶		3/19/68				

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UNITED STATES
ATOMIC ENERGY COMMISSION

SOURCE MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954, and Title 10, Code of Federal Regulations, Chapter 1, Part 40, "Licensing of Source Material," and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, possess and import the source material designated below; to use such material for the purpose(s) and at the place(s) designated below; and to deliver or transfer such material to persons authorized to receive it in accordance with the regulations in said Part. 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, including Title 10, Code of Federal Regulations, Chapter 1, Part 20, "Standards for Protection Against Radiation," and to any conditions specified below.

Licensee		3. License No.
1. Name	The Dow Chemical Company	STB-527
2. Address	Midland, Michigan 48640	4. Expiration Date
		March 31, 1973
		5. Docket No.
		40-17
6. Source Material	7. Maximum quantity of source material which licensee may possess at any one time under this license One hundred thousand (100,000) pounds as metal, ten thousand (10,000) pounds as oxide or fluoride and five hundred (500) pounds as compounds.	
Thorium		

CONDITIONS

8. Authorized use (Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.)
- For use in accordance with the procedures described in the licensee's applications dated February 22, 1962, March 30, 1962, and February 23, 1968.
9. Authorized places of use: The licensee's facilities located at:
- a. Bay City, Michigan
 - b. Midland, Michigan
 - c. Madison, Illinois
10. The licensee is hereby exempt from the requirements of Section 20.203(e)(2) of 10 CFR 20 during the storage and fabrication of magnesium-thorium alloys containing not more than four percent (4%) thorium.
11. Pursuant to Sections 20.106(b) and 20.302 of 10 CFR 20, the licensee is hereby authorized to treat and dispose of licensed material in accordance with the procedures described in his application dated February 23, 1963.

Date of issuance

MAR 20 1969

For the U. S. ATOMIC ENERGY COMMISSION

Don F. Harmon

Division of Materials Licensing

COPY

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DOCKET NO. 63-17

For Div of Compliance



THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

January 22, 1969

Mr. Don F. Harmon
Source & Special Nuclear Materials Branch
Division of Materials Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Harmon:

Will you please add our Ludington, Michigan plant to the authorized places using thorium on our A.E.C. License Number STB-527.

Enclosed is a copy of a letter from our Biochemical Research Laboratory stating that appropriate A.E.C. regulations, radiation biology and radiological health standards are used in the handling of thorium in this location.

Yours very truly,

W. Otis Heath
Corporate Statistician
Phone: 517 636-5714

Enc.

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FEB 6 1970

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THE DOW CHEMICAL COMPANY

Received w/Ltr Dated 1-22-70

MIDLAND, Michigan
January 14, 1970

JAN 21 1970

✓ L. G. Silverstein
Biochemical Res. Lab.
1701 Building

Otis Heath has informed me he wishes to add Ludington to our AEC Source Materials License as a location that is permitted to handle source material. The Ludington personnel will be handling thorium for the purpose of preparing a thorium oxide/alumina catalyst for use in the Midland location.

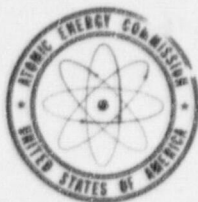
On October 10, 1969, I visited the Ludington location and examined the location and equipment involved in preparing the catalyst. It is well suited for the proper and safe handling of thorium. I also reviewed with the personnel the appropriate AEC regulations, radiation biology and radiological health associated with the handling, shipment and disposal of thorium. They demonstrated a complete understanding of the hazards involved and the control thereof.

If you would pass the information on to Otis Heath, he could then apply for a revision of our Source Materials License.

J. B. Charm
Biochemical Research Laboratory
1701 Building

JBC:sjl

Otis: I've tried to explain why he didn't write to you directly, but I don't understand it. The license change to include Ludington has my approval.



UNITED STATES
ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

JAN 30 1970

DML:DPH
40-17

The Dow Chemical Company
Midland, Michigan 48640

Attention: Mr. W. Otis Heath
Corporate Statistician

Gentlemen:

In reply to your letter of January 22, 1969, an application for amendment of your AEC License No. STB-527 to conduct a new manufacturing activity at Ludington, Michigan, should be filed using the enclosed Form AEC-2 in accordance with the provisions of Section 40.44, 10 CFR 40, copy enclosed.

Please let me know if you have any questions concerning the above.

Sincerely,

Original signed by
Don F. Harmon

Don F. Harmon
Source and Special Nuclear
Materials Branch
Division of Materials Licensing

Enclosures:
1. Form AEC-2
2. 10 CFR 40

DISTRIBUTION:

BDR
Docket file
Branch R/F
Division R/F
Harmon's R/F
CO, Region II
N. Deulos, DML

FEB 2 1970

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DOCKE. NO. 40-17
THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

December 3, 1970

For Div. of Compliance

Mr. Lyall Johnson
Acting Director
Division of Materials Licensing
Materials Branch, U.S. AEC
Washington, D.C. 20545

Dear Mr. Johnson:

Attached is a copy of a letter to Donald Van Farowe,
Radiation Chief, Michigan Department of Public Health,
requesting permission to bury thorium contained in
sludge partly containing magnesium-thorium alloy sludge.

I should like to request the same permission from you.
Could you notify me as soon as possible of your
decision.

Sincerely,

Joel B. Charm

J. B. Charm
Biochemical Research Laboratory
1701 Building
Melrose 6-0641 (Area Code 517)

JBC:sjl

enclosure

Ref.: AEC License #STB-527

cc: D. Smith, The Dow Chemical Company, Bay City Plants
O. Heath, The Dow Chemical Company
L. G. Silverstein, The Dow Chemical Company
H. R. Hoyle, Chairman, Radiation Safety Committee

DEC 18 1970

A/61



THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

December 3, 1970

Mr. Donald E. Van Farowe
Radiation Chief
Michigan Department of Public Health
Dewitt Road
Lansing, Michigan 48904

DEC 7 1970

Dear Mr. Van Farowe:

From the 1950's to present, the Bay City Plant of The Dow Chemical Company has been accumulating sludge from its, and its contractor's, magnesium-thorium alloy process. Supervision of the Bay City Plant would like permission to dispose of this sludge by burial.

The total amount of the sludge is 4,640,000 pounds, of which approximately 66,000 pounds is thorium, about 1.4% thorium. The thorium is predominantly in the form of thorium oxide, which is insoluble in water. A small quantity (<1%) is in the form of magnesium-thorium, which is insoluble in water. However, due to the presence of chloride flux, HCl could be generated in the presence of water that would slowly decompose the magnesium-thorium alloy and release the thorium in a soluble form. Nonetheless, the vast majority of thorium is the insoluble thorium oxide.

The radioactive concentration of thorium in the sludge pile is an average 1.7×10^{-3} $\mu\text{Ci/g}$, with a total of approximately 3.4 Ci, as determined by gamma spectral analysis.

✓ The burial site is on Dow Chemical property along the Saginaw River approximately 1 mile from the mouth. Drainage of the site is shown in the enclosed Figure 1. The topsoil of the site is foundry sand, cores, brick and slag to a depth of 2-4 feet. From a depth of 4-6 feet, medium compact wet, fine sand is found. From 6-7 feet, firm, moist swamp bottom material prevails. From a depth of 7 feet on, an extremely stiff, blue clay, sand and pebbles mixture is found. Figures 2-4 show the results of borings in the area.

3800

December 3, 1970

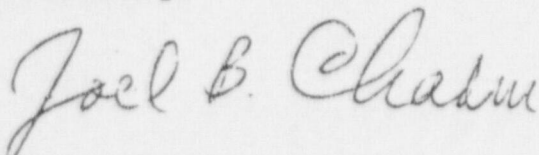
The nearest occupied buildings belong to the United States Coast Guard, about 1000 feet to the north of the site.

The nearest known water supply is the Bay City Municipal water intake in the Saginaw Bay, several miles to the north. Other water supplies to Dow and Consumers Power are used for cooling purposes, not for human consumption.

The proposal is to bury this material at its present site with a minimum of 4-6 feet of soil cover in a hole 10 feet deep. The clay base is relatively impervious to water flow and the leaching rate to the river should be many times lower than the current rate under open air conditions.

If this proposal meets with your approval, I would appreciate an answer as soon as possible (before inclement weather sets in). If you wish additional information, please feel free to contact me.

Sincerely,



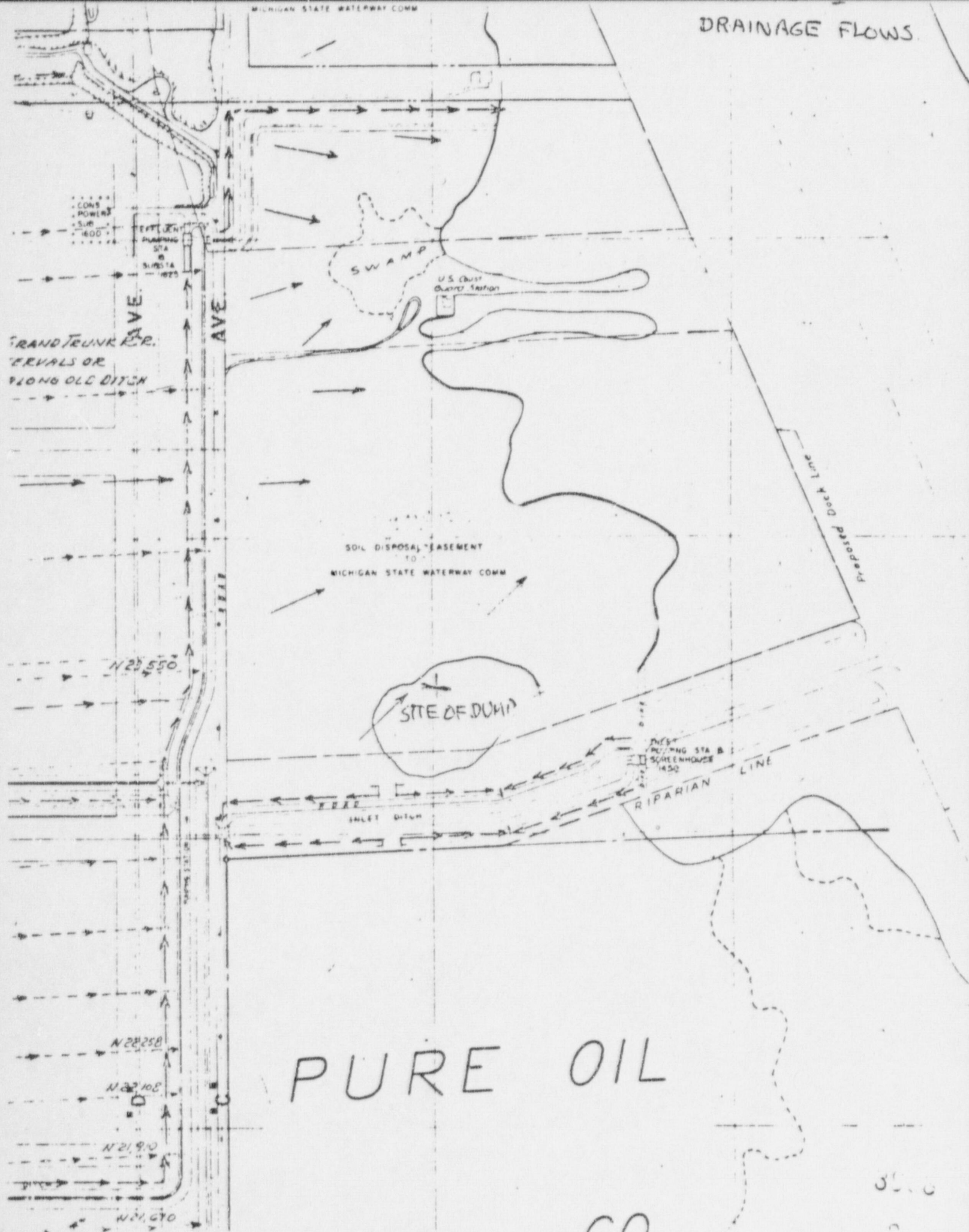
J. B. Charm
Biochemical Research Laboratory
1701 Building
MElrose 6-0641 (Area Code 517)

JBC:sjl

enclosures

cc: D. Smith, The Dow Chemical Company, Bay City Plants
O. Heath, Business Statistics, The Dow Chemical Company
L. G. Silverstein, Industrial Hygiene & Safety, The Dow Chemical Company
H. R. Hoyle, Chairman, Radiation Safety Committee, The Dow Chemical Company

MICHIGAN STATE WATERWAY COMB



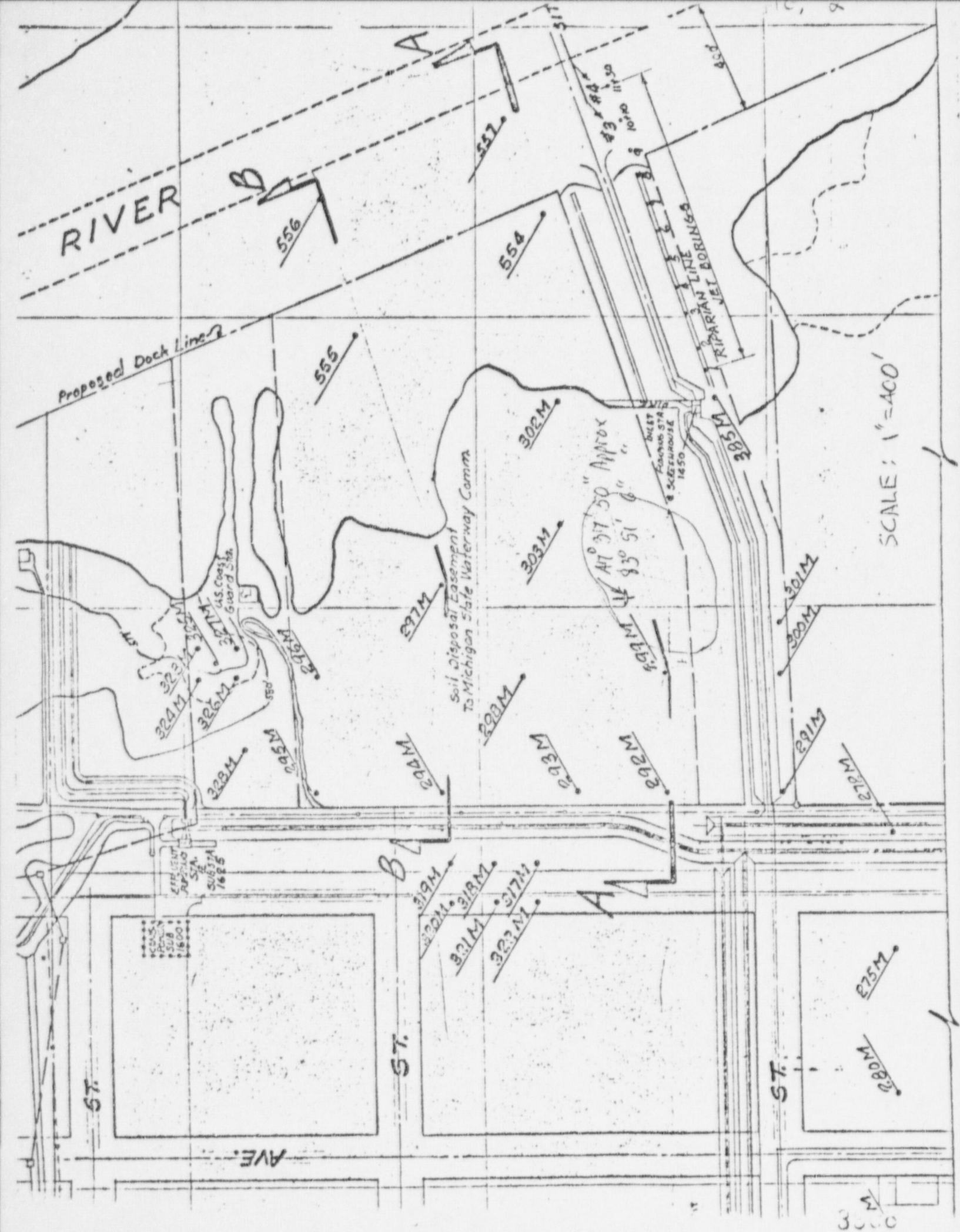
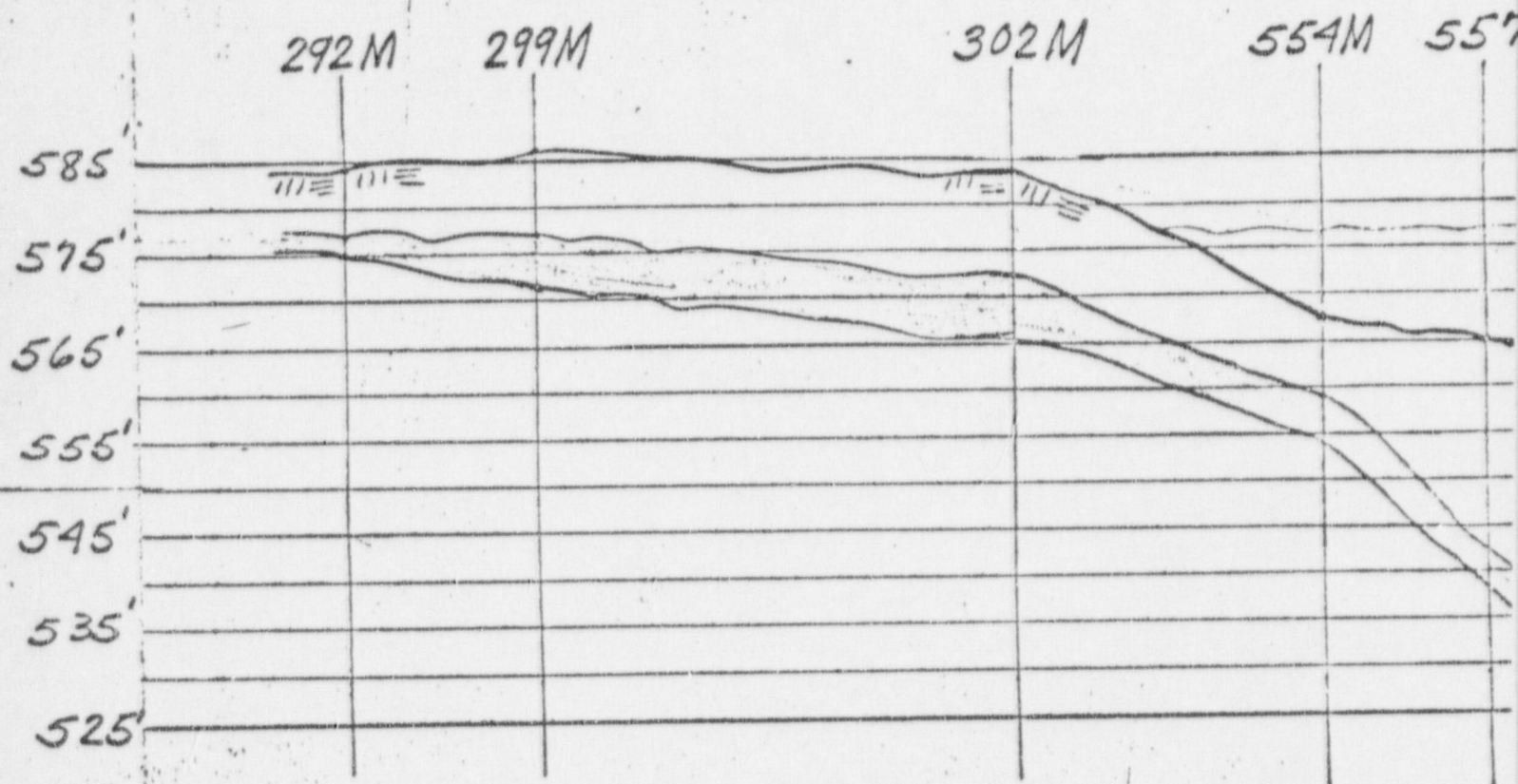


FIG. 3



HORIZ. 1" = 400'

VERT. 1" = 20'

SECTION A-A

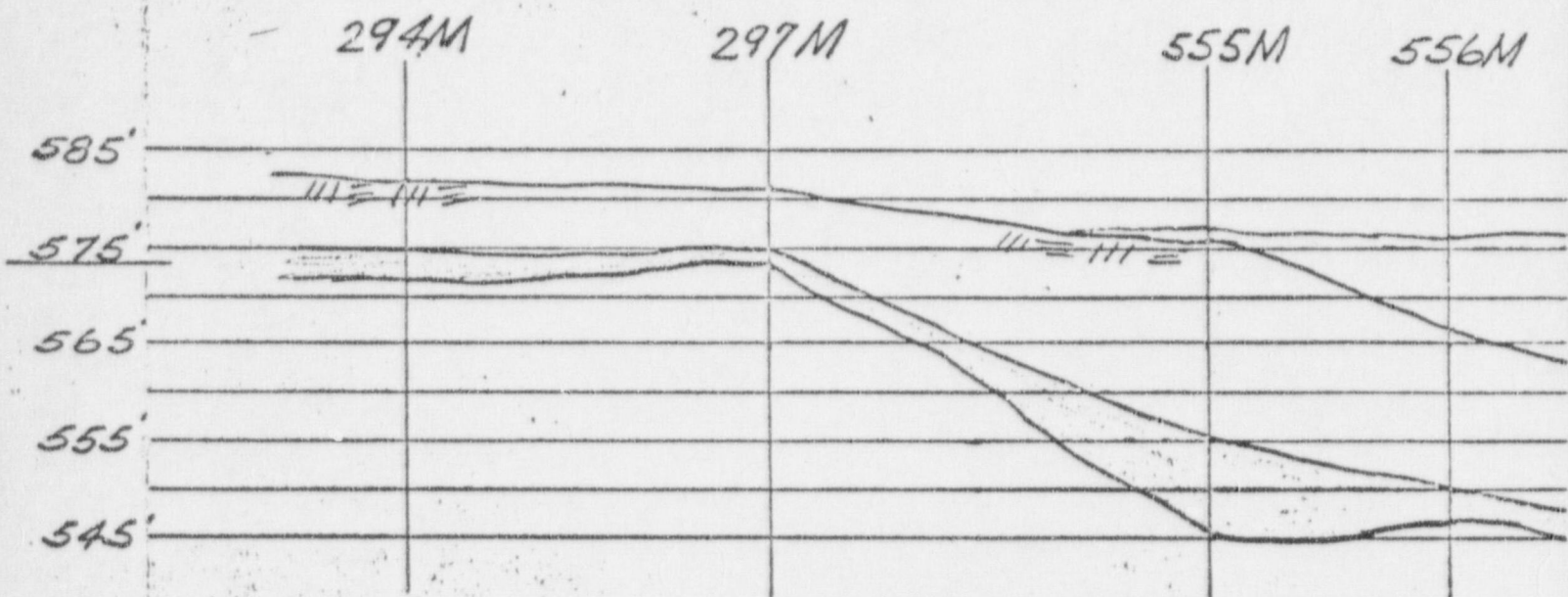
294M

297M

555M

556M

FIG. 4.



Horiz. 1" = 400'
Vert. 1" = 20'

SECTION B.B