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DTE Energy

December 03, 2009
NRC-09-0070

U.S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, D.C. 20555

Reference:

1) Enrico Fermi Atomic Power Plant, Unit 1
NRC Docket No. 50-16
NRC License No. DPR-9

2) Detroit Edison Letter, NRC-09-0017, "Proposed License Amendment – License Termination Plan", Dated March 25, 2009

3) Detroit Edison Letter, NRC-09-0046, "Modeling Scenarios for Fermi 1 License Termination Plan Criteria", Dated August 27, 2009

4) Detroit Edison Letter, NRC-09-0053, "Information Regarding the Fermi 1 License Termination Plan", dated October 30, 2009

Subject: Enrico Fermi Atomic Power Plant, Unit 1
Information Regarding the Fermi 1 License Termination Plan

The NRC requested that certain documents be submitted and docketed to aid in their technical review of the Enrico Fermi Unit 1 (EF1) License Termination Plan (LTP).

The following documents are being submitted for review:

1. An EF1 site boundary diagram
2. Figures 1.2 and 1.3 in 11x17 legible versions
3. Site locations of events

LIMSS01
FSME

4. List of LTP references revisions or effective date
5. List of questions with EF1 answers
6. MEF215, "Final Status Survey Background Assessment" and associated Form 52, "Background Assessment Data Sheet"

Note that the attached site drawing shows the Fermi 1 portion of the Fermi site. The actual license termination boundary is the portion of the site within the Fermi 1 perimeter road as discussed in the License Termination Plan, Section 1.3.2.

Should you have any questions, please contact Lynne Goodman, Manager, Fermi 1 at (734)586-1205

Sincerely,

Joseph H. Plona

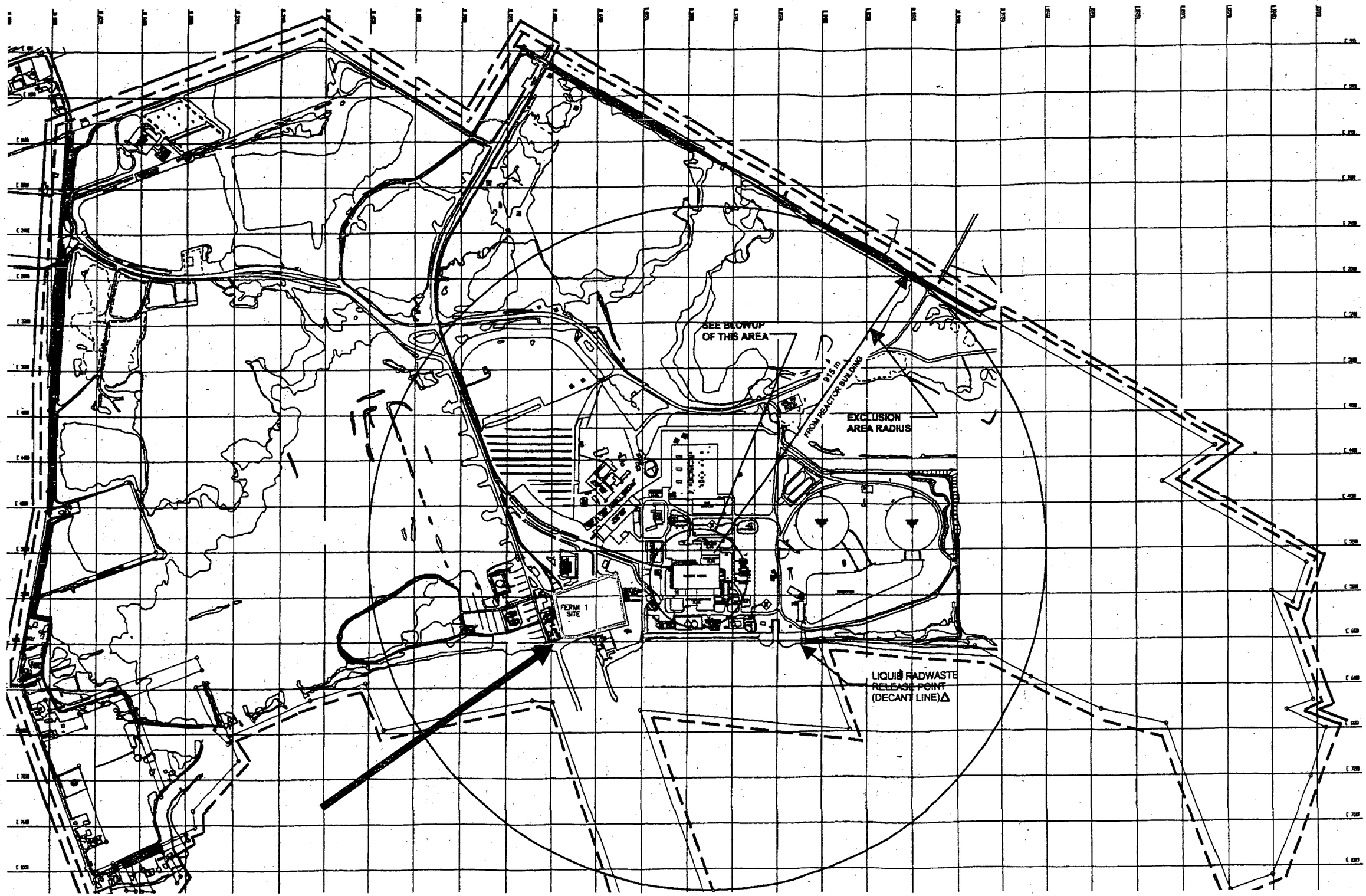
JHP/ME/ljd

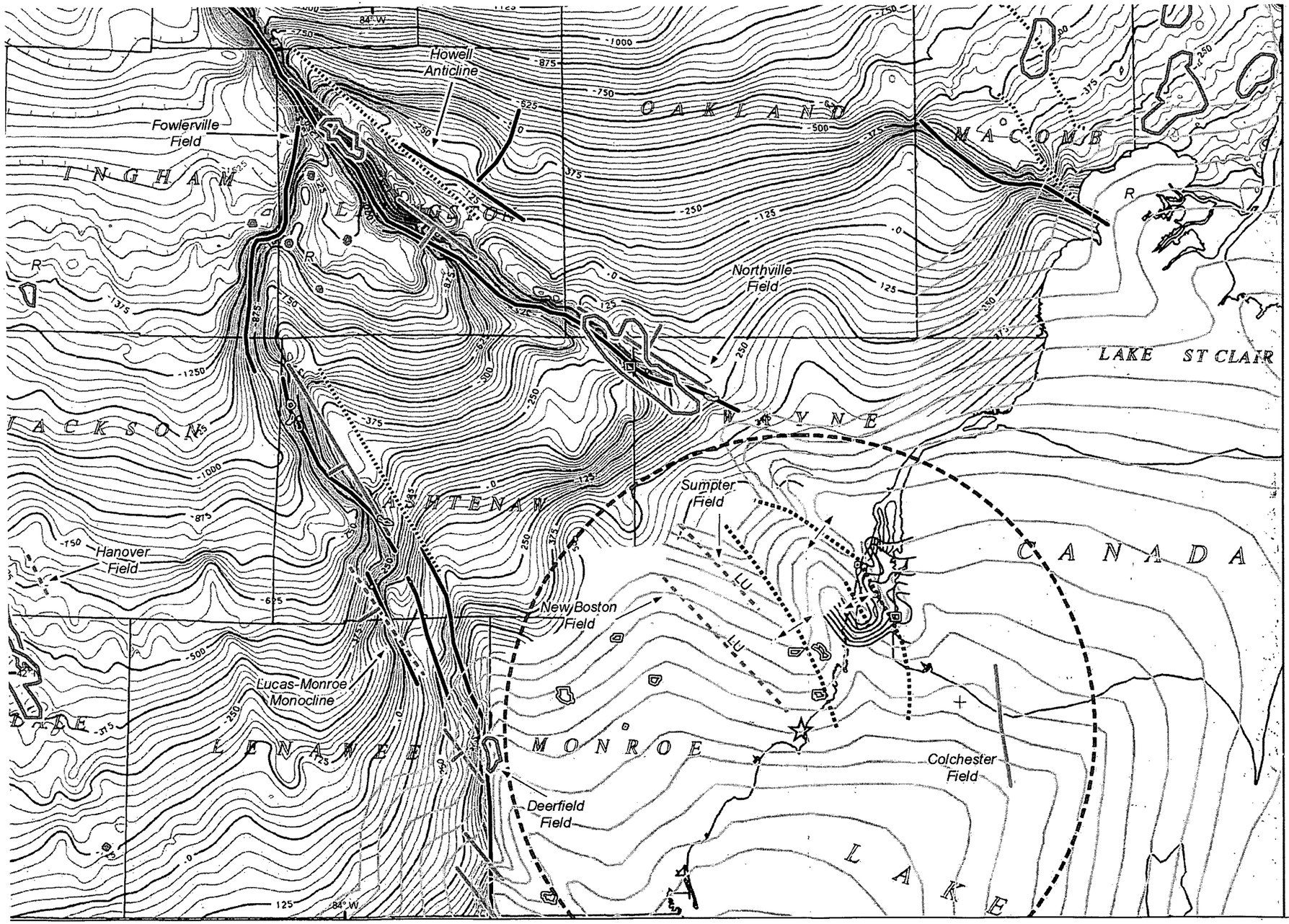
Attachments

cc: NRC Regional Administrator, Region III
T. Smith, NRC (Washington, D.C.)
NRC Resident Inspector- Fermi 2
P. Lee, NRC Region III
T. Strong (Michigan Dept. of Environmental Quality)

bcc: w/o attachments
J. Austerberry
D. Breiding
A. Bodipo-Memba
C. Byrd
W. Colonnello
J. Conner
J. Conen
L. Goodman
R. Johnson
K. Lindsey
R. Nearhoof
D. Niemeyer
J. H. Plona
J. Robinson
S. Stasek
J. Thorson
T. VanderMey
Fermi 1 Staff

Information Management (140 NOC) - Fermi 1 Records w/electronic attachments
NRR Chron File (Licensing) w/o attachments
NRC Notebook (Fermi 1) w/o attachments


SEE BLOWUP
OF THIS AREA
915 m
FROM REACTOR BUILDING
EXCLUSION
AREA RADIUS
FERMI 1
SITE
LIQUID RADWASTE
RELEASE POINT
(DECANT LINE)Δ



N
W E
S

LEGEND

- Fermi 3
- 25-mi. (40-km) Radius from Site
- Michigan Quarries
- Structure Contours on the top of the Sylvania Sandstone (Newcombe, 1933)
- Structure Contours on the top of the Traverse Sandstone (Newcombe, 1933)
- Oil and Gas Fields (Wollensack, 1969; Wollensack, 1991)

Structures

- Anticlinal trends, Devonian Dundee Formation (Ells, 1962; This Study)
- Possible Fault (Ells, 1962)
- LU Location Uncertain
- Probable Fault (Ells, 1962)
- Subsurface Fault Interpreted (This Study) from Structure Contour Map of Top of Dundee Formation (Aangstrom Precision, 1989)

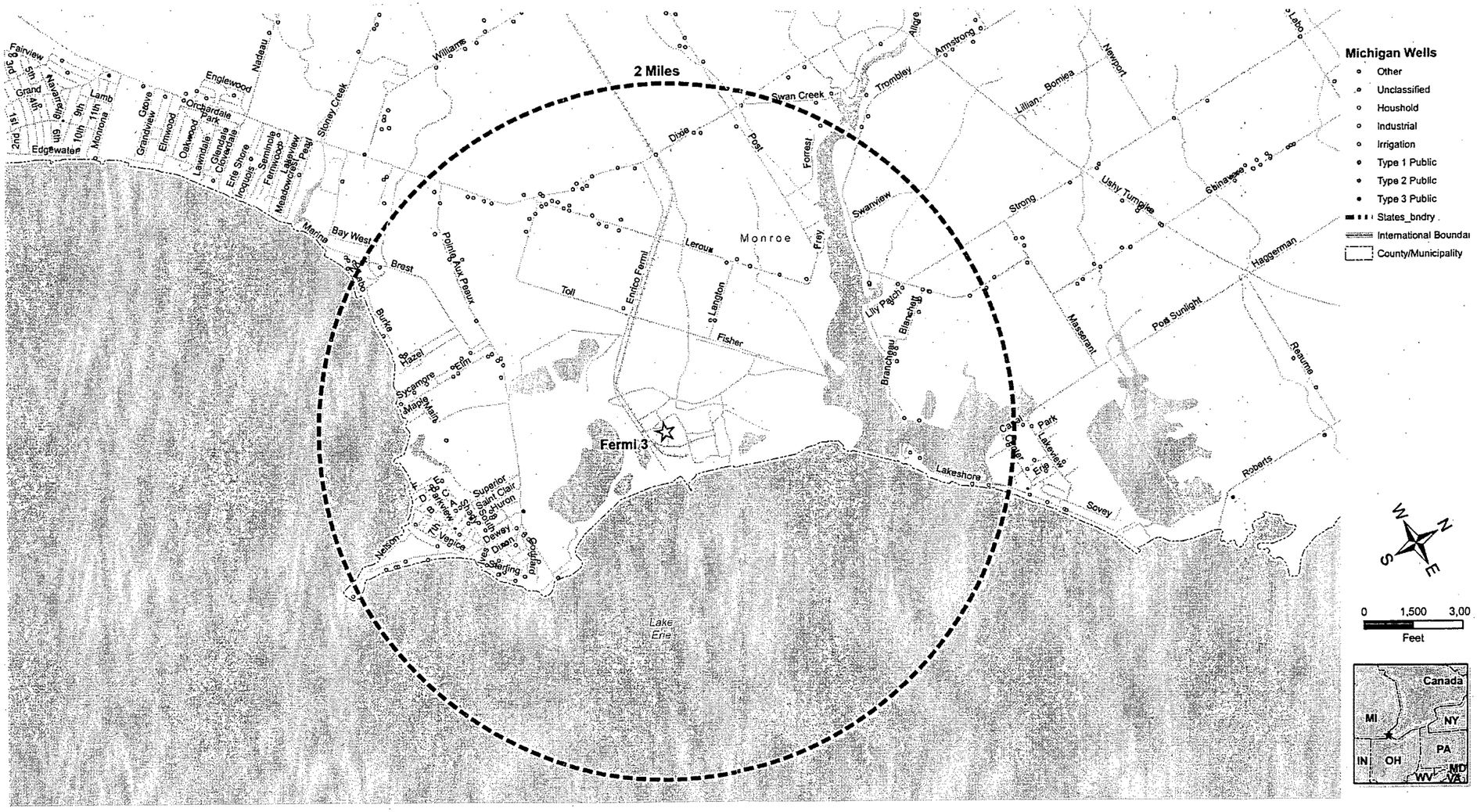
Base Map: Structure Contours on the top of the Dundee Limestone (Aangstrom Precision, 1989)

Note: See Table 2.5.1-201 for description of structures associated with oil and gas fields (indicated by label)

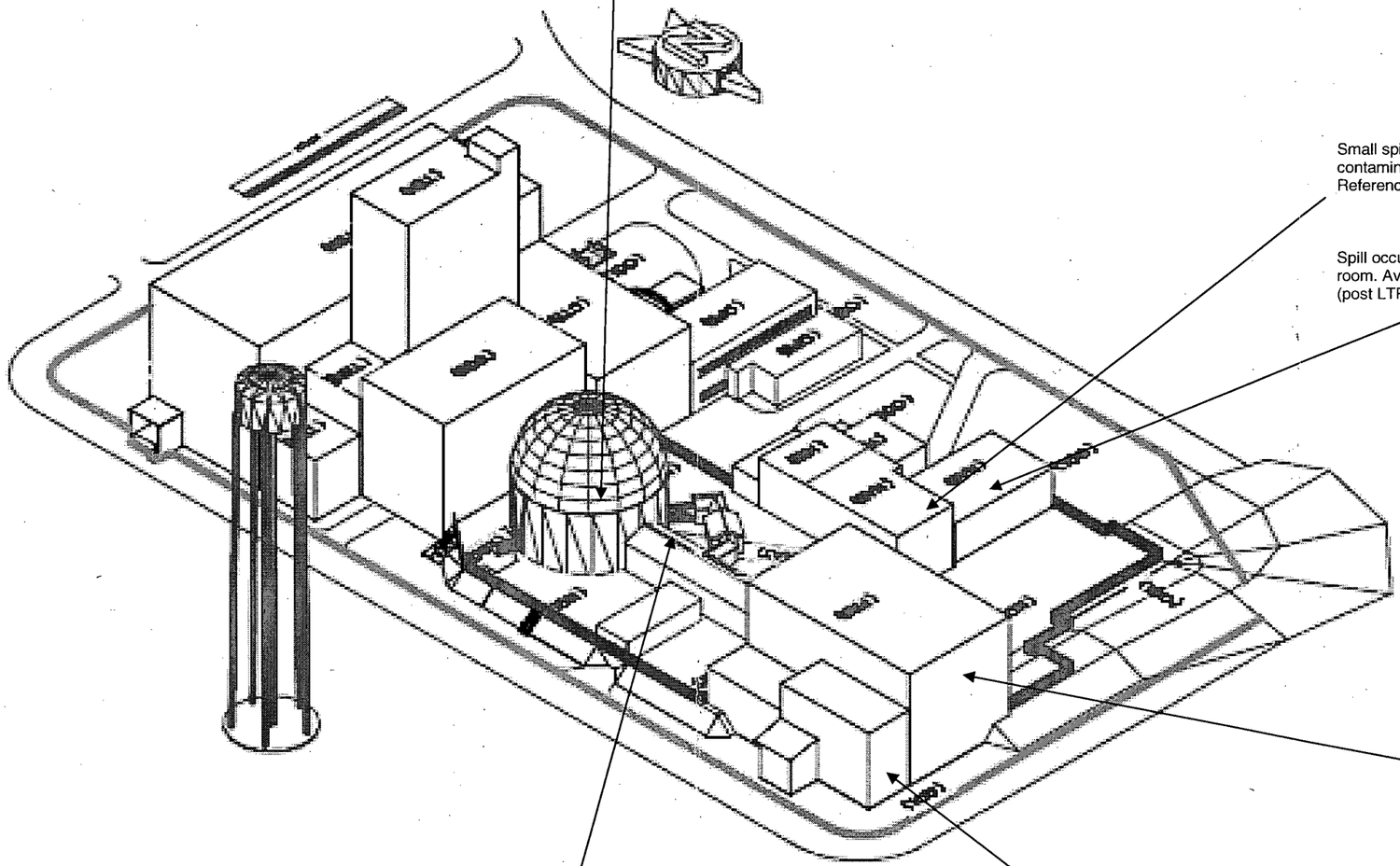
0 5 10 20
Kilometers
0 2.5 5 10
Miles

Figure 1-3 Potable Water Supplies in Vicinity of EF1
Enlarged
NRC-09-0070

Figure 2.4-236 All Wells Within 2 Mi [EF3 COL 2.0-23-A]



Fire in the Reactor Bldg. basement referenced -in sections 2.1.6 and 2.1.8.7 of the LTP. Basement was decontaminated to<500 dpm/100cm^2 with the exception of the area directly under the fire which was inaccessible due to piping and scaffold. Area estimated to be 8000dpm/100cm^2.



Small spills in the Cold Trap room. Average contamination levels of 1000 dpm/100cm^2. Referenced in section 2.1.8.10 of the LTP.

Spill occurred in the Primary Sodium Storage Tank room. Average contamination of 2000dpm/100cm^2 (post LTP submittal).

A spill from intermodal in FARB was up to 2 million dpm/100cm^2 fixed contamination. Spill occurred after LTP was submitted.

Location of break in Radwaste discharge line referenced in sections 2.1.6 and 2.1.8.1 of LTP. Historical samples indicated no activity and Well # EF-9S was located at this site. The pipe will be excavated and the surface beneath the pipe will be surveyed

Minor leaks of sodium mentioned in the Trestle way and referenced in sections 2.1.6 and 2.1.8.9 of the LTP.

Chapter 1

U.S. Nuclear Regulatory Commission Regulatory Guide 1.179 "Standard Format and Contents for License Termination Plans for Nuclear Power Reactors" January, 1999

U.S. Nuclear Regulatory Commission NUREG-1575 "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Rev. 1" August, 2000

U.S. Nuclear Regulatory Commission NUREG-1700 "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans" Rev. 1 April, 2003

U.S. Nuclear Regulatory Commission NUREG-1757 "Consolidated NMSS Decommissioning Guidance" Vol. 2 Rev. 1 September, 2006

U.S. Nuclear Regulatory Commission NUREG-0586 "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities." August, 1988

Chapter 2

Enrico Fermi Atomic Power Plant, Unit 1, Fermi 1 Manual Revision 110

Power Reactor Development Company, Technical Information and Hazards Summary Report June, 1961

Technical Based Document, (TBD) NESF-08-0018, Radionuclide Selection for *DCGL Development* Revision 0

U.S. Nuclear Regulatory Commission NUREG/CR-2082 – Monitoring for Compliance with Decommissioning Termination Survey Criteria 1981

Chapter 3

Fermi 2 Updated Final Safety Analysis Report Revision 13

Chapter 4
None

Chapter 5
Technical Based Document, (TBD) NESF-08-0018, "Radionuclide Selection for DCGL Development" Rev. 0

Technical Based Document, (TBD) NESF-08-0022, "Instrument Efficiency Determination for Use in Minimum Detectable Concentration Calculations Rev. 1

Enrico Fermi Atomic Power Plant, Unit 1, Fermi 1 Manual Rev. 110

MEF200 Final Status Survey (FSS) Program Rev. 0
MEF201 FSS Quality Assurance Program Procedure (QAPP) Rev.0
MEF202 Collection of Site Characterization and FSS Samples Rev. 0
MEF203 Sample Security and Chain of Custody Rev. 0
MEF204 Sample Receipt and Preparation Rev. 0
MEF205 Determination of the Number and Locations of FSS Samples Rev.0
MEF206 Turnover and Control of Areas for FSS Rev.0
MEF207 Survey Unit Classification Rev. 0
MEF208 Preparation of FSS Survey Plans Rev. 0
MEF209 Statistical Tests Draft
MEF210 Area Surveillance Following FSS Draft
MEF211 Data Quality Assessment Draft
MEF212 Preparation of FSS Reports Draft
MEF213 Split Sample Assessment for Final Status Survey Draft
MEF214 Computer Determination of the Number and Location of FSS Samples and Measurements Rev. 0
MEF215 FSS Background Assessment Rev. 0
MEF216 ALARA Evaluations for Final Status Survey Areas Draft
MEF217 Setup and Operation of the Ludlum 2350-1 Digital Survey Instrument Rev. 0
MEF218 Control and Accountability of FSS Portable Survey Instruments Rev.0

Chapter 6
Code of Federal Regulations, Title 10, Section 20.1402, "Radiological Criteria for Unrestricted Uses." (1–1–03 Edition)

Chapter 7
None

Chapter 8
Fermi 1 Safety Analysis Report. Rev.5
Fermi 2 Updated Final Safety Analysis Report Rev. 13

Q. *Explain how the volumetric contamination will be determined for the exteriors of the buildings as part of the characterization process.*

EF1 Answer:
Through the years there have some repairs made to the roofs of the EF1 structures. There repairs have been the addition of tar or membranes to provide a leak-tight surface. It is EF1 intentions to perform scans and fixed-point measurements on the surfaces with gas-flow proportional instrumentation as well as gamma scans performed with a scintillation detector. It is our opinion that a layer of tar or a membrane would not attenuate the gamma readings sufficiently so as to mask potential areas of activity and that scanning and fixed-point measurements are sufficient for the surveys. Should activity be identified there may be need for volumetric assessments.

Q. *Explain how the potential for under building contamination will be determined and verification that the subsurface soils are below release criteria.*

EF1 Answer:
The interior surfaces of the EF1 buildings will be surveyed and will be assessed for not only the presence of contamination but for the potential for the migration of contamination through the structure into the subsurface soils. If there is indication that contamination may have migrated into the subsurface soils, EF1 will perform subsurface soil assessments by appropriate means (e.g. core boring, etc.).

Q. *Provide the technical basis for the determination and use of reference background areas employed in the Fermi-1 characterization, remedial action and final status surveys.*

EF1 Answer:
EF1 procedure MEF215 "Final Status Survey Background Assessment" provides direction on the determination and use of background areas and a copy of that procedure is attached.

Q. *Provide decommissioning technical basis documents for the following:*

Bartlett Engineering Calculations ENG-001 through ENG-006
Radionuclide selection for DCGL development (Ref 6.8.5, NSEF-08-0018, July 21,2008)
Buried and embedded piping derived concentration guideline levels (DCGLs)
DCGLs for volumetrically contaminated materials
Detector sensitivity for minimum detectable concentrations (MDCs)
Determination of investigation criteria and hot particle detection
Provide your evaluation of the effects of surface coatings for beta detection (NUREG-1507)

EF1 Answer:

All documents have been, or will be, provided with the exception of the "Determination of investigation criteria and hot particle detection" and DCGLs for volumetrically contaminated materials. EF1 has not experienced the presence of hot particles and historical documentation has not determined that hot particles have been present at EF1, therefore we have not found it necessary to generate a Technical Based Document addressing hot particles. If during the continuing characterization process we identify hot particles we will develop a document addressing these. During the course of characterization of the EF1 site, volumetric contamination has not been observed. This is expected due to the very limited duration of operation of the plant as well as the design of a Liquid Metal Fast Breeder Reactor (LMFBR). If, during the continued characterization of EF1, volumetric contamination is found, EF1 will develop volumetric DCGLs and submit them, and the methodology, to the NRC for approval. The engineering calculations will be submitted in a separate letter.

Q. *Explain how direct radiation measurements are performed and evaluated for the containment structure, specifically the exterior containment dome*

EF1 Answer:
Biased scans and biased fixed-point measurements will be performed on accessible exterior areas of the dome (i.e. locations accessible from the ground). The paint on the dome is original; therefore no correction is necessary for the coatings. The maximum distance from the surface to the detector (due to the curvature of the dome) will be utilized in the correction to the 4π efficiency.

Q. *Indicate if grouting of embedded piping will occur. Note that if new DCGLs are developed for embedded piping, NRC review and approval of the DCGLs will be required.*

EF1 Answer:
If the embedded piping DCGLs are utilized the embedded piping will be grouted in accordance with Technical Based Document NSEF-09-0016 "Derived Concentration Guideline Levels for Embedded Piping" which has been included in the documents submitted.
Q. Provide the following nine references:

EF1 Historical Site Assessment from 2008, (Ref 2.6.6)

6.8.5 Detroit Edison Technical Based Document, "Radionuclide Selection for DCGL Development, " Enrico Fermi Unit 1, NSEF-08-0018, July 21, 2008.

6.8.11 Bartlett Engineering Calculation ENG-001, Sensitivity Analyses to Support EF1 Building Surface DCGLs, July 2008.

6.8.12 Bartlett Engineering Calculation ENG-002, Sensitivity Analysis for EF1 DCGLs for Soil, July 2008

6.8.13 Bartlett Engineering Calculation ENG-003, Calculation of EF1 Building Surface DCGLs, September 2008.

6.8.14 Bartlett Engineering Calculation ENG-004, Calculation of EF1 Soil DCGLs, September 2008.

6.8.15 Bartlett Engineering Calculation ENG-005, Calculation of EF1 Building Surface Area Factors, October 2008.

6.8.16 Bartlett Engineering Calculation ENG-006, Calculation of DECo EF1 Area Factor for Soil, October 2008.

8.5.2 Detroit Edison letter, NRC-87-0174, "Transmittal of Supplemental Environmental Information Enrico Fermi Atomic Power Plant, Unit 1", dated September 25, 1987 as listed on page 8-17.

EF1 Answer:
The requested documents with the exception of the Engineering Calculations were submitted in Reference 4. The Engineering Calculations will be submitted separately.

Q. *Provide requested hydrogeological information in GW questions*

EF1 Answer:
The hydrogeological information will be submitted in a subsequent submittal.

Q. *If not already provided, provide information on the radiological characterization of the site. This would include residual radioactivity in all media (including buildings, systems and equipment that will remain after license termination, surface and subsurface soil, and surface and subsurface ground water), characterization of the radiological status (e.g., process historical development, records of leakage or disposal), and clearly relate the information provided in the discussion of radiological status of the site with the discussion of source-term abstraction. Maps and cross-sections would be of benefit when detailing the extent of residual radioactivity left on the site.*

EF1 Answer:
A site map is submitted with the locations of historical spills. The radiological characterization was provided in the EF1 Historical Site Assessment submitted in Reference 4.

Q. *If not already provided, provide information on the potential contaminants of concern including details on the process of obtaining the final radionuclides of concern*

EF1 Answer:
The Technical Based Document on Radionuclide selection for DCGL development provides these details and was included in Reference 4.

Q. *The site-specific conceptual model should describe the following:*

1. Either the qualitative or quantitative justification that the critical group is the highest exposed group for the assumed land use(s). The selection of the critical group may be dependent on the assumption of the relative mixture of radionuclides and sources of residual radioactivity present at the site.
2. Both the hydrologic and environmental transport processes important at the site, including the most important physical, chemical, and biological processes at the site.
3. The contaminants of the source area and how they are likely to be released into the environment.
4. How contaminants of the groundwater pathway could migrate through the unsaturated and saturated zones to potential receptors (e.g., a well or a spring). Important processes that should be characterized include the dimensions and state conditions (e.g., steady-state) of flow; dimensions and state conditions of transport (e.g., dispersion); chemical and mass transfer processes (e.g., sorption, precipitation, complexation); and transformation processes (e.g., radioactive ingrowth and decay).
5. Major assumptions which are consistent and defensible.

EF1 Answer:
The site-specific conceptual model will be submitted in a subsequent submittal.

Q. *Provide input/output files or printouts of computer modeling data*

EF1 Answer:
These files were submitted in Reference 3.

Q. *Sec. 2.1.6 "Event Descriptions," p. 2-15: The EF1 Historical Site Assessment (HSA) from 2008 as described in Sec. 2.1.1 on p. 2-6 should provide more qualitative and quantitative detail on the unplanned events.*

EF1 Answer:
Details of these events are in EF1 Historical Site Assessment from 2008 which is included with Reference 4.

Q. *App. 6A, Sec. 1 "Room Dimensions," p. 6-23: "The room on the second floor of the Sodium Building was selected as a representative room for the EF1 site buildings and was used as the modeling basis for the building surfaces DCGLs." Provide the technical basis on why the Sodium Building can be used a representative room.*

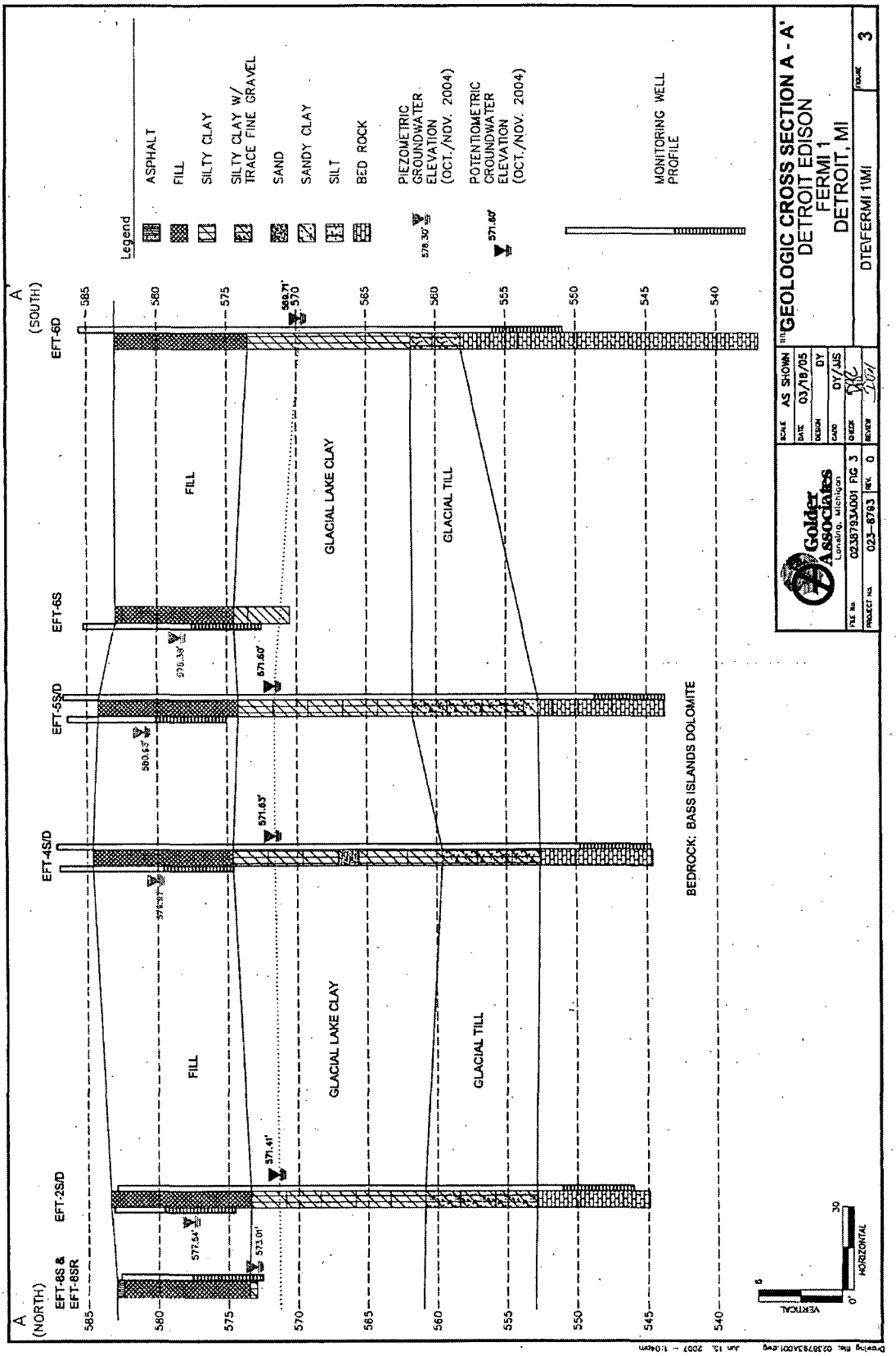
EF1 Answer:
While the 2nd floor of the Sodium Building is not the largest room at EF1 (e.g. OFB (1170 m^2 each floor), RXB (757 m^2 each floor)) it is not the smallest (e.g. Vent. Bldg. (175 m^2, Tressleway (200 m^2) the room selected (316 m^2) falls between the rooms available for selection, size wise, and is the most probable for occupancy in the future since there are no scheduled

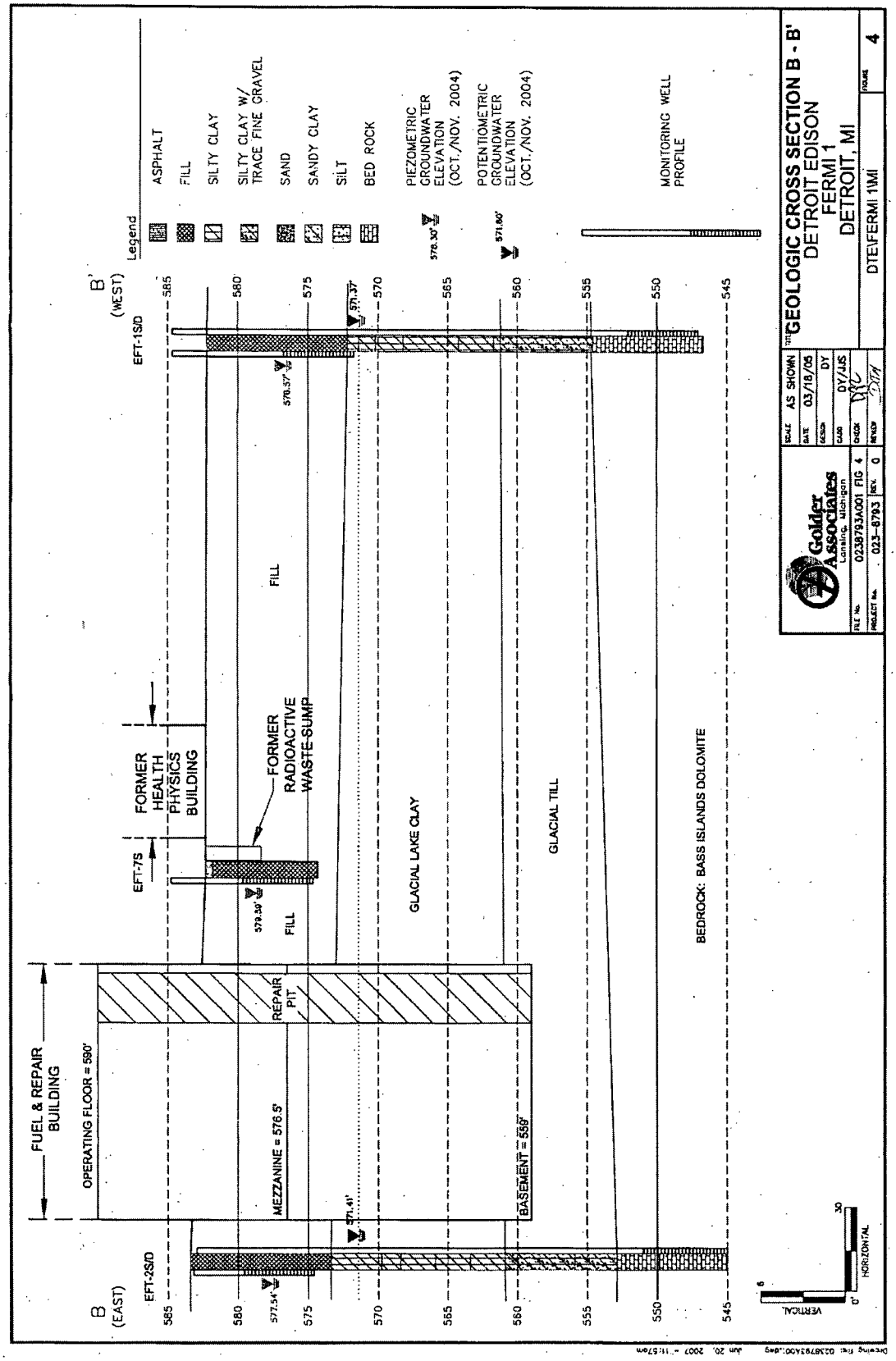
demolition/remedial actions that would hamper occupancy (i.e. activities that would cause large holes in the floor or walls).

Q. *App. 6F, Sec. 3 "Contaminated Zone Erosion Rate," p. 6-49: The relationship between two groundwater monitoring wells and the erosion rate is not clear. If the topographic elevation of the two well localities were used in order to determine the slope between the two topographic points, the representativeness of these two points for the site slope would need to be demonstrated.*

EF1 Answer:
The "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil" states the following:
The erosion rate of the contaminated zone only becomes significant if and when the cover zone is completely eroded, thus exposing the contaminated zone to the erosive effects of the environmental elements. If there is no initial cover, a greater erosion rate will remove the contaminated material faster. This may lead to lower doses than found for an initial cover case.

The RESRAD model uses a default value of an annual erosion rate equal to 0.001 m/y for both the cover and contaminated zones. The modeling for the Fermi 1 site did not include a cover, thus, the only erosion rate required was that for the contaminated zone. Rather than using the RESRAD default erosion rate, an erosion rate for the Fermi 1 site was determined from site-specific information provided in the Golder Associates report. This determination was enabled because the RESRAD modeling guidance cited above and Attachment C to NUREG/CR-6697 both provide erosion rates based on slope. The slope based on elevations of and distance between wells 10S and 8S (1.9%) was used as the basis for selecting the erosion rate input value ($6X10^{-4}$ m/y, which should be assumed for a 2% slope). The calculated slope (1.9%) is supported as a representative site slope by Figures 3 and 4 in the "Report on Groundwater Characterization – Enrico Fermi 1 License Termination" issued by Golder Associates Inc.
Figure 3 shows the geologic cross section, including an elevation profile, for the Protected Area at the Fermi 1 site in the north-south direction. As shown in that figure, well 4S is located at the highest elevation near the mid-point of the north-south length of the Protected Area. This creates 2 potential slopes: one slope from well 4S to lower site elevations to the north and another slope from well 4S to lower elevations to the south. The slope from well 4S to well 8S approximately 145 ft to the north is approximately 1.1%. A similar slope exists to the south of well 4S. The slope from well 4S to well 6D (a distance of about 180 ft) is approximately 0.9%.
The geologic cross section, including an elevation profile, in the east-west direction is provided by Figure 4. The site slope from well 2S to well 1S, separated by a distance of approximately 320 ft across the span of the Protected Area, is approximately 0.4%.
The elevation profiles shown in these 2 figures provide additional support that the use of an erosion rate based on a site slope of 1.9% is representative for the Fermi 1 site.


A (NORTH)
A' (SOUTH)
EFT-8S & EFT-8SR
EFT-2S/D
EFT-4S/D
EFT-5S/D
EFT-6S
EFT-6D
Legend
ASPHALT
FILL
SILTY CLAY
SILTY CLAY W/ TRACE FINE GRAVEL
SAND
SANDY CLAY
SILT
BED ROCK
PIEZOMETRIC GROUNDWATER ELEVATION (OCT./NOV. 2004)
POTENTIOMETRIC GROUNDWATER ELEVATION (OCT./NOV. 2004)
MONITORING WELL PROFILE
FILL
GLACIAL LAKE CLAY
GLACIAL TILL
BEDROCK: BASS ISLANDS DOLOMITE
585
580
575
570
565
560
555
550
545
540
577.54'
573.01'
571.41'
576.97'
571.63'
580.63'
576.39'
571.60'
578.71'
578.30'
571.60'
VERTICAL
HORIZONTAL
30
0'
"GEOLOGIC CROSS SECTION A - A'
DETROIT EDISON
FERMI 1
DETROIT, MI
DTE\FERMI 1\MI
FIGURE 3
Golder Associates
Lansing, Michigan
SCALE AS SHOWN
DATE 03/18/05
DESIGN DY
CADD DY/JJS
CHECK
REVIEW
FILE No. 023879134.001 FIG 3
PROJECT No. 023-8793 REV. 0


GEOLOGIC CROSS SECTION B - B'
DETROIT EDISON
FERMI 1
DETROIT, MI
DTEVFERMI 1Mi
Golder Associates
Legend
ASPHALT
FILL
SILTY CLAY
SILTY CLAY W/ TRACE FINE GRAVEL
SAND
SANDY CLAY
SILT
BED ROCK
PIEZOMETRIC GROUNDWATER ELEVATION (OCT./NOV. 2004)
POTENTIOMETRIC GROUNDWATER ELEVATION (OCT./NOV. 2004)
MONITORING WELL PROFILE
B (EAST)
B' (WEST)
EFT-1S/D
EFT-2S/D
EFT-7S
FORMER HEALTH PHYSICS BUILDING
FORMER RADIOACTIVE WASTE SUMP
FUEL & REPAIR BUILDING
OPERATING FLOOR = 590'
MEZZANINE = 576.5'
BASEMENT = 558'
REPAIR PIT
FILL
GLACIAL LAKE CLAY
GLACIAL TILL
BEDROCK: BASS ISLANDS DOLOMITE
VERTICAL
HORIZONTAL

Q. *App. 6F, Sec. 4 "Soil Type," p. 6-49: The EF1 site soil is classified as a sandy loam in this section. However, this description seems to contradict the description given in Section 2.2.3.1, page 2-53, number 2. In this section the fill material was described as consisting primarily of clay, and to a lesser extent sand and crushed stone. The 2007 Golder report also described the fill material as being clay rich (Section 3.1.1).*

EF1 Answer:
When classifying the soil type for the modeling of the Resident Farmer Scenario EF1 thought it prudent to rely on empirical data and therefore collected seven soil samples for analysis. The results of these samples are found in ENG-002 "DTE EF1 Soil Sensitivity Calc. Rev. 1" Attachment 2. The results indicate a content of 5.2-19.3 % clay with the remainder comprised of sand, silt and gravel. While visually the soils would appear to be clay rich, the grain size distributions, as applied to the USDA method of soil classification, determined that the soil was of a sandy loam type, and as a result EF1 used this classification in the modeling.

Q. *App. 6F, Sec. 9&10, pp. 6-52&53: The calculated unsaturated zone thickness is given at 6.5 ft. If the fill material is 10 ft thick, the remaining thickness for the saturated zone is 3.5 ft. It would need to be demonstrated that this saturated zone could provide enough water to satisfy the water use consumption as given in Table 6F-3 on p. 6-52. Specifically, the following items would need to be addressed: the thinness of the aquifer, the low rate of recovery of water levels that were observed during slug tests, and highly localized horizontal movement of the perched groundwater as stated in Section 2.2.3.1, page 2-53, number 4.*

EF1 Answer:
The resident farmer scenario includes certain water use assumptions. Consistent to the scenario, these water use assumptions were included in the development of the DCGL values for contaminated soil without confirmation of actual yield of the aquifers at the Fermi 1 site. The belief held is that if the aquifers cannot actually support the water use assumptions, then there is added conservatism in the soil DCGL values.

Q. *Golder Work Plan (August 2005), Figure 2: The sheet piling shown in this figure may be important to both the hydrogeology of the site and the erosion rate if the pilings start to deteriorate. Provide more information on potential influences the pilings may have on the hydrogeology and on the pilings themselves, e.g., how are they designed, component materials, design life, effort and cost of maintenance and repair.*

EF1 Answer:
This question will be addressed as part of the submittal addressing the groundwater questions.

FINAL STATUS SURVEY BACKGROUND ASSESSMENT

CONTENTS

FINAL STATUS SURVEY BACKGROUND ASSESSMENT

PURPOSE

The purpose of this procedure is to establish a process for background assessments for Final Status Survey (FSS) at Fermi Unit 1 (EF1).

SCOPE

This procedure provides instructions for determining background and ambient radiation levels and background radionuclide concentrations for use in assessing data collected for Final Status Survey (FSS) at Fermi Unit 1 (EF1).

1.0 DEFINITIONS

Disturbed soil – For the purpose of this procedure, disturbed soil is soil that is known to have been moved by earth-moving equipment since 1945.

Reference Area – An area that has similar physical, chemical, radiological and biological characteristics to the site being surveyed, but which has not been contaminated by site activities. The distribution and concentration of background radiation in the reference area should be the same as that which would be expected on the site if the site had never been contaminated.

2.0 DISCUSSION

For the FSS, the Derived Concentration Guideline Levels (DCGLs) for residual radioactivity are levels above background. "Background", in this application, includes all non-plant related radioactive materials in the area being surveyed, including naturally occurring materials and global fallout from nuclear weapons tests and nuclear accidents such as Chernobyl. It is necessary to measure background radionuclide concentrations in order to determine the impact of plant-related (above background) radioactivity in a survey unit.

For direct measurement of radiation levels, "background" refers to all non-EF1 related sources of radiation, including cosmic radiation, radiation from naturally occurring radioactive materials in the ground and building materials and radiation from fallout. Direct radiation emanating from the operation of Fermi 2 is also part of the EF1 ambient radiation level for FSS purposes.

The Data Quality Objective (DQO) process will be used during the planning phase in the preparation of an FSS plan to determine whether media-specific backgrounds, ambient levels or no background will be applied to a survey area or unit.

Background levels are needed when applying the Wilcoxon Rank Sum (WRS) test. If the Sign test is to be used, background levels may be used in some cases but generally are ignored.

All background and ambient measurements should account for both spatial variability over the area being assessed and the precision of the instrument or method being used to make the measurements.

Background levels will be subtracted from total radiation or radioactivity levels to determine the net residual contamination from licensed operations. Therefore, it is necessary for backgrounds to be determined with a detection sensitivity and accuracy equivalent to the data from which it will be subtracted. This can be achieved by using the same instruments and techniques for background assessments as are used in evaluating

the final site conditions.

This procedure describes the method for determining the background levels that will be used in total surface contamination measurements, soil sampling and other sampling. Scan surveys will not use background measurements since scans are performed to identify areas of elevated readings. Other methods of determining applicable background values for specific survey areas (e.g., use of existing empirical data, etc.) may be utilized if the approach is technically sound and documented as approved by the License Termination Manager. Other procedures will determine background levels in laboratory instruments, such as smear counters and gamma detection instruments (HPGe detectors), for sample analysis.

This procedure is implemented at the direction of the License Termination Manager, by a FSS Engineer with support from a Lead FSS Technician. FSS Technicians may be used to take measurements or samples under the direction of a Lead FSS Technician or FSS Engineer.

3.0 PREREQUISITES

- Personnel using this procedure shall be specifically trained as to its contents.
- If on-site locations are to be used, coordinate with RP supervision to ensure that no radioactive material shipments/movements will affect the ambient levels in the area to be surveyed.
- Ensure that any computer programs to be used have been verified in accordance with MES38, "Software Controls for Non-process Computer Systems."

4.0 PROCEDURE

4.1 Background Survey Design

4.1.1 Selection of Reference Areas

NOTE (1): EF1 license termination land areas are comprised of disturbed soils. Historical data has shown that the Cs^{137} concentration in disturbed soils is low level and too widely varied to be used with background data therefore, any background activity in soil samples taken at EF1 will have to be disregarded, which is conservative.

NOTE (2): Building surveys may use locally acquired ambient data, taken at the time of the survey. This process is described in EF1 License Termination Plan (LTP) as the "alternative" method. In its simplest form, it would consist of subtracting a closed-window reading from an open-window reading at each sample point. If this method is employed, a technical basis will be documented.

a) Identify the material types that comprise the buildings, systems and components at EF1 where a reference area will be needed.

b) For each material type identified, locate an uncontaminated area that has similar physical, chemical, radiological and biological characteristics.

4.1.2 Selection of Individual Measurement Locations

a) Select 30 individual locations by following the process described in either MEF205 "Determination of the Number and Locations of FSS Samples" or MEF214 "Computer Determination of the Number and Location of FSS Samples and Measurements", unless an alternate number of locations is specified by the License Termination Manager. If you are using the Visual Sample Plan (VSP) in MEF214, modify the process as follows:

- Adjust the LBGR as needed to get the desired number of locations or specify the number of measurements in VSP.

- Determine just the locations from the VSP results. Disregard the LBGR and other numbers produced by this process.

4.1.3 Reference Area Survey Package

a) Initiate Form 52, "Background Assessment Data Sheet" for each material type identified.

b) Fill in the header information and any survey instructions that have been established and sign as the initiator.

- Specify the same instrument/detector combination that will be used for FSS direct measurements.

- In the "Survey Instructions" section, specify the same mode of operation (i.e., scaler or count rate) that will be used in the performance of surveys.

c) Attach any worksheets, maps and/or printouts providing specific direction for measurement locations.

d) Submit the survey package to the License Termination Manager for approval.

4.2 Special Assessments

Special background assessments shall be performed as directed by the License Termination Manager.

4.3 Background Survey Implementation

NOTE: This section of the procedure may be performed by a FSS Technician, Lead FSS Technician or a FSS Engineer.

4.3.1 Direct Measurements

a) Radiological Instrumentation:

Table 1 provides a list of suggested FSS instrumentation and detectors to be used for surface contamination and exposure rate measurements for which various types of background or ambient levels may be needed.

Table 1
Instruments Available for FSS

Instrument	Detector	Purpose	Units
2350-1	43-68	Alpha/beta detection	cpm
2350-1	43-37	Alpha/beta detection	cpm
2350-1	SPA-3	Gamma detection	cpm
Bicron	Plastic Scint.	Gamma detection	µrem/hr

b) Material Background Measurements

- For each instrument/detector combination, record the serial numbers and calibration due dates on Form 52, "Background Assessment Data Sheet".
- Record any comments related to the background measurement in the "Notes/Remarks" section.
- Place the detector at each survey point specified and take a one-minute count (or for a different count time if directed by the License Termination Manager).
- If using an instrument with data-logging capabilities, log each count into the memory. If a barcode system is in place, use it to associate to material type/location with the data.
- For manual instruments, record the data on the same type of data sheet used for similar FSS measurements.

c) Data Handling

1) Establish an electronic file for reference area data.

2) Logged data;

- After collecting background or ambient measurements, download the data from the instrument in accordance with MEF217 "Operation of the Ludlum 2350-1 Digital Ratemeter".
- Save the downloaded data in the electronic file established in Step 4.3.1 c) 1).
- Print a copy of the data file and attach it to Form 52, "Background Assessment Data Sheet".
- Go to Step 4.3.1 c) 4).

3) Manual data

- Manually enter the data into a spreadsheet
- Save the spreadsheet in the electronic file established in Step 4.3.1 c) 1).
- Print a copy of the data file and attach it to Form 52, "Background Assessment Data Sheet".
- Attach the original data sheet to Form 52, "Background Assessment Data Sheet".

4) Enter the electronic file name in the space indicated on Form 52, "Background Assessment Data Sheet".

4.4 Data Evaluation

4.4.1 Acceptability Determination

On a spreadsheet with the data, determine the mean and standard deviation of the results.

Calculate the acceptable number of data points for both the WRS and Sign test by one of the following methods:

- Run the COMPASS program, using "practice" with the following inputs:

  Test: (run program twice, once for each test)

  DCGL: Value for Cs-137 from the EF1 LTP (or as directed by the License Termination Manager).

LBGR: Initially ½ of the DCGL, this can be adjusted to (DCGL-2σ) if necessary to get the relative shift between 1 and 3.

Sigma: Standard deviation calculated above.

Type I (α): 0.05
Type II (β): 0.05

-OR-

- Run MARSSIM Power 2000 using the above described values for input.

-OR-

- Manually calculate N and N/2 using the steps outlined in procedure MEF205 "Determination of the Number and Locations of FSS Samples".

Compare the calculated N (Sign test) and N/2(WRS test) with the actual number of measurements in the background survey. If the calculated number is no greater than the number of measurements, the data may be used as reference data for either test. Otherwise, bring it to the attention of the License Termination Manager who will decide whether more measurements should be taken or other actions.

Print any worksheet, COMPASS output or MARSSIM Power 2000 sheet and incorporate it into the report.

Fill in and sign the Data Evaluation section of Form 52, "Background Assessment Data Sheet".

4.4.2 Review

- Forward Form 52, "Background Assessment Data Sheet", and all attachments to the License Termination Manager for approval.

- If the data are utilized by the FSS, document the background data set and include a copy in the FSS files.

- If the data are determined to be not applicable (N/A) by the License Termination Manager, annotate on Form 52, "Background Assessment Data Sheet" and file it in the FSS files.

5.0 REFERENCES

Fermi 1 License Termination Plan

NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), Revision 1, August 2000

MEF200, "Final Status Survey Program"

MEF201, "Final Status Survey Quality Assurance Project Plan (QAPP)"

MEF205, "Determination of the Number and Locations of FSS Samples"

MEF208, "Preparation of FSS Survey Plans"

MEF209, "Statistical Tests"

MEF214, "Computer Determination of the Number and Location of FSS Samples and Measurements"

MEF217, "Operation of the Ludlum 2350-1 Digital Ratemeter"

MEF218, "Control and Accountability of Final Status Survey Portable Instrumentation"

MES38, "Software Controls for Non-process Computer Systems"

BACKGROUND ASSESSMENT DATA SHEET

Reference Area Description:	Instruments: 2350-1 _____ Bicron _____ Other _____
Material Type:	Detectors: 43-37____ 43-68____
Prepared by (print):	SPA-3: _____ Other: _____
Date:	Materials:
Survey Instructions:	

Initiator sign/date:	License Termination Manager additional instructions:
Prepared by (print):	None ☐ Attached ☐

Survey data	**Instrument Data**		
Performed by (print):	Type	Serial Number	Cal. Due
Date/time:			
Download file name:			

Notes/Remarks:
☐ Additional page(s) attached
Performed by (Surveyor sign):
Data Evaluation:
Sign Test LBGR _____ N = _____ Sat. _____ Unsat. _____
WRS Test LBGR _____ N/2= _____ Sat. _____ Unsat _____
Evaluator sign: Date:
Reviewed by: Date:
Approved by:_____Date:_____ License Termination Manager