The Detroit Edison Company
One Energy Plaza, Detroit, MI 48226-1279

10 CFR 52.79

September 30, 2009
NRC3-09-0027

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington DC 20555-0001

References: 1) Fermi 3
Docket No. 52-033
2) Letter from Jerry R. Hale (USNRC) to Jack M. Davis (Detroit Edison), "Request for Additional Information Letter No. 10 Related to the SRP Sections 2.4.2, 2.4.3, 2.4.4, 2.4.5, 2.4.9, 2.4.12, and 17.5 for the Fermi 3 Combined License Application," dated August 12, 2009.

Subject: Detroit Edison Company Response to NRC Request for Additional Information Letter No. 10

In the referenced letter, the NRC requested additional information to support the review of certain portions of the Fermi 3 Combined License Application (COLA). The responses to the following Requests for Additional Information (RAIs) are provided as Attachments 1 through 14 of this letter:

- RAI Question 17.5-1 QAPD Section 7.2
- RAI Question 17.5-2 QAPD Section 16.1
- RAI Question 17.5-3 FSAR Part 2, Chapter 17.5
- RAI Question 17.5-4 FSAR Chapter 17.5
- RAI Question 17.5-6 FSAR Chapter 13.1 and QAPD Part II, Section 1 & 2.5
- RAI Question 17.5-5 QAPD Part II, Section 1
- RAI Question 17.5-7 QAPD Part II, Section 2.7
- RAI Question 17.5-8 QAPD Part II, Sections 1, 2, 4, 6, and 16
- RAI Question 02.04.02-1 Floods
- RAI Question 02.04.03-1 Probable Maximum Flood (PMF) on Streams and Rivers
- RAI Question 02.04.04-1 Potential Dam Failures
- RAI Question 02.04.09-1 Channel Diversions
- RAI Question 02.04.05-1 Probable Maximum Surge and Seiche Flooding
- RAI Question 02.04.12-1 Groundwater

D095
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Information contained in these responses will be incorporated into a future COLA submission as described in the RAI response.

The response to RAI 02.04.05-1 contains an electronic file submitted on CD as a separate enclosure. Appendix A provides a list of files contained on the enclosed CD.

If you have any questions, or need additional information, please contact me at (313)235-3341.

I state under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of September 2009.

Sincerely,

Peter W. Smith, Director
Nuclear Development – Licensing & Engineering
Detroit Edison Company

Appendices: Appendix A – List of Electronic Files on Enclosed CD

Attachments:
1) Response to RAI Letter No. 10 (Question No. 17.5-1)
2) Response to RAI Letter No. 10 (Question No. 17.5-2)
3) Response to RAI Letter No. 10 (Question No. 17.5-3)
4) Response to RAI Letter No. 10 (Question No. 17.5-4)
5) Response to RAI Letter No. 10 (Question No. 17.5-6)
6) Response to RAI Letter No. 10 (Question No. 17.5-5)
7) Response to RAI Letter No. 10 (Question No. 17.5-7)
8) Response to RAI Letter No. 10 (Question No. 17.5-8)
9) Response to RAI Letter No. 10 (Question No. 02.04.02-1)
10) Response to RAI Letter No. 10 (Question No. 02.04.03-1)
11) Response to RAI Letter No. 10 (Question No. 02.04.04-1)
12) Response to RAI Letter No. 10 (Question No. 02.04.09-1)
13) Response to RAI Letter No. 10 (Question No. 02.04.05-1)
14) Response to RAI Letter No. 10 (Question No. 02.04.12-1)

cc: Jack M. Davis, Senior Vice President and Chief Nuclear Officer
Mark Tonacci, NRC Fermi 3 Project Manager
Stephen Lemont, NRC Fermi 3 Environmental Project Manager
Fermi 2 Resident Inspector
NRC Region III Regional Administrator
NRC Region II Regional Administrator
Supervisor, Electric Operators, Michigan Public Service Commission
Michigan Department of Environmental Quality
Radiological Protection and Medical Waste Section

Appendix A
NRC3-09-0027

List of Electronic Files on Enclosed CD

Directory of Lake Erie Hourly Level Data Requested Files (Attachment 13 - RAI 02.04.05-1)
Publicly Available

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Directory of D:\
        09/28/2009  09:14 AM        74,791,311 Lake Erie Hourly Level Data.xls
                1 File(s)    74,791,311 bytes
                0 Dir(s)           0 bytes free
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Attachment 1
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3301)

RAI Question No. 17.5-1

NRC RAI 17.5-1

Appendix B to 10 CFR Part 50 states, in part, that every applicant for a combined license under part 52 is required to include in its final safety analysis report a description of the quality assurance applied to the design, and to be applied to the fabrication, construction, and testing of the structures, systems, and components of the facility.

The NRC endorsed the Nuclear Energy Institute (NEI) QAPD template (NEI 06-14, "Template for an Industry Quality Program Description") as a method for providing a QAPD that meets the requirements of 10 CFR Part 50, Appendix B.

Detroit Edison Fermi 3 QAPD (FSAR Appendix 17AA) part II, section 7.2 describes an exception to NQA-1-1994, Supplement 7S-1, Section 10, "Commercial Grade Item," which states that Fermi 3 will also use other appropriate approved regulatory means and controls to support commercial grade dedication activities. Section 7.2 cites the Regulatory Issue Summary (RIS) 2002-22 as providing an approved regulatory method for commercial grade dedication. Attachment 1 to the RIS provides the NRC safety evaluation, documenting the basis for the guidelines documented in the RIS 2002-22.

The regulatory basis for accepting the methods outlined by RIS 2002-22 are 1) the acceptance criteria of SRP Chapter 7, which pertains to licensing of digital I&C and 2) requirements for implementing digital I&C replacements under the provisions of 10 CFR 50.59. However, RIS 2002-22 does not provide an approved regulatory method for commercial grade dedication. The staff requests that the reference be removed from the QAPD.

Response

FSAR Appendix 11AA, Part II, Section 7.2 will be revised to replace the example reference of NRC Regulatory Issue Summary 2002-22, "Use of EPRI/NEI Joint Task Force Report, 'Guideline on Licensing Digital Upgrades: EPRI TR-102348, Revision 1, NEI 01-01: A Revision of EPRI TR-102348 to Reflect Changes to the 10 CFR 50.59 Rule'" with the example reference Electrical Power Research Institute (EPRI) Topical Report TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications", which pertains directly to commercial grade dedications, provided in NEI 06-14, Revision 7.

Proposed COLA Revision

The last bullet item in FSAR Appendix 11AA, Part II, Section 7.2 will be revised to replace the reference for RIS 2002-22 with EPRI Topical Report TR-106439.

Markup of Detroit Edison COLA
(Following page)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

- The accreditation is based on ANS/ISO/IEC 17025.
- The published scope of accreditation for the calibration laboratory covers the necessary measurement parameters, ranges, and uncertainties.

- For Section 8.1, Fermi 3 considers documents that may be stored in approved electronic media under Fermi 3 or vendor control and not physically located on the plant site but which are accessible from the respective nuclear facility site as meeting the NQA-1 requirement for documents to be available at the site. Following completion of the construction period, sufficient as-built documentation will be turned over to Fermi 3 to support operations. The Fermi 3 records management system will provide for timely retrieval of necessary records.
- In lieu of the requirements of Section 10, Commercial Grade Items, controls for commercial grade items and services are established in Fermi 3 documents using 10 CFR 21 and the guidance of EPRI NP-5652 as discussed in Generic Letter 89-02 and Generic Letter 91-05.
- For commercial grade items, special quality verification requirements are established and described in Fermi 3 documents to provide the necessary assurance an item will perform satisfactorily in service. The Fermi 3 documents address determining the critical characteristics that ensure an item is suitable for its intended use, technical evaluation of the item, receipt requirements, and quality evaluation of the item.
- Fermi 3 will also use other appropriate approved regulatory means and controls to support Fermi 3 commercial grade dedication activities. ~~One example of this is NRC Regulatory Issue Summary 2002-22.~~ Fermi 3 will assume 10 CFR 21 reporting responsibility for all items that Fermi 3 dedicates as safety-related.

"One example of this is Electric Power Research Institute (EPRI) Topical Report TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications," dated July 17, 1997. "

Attachment 2
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3302)

RAI Question No. 17.5-2

NRC RAI 17.5-2

SRP section 17.5, section P, "Corrective Action (10 CFR Part 50, Appendix B, Criterion XVI)," states that specific responsibilities within the corrective action program may be delegated, but that the applicant still maintains responsibility for the program's effectiveness.

The Detroit Edison Fermi 3 QAPD (FSAR Appendix 17AA) part II, section 16.1 states, "Such a reporting program applies to safety-related activities and services performed by Fermi 3 and/or Fermi 3 suppliers / sub-suppliers providing input to the COL application development." Based on Detroit Edison Fermi 3 FSAR Section 17.5, it is unclear to the staff how Detroit Edison will monitor the effectiveness of the program. Please provide information on how Detroit Edison will accomplish this.

Response

The response to RAI 17.5-3 within this letter provides the steps Detroit Edison took to implement 10 CFR 50 Appendix B for safety-related activities and services performed as part of COL application development.

A team consisting of a lead auditor, Major Enterprise Project's Director, Quality Management, and Nuclear Development's Director, Nuclear Licensing and Engineering audited the COLA contractor's 10 CFR 50 Appendix B/NQA-1 Quality Assurance program and found their corrective action program to be effectively implemented. During this audit, the audit team reviewed the COLA contractor's QA program requirements for securing safety related services, i.e. subcontracts, and confirmed that 10 CFR 21 reporting requirements were required to be implemented for safety related services.

Examination of the Fermi 3 QAPD identified the need to update Section 16.1 of the QAPD to reflect NEI 06-14, Revision 7.

Proposed COLA Revision

FSAR Appendix 17AA, Part II, Section 16.1 will be revised to reflect NEI 06-14, Revision 7 and the R-COLA as shown in the attached markup.

Markup of Detroit Edison COLA
(Following page)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

SECTION 16 CORRECTIVE ACTION

Fermi 3 has established the necessary measures and governing procedures to promptly identify, control, document, classify and correct conditions adverse to quality. Fermi 3 procedures assure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with regulatory requirements and applicable quality standards. Fermi 3 procedures require personnel to identify known conditions adverse to quality. When complex issues arise where it cannot be readily determined if a condition adverse to quality exists, Fermi 3 documents establish the requirements for documentation and timely evaluation of the issue. Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality and significant adverse trends are documented and reported to responsible management. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken.

Fermi 3

In the case of suppliers working on safety-related activities, or other similar situations, ~~the licensee~~ may delegate specific responsibilities of the Corrective Action program but ~~the licensee~~ maintains responsibility for the program's effectiveness.

Fermi 3

16.1 Reporting Program

~~Fermi 3 has in-place the necessary measures and governing procedures that implement a program to identify, evaluate and report defects and noncompliances in accordance with 10 CFR 50.55(e) and/or 10 CFR Part 21, as applicable. Such a reporting program applies to safety-related activities and services performed by Fermi 3 and/or Fermi 3 suppliers / sub-suppliers providing input to the COL application development.~~

16.2 NQA-1-1994 Commitment

In establishing provisions for corrective action, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 16.

Fermi 3 has the necessary measures and governing procedures that implement a reporting program that conforms to the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR Part 21 during COL design and construction, and 10 CFR 21 during operations.

Attachment 3
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3341)

RAI Question No. 17.5-3

NRC RAI 17.5-3

10 CFR 52.79(a)(25) requires the applicant to provide a QA program consistent with Appendix B to 10 CFR Part 50 for design, fabrication and construction activities. Regulatory Guide 1.206 section C.I.17.5.3 states that the FSAR should 1) describe how the applicant will retain responsibility for, and maintain control over, those portions of the QA program delegated to other organizations, 2) should identify the responsible organization and the process for verifying that delegated QA functions are effectively implemented, 3) identify major work interfaces for activities affecting quality, and 4) describe how clear and effective lines of communication between the applicant and its principal contractors are maintained to assure coordination and control of the QA program.

FSAR part 2, chapter 17.5, states that 1) the Black & Veatch's Quality Assurance Program is used for the Detroit Edison Company COL Application Project, including the site characterization and COL preparation, 2) Detroit Edison provided oversight of the contracted activities by way of procurement control, control of purchased services, and oversight / surveillances of those activities and services, and 3) subsequent to contracting with Black & Veatch, Detroit Edison developed and implemented a Nuclear Development Quality Assurance Program which invokes the COLA contractor QA program for COLA activities.

Please clarify how FSAR part 2, chapter 17.5, meets the requirements of 10 CFR 52.79(a)(25) and provide justification for any exceptions to the guidance provided in Regulatory Guide 1.206. Specifically, explain how DTE retains responsibility and maintains control over those portions of the QA program that have been delegated to Black & Veatch, and how DTE verifies that delegated QA functions have been effectively implemented.

Response

In early 2007, Detroit Edison initiated a project to prepare a Combined License Application (COLA) for a potential new unit to be located at the site of the company's existing Fermi 2 nuclear power plant. The project is a corporate initiative and is currently being conducted independent of Fermi 2 so as not to be a distraction and minimize the burden on the plant organization and infrastructure. As such, the project was initiated independent of the Fermi 2 Quality Assurance (QA) program. Initially, the COLA project was to be conducted as essentially a turnkey project, using a primary COLA contractor with a minimal Detroit Edison staff. An Owner's Engineer (OE) concept was envisioned as an extension of the Detroit Edison staff to support the project. The initial mandate for the project was to prepare a COLA to be ready for submittal prior to December 31, 2008, corresponding to the initial tax credit qualifying milestone from the *Energy Policy Act of 2005*. The COLA would be categorized as referencing a Certified Design without an Early Site Permit (ESP), for the purpose of defining the applicable guidance from Regulatory Guide 1.206 (DG-1145).

With this background, the response will discuss the four attributes from Reg. Guide 1.206, C.I.17.5.3 related to this question and how they were satisfied for three distinct periods from project initiation to present. The first period covers from project initiation in January 2007 until November 2007. Major activities in this period included: selection of COLA contractor and OE, conduct of site characterization, information gathering, and initial COLA development. The second period began in

November 2007 and ended with submittal of the COLA on September 18, 2008. The major activity in this period was the receipt, review, and acceptance of COLA work product from the COLA contractor for submittal to the NRC. The third period began with submittal of the COLA on September 18, 2008 and continues to the present. Major activities to date in this period include: updating the COLA, responding to RAIs and other activities to support NRC review.

The following attributes from Reg. Guide 1.206, C.I.17.5.3 are discussed for each of these project periods:

1. Description of how the applicant will retain responsibility for, and maintain control over, those portions of the QA program delegated to other organizations;
2. Identification of the responsible organization and the process for verifying that delegated QA functions are effectively implemented;
3. Identification of major work interfaces for activities affecting quality, and
4. Description of how clear and effective lines of communication between the applicant and its principal contractors are maintained to assure coordination and control of the QA program;

Project Initiation (January 2007 to November 2007)

The initial phase of the project was to select a COLA contractor. No QA program was used for the procurement of a COLA contractor as this corporate project was being executed independent of Fermi 2. The intention was to fully delegate to the COLA contractor the establishment and execution of the QA program related to the COLA project, as permitted by 10 CFR 50 Appendix B Criterion 1 and associated footnote. Accordingly, requests for proposal were solicited only from potential contractors who were established in the nuclear services business, and who were currently executing comparable projects for other potential applicants.

Specifically, Detroit Edison prepared a request for proposal to perform all activities necessary to prepare a COLA. In part the request for proposal required bidders to establish that they had the prerequisite 10 CFR 50 Appendix B QA program and how it was to be applied to the COLA development project.

In February 2007, Detroit Edison received several proposals in response to the request for proposal solicitation. Black & Veatch (B&V), headquartered in Overland Park, Kansas, and who was ultimately selected as the COLA contractor, provided a detailed proposal in response. Detroit Edison based its selection on a review of the submitted proposal including, but not limited to the following attributes:

1. Knowledge that the B&V's 10 CFR 50 Appendix B/NQA-1 QA program was being properly implemented based on reporting of independent reviews by other NRC approved 10 CFR 50 Appendix B programs such as Entergy, American Electric Power and Nebraska Public Power District in the proposal; and
2. B&V was leading the development of the Entergy River Bend COLA

In April 2007, Detroit Edison established a contract with B&V for the development of the COLA. The procurement controls documented within the COLA contract included:

1. Scope of work to be performed by B&V,
2. Technical requirements for the prepared COLA in accordance with 10 CFR 52, 10 CFR 51, 10 CFR 50, 10 CFR 20, NUREG-0800, NUREG-1555, Reg. Guide 1.206 (DG-1145), etc.,
3. Acceptance requirements and control measures for Detroit Edison's evaluation of COLA and intermediary work product developed by B&V,
4. Organizational responsibilities (including reporting and communication methods), 10 CFR 50 Appendix B/NQA-1 requirements, and 10 CFR 50 Appendix B/NQA-1 applicability to FSAR Chapters 2 through 9, 14, 15, 16, 18 and 20, geotechinical site boring program, radiological analyses, and meteorological analyses associated with the radiological analyses,
5. Access to B&V's facilities and records for inspection or audit by Detroit Edison,
6. Identification of the documentation requirements and dates of submission required by Detroit Edison, and
7. Requirements for reporting and disposition of nonconformances in accordance with 10 CFR 21.

In late April 2007, Detroit Edison formally established a small Nuclear Development group to oversee the COLA project and secured the services of an OE (B&V, Ann Arbor) to support owner-related activities such as, but not limited to: reactor technology selection, project cost estimates, development of owner's QA program, engineering support services, and COLA contractor oversight.

With these organizational and contractual elements in place, COLA development commenced under the B&V 10 CFR 50 Appendix B/NQA-1 QA program. Major work interfaces for activities affecting COLA development including clear and effective lines of communication were established through the implementation of the B&V Project Management Memorandum (PMM) for the Detroit Edison COLA project. The PMM is the B&V mechanism for addressing project organization, responsibilities, interfaces, communication mechanisms, and invoking applicable B&V 10 CFR 50 Appendix B/NQA-1 QA program implementing procedures. For example, the B&V Request for Review process was used to obtain owner's review of changes to the data collection plan. Similarly, the B&V Request for Information process was used to provide owner information and decisions (e.g. site layout, meteorological data) necessary for COLA development.

In late April, 2007, construction of the monitoring wells for hydrology investigation and core boring activities for geotechnical data collection commenced at the Fermi 2 site. The applicable Fermi 2 programs for access, work control, and contractor oversight were followed for site work. Senior, nuclear experienced, Detroit Edison personnel provided direct oversight for all site work to ensure compliance with the Fermi 2 programs and provided the necessary interface between the COLA project and the operating Fermi 2 plant. To maintain oversight, and consistent with Detroit Edison's overall responsibility, staff of the OE performed and documented surveillances of onsite activities.

In May 2007 and during the conduct of site investigation activities, Detroit Edison submitted a voluntary response to Regulatory Issue Summary 2007-08, *Updated Licensing Review Approach*, notifying the NRC that (Ref. ML071580347):

1. Activities to prepare the COLA referencing a Certified Design without an Early Site Permit, were underway,
2. B&V had been secured to support the preparation of the COLA and was performing similar work for the Entergy River Bend COLA,
3. B&V's 10 CFR 50 Appendix B/NQA-1 QA program was being applied to appropriate aspects of the work scope,
4. B&V's principal subcontractors would be governed by the B&V QA requirements, and
5. An OE had been secured to support the project.

Additionally, in May 2007, Detroit Edison notified the NRC of the schedule for on-site geotechnical investigation activities and stated that "The Black & Veatch Quality Assurance Program, which meets the requirements of 10 CFR 50, Appendix B and ASME NQA-1, is being applied to the geotechnical investigation work scope." (ML071580350).

Subsequently on July 9 – 11, 2007, Region II inspectors accompanied by members of the Office of New Reactors (NRO) conducted an audit at the Fermi site in accordance with Inspection Manual Chapter 2502, *Construction Inspection Program: Pre-Combined License (Pre-COL) Phase,* dated June 22, 2005. Inspection Manual Chapter 2502 invokes, for COLAs not referencing an ESP, Inspection Procedure 35004, *Pre-Docketing Early Site Permit Quality Assurance Controls Inspection* dated, May 29, 2003. As stated in the inspection procedure, the purpose of the audit was to observe COL, pre-application subsurface investigation activities being conducted to obtain geotechnical and seismic data necessary to support a COLA for the purpose of providing background information for the NRC's future review of the expected COL. The audit report concluded that "the work was being done in an appropriately controlled manner" (ML072190660).

Concurrent with site investigation, B&V commenced assembling the research, data, references, etc. necessary to support development of the COLA. When B&V required information or decisions from Detroit Edison, a formal request was communicated using B&V's Request for Information process. The B&V Request for Information was then reviewed and accepted consistent with B&V's 10 CFR 50 Appendix B/NQA-1 QA program as applicable.

<u>Development, Receipt, Review and Acceptance of COLA Work Product (November 2007 to September 2008)</u>

In November 2007, anticipating the activities necessary to receive, review and accept the COLA work product from B&V, Detroit Edison began to develop the necessary staffing to support the receipt, acceptance review, submittal, NRC review, and concurrent maintenance of the COLA. The increase in staffing also included the addition of an experienced QA professional. Subsequently, staff of Nuclear Development drafted the *Nuclear Development Quality Assurance Program Document* (ND QAPD) and implementing procedures for those elements of the ND QAPD associated with the activities planned to be performed by Detroit Edison at the time (e.g., review of B&V COLA work product).

In February 2008, the Sr. VP Major Enterprise Projects approved for use the ND QAPD (a copy is provided as an enclosure to this response), which continued to delegate quality and safety related services for COLA development to B&V (e.g., site characterization, development of conceptual designs). Subsequently, the implementing procedures were approved and the Nuclear Development staff was trained on the procedures necessary to review and accept the B&V developed COLA products. Specifically, Nuclear Development implemented a procedure to complete the formal review of each chapter of the Fermi 3 COLA submitted by B&V's Request for Review process as a means to assure coordination and control of the finalization of the COLA. Comments generated during Detroit Edison's review of the COLA work product against relevant regulatory guidance, information provided by Detroit Edison to B&V, and the Reference COLA (R-COLA), as applicable, were provided to B&V for resolution and incorporation. The Request for Review process required signoff by both the Detroit Edison reviewer and B&V for all comments.

In May 2008, a Nuclear Development lead auditor conducted a surveillance of B&V COLA development activities and verified selected portions of B&V's 10 CFR 50 Appendix B/NQA-1 QA program were being satisfactorily implemented.

Application for the Combined Operating License (September 2008 to Present)

By early September 2008, the review was completed and all comments were documented, incorporated and accepted by Detroit Edison in accordance with applicable procedures. On September 18, 2008, Detroit Edison submitted the COLA for Fermi 3. Additionally, with the submittal of the Fermi 3 COLA, the ND QAPD was superseded by the Fermi 3 QAPD submitted as part of the COLA. The in-use Fermi 3 QAPD is revised with the submission of each COLA revision containing a revision to FSAR, Appendix 17 AA, *QAPD*.

After submittal of the COLA, Nuclear Development prepared, approved, and trained on the procedures necessary to make the transition post-application, adopting the Fermi 3 QAPD, and to support the post-application scope of work. In this transition, Detroit Edison took ownership of the application; however, contractually, continues to delegate the execution of quality and safety related services associated with COLA revision and review support to the B&V 10 CFR 50 Appendix B/NQA-1 QA program in accordance with the Fermi 3 QAPD. To assure clear and effective lines of communication, Nuclear Development utilizes its own Request for Information process to request quality related services from B&V pertaining to COLA sections that were originally developed under the B&V 10 CFR 50 Appendix B/NQA-1 QA program as specified in the COLA contract. B&V then executes the necessary activities to provide the requested information contained in FSAR Chapters 2 through 9, 14, 15, 16, 18 and 20, geotechinical site boring information, radiological analyses, and meteorological analyses associated with the radiological analyses. Subsequently, B&V's response to Detroit Edison's Request for Information is reviewed and accepted for incorporation into a COLA revision or a response to an NRC Request for Additional Information. This and other B&V COLA project interfaces are described in a new Project Management Memorandum developed for this phase.

In March 2009, the Sr. VP Major Enterprise Projects established the functional quality assurance manager (current title Director, Quality Management) who reports to the Sr. VP/CNO and to the Sr.

VP Major Enterprise Projects to implement the Fermi 3 QAPD, evaluate compliance to the program, and manage QA organization resources.

In July 2009, an audit team from Detroit Edison performed an audit of B&V's 10 CFR 50 Appendix B/NQA-1 QA processes according to Fermi 3 QAPD implementing procedures. The B&V QA program was assessed as effectively implementing the requirements of 10 CFR 50, Appendix B/NQA-1 for Fermi 3, quality related, COLA activities.

B&V remains the COLA contractor for Detroit Edison and continues to perform delegated quality functions. Detroit Edison retains responsibility via processes and programs necessary to implement the Fermi 3 QAPD contained in FSAR, Appendix 17AA, including procurement control and verification of the effectiveness of B&V's 10 CFR 50 Appendix B/NQA-1 QA program.

Proposed COLA Revision

As the Fermi 3 project is not utilizing the Fermi 2 NRC approved QAPD, Chapter 17 of the FSAR will be revised to improve the description of the extent to which Detroit Edison has and will delegate the work of establishing and executing the 10 CFR 50 Appendix B/NQA-1 QA program, or any part thereof, to contractors (Ref. Reg. Guide 1.206, C.I.17.5.3) based upon the response to this RAI as shown on the attached markup.

Markup of Detroit Edison COLA
(Following 2 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Refer to Subsection 17.4.1 for the implementation of reliability assurance activities.

17.4.13 **COL Information**

17.4-1-H **Operation Reliability Assurance Activities**

STD COL 17.4-1-H This COL Item is addressed in Subsection 17.4.1, Subsection 17.4.6, Subsection 17.4.9, Subsection 17.4.10, and Subsection 17.6.

EF3 COL 17.3-1-A

17.5 Quality Assurance Program Description – Design Certification, Early Site Permits, and New License Applicants

QA applied to the DC activities is described in DCD Section 17.1. ESP QA is not applicable to Fermi 3.

EF3 SUP 17.5-2

Replace EF3 SUP 17.5-2 with insert 1.

~~Black & Veatch was contracted as the COLA contractor responsible for activities related to COLA preparation. The Detroit Edison Company COL Application Project, including the site characterization and COL preparation was performed under the Black & Veatch's Quality Assurance Program, which complies with 10 CFR50, Appendix B. The Black and Veatch Nuclear Quality Assurance Program invokes the applicable requirements of 10CFR50.55(e) and 10CFR21. The Black & Veatch QA Program allows for project specific procedures which are the vehicle to identify which activities in the project require the application of the Black & Veatch Nuclear Quality Assurance Program and those that can be performed under the Black & Veatch Energy Commercial Quality Assurance Program. Detroit Edison provided oversight of the contracted activities by way of procurement control, control of purchased services, and oversight / surveillances of those activities and services. The Black and Veatch Quality Assurance Program has been audited and found acceptable by other US nuclear utilities. Subsequent to contracting with Black & Veatch, Detroit Edison developed and implemented a Nuclear Development Quality Assurance Program which invokes the COLA contractor QA program for COLA activities to provide assurance of the integrity and reliability of the COL data or analysis that would affect the performance of safety related systems, structures, and components (SSCs). The requirements of this quality assurance program are consistent with the applicable requirements of Appendix B to 10CFR Part 50.~~

Insert 1

The following section describes the quality assurance programs applied to Fermi 3 COLA development activities, and COLA support activities, through anticipated COL issuance, in three phases. The first period began with project initiation including, selection of COLA contractor and OE, conduct of site characterization, information gathering, and initial COLA development. The second period began with the approval of the Nuclear Development Quality Assurance Program Description and ends with submittal of the COLA including activities such as; receipt, review, and acceptance of COLA work product from the COLA contractor for submittal to the NRC. The third period began with submittal of the COLA and continues through to anticipated COL issuance including updating of the COLA, responding to RAIs and other activities to support NRC review.

The initial phase of the project was to select a COLA contractor. Detroit Edison intended to fully delegate to the COLA contractor the establishment and execution of the QA program related to the COLA project. Accordingly, requests for proposal were solicited only form potential contractors who were established in the nuclear services business, and who were currently executing comparable projects for other potential applicants under a 10 CFR 50 Appendix B QA program. Black & Veatch (B&V), headquartered in Overland Park, Kansas was ultimately selected as the COLA contractor. Detroit Edison formally established a Nuclear Development group to oversee the COLA project and secured the services of an OE to support owner-related activities such as, but not limited to: reactor technology selection, project cost estimates, development of owner's QA program, engineering support services, and COLA contractor oversight. With these organizational and contractual elements in place, COLA development commenced under the B&V 10 CFR 50 Appendix B/NQA-1 QA program. Major work interfaces for activities affecting COLA development including clear and effective lines of communication were established through the implementation of the B&V Project Management Memorandum (PMM) for the Detroit Edison COLA project.

The second phase began as Detroit Edison developed the necessary staffing to support the submittal, review, and subsequent maintenance of the COLA. The increase in staffing also included the addition of an experienced QA professional. At the same time, staff of Nuclear Development drafted the *Nuclear Development Quality Assurance Program Document* (ND QAPD) and implementing procedures for those elements of the ND QAPD associated with the activities planned to be performed by Detroit Edison at the time (e.g., review of B&V COLA work product).

The Sr. VP Major Enterprise Projects approved for use the ND QAPD, which continued to delegate quality and safety related services for COLA development to B&V (e.g., site characterization, development of conceptual designs). Subsequently, the implementing procedures were approved and the Nuclear Development staff was trained on the procedures necessary to review and accept the B&V developed COLA products.

The third phase commences with submittal of the Fermi 3 COLA. At this point, the ND QAPD is superseded by the Fermi 3 QAPD submitted as part of the COLA (FSAR Chapter 17, Appendix 17AA). B&V remains the COLA contractor for Detroit Edison and continues to perform delegated quality functions. Detroit Edison retains responsibility via processes and programs necessary to implement the Fermi 3 QAPD, including procurement control and verification of the effectiveness of B&V's 10 CFR 50 Appendix B/NQA-1 QA program. All COLA activities through anticipated COL issuance will be completed in accordance with the Fermi 3 QAPD, this includes delegating responsibilities as described in Part II, Section 2 of the Fermi 3 QAPD.

NRC3-09-0027
Response to RAI Letter No. 10
(eRAI Tracking No. 3341)

RAI Question No. 17.5-3

Enclosure 1

Detroit Edison, Nuclear Development Quality Assurance Program Document
(following 24 pages)

Detroit Edison Nuclear Development

Quality Assurance Program Description (QAPD)

February 2008

Quality Assurance Program Description

Title: Detroit Edison Nuclear Development Quality Assurance Program Description

Process/Program Owner: **Director & Project Manager Nuclear Development**

DECO ND QAPD	Version Number **Revision 0**	Effective Date **February 4, 2008**

Revision Summary

Initial Issue 0

Reviewed By/Date:	Approved By/Date:
1/31/08	2-1-08
Director & Project Manager Nuclear Development	Senior Vice President DTE Energy

Detroit Edison Company

POLICY STATEMENT

The Detroit Edison Company (DECo) shall perform Combined Construction and Operating License Application (COLA) activities in a manner that will ensure that quality processes are used in the development of the COL application and that technical, quality, and administrative requirements important to public health and safety are effectively implemented for pre-COL activities.

The DECo Nuclear Development Quality Assurance Program (QAP) is the Quality Assurance Program Description (QAPD) provided in this document and the associated implementing documents. Together they provide for assurance of the integrity and reliability of the COL data or analysis that would affect the performance of safety related systems, structures, and components (SSCs). The requirements of this QAP are consistent with the applicable requirements of Appendix B to 10CFR Part 50.

The QAPD is the top-level policy document that establishes the manner in which quality is to be achieved for COLA activities and presents DECo's overall philosophy regarding achievement and assurance of quality. Implementing documents assign more detailed responsibilities and requirements and define the organizational interfaces involved in conducting activities within the scope of the QAP. Compliance with the QAPD and implementing documents is mandatory for personnel directly or indirectly associated with implementation of the DECo QAP.

Signed _____ Date 2-1-08
Ron May
Senior Vice President DTE Energy

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PART I INTRODUCTION

SECTION 1 GENERAL

The Detroit Edison Company (DECo) Nuclear Development Quality Assurance Program Description (QAPD) is the top-level policy document that establishes the quality assurance policy and assigns major functional responsibilities for COL activities conducted by or for DECo. The QAPD describes the methods and establishes QAPD and administrative control requirements that and is consistent with the applicable requirements of Appendix B to 10CFR Part 50. The QAPD is also consistent with the applicable (to the work scopes being performed) requirements of ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications".

The QAPD is defined by the Quality Assurance Program (QAP) elements, along with the associated implementing documents. Procedures and instructions that control DECo Nuclear Development COLA activities will be developed prior to commencement of those activities. Procedures establish practices for certain activities which are common to all DECo organizations performing those activities such that the activity is controlled and carried out in a manner that meets these requirements. Project or organization specific procedures establish detailed implementation requirements and methods, and may be used to implement Policies or be unique to particular functions or work activities.

1.1 Scope / Applicability

This QAPD applies to COL activities affecting the integrity and reliability of the COL data or analysis that would affect the performance of safety related systems, structures, and components (SSCs).

Safety-related systems, structures, and components are identified by design control documents. The technical aspects of these items are considered when determining program applicability, including, as appropriate, the item's design safety function. Implementing documents assign more specific requirements regarding QAPD applicability.

PART II QAPD DETAILS

SECTION 1 ORGANIZATION

This Section describes the DECo Nuclear Development organizational structure, functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying QAPD implementation. The organizational structure includes corporate and onsite functions for DECo Nuclear Development including interface responsibilities for multiple organizations performing COLA functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of this QAPD. Management gives careful consideration to the timing, extent and effects of organizational structure changes.

COLA services are provided to the DECo Nuclear Development organization, under contract, by Black & Veatch (Kansas City). Owner's Engineering services are provided to the DECo Nuclear Development project, under separate contract, by Black & Veatch (Ann Arbor). DECo internal organizations Environmental, Nuclear Generation, Legal, Supply Chain, and Real Estate. are also supporting the DECo Nuclear Development project. The Reactor Technology Vendor is responsible for interfacing with the NRC and other organizations for Design Control Document and technology certification activities within their scope of responsibility.

The following sections describe the reporting relationships, functional responsibilities and authorities for organizations implementing and supporting the DECo Nuclear Development QA Program. The DECo organization and the DECo Nuclear Development organization are shown in Figures II.1-1 and II.1-2 respectively.

1.1 Chairman and Chief Executive Officer

The Chairman/CEO is responsible for all aspects of design, construction and operation of DECo's nuclear plants. The Chairman/CEO reports to the Board of Directors with respect to all matters.

1.1.1 Senior Vice President DTE Energy

The **DTE Energy** Senior Vice President DTE Energy (SVP) reports to the **Chairman**/CEO and is responsible for the administration of the DECo Nuclear Development QAPD. The SVP also directs the planning and development of the DECo Nuclear Development staff, and organization resources.

1.2 DECo Nuclear Development

DECo Nuclear Development (ND) organization is responsible for new nuclear plant licensing and other COLA related activities.

1.2.1 Director & Project Manager Nuclear Development

The Director & Project Manager Nuclear Development reports to the Senior Vice President DTE Energy and is responsible for the implementation of quality assurance requirements in the areas specified by this QAPD.

For the purposes of this program, the description of the duties of the Director & Project Manager Nuclear Development and staff will be limited to those activities that support the DECo Nuclear Development COLA preparation and submittal.

1.2.1.1 Owner's Engineer Organization

The Owner's Engineer Organization (Black & Veatch Ann Arbor) reports to the Director Nuclear Development Licensing/Engineering and is responsible for supporting COLA on-site work, quality assurance, scheduling of DECo activities, risk management, RTV evaluation and selection, and cost estimating.

1.2.1.2 Quality Assurance

The DECo Quality Assurance Organization is responsible for independently planning and performing activities to verify the development and effective implementation of the QAPDs activities that support COLA activities.

1.2.1.2.1 ND Quality Assurance Manager

The ND Quality Assurance Manager (QAM) reports to the Director and Project Manager Nuclear Development for the COLA activities and is responsible for developing and maintaining the DECo Nuclear Development QAPDs, evaluating compliance to the programs and managing the QA resources.

The Nuclear QA Oversight Quality Assurance function reports administratively to the Director & Project Manager Nuclear Development. This ensures that the personnel performing QA oversight functions are not subject to line influence. This also ensures that quality assurance personnel are provided direct access to senior management that is independent of the line functions for reporting QA concerns.

Day to day work direction is provided from the Manager Nuclear Development Program Office.

The QAM is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; for monitoring organization processes to ensure conformance to licensing document requirements; for ensuring that vendors providing quality services to DECo are meeting the requirements of 10 CFR 50, Appendix B through vendor audits. The QAM has sufficient independence from other DECo Nuclear Development priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas necessary regarding DECo COLA activities. The QAM may make recommendations to the DECo Nuclear Development management regarding improving the quality of work processes. If the QAM disagrees with any actions taken by the Nuclear Development organization and is unable to obtain resolution, the QAM shall bring the matter to the attention of the Senior Vice President DTE Energy who will determine the final disposition.

1.2.1.3 Reactor Technology Vendor (RTV)

The RTV provides engineering services for plant design and licensing. These engineering services for new nuclear generation include Design Certification Document (DCD) engineering

and design for their scope (as defined in the DCD) and as necessary to support development of the COL application.

1.2.1.4 Black and Veatch Kansas City

Black and Veatch Kansas City provides quality and safety related services for the development of the COL application that are not the responsibility of the RTV (as defined in the DCD). These services include site characterization and other activities necessary to support development of the COL application.

1.3 Authority to Stop Work

Quality assurance personnel have the authority, and the responsibility, to stop work in progress which is not being done in accordance with approved procedures. This extends to off-site work performed by suppliers furnishing COLA related services to DECo.

1.4 Quality Assurance Organizational Independence

For the COL, independence shall be maintained between the organization performing the checking (quality assurance) functions and the organizations performing the functions.

Figure II.1-1

Nuclear Development Organization

February, 2008

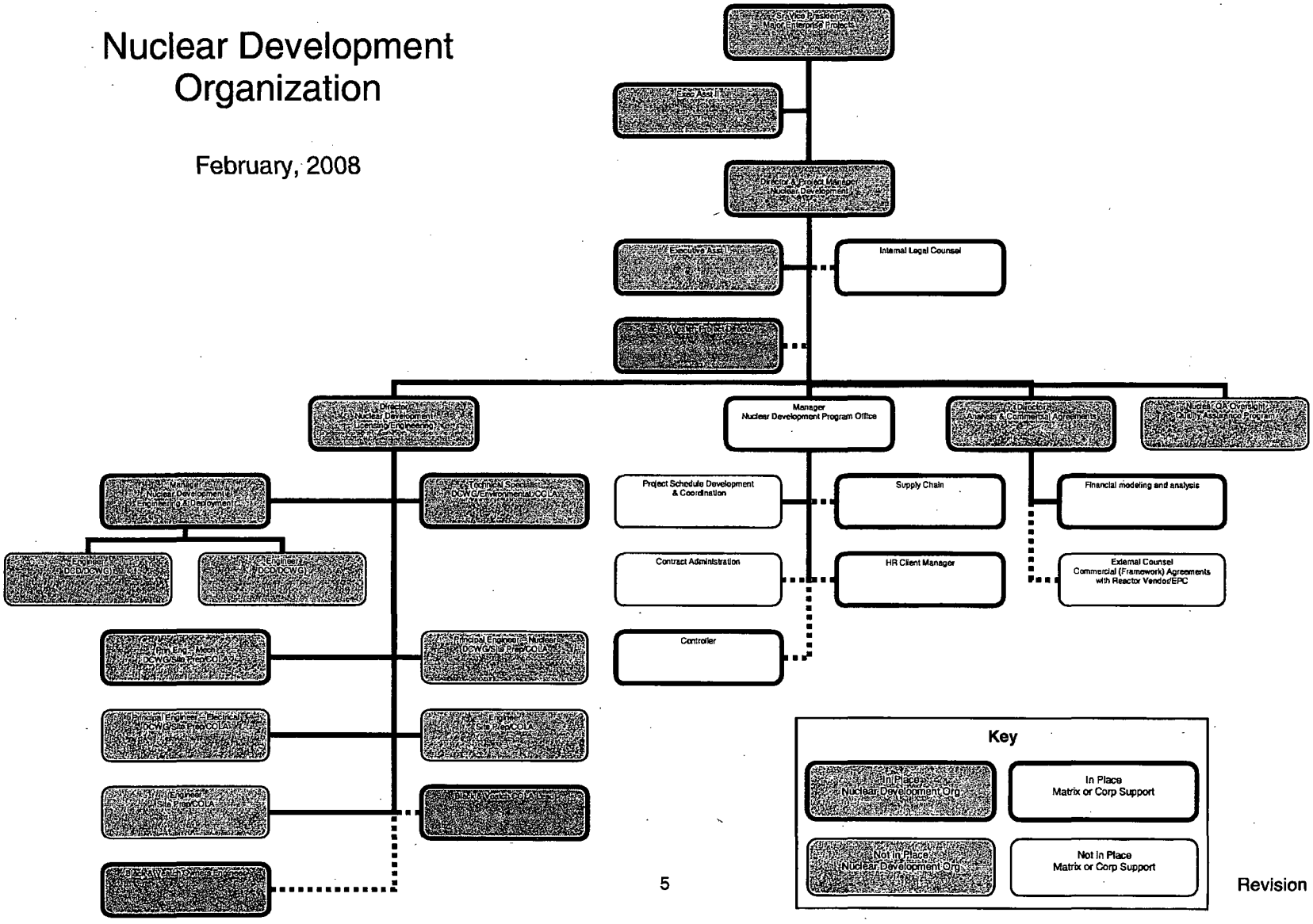
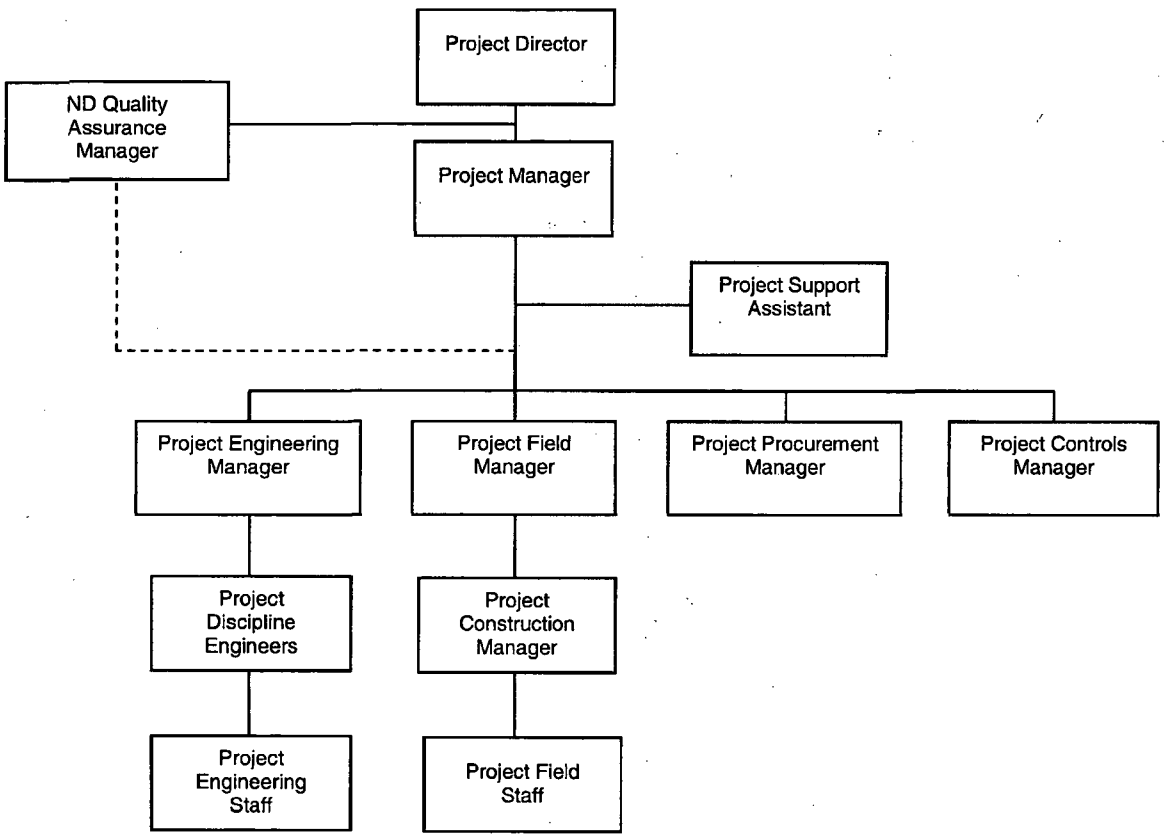


Figure II.1-2

Owner's Engineer
Nuclear Development
Project Organization



-------- Denotes coordination

SECTION 2 QUALITY ASSURANCE PROGRAM

DECo has established procedures to implement this QAPD. DECo is committed to implementing the Quality Assurance Program to the extent applicable for COLA activities. Further, DECo ensures that suppliers of COLA related services meet the applicable requirements of this QAPD. Senior management is regularly apprised of the adequacy of implementation of the QAPD through the audit functions described in Section 18.

The objective of the QAPD is to provide assurance of the integrity and reliability of the COL data or analysis that would affect the performance of safety related systems, structures, and components (SSCs). The requirements of this QAP are consistent with the applicable requirements of Appendix B to 10CFR Part 50 and ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications."

The QAPD applies to processes used in the development of the COL application and to technical, quality, and administrative requirements important to public health and safety including:

- COL Final Safety Analysis Report, Emergency Plan, Security Plan, and the Environmental Report.
- Site geotechnical investigations, seismic analysis, and meteorological analysis and engineering activities that are used to characterize the site or analyze that characterization.

The RTV Design Control Document is used as the detailed basis for classification of SSCs that are within the scope of this QAPD.

Delegated responsibilities may be performed under a supplier's QAPD, provided that the supplier activities are within the scope of this QAPD, and the supplier has been approved in accordance with this QAPD. Periodic audits and assessments of suppliers are performed to assure compliance with the supplier's quality program. In addition, routine interfaces with project personnel assure that quality expectations are met.

The program requirements specified herein are detailed in implementing procedures that are either DECo implementing procedures, or an approved supplier quality program.

2.1 Responsibilities

Personnel who work directly or indirectly for DECo are responsible for performing quality work covered by this QAPD. This includes those activities delineated in Part I, Section 1.1 of this QAPD. Activities governed by the QAPD are performed as directed by documented instructions, procedures and drawings that are of a detail appropriate for the activity's complexity and effect on safety. Instructions, procedures and drawings specify quantitative or qualitative acceptance criteria as applicable or appropriate for the activity, and DECo personnel performing review and acceptance activities ensure verification against these criteria. Provisions are established to designate or identify the proper documents to be used in an activity, and to ascertain that such documents are being used. The ND Quality Assurance Manager is responsible to verify that processes and procedures comply and are implemented in accordance with the QAPD and other applicable requirements.

2.2 Delegation of Work

DECo has the responsibility for the scope and implementation of an effective QAPD. Positions identified in the Organization Section of this QAPD may delegate responsibility for all or part of the activities of planning, establishing, and implementing the program but retain the responsibility for the program's effectiveness. Decisions affecting safety are made at the level appropriate for its nature and effect, and with any necessary technical advice or review.

2.3 COL Identification of Site Specific Safety-Related Design Basis Activities

COL site specific safety-related activities are defined as those activities, including sampling, testing, data collection and supporting engineering calculations and reports that will be used to establish design inputs for safety-related SSCs. The development of the DECo COL application will involve site testing, data collection and calculations that may create or bound safety-related design basis data. Site testing and data collection of information pertaining to the physical characteristics of the site that have the potential to affect safety-related design will be treated as safety-related.

2.4 Periodic Review of the Quality Assurance Program

Management of those organizations implementing the QA program or portions thereof, assess the adequacy of that part of the program for which they are responsible and assure its effective implementation at least once each year or at least once during the life of the activity, should the activity duration be less than one year.

2.5 Issuance and Revision to Quality Assurance Program

Changes to the QAPD are evaluated by the ND Quality Assurance Manager to ensure that such changes do not degrade previously approved quality assurance controls specified in the QAPD. This document shall be revised as appropriate to incorporate additional QA commitments that may be established during the COL application development process. New revisions to the document will be reviewed, at a minimum, by the Director & Project Manager Nuclear Development and approved by the Senior Vice President DTE Energy.

2.6 Personnel Qualifications

Management shall ensure that personnel assigned to implement elements of the QAPD be capable of performing their assigned tasks, i.e., qualified by experience.

2.7 Independent Review Body

A group may function as an independent review body (IRB). In discharging its review responsibilities, the IRB keeps safety considerations paramount when opposed to cost or schedule considerations. One or more organizational units may collectively perform this function.

SECTION 3 DESIGN CONTROL

DECo has established a Project Steering Committee (PSC) to review the RTV recommendations, design changes and impacts to the nuclear development project.

3.1 Project Steering Committee (PSC)

The Project Steering Committee (PSC) will review recommendations for 1) design departures from the selected reactor technology Design Certification Document; 2) significant design features to adapt the selected reactor technology to DECo FERMI site specific design conditions, and 3) shared common equipment for a dual unit site, for potential incorporation into the DECo FERMI design. Departures from RTV design will not be made without discussions that include other US utilities which have filed Letters of Intent to the U.S. NRC for submittal of COLAs for like technology, and Black & Veatch Kansas City.

3.2 Project Design Control

Design activities being performed during the COLA development are performed under contract by the RTV and Black & Veatch Kansas City. Contracts for design activities will incorporate the requirements of ASME NQA-1 Requirement 3 and 10CFR52.79 (a) (17).

SECTION 4 PROCUREMENT DOCUMENT CONTROL

DECo procedures assure that purchased items and services are subject to appropriate quality and technical requirements. Procurement document changes shall be subject to the same degree of control as utilized in the preparation of the original documents. These controls include provisions such that:

- Applicable technical, regulatory, administrative, quality and reporting requirements are invoked for procurement of items and services. 10 CFR 21 requirements for posting, evaluating and reporting will be followed and imposed on suppliers when applicable. Applicable design bases and other requirements necessary to assure adequate quality shall be included or referenced in documents for procurement of items and services. To the extent necessary, procurement documents shall require suppliers to have a documented QA program that is determined to meet the applicable requirements of this QAPD as appropriate to the circumstances of procurements (or the supplier may work under this QAPD.

- Where original technical or quality assurance requirements cannot be determined, an engineering evaluation is conducted and documented by qualified staff to establish appropriate requirements and controls to assure that interfaces, interchangeability, safety, fit and function, as applicable, are not adversely affected or contrary to applicable regulatory requirements.

Reviews of procurement documents shall be performed by personnel who have access to pertinent information and who have an adequate understanding of the requirements and intent of the procurement documents.

SECTION 5 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

DECo has procedures to ensure that activities affecting quality are performed in accordance with instructions, procedures or drawings of a type appropriate to the circumstances and which, where applicable, include quantitative or qualitative acceptance criteria to implement this QAPD. Such documents are prepared and controlled according to Part II, Section 6 of this QAPD. Provisions are included for reviewing, updating, and canceling such procedures.

5.1 Procedure Adherence

The DECo policy is that procedures are followed, and the requirements for use of procedures have been established in administrative procedures. Where procedures cannot be followed as written, provisions are established for making changes in accordance with Part II, Section 6 of this QAPD.

SECTION 6 DOCUMENT CONTROL

DECo has procedures to control the preparation of, issuance of, and changes to documents that specify quality requirements or prescribe how activities affecting quality are controlled to assure that correct documents are being employed. The control system shall be documented and shall provide for the following:

1) a method to identify the correct document and revision to be used and control of superseded documents;
2) review of documents for adequacy, completeness, and correctness prior to approval and issuance.
3) coordinating and controlling interface documents and procedures.

The types of documents to be controlled include:

1) purchase orders and related documents
2) vendor-supplied documents
3) audit, surveillance, and quality verification/inspection procedures
4) test reports
5) instructions and procedures for activities covered by this QAPD.

6.1 Review and Approval of Documents

Documents shall be reviewed for adequacy by qualified persons other than the preparer. The documented review signifies concurrence.

Prior to issuance or use, documents, shall be approved by the designated authority. A listing of all controlled documents identifying the current approved revision, or date, is maintained so personnel can readily determine the appropriate document for use.

6.2 Changes to Documents

Changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated. The reviewing organization shall have access to pertinent background data or information upon which to base their approval.

SECTION 7 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

DECo has procedures to control the procurement of items and services to assure conformance with specified requirements. Such control shall provide for the following as appropriate: source evaluation and selection, evaluation of objective evidence of quality furnished by the supplier, source inspection, audit, and examination of items or services.

7.1 Acceptance of Item or Service

DECo establishes and implements measures to assess the quality of purchased items and services, whether purchased directly or through suppliers, at intervals and to a depth consistent with the item's or service's importance to safety, complexity, quantity and the frequency of procurement. Verification actions include testing, as appropriate, during design, fabrication and construction activities. Verifications occur at the appropriate phases of the procurement process.

Measures to assure the quality of purchased items and services include the following, as applicable:

- Items are inspected, identified, and stored to protect against damage, deterioration, or misuse.

- Prospective suppliers of safety-related items and services are evaluated to assure that only qualified suppliers are used. Qualified suppliers are audited on a triennial basis. In addition, if a subsequent contract or a contract modification significantly enlarges the scope of or changes the methods or controls for activities performed by the same supplier, an audit of the modified requirements is conducted, thus starting a new triennial period. DECo may utilize audits conducted by outside organizations for supplier qualification provided that the scope and adequacy of the audits meet DECo requirements. Documented annual evaluations are performed for qualified suppliers to assure they continue to provide acceptable items and services. Industry programs, such as those applied by ASME, Nuclear Procurement Issues Committee (NUPIC), or other established utility groups, are used as input or the basis for supplier qualification whenever appropriate. The results of the reviews are promptly considered for effect on a supplier's continued qualification and adjustments made as necessary. In addition, results are reviewed periodically to determine if they constitute a significant condition adverse to quality requiring additional action.

- Provisions are made for accepting purchased items and services, such as source verification, receipt inspection, pre- and post-installation tests, certificates of conformance, and document reviews. Acceptance actions/documents should be established by the Purchaser with appropriate input from the Supplier and be completed to ensure that procurement, inspection, and test requirements, have been satisfied before relying on the item to perform its intended safety function.

- Controls are imposed for the selection, determination of suitability for intended use (critical characteristics), evaluation, receipt and acceptance of commercial-grade services or items to assure they will perform satisfactorily in service in safety-related applications.

- If there is insufficient evidence of implementation of a QA program, the initial evaluation is of the existence of a QA program addressing the scope of services to be provided. The initial audit is performed after the supplier has completed sufficient work to demonstrate that its organization is implementing a QA program.

SECTION 8 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS, AND COMPONENTS

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 9 CONTROL OF PROCESSES

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 10 INSPECTION

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 11 TEST CONTROL

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 12 CONTROL OF MEASURING AND TEST EQUIPMENT

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 13 HANDLING, STORAGE, AND SHIPPING

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 14 INSPECTION, TEST, AND OPERATING STATUS

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 15 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

This section does not apply to the DECo Nuclear Development project scope of work at this time.

SECTION 16 CORRECTIVE ACTION

DECo has procedures to promptly identify, control, document, classify and correct conditions adverse to quality. DECo procedures assure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with this QAPD, regulatory requirements and applicable quality standards. DECo procedures require personnel to identify known conditions adverse to quality. When complex issues arise where it cannot be readily determined if a condition adverse to quality exists, DECo documents establish the requirements for documentation and timely evaluation of the issue. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken.

In the case of suppliers working on safety-related activities, or other similar situations, DECo may delegate specific responsibilities of the Corrective Action program but retains responsibility for the program's effectiveness.

16.1 Reporting Program

DECo has procedures that implement a program to identify, evaluate and report defects and non-compliances in accordance with 10 CFR Part 21. Such a reporting program applies to safety-related activities and services performed by DECo and/or DECo suppliers / sub-suppliers providing input to the COL application development.

SECTION 17 QUALITY ASSURANCE RECORDS

DECo has procedures to ensure that sufficient records of items and activities affecting quality are developed, reviewed, approved, issued, used, and revised to reflect completed work. The procedures include requirements for records administration, receipt, preservation, retention, storage, safekeeping, retrieval, access controls, user privileges, and final disposition.

17.1 Record Retention

Measures are established that ensure that sufficient records of completed items and activities affecting quality are appropriately stored. Such records and their retention times are defined in procedures. In all cases where state, local, or other agencies have more restrictive requirements for record retention, those requirements will be met. Records may be stored using electronic records storage and retrieval systems.

SECTION 18 AUDITS

DECo has procedures to implement audits to verify that activities covered by this QAPD are performed in conformance with the requirements established. The audit programs are themselves reviewed for effectiveness as a part of the overall audit process.

18.1 Performance of Audits

Internal audits of selected aspects of the COLA process are performed with a frequency commensurate with safety significance and in a manner which assures that audits of safety-related activities are completed. Audits will focus on site investigation, procurement, corrective action and other areas as directed by the ND Quality Assurance Manager. Effectiveness of implementation of an organization's QA program will be verified.

The audits are scheduled on a formal preplanned audit schedule. The audit system is reviewed periodically and revised as necessary to assure coverage commensurate with current and planned activities. Additional audits may be performed as deemed necessary by management. The scope of the audit is determined by the quality status and safety importance of the activities being performed. These audits are conducted by trained personnel not having direct responsibilities in the area being audited and in accordance with preplanned and approved audit plans or checklists, under the direction of a qualified lead auditor and the cognizance of the ND Quality Assurance Manager.

DECo is responsible for conducting periodic internal and external audits. Internal audits are conducted to determine the adequacy of programs and procedures (by representative sampling), and to determine if they are meaningful and comply with the overall QAPD. External audits determine the adequacy of supplier and contractor quality assurance program.

The results of each audit are reported in writing to the responsible director within the Nuclear Development Organization, or designee, as appropriate. Additional internal distribution is made to other concerned management levels in accordance with approved procedures.

Management responds to all audit findings and initiates corrective action where indicated. Where corrective action measures are indicated, documented follow-up of applicable areas through inspections, review, re-audits, or other appropriate means is conducted to verify implementation of assigned corrective action.

Audits of suppliers of services are conducted as described in Section 7.1.

18.2 Surveillances

As part of the oversight activities conducted by the DECo Nuclear Development QA Organization, surveillances will be conducted on the DECo COL work. Surveillance personnel shall be qualified to the Surveillance procedure by the ND Quality Assurance Manager. Surveillance activities include initial planning, conducting, reporting, and tracking of surveillance findings.

Detroit Edison

DATE: January 30, 2008

TO: Ron May

FROM: David Harwood

SUBJECT: Nuclear Development Quality Assurance Program Description (QAPD)

The Detroit Edison Nuclear Development Quality Assurance Program Description (QAPD) is attached for your review and approval. This QAPD is consistent with the applicable requirements of Appendix B to 10 CFR Part 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and provides the guidance to ensure that quality processes are used in the development of the COL application. While the QAPD is a top-level policy document, there also exist underlying implementing documents that describe more detailed responsibilities and requirements.

With respect to implementation of this QAPD and underlying documents, Nuclear Development procedure NDP-NP-2.1 specifies requirements for training of Nuclear Development personnel. This procedure provides minimum requirements for individuals prior to starting nuclear work; and allows for each supervisor to specify additional training and orientation based on each group's functional needs as well as the individual needs.

The requirements of this procedure will be applied to current personnel by February 4th. New Nuclear Development personnel (that start work after January 28, 2008) will meet the requirements of this procedure prior to those employees starting nuclear work. All personnel (employees & contingent) will be required to read the QAPD and implementing procedures identified in our procedure plus any additional reading or orientation specified by their supervisor as identified on their individual Nuclear Development Project Training Plan.

Additionally, we will be undergoing a needs analysis that will look at additional formal (stand up) training. The ND Quality Assurance Manager will be responsible for coordinating the needs analysis effort. The needs analysis along with development of more formal training will be completed in March, 2008.

If you have any questions or concerns, please contact me.

Attachment

Attachment 4
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3343)

RAI Question No. 17.5-4

NRC RAI 17.5-4

Appendix B to 10 CFR Part 50 states, in part, that every applicant for a combined license under part 52 is required to include in its final safety analysis report a description of the quality assurance applied to the design, and to be applied to the fabrication, construction, and testing of the structures, systems, and components of the facility.

FSAR part 2, chapter 17.5, states, in part, that the Black & Veatch's Quality Assurance Program is used for safety-related COLA preparation activities performed prior to the start of construction (e.g., site characterization and COL preparation). In addition, FSAR part 2, chapter 17.5, states that the QAPD described in FSAR Appendix 17AA will be applied during activities to adapt the design to specific plant implementation, construction, and operations.

Please clarify the expected scope of work for each QAPD related to design and procurement activities from the beginning of the Detroit Edison Company COL Application Project until the time the COL might be issued. In particular, please identify when and where these design and procurement activities would take place, and specifically under which QAPD the activities will be conducted.

In addition to supporting the staff's review of the COLA, this information will be used to support the planned inspection of the implementation of the Fermi 3 QAPD consistent with the guidance of Inspection Manual Chapter 2502, "Pre-Combined License (Pre-COL) Phase."

Response

The "scope of work for each QAPD related to design and procurement activities from the beginning of the Detroit Edison Company COL Application Project" through current activities is documented in the response to RAI 17.5-3, Attachment 3 of this letter. Currently, and for all future COLA activities, the COLA scope of work will be completed in accordance with the Fermi 3 QAPD (FSAR Chapter 17, Appendix 17AA), this includes delegating responsibilities as described in Part II, Section 2 of the Fermi 3 QAPD. The response to RAI 17.5-3, Attachment 3 of this letter, and the Detroit Edison / B&V COLA contract, specifies the current level of delegation to the COLA contractor, which includes all quality and safety related services for COLA support. Future procurement and design responsibilities including EPC, NSSS, and or A/E scope of work, as outlined in the organizational descriptions of FSAR Chapter 13 and the Fermi 3 QAPD, will be conducted in accordance with Fermi 3 QAPD requirements.

Proposed COLA Revision

None

Attachment 5
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3344)

RAI Question No. 17.5-6

NRC RAI 17.5-6

SRP Section 17.5 part II, subsection A, "Organization," states that the applicant's QAPD should 1) contain an organizational description that addresses the organizational structure, functional responsibilities, levels of authority, and interfaces, 2) include the onsite and offsite organizational elements that function under the cognizance of the QA program, 3) define the interface responsibilities for multiple organizations.

The Fermi 3 QAPD (FSAR Appendix 17AA) part II, section 1.2 and 1.3, uses organizational titles such as "technical services", "technical support and services", and "operations and maintenance". The FSAR part 2, chapter 13.1.1, uses organizational titles such as "management and technical support", "nuclear operations", "engineering and technical services", "maintenance support", and "operations support". FSAR part 2, figure 13.1-201, uses a third set of organizational titles that appear to differ from chapter 13.1 and the QAPD.

The Fermi 3 QAPD, section 1.2, also states the organizational transition from the construction phase to the operating phase is addressed in the FSAR part 2, chapter 13, while many sections of FSAR part 2, chapter 13, refers to "Section 17.5" for information on key positions, functions, and responsibilities. Examples include Appendix 13AA, "Design and Construction Responsibilities," chapter 13.1.1, "Management and Technical Support Organization," and chapter 13.1.2, "Operating Organization," and their subsections.

The Fermi 3 QAPD, section 2.5, states administrative control of the QAPD will be in accordance with 10 CFR 50.55(f) and 10 CFR 50.54(a), as appropriate. Staff review of regulatory requirements has identified that changes to the QAPD are made under 10 CFR 50.54(a) while changes to the FSAR are made under 10 CFR 50.59.

Please clarify the following for section 1 of the QAPD, or provide justification for any exceptions to the guidance provided in SRP Section 17.5 part II, subsection A:

- *Define each organizational generic functional description, or title (as appropriate), provided in the Fermi 3 QAPD, and ensure consistency with the FSAR part 2, chapter 13.*

- *Describe the organizational structure for the COLA preparation, design, construction, and operational phases, and ensure cross-reference consistency between the Fermi 3 QAPD and FSAR part 2, chapter 13.*

- *Clarify whether 10 CFR 50.54(a) or 10 CFR 50.59 is intended to be applicable to changes made to the operating organizational description provided in FSAR part 2, chapter 13.*

Response

- *Define each organizational generic functional description, or title (as appropriate), provided in the Fermi 3 QAPD, and ensure consistency with the FSAR part 2, chapter 13.*

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" will be revised to provide each Fermi 3 functional description or title using the guidance provided in NEI 06-14, Revision 7.

FSAR Chapters 13 and 17 both require an organizational description and Detroit Edison has elected to describe the detailed organization in both sections in a manner to avoid duplication of information between these two chapters with the information in the supporting chapter incorporated by reference, as appropriate (e.g. Chapter 13 refers to Chapter 17 as appropriate). Therefore, FSAR Chapter 13 will similarly be revised as necessary to ensure consistency with the Fermi 3 QAPD organizational description. The markups for FSAR Chapter 13 and Chapter 17 QAPD are attached.

- *Describe the organizational structure for the COLA preparation, design, construction, and operational phases, and ensure cross-reference consistency between the Fermi 3 QAPD and FSAR part 2, chapter 13.*

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" will be revised to provide the Fermi 3 organizational structure for Pre-COL, Design and Construction, and Operational phases.

FSAR Chapters 13 and 17 both require an organizational description and Detroit Edison has elected to describe the detailed organization in both sections in a manner to avoid duplication of information between these two chapters with the information in the supporting chapter incorporated by reference, as appropriate (e.g. Chapter 13 refers to Chapter 17 as appropriate). Therefore, FSAR Chapter 13 will similarly be revised as necessary to ensure consistency with the Fermi 3 QAPD organizational description. The markups for FSAR Chapter 13 and Chapter 17 QAPD are attached.

- *Clarify whether 10 CFR 50.54(a) or 10 CFR 50.59 is intended to be applicable to changes made to the operating organizational description provided in FSAR part 2, chapter 13.*

FSAR Chapters 13 and 17 both require an organizational description and Detroit Edison has elected to describe the detailed organization in both sections in a manner to avoid duplication of information between these two chapters with the information in the supporting chapter incorporated by reference, as appropriate (e.g. Chapter 13 refers to Chapter 17 as appropriate).

Since both chapters are intertwined and since the organization described in Chapter 13 is integral with the QA program described in Chapter 17, it is appropriate to manage any changes to the organizational description provided in Chapter 13 in accordance with 10 CFR 50.54(a) to consistently ensure NRC review and approval.

Proposed COLA Revision

FSAR QAPD Part II, Section 1 and FSAR Chapter 13 will be revised to clarify the Fermi 3 organizational structure description as shown on the attached markup.

FSAR Section 13.1.1 will be revised to include the following requirement as a new paragraph:

> Changes to the organization described herein are reviewed under the provisions of 10 CFR 50.54(a) to ensure that any reduction in commitments to the QAPD (as accepted by the NRC) are submitted to, and approved by the NRC, prior to implementation.

Markup of Detroit Edison COLA
(Following 34 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

PART II QAPD DETAILS

Delete Section 1 Organization, and replace with Insert 1

SECTION 1 ORGANIZATION

This Section describes the Detroit Edison Fermi 3 organizational structure, functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying QAPD implementation. The organizational structure includes corporate support and onsite functions for Fermi 3 including interface responsibilities for multiple organizations performing quality-related functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of this QAPD. Management gives careful consideration to the timing, extent and effects of organizational structure changes.

Detroit Edison Fermi 3 management is responsible to size the Quality Assurance organization commensurate with the duties and responsibilities assigned.

The following sections describe the reporting relationships, functional responsibilities and authorities for organizations implementing and supporting the QA Program. The titles used herein are generic functional descriptions. Administrative documents are maintained to relate the generic titles to the Detroit Edison Fermi 3 organization.

1.1 Chief Nuclear Officer (CNO)

The CNO is responsible for all aspects of design, construction and operation of Detroit Edison's nuclear plants. The CNO is also responsible for all technical and administrative support activities provided by Detroit Edison and contractors. The CNO establishes the Fermi 3 quality assurance policy and provides guidance regarding its implementation. The CNO has delegated the responsibility and authority for approval of the QAPD to the executive in charge of the major enterprise projects (MEP) organization. The CNO has the authority to resolve disputes related to implementation of this QAPD for which resolution is not achieved at lower levels with the organization.

1.2 Technical Services and New Plant Development

The Fermi 3 MEP organization is responsible for implementing QAP requirements for activities involved with new nuclear plant engineering, design, procurement, construction, startup and operational development activities. These responsibilities include establishing appropriate interface controls with agents and contractors and the operating units. The Fermi 3 MEP organization is also responsible for implementing QAP requirements applicable to design engineering, technical support for programs such as fire protection, in-service inspection and testing, PRA, and configuration management and records managements activities. This organization is also responsible for surveillance and inspection of nuclear fuel suppliers and receipt inspection of nuclear fuel. The executive in charge of MEP reports to the CNO. The

Delete Section 1 Organization, and replace with Insert 1

organizational transition from the construction phase to the operating phase is addressed in the Fermi 3 FSAR, Chapter 13.

1.3 Site Executive

The site executive reports to the CNO and is responsible for the overall safe and efficient operation of the Fermi 3 plant, and for the implementation of quality assurance requirements in the areas specified by the operations QAPD.

For the purposes of this program, the description of the duties of the site executive and staff will be limited to those site activities that support Fermi 3 plant activities.

1.3.1 Technical Support and Services

The Fermi 3 technical support and services organizations are responsible for implementing the QAP requirements related to nuclear facility operation, including maintenance, refueling, and modification activities, and support functions such as training, procurement (supply chain), security and emergency preparedness. The transition from the construction to operations phases of the plant as well as a more detailed description of the operation organization is described in the Fermi 3 FSAR, Chapter 13. The Fermi 3 technical support and services organizations report to the site executive.

1.3.2 Operations and Maintenance

The operations and maintenance organization is responsible for implementing the QAP requirements for facility operation. The responsibilities include operating the facility in accordance with the license, regulatory requirements and the provision of the Technical Specifications. This organization is also responsible for the scheduling and conduct of maintenance and refueling activities, and performing modifications to the facility.

1.4 Quality Assurance

The Detroit Edison quality assurance (QA) organization is responsible for independently planning and performing activities to verify the development and effective implementation of the Fermi 3 QAPD including but not limited to engineering, document control, corrective action program and procurement that support new nuclear plant generation.

1.4.1 New Plant Oversight Manager

The new plant oversight manager is responsible for developing and maintaining the Fermi 3 QAPD, evaluating compliance to the programs, and managing QA resources. The new plant oversight manager is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; for monitoring organization processes to ensure conformance to commitments and licensing document requirements; for ensuring that vendors providing quality services, parts and materials to Fermi 3 are meeting the requirements of 10 CFR 50, Appendix B through NUPIC or Fermi 3 vendor audits.

Delete Section 1 Organization, and replace with Insert 1

The new plant oversight manager has sufficient independence from other department priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas necessary regarding Fermi 3 nuclear activities. The new plant oversight manager may make recommendations to management regarding improving the quality of work processes. If the new plant oversight manager disagrees with any actions taken by other Fermi 3 organizations and is unable to obtain resolution, the new plant oversight manager shall bring the matter to the attention of the executive in charge of the MEP organization who will determine the final disposition.

1.5 Agents and Contractors

The initial design of Fermi 3 for the COL application is the responsibility of GEH with a primary contract to Black & Veatch for site specific features.

For the construction phase of Fermi 3, Detroit Edison will establish an Engineering, Procurement and Construction (EPC) contract that identifies the Engineer and Constructor for the unit. This contract shall extend the quality program requirements described in this document to all applicable supplier, contractor and subcontractors. The executive in charge of the MEP organization is responsible for implementation of the QAP requirements of this document assigned to the EPC contractor and subcontractors.

1.6 Authority to Stop Work

The QA organization and inspection personnel have the authority, and the responsibility, to stop work in progress, which is not being done in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This extends to off-site work performed by suppliers furnishing safety-related materials and services to Fermi 3.

1.7 Quality Assurance Organizational Independence

For the COL, independence shall be maintained between the organization or organizations performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.8 NQA-1-1994 Commitment

In establishing its organizational structure, Detroit Edison commits to compliance with NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.

SECTION 1 ORGANIZATION

This section describes the Fermi 3 organizational structure, functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying QAPD implementation. The organizational structure includes corporate support and on-site functions for Fermi 3 including interface responsibilities for multiple organizations that perform quality-related functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of the QAPD. Management gives careful consideration to the timing, extent, and effects of organizational structure changes.

Major Enterprise Projects, specifically the Nuclear Development (ND) organization is responsible for new nuclear plant licensing, engineering, procurement, construction, startup and operations development activities. During these phases, several organizations within Detroit Edison implement and support the QAPD. These organizations include, but are not limited to Major Enterprise Projects (MEP), MEP Program Office, and Corporate Services.

Design, engineering and environmental services may be provided to the Fermi 3 Nuclear Development organization by suppliers in accordance with their 10 CFR 50 Appendix B/NQA-1 QAPDs, as established contractually to assure that applicable regulatory requirements to assure adequate quality.

The Fermi 3 Site organization is responsible for operational activities. During operations, the corporate services organization within Detroit Edison also implements and supports the QAPD.

Design, engineering and environmental services may be provided to the Fermi 3 Operations organization by suppliers in accordance with their 10 CFR 50 Appendix B/NQA-1 QAPDs, as established contractually to assure that applicable regulatory requirements to assure adequate quality.

The following sections describe the reporting relationships, functional responsibilities and authorities for organizations implementing and supporting the Fermi 3 Nuclear Development QA Program. The Fermi 3 pre-COL Nuclear Development organization, the Fermi 3 Design and Construction organization, and the Fermi 3 Site organization are shown in QAPD Figures II.1-1, II.1-2, and II.1-3 respectively.

1.1 Fermi 3 Pre-COL Organization

This section describes the organizational structure for the COL application activities of Fermi 3 and the Fermi 3 Pre-COL organizational structure is shown in Figure II.1-1.

1.1.1 Chairman and CEO

The DTE Energy Chairman/CEO is responsible for all aspects of design, construction and operation of Detroit Edison's nuclear plants. The Chairman/CEO is also responsible for all technical and administrative support activities provided by Detroit Edison and contractors. The Chairman/CEO directs the Senior Vice President Major Enterprise Projects and the Sr. Vice President/CNO in fulfillment of their responsibilities. The Chairman/CEO reports to the DTE Energy Company Board of Directors with respect to all matters.

1.1.2 Major Enterprise Projects – Nuclear Development
The Major Enterprise Projects (MEP) organization, specifically Nuclear Development, is responsible for new nuclear plant licensing, engineering, procurement, construction, startup and operational development activities necessary to deliver new nuclear generating capacity to the Sr. Vice President/CNO. Nuclear Development will facilitate organizational transitions between Fermi 3 project phases. Nuclear Development is responsible for controlling interfaces between the operating units and any preconstruction or construction activities.

1.1.2.1 Senior Vice President, MEP
The Senior Vice President MEP (Sr. VP MEP) ultimately reports to the DTE Energy Chairman and CEO and is responsible for the administration of the Fermi 3 QAPD. The Sr. VP MEP also directs the planning and development of the Nuclear Development staff and organization resources as well as the initial Fermi 3 staff and organization resources. The Sr. VP MEP is responsible to size the Fermi 3 Quality Assurance organization commensurate with the duties and responsibilities assigned through construction. The Sr. VP MEP is also responsible for establishing and managing contracts for the development of new nuclear generation. The Sr. VP MEP shall transition the Nuclear Development organization through the Pre-COL / Design and Construction / Operations responsibilities described in the QAPD, as those Fermi 3 activities commence.

1.1.2.2 Director, Nuclear Development
The Director, Nuclear Development reports to the Sr. VP MEP and to the CNO and is responsible for the implementation of quality assurance requirements in the areas specified by the QAPD. For the purposes of this program, the description of the duties of the Director Nuclear Development and the Nuclear Development staff will be limited to those activities that support the Fermi COL application development.

1.1.2.2.1 Nuclear Development, Nuclear Licensing and Engineering
The Nuclear Development Licensing and Engineering (NDLE) organization is responsible for support of the Nuclear Development organization by providing engineering, licensing and document control support where applicable.

1.1.2.2.1.1 Director, Nuclear Licensing and Engineering
The Director, Nuclear Licensing and Engineering reports to the Director Nuclear Development and is responsible for the administration of engineering and nuclear licensing for Fermi 3 under the QAPD.

1.1.2.2.1.1.1 NSSS
The Nuclear Steam Supply System (NSSS) vendor supports the COL application through the review and subsequent approval of the Design Certification application for the selected standard design. A QAPD submitted by the Design Certification application covering design QA activities in support of the COL application would be implemented under the QAPD submitted by the NSSS vendor and reviewed and approved by the NRC as part of the Design Certification reviews.

1.1.2.2.1.1.2 COLA Contractor
The COLA Contractor provides engineering services for the development of the COL application. These engineering services include site-specific license engineering, and design activities necessary to support development of the COL application in accordance with the COLA Contractor's 10 CFR 50 Appendix B/NQA-1 QAPD, as established contractually to assure that applicable regulatory requirements necessary to assure adequate quality are satisfied. The COLA Contractor also provides engineering services in planning and support for preconstruction activities for Fermi 3.

1.1.2.3 MEP Program Office
The MEP Program Office is responsible for supporting the Nuclear Development organization through performing activities related to procurement, budget, planning, etc. where applicable.

1.1.2.3.1 Director, MEP Program Office
The Director, MEP Program Office reports to the Sr. VP MEP and is responsible for managing the MEP support functions for Nuclear Development activities in accordance with the QAPD.

1.1.3 Senior Vice President / Chief Nuclear Officer
The Senior Vice President/Chief Nuclear Officer (CNO) ultimately reports to the Chairman and CEO and is responsible for the overall administration of Detroit Edison nuclear plants. The CNO is the ultimate management authority for establishing QA policy and responsibility for the QA function. The CNO will support Nuclear Development activities through the Director, Nuclear Development and the Director, Quality Management.

1.1.3.1 Quality Assurance
The Quality Assurance organization is responsible for independently planning and performing activities to verify the development and effective implementation of the Fermi 3 QAPD including but not limited to Nuclear Development, engineering, licensing, document control, corrective action program and procurement that support preconstruction activities for Fermi 3. The QA organization reports to the Director, Quality Management.

1.1.3.1.1 Director, Quality Management
The Director, Quality Management (DQM) reports to the CNO and to the Sr. VP MEP for Fermi 3 activities and is responsible for developing and maintaining the Fermi 3 QAPD, evaluating compliance to the program and managing the QA organization resources. The DQM is responsible for developing and verification of implementation of the QAPD described in this document. The DQM is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; for monitoring organization processes to ensure conformance to commitments and licensing document requirements; for ensuring that vendors providing quality services, parts and materials to Fermi 3 are meeting the requirements of 10 CFR 50, Appendix B through Nuclear Procurement Issues Committee (NUPIC) or Detroit Edison vendor audits. The DQM has sufficient independence from other Nuclear Development priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas necessary regarding Fermi 3's Nuclear Development activities. The DQM may make recommendations to Fermi 3 management regarding improving the quality of work processes. If the DQM disagrees with any actions taken by the Nuclear Development organization and is unable to obtain resolution, the DQM shall bring the matter to the attention of the CNO who will determine the final disposition.

1.1.4 Corporate Services
The Corporate Services organization is responsible for supporting the Nuclear Development organization through performing activities related to procurement, contract management, business performance, records management, logistics, etc. where applicable.

1.1.4.1 Director, Corporate Services
The Director, Corporate Services reports to the DTE Energy Executive Vice President and CFO and is responsible for managing the overall Corporate Services organization including assuring that Supply Chain Management, Financial and Operational Performance, and Materials and Logistics support for Nuclear Development activities in accordance with the QAPD.

1.1.8 Authority to Stop Work
Quality assurance and inspection personnel have the authority, and the responsibility, to stop work in progress which is not being performed in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This extends to off-site work performed by suppliers that furnish safety-related materials and services to Fermi 3.

1.1.9 Quality Assurance Organizational Independence
For COL application activities, independence shall be maintained between the organization or organizations performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.1.10 NQA-1-1994 Commitment
In establishing its organizational structure, Detroit Edison, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.

1.2 Fermi 3 Design and Construction Organization
This section describes the organizational structure through the design and construction phase of the Fermi 3 project. It is anticipated that even after fuel load, construction activities will be ongoing. Those positions required to support these activities will retain their applicable construction / preoperational responsibilities until it is deemed that they are no longer necessary. As the construction of systems, structures, and components (SSC), or portions thereof is completed, control and authority (including oversight, configuration and operations) is transferred from the contractor to the cognizant owner departments in the operations phase fully described in Section 1.3. During the transition, responsibilities will be clearly defined in instructions and procedures to ensure appropriate control is maintained over each SSC. The Fermi 3 Design and Construction organization is represented in Figure II.1-2.

1.2.1 Chairman and CEO
The DTE Energy Chairman/CEO is responsible for all aspects of design, construction and operation of Detroit Edison's nuclear plants as described in Section 1.1.1

1.2.2 Major Enterprise Projects – Nuclear Development
The Major Enterprises Project (MEP) organization, specifically Nuclear Development is responsible for new nuclear plant licensing, engineering, procurement, construction, startup and operational development activities necessary to deliver new nuclear generating capacity to the Sr. Vice President/CNO. Nuclear Development will facilitate organizational transitions between the Fermi 3 Pre-COL, Design and Construction, and Operations phases. Nuclear Development

is responsible for controlling interfaces between the operating units and any preconstruction or construction activities.

1.2.2.1 Senior Vice President, MEP
The Sr. VP MEP ultimately reports to the DTE Energy Chairman and CEO and is responsible for the administration of the Fermi 3 QAPD. The Sr. VP MEP also directs the planning and development of the Nuclear Development staff and organization resources as well as the initial Fermi 3 staff and organization resources. The Sr. VP MEP is responsible to size the Fermi 3 Quality Assurance organization commensurate with the duties and responsibilities assigned through construction. The Sr. VP MEP is also responsible for establishing and managing contracts for the development of new nuclear generation. The Sr. VP MEP shall transition the Nuclear Development organization through the Pre-COL / Design and Construction / Operations responsibilities described in the QAPD, as those Fermi 3 activities commence.

1.2.2.2 Director, Nuclear Development
The Director, Nuclear Development reports to the Sr. VP MEP and to the CNO and is responsible for the implementation of quality assurance requirements in the areas specified by the QAPD. For the purposes of this program, the description of the duties of the Director Nuclear Development and the Nuclear Development staff will be limited to those activities that support the Fermi 3 Design and Construction activities.

1.2.2.2.1 Nuclear Development, Nuclear Licensing and Engineering
The Nuclear Development Licensing and Engineering (NDLE) organization is responsible for support of the Nuclear Development organization by providing engineering, licensing and document control support where applicable.

1.2.2.2.1.1 Director, Nuclear Licensing and Engineering
The Director, Nuclear Licensing and Engineering reports to the Director Nuclear Development and is responsible for the administration of engineering, nuclear fuel and nuclear licensing and support activities for Fermi 3 under the QAPD.

1.2.2.2.1.1.1 COL Contractor
The COL Contractor provides engineering services in support of licensing activities necessary to support updates, changes, etc. to the COL. These engineering services include site-specific license engineering, and design activities necessary to support development of proposed COL updates, changes etc., and planning and support for preconstruction and construction of Fermi 3.

1.2.2.3 MEP Program Office
The MEP Program Office is responsible for supporting the Nuclear Development organization through performing activities related to procurement, budget, planning, etc. where applicable.

1.2.2.3.1 Director, MEP Program Office
The Director, MEP Program Office reports to the Sr. VP MEP and is responsible for managing the MEP support functions for Nuclear Development activities in accordance with the QAPD.

1.2.3 Corporate Services
The Corporate Services organization is responsible for supporting the Nuclear Development organization through performing activities related to procurement, contract management, business performance, records management, logistics, etc., where applicable.

1.2.3.1 Director, Corporate Services
The Director, Corporate Services reports to the DTE Energy Executive Vice President and CFO and is responsible for managing the overall Corporate Services organization including assuring that Supply Chain Management, Financial and Operational Performance, and Materials and Logistics support for Nuclear Development activities in accordance with the QAPD.

1.2.4 Senior Vice President / CNO
The Senior Vice President/CNO ultimately reports to the Chairman and CEO and is responsible for the overall administration of Detroit Edison nuclear plants as described in Section 1.3.2

1.2.4.1 Quality Assurance
The Fermi 3 Quality Assurance Organization is responsible for independently planning and performing activities to verify the development and effective implementation of the Fermi 3 QAPD as described in section 1.3.2.1

1.2.4.1.1 Director, Quality Management
The DQM is responsible for developing and maintaining the Fermi 3 QAPD from COL through to and including operations as described in section 1.3.2.1.1

1.2.4.2.1.1.1 Fermi 3 Quality Assurance Project Manager
The Fermi 3 Quality Assurance Project Manager (QAPM) reports to the DQM and is responsible for the development and verification of implementation of the QAPD described in this document. The QAPM is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; for monitoring organization processes to ensure conformance to commitments and licensing document requirements; for ensuring that vendors providing quality services, parts and materials to Fermi 3 are meeting the requirements of 10 CFR 50, Appendix B through Nuclear Procurement Issues Committee (NUPIC) or Detroit Edison vendor audits. The QAPM has sufficient independence from other Fermi 3 priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas necessary regarding Fermi 3 activities. The QAPM may make recommendations to Fermi 3 management regarding improving the quality of work processes. If the QAPM disagrees with any actions taken by the Fermi 3 organization and is unable to obtain resolution, the QAPM shall inform the DQM who will bring the matter to the attention of the CNO to determine the final disposition. As the QA organization transitions from design and construction to operations (i.e. the project phase ends), the QAPM becomes the Fermi 3 Quality Assurance Manager described in Section 1.3.2.1.1.1.

1.2.4.2 Site Organization
The Fermi 3 site organization executes all activities for operations, maintenance, security, training, pre-operational testing, startup testing, emergency planning, etc. of the Fermi 3 systems, structures and components (SSC), or portions thereof to support transfer from the construction contractor to the cognizant owner departments as described in FSAR Appendix 13AA, Section 13AA.2.2.

1.2.5 NSSS
NSSS provides engineering services for plant design and licensing of Fermi 3 on the Detroit Edison site. These engineering services for Fermi 3 include site-specific engineering and design necessary to support preconstruction and construction activities associated with the nuclear steam supply system (NSSS), i.e. the certified portion of the design.

1.2.6 A/E
A/E Firm provides engineering services for the development of the COL application. These engineering services include site-specific license engineering, and design activities necessary to support development of the COL application, and planning and support for preconstruction and construction activities for Fermi 3.

1.2.7 Authority to Stop Work
Quality assurance and inspection personnel have the authority, and the responsibility, to stop work in progress which is not being performed in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This extends to off-site work performed by suppliers that furnish safety-related materials and services to Fermi 3.

1.2.8 Quality Assurance Organizational Independence
For the Design and Construction phase, independence shall be maintained between the organization or organizations performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.2.9 NQA-1-1994 Commitment
In establishing its organizational structure, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.

1.3 Fermi 3 Operational Organization
This section describes the organizational structure for the operational activities of Fermi 3 and the Fermi 3 Site organizational structure is shown in Figure II.1-3.

1.3.1 Chairman and CEO
The Chairman/CEO is responsible for all aspects of design, construction and operation of Detroit Edison's nuclear plants as described in Section 1.1.1

1.3.2 Senior Vice President / CNO
The Senior Vice President/CNO ultimately reports to the Chairman and CEO and is responsible for the overall administration of Detroit Edison nuclear plants. The CNO is the ultimate management authority for establishing QA policy and responsibility for the QA function. Reporting to the CNO are the Director Quality Management and the Fermi 3 Site Executive.

1.3.2.1 Quality Assurance
The Fermi 3 Quality Assurance Organization is responsible for independently planning and performing activities to verify the development and effective implementation of the Fermi 3 QAPD including but not limited to engineering, licensing, document control, corrective action program and procurement that support Fermi 3 operations. Personnel resources of the QA organization are shared between units. The Fermi 3 Quality Assurance Manager, see 1.3.2.1.1.1, oversees the QA group for the Fermi 3 site.

1.3.2.1.1 Director, Quality Management
The DQM reports to the CNO for the operations activities and is responsible for developing and maintaining the Fermi 3 QAPD, evaluating compliance to the programs and managing the QA organization resources. The DQM is responsible to size the Quality Assurance organization commensurate with the duties and responsibilities assigned during operations.

1.3.2.1.1.1 Fermi 3 Quality Assurance Manager
The Fermi 3 Quality Assurance Manager (QAM) reports to the DQM and is responsible for the development and verification of implementation of the QAPD described in this document. The QAM is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; for monitoring organization processes to ensure conformance to commitments and licensing document requirements; for ensuring that vendors providing quality services, parts and materials to Fermi 3 are meeting the requirements of 10 CFR 50, Appendix B through Nuclear Procurement Issues Committee (NUPIC) or Detroit Edison vendor audits. The QAM has sufficient independence from other Fermi 3 priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas necessary regarding Fermi 3 activities. The QAM may make recommendations to Fermi 3 management regarding improving the quality of work processes. If the QAM disagrees with any actions taken by the Fermi 3 organization and is unable to obtain resolution, the QAM shall inform the DQM who will bring the matter to the attention of the CNO to determine the final disposition.

1.3.3 Corporate Services
The Corporate Services organization is responsible for supporting the Nuclear Development organization through performing activities related to procurement, contract management, business performance, records management, logistics, etc., where applicable.

1.3.3.1 Director, Corporate Services
The Director, Corporate Services reports to the DTE Energy Executive Vice President and CFO and is responsible for managing the overall Corporate Services organization including assuring that Supply Chain Management, Safety and Health and Information Technology support Nuclear Development activities in accordance with the QAPD.

1.3.4 Fermi 3 Operating Organization
The Fermi 3 Operating Organization executes all activities for operations, maintenance, security, training, modification, outage management, procurement, engineering, emergency planning, etc. of the Fermi 3 plant site. The Fermi 3 Operating Organization is responsible for operations quality inspection activities of operations on-site work, as well as controlling interfaces between the Nuclear Development organization (for future or continuing capital projects), operating units, and any preconstruction or construction activities. Full details of the Fermi 3 Operating Organization are available in FSAR Chapter 13.

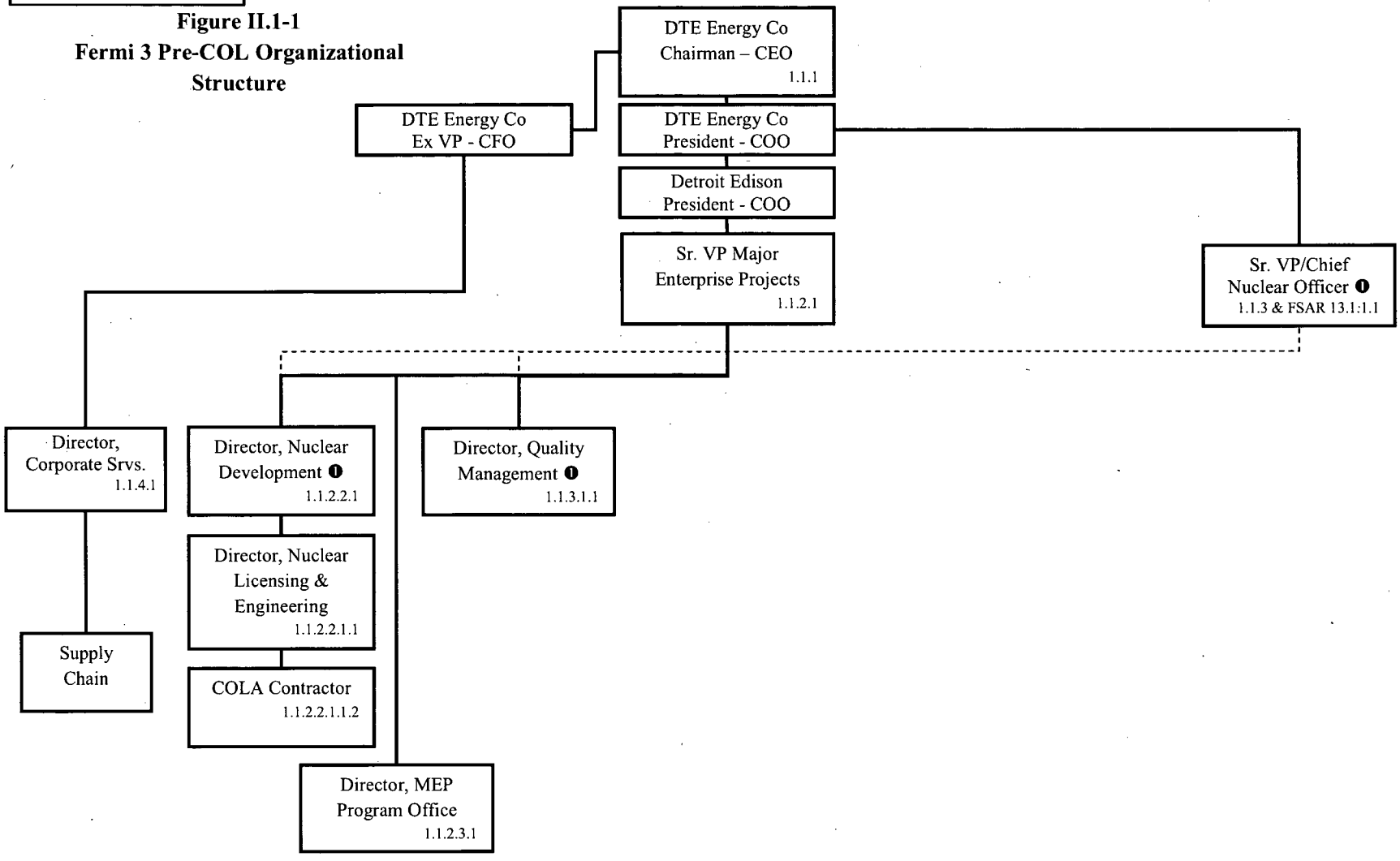
1.3.5 Authority to Stop Work
Quality assurance and inspection personnel have the authority, and the responsibility, to stop work in progress which is not being performed in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This extends to off-site work performed by suppliers that furnish safety-related materials and services to Fermi 3.

1.3.6 Quality Assurance Organizational Independence
Independence shall be maintained between the organization or organizations performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.3.7 NQA-1-1994 Commitment
In establishing its organizational structure, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.

Insert 1 Page 10 of 12

Figure II.1-1
Fermi 3 Pre-COL Organizational Structure

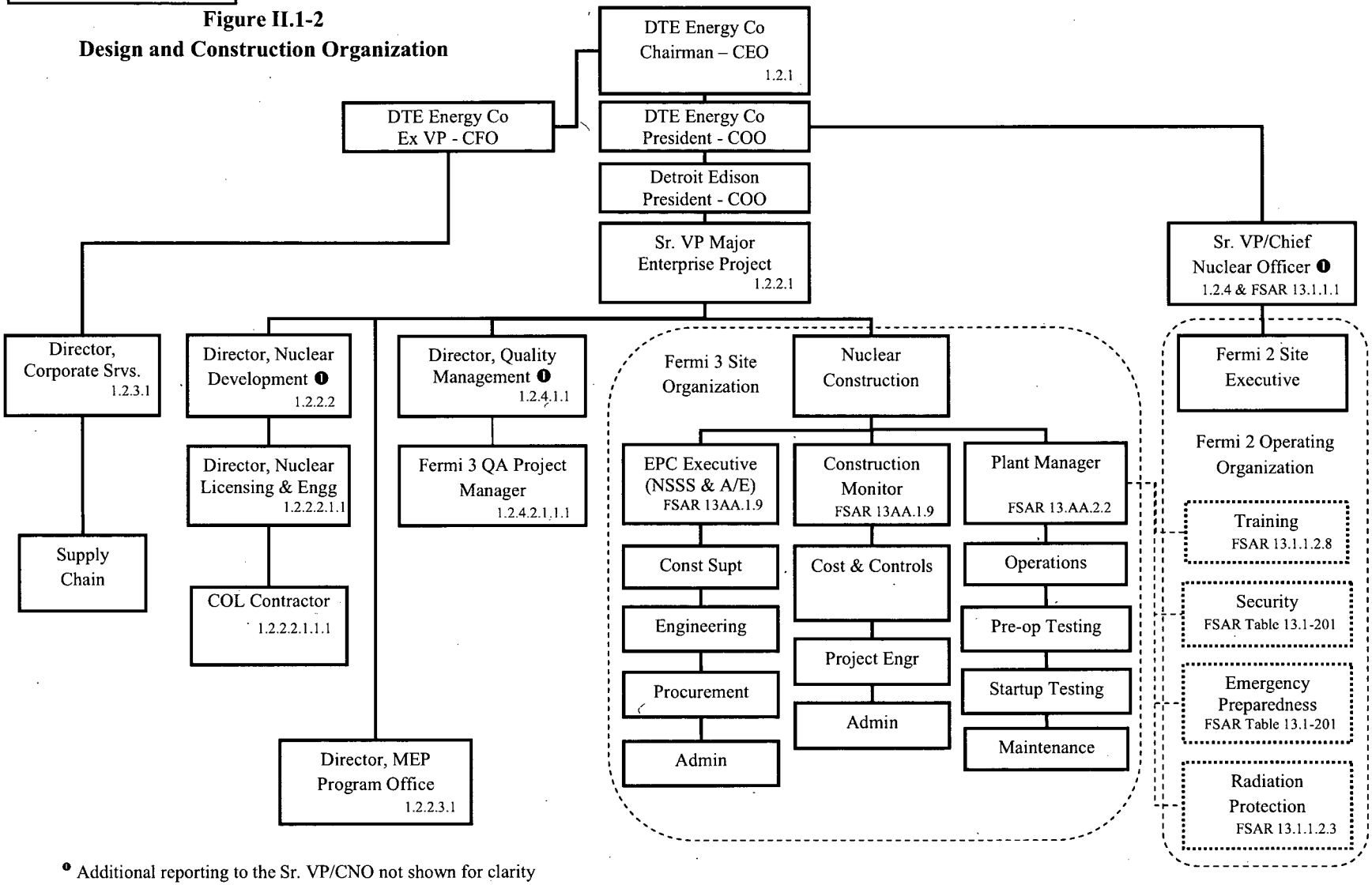


❶ Additional reporting to the Sr. VP/CNO not shown for clarity

Applicable section numbers are cross referenced above for additional detail. "FSAR" prefix represents FSAR Chapter 13 sections; all other numbers represent QAPD sections.

Insert 1 Page 11 of 12

Figure II.1-2
Design and Construction Organization

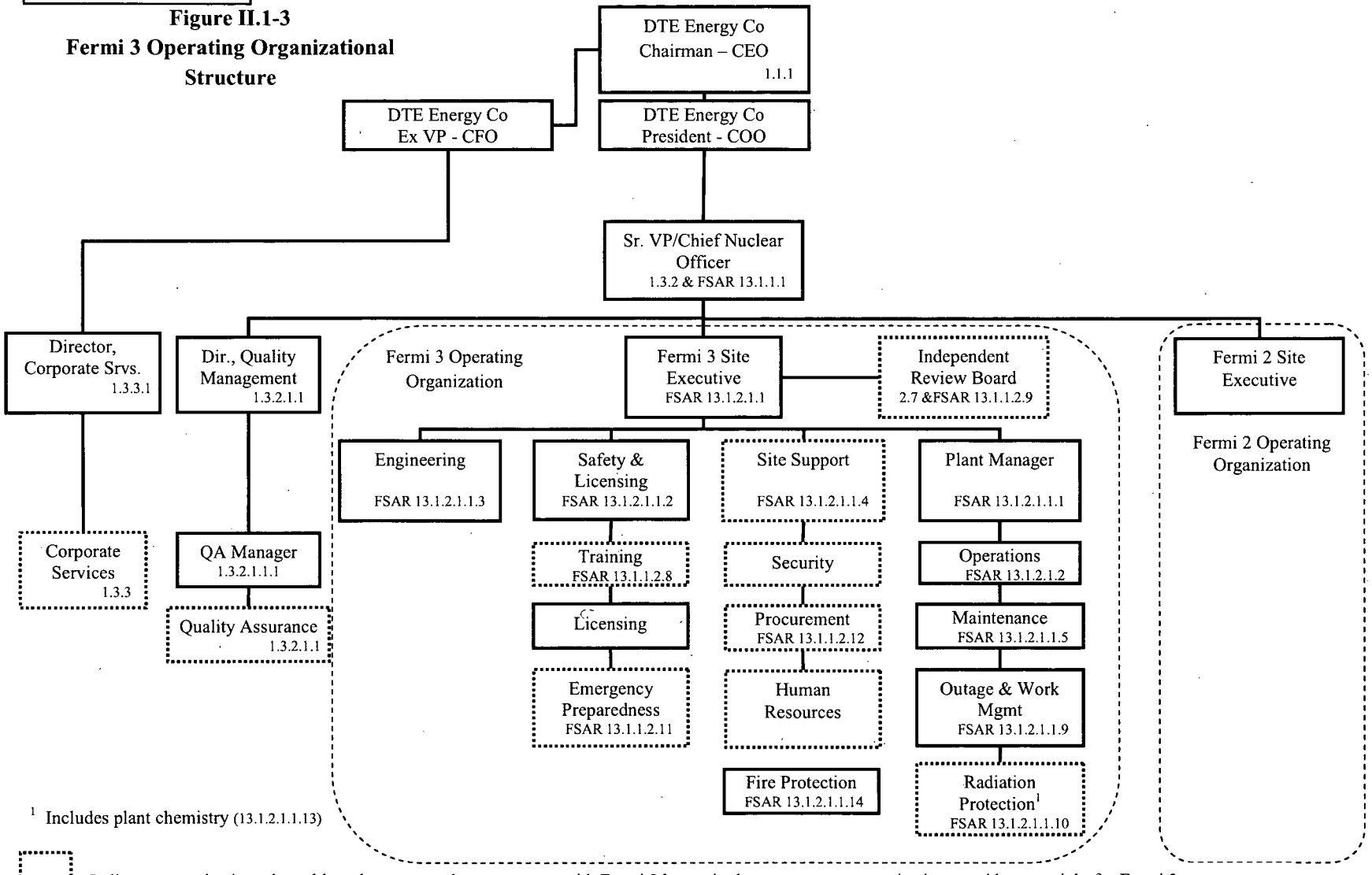


❶ Additional reporting to the Sr. VP/CNO not shown for clarity

Applicable section numbers are cross referenced above for additional detail. "FSAR" prefix represents FSAR Chapter 13 sections; all other numbers represent QAPD sections.

Insert 1 Page 12 of 12

Figure II.1-3
Fermi 3 Operating Organizational Structure



[1] Includes plant chemistry (13.1.2.1.1.13)

Indicates organizations that, although separate, share resources with Fermi 2 but a single management organization provides oversight for Fermi 3

Applicable section numbers are cross referenced above for additional detail. "FSAR" prefix represents FSAR Chapter 13 sections; all other numbers represent QAPD sections.

are made at the level appropriate for its nature and effect, and with any necessary technical advice or review.

2.3 COL Identification of Site Specific Safety-Related Design Basis Activities

The development of the Fermi 3 COL application involved site testing, data collection and calculations that may create or bound safety-related design basis data. Site testing and data collection of information pertaining to the physical characteristics of the site that have the potential to affect safety-related design will be considered safety-related. In addition, calculations and other engineering data that bounds or characterizes the site are classified as safety-related. The Fermi 3 COL application was developed by procedurally and/or contractually imposing appropriate quality requirements on those sections where the content is supported by safety–related design basis activities.

2.4 Periodic Review of the Quality Assurance Program

Management of those organizations implementing the QA program or portions thereof, assess the adequacy of that part of the program for which they are responsible and assure its effective implementation at least once each year or at least once during the life of the activity, whichever is shorter. However, the period for assessing QA programs during the operations phase may be extended to once every two years.

2.5 Issuance and Revision to Quality Assurance Program

Administrative control of the QAPD will be in accordance with 10 CFR 50.55(f) and 10 CFR 50.54(a), as appropriate. Changes to the QAPD are evaluated by the QA organization to ensure that such changes do not degrade previously approved quality assurance controls specified in the QAPD. This document shall be revised as appropriate to incorporate additional QA commitments that may be established during the COL application development process. New revisions to the document will be reviewed, at a minimum, by the ~~Fermi 3 new plant oversight manager~~ Director, Quality Management and approved by the executive in charge of the MEP organization.

Regulations require that the Final Safety Analysis Report (FSAR) include, among other things, the managerial and administrative controls to be used to assure safe operation, including a discussion of how the applicable requirements of Appendix B will be satisfied. In order to comply with this requirement, the FSAR references this QAPD and, as a result, the requirements of 10 CFR 50.54(a) are satisfied by and apply to the QAPD.

2.6 Personnel Qualifications

Personnel assigned to implement elements of the QAPD shall be capable of performing their assigned tasks. To this end Fermi 3 establishes and maintains formal indoctrination and training programs for personnel performing, verifying, or managing activities within the scope of the QAPD to assure that suitable proficiency is achieved and maintained. Plant and support staff minimum qualification requirements are as delineated in the Technical Specifications. Other

qualification requirements may be established but will not reduce those required by Technical Specifications. Sufficient managerial depth is provided to cover absences of incumbents. When required by code, regulation, or standard, specific qualification and selection of personnel is conducted in accordance with those requirements as established in the applicable Fermi 3 procedures. Indoctrination includes the administrative and technical objectives, requirements of the applicable codes and standards, and the QAPD elements to be employed. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implement a systematic approach to training. Records of personnel training and qualification are maintained.

~~The minimum qualifications of the Fermi 3 new plant oversight manager are to hold an engineering or related science degree and have a minimum of four years of related experience (3 of the 4 years must include 2 years of nuclear power plant experience and 1 year of supervisory or management experience). One year of experience performing quality verification activities.~~ Special requirements shall include management and supervisory skills and experience or training in leadership, interpersonal communication, management responsibilities, motivation of personnel, problem analysis and decision making, and administrative policies and procedures. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications of the individuals responsible for planning, implementing and maintaining the programs for the QAPD are that each has a high school diploma or equivalent and has a minimum of one year of related experience. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

2.7 Independent Review

Activities occurring during the operational phase shall be independently reviewed on a periodic basis. **[START COM 17AA-001]** The independent review program shall be functional prior to initial core loading. **[END COM 17AA-001]** The independent review function performs the following:

a. Reviews proposed changes to the facility as described in the final safety analysis report (FSAR). The Independent Review Body (IRB) also verifies that changes do not adversely affect safety and if a technical specification change or NRC review is required.

The minimum qualifications of the Director, Quality Management, and functional QA manager *are* that *each* holds an engineering or related science degree and a minimum of four years of related experience including two years of nuclear power plant experience, one year of supervisory or management experience, and one year of the experience is in performing quality verification activities.

SECTION 18 AUDITS

Fermi 3 has established the necessary measures and governing procedures to implement audits to verify that activities covered by this QAPD are performed in conformance with the requirements established. The audit programs are themselves reviewed for effectiveness as a part of the overall audit process.

18.1 Performance of Audits

Internal audits of selected aspects of licensing, design, construction phase and operating activities are performed with a frequency commensurate with safety significance and in a manner which assures that audits of safety-related activities are completed. During the early portions of Fermi 3 COL activities, audits will focus on areas including, but not limited to, site investigation, procurement, and corrective action. Functional areas of an organization's QA program for auditing include at a minimum verification of compliance and effectiveness of implementation of internal rules, procedures (e.g., operating, design, procurement, maintenance, modification, refueling, surveillance, test, security, radiation control procedures, and the emergency plan), Technical Specifications, regulations and license conditions, programs for training, retraining, qualification and performance of operating staff, corrective actions, and observation of performance of operating, refueling, maintenance and modification activities, including associated record keeping.

The audits are scheduled on a formal preplanned audit schedule. The audit system is reviewed periodically and revised as necessary to assure coverage commensurate with current and planned activities. Additional audits may be performed as deemed necessary by management. The scope of the audit is determined by the quality status and safety importance of the activities being performed. These audits are conducted by trained personnel not having direct responsibilities in the area being audited and in accordance with preplanned and approved audit plans or checklists, under the direction of a qualified lead auditor and the cognizance of the ~~new plant oversight manager.~~ Director Quality Management or functional QA manager as applicable.

Fermi 3 is responsible for conducting periodic internal and external audits. Internal audits are conducted to determine the adequacy of programs and procedures (by representative sampling), and to determine if they are meaningful and comply with the overall QAPD. External audits determine the adequacy of supplier and contractor quality assurance program.

The results of each audit are reported in writing to the responsible executive, or designee, as appropriate. Additional internal distribution is made to other concerned management levels in accordance with approved procedures.

Management responds to all audit findings and initiates corrective action where indicated. Where corrective action measures are indicated, documented follow-up of applicable areas

Chapter 13 Conduct of Operations

The introductory paragraph of this chapter of the referenced DCD is incorporated by reference with no departures or supplements.

13.1 Organizational Structure of Applicant

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

DCD Section 13.1.1, Combined License Information, is renumbered in this FSAR as Subsection 13.1.4 for administrative purposes to allow section numbering to be consistent with RG 1.206 and the Standard Review Plan.

Replace the first paragraph with the following.

EF3 COL 13.1-1-A

This section describes the organization of Fermi 3. The organizational structure is described in this section and is consistent with the Human System Interface (HSI) design assumptions used in the design of the ESBWR as described in DCD Chapter 18. The organizational structure is consistent with the ESBWR HFE design requirements and complies with the requirements of 10 CFR 50.54(i) through (m).

13.1.1 Management and Technical Support Organization

Detroit Edison has over 35 years of experience in the operation of nuclear generating stations. Detroit Edison currently operates Fermi 2.

Corporate offices provide support for Fermi site including executive level management to provide strategic and financial support for plant initiatives, and coordination of functional efforts.

Section 17.5 provides high-level illustrations of the corporate organization. More detailed charts and position descriptions, including qualification requirements and staffing numbers for corporate support staff, are maintained in corporate offices.

Insert New Paragraph "Changes to the organization described herein are reviewed under the provisions of 10 CFR 50.54(a) to ensure that any reduction in commitments in the QAPD (as accepted by the NRC) are submitted to, and approved by the NRC, prior to implementation."

13.1.1.1 Design, Construction, and Operating Responsibilities

The chief nuclear officer (CNO) has overall responsibility for functions involving planning, design, construction, and operation of Detroit Edison's current and future nuclear units. Line responsibilities for those functions are passed to the executives in charge of nuclear operations,

- Maintaining the design basis by updating the record copy of design documents as necessary to reflect the actual as-built configuration of the plant
- Accident and transient analyses
- Human Factors Engineering design process

Reactor engineering, led by the functional manager in charge of reactor engineering, provides technical assistance in the areas of core operations, core thermal limits, and core thermal hydraulics.

Design work may be contracted to and performed by outside companies in accordance with Section 17.5.

13.1.1.2.2 Plant Chemistry

A chemistry program is established to monitor and control the chemistry of various plant systems such that corrosion of components and piping is minimized and radiation from corrosion by-products is kept to levels that allow operations and maintenance with radiation doses as low as is reasonably achievable.

The functional manager in charge of chemistry is responsible for maintaining chemistry programs and for monitoring and maintaining the water chemistry of plant systems. The staff of the chemistry department consists of laboratory technicians, support personnel, and supervisors who report to the functional manager in charge of chemistry.

13.1.1.2.3 Radiation Protection

A radiation protection (RP) program is established to protect the health and welfare of the surrounding public and personnel working at the plant. The RP program is described in Chapter 12.

The RP department is staffed by radiation protection technicians, support personnel, and supervisors who report to the radiation protection manager. ~~To provide sufficient organizational freedom from operating pressures, the radiation protection manager reports directly to the director responsible for facility safety and licensing.~~

Personnel resources of the RP organization are shared between units. A single management organization oversees RP for the units.

13.1.1.2.4 Fueling and Refueling Operations Support

The function of fueling and refueling is performed by a combination of personnel from various departments including operations, maintenance, radiation protection, engineering, and reactor technology vendor or other contractor staff. ~~Initial fueling is a function of the startup management organization discussed in Appendix 13AA~~. Refueling operations are a function of the operations organization.

13.1.1.2.5 Maintenance Support

The maintenance department includes mechanical maintenance, electrical maintenance, and instrumentation and control (I&C) groups. Each group includes supervisors, foremen, and technicians in sufficient numbers to provide for the safe and efficient operation of the plant during all phases of plant life.

In support of maintenance activities, planners, schedulers, and parts specialists prepare work packages, acquire proper parts, and develop procedures that provide for the successful completion of maintenance tasks. Maintenance tasks are integrated into the station schedule for evaluation of operating or safe shutdown risk elements and to provide for efficient and safe performance. Functional managers in charge of planning and scheduling report to outage and planning management.

13.1.1.2.6 Operations Support

The operations support function is provided under the direction of the operations manager, and includes the following programs:

- Operations procedures
- Operations surveillances
- Equipment tagging preparation
- Fuel handling

13.1.1.2.7 Quality Assurance

Safety-related activities associated with the operation of the plant are governed by the quality assurance (QA) program described in Chapter 17. ~~QA includes:~~

~~• Maintenance of the QAPD~~

~~• Coordinating the development of audit schedules~~

~~• Audit, surveillance, and evaluation of Nuclear Division suppliers~~

~~- Quality control (QC) inspection/testing activities~~

~~QA management is independent of the station management line organization. The manager of QA reports administratively to the director responsible for facility safety and licensing and functionally to the site executive.~~

~~Personnel resources of the QA organization are shared between units. A single management organization oversees the QA group for the site.~~

13.1.1.2.8 Training

The training department is responsible for providing training programs that are established, maintained, and implemented in accordance with applicable plant administrative directives, regulatory requirements, and company operating policies so that station personnel can meet the performance requirements of their jobs in operations, maintenance, technical support, emergency response, and other areas. The training department's responsibilities encompass operator initial license training, requalification training, and plant staff training as well as the plant access training (general employee training) course and radiation worker training. To maintain independence from operating pressures, the manager of training reports to the director responsible for facility safety and licensing. Nuclear plant training programs are described in Section 13.2.

To the extent practicable given the differences between plant designs, personnel resources of the training department are shared between units. A single management organization provides oversight of station training activities.

13.1.1.2.9 Safety Review

Review and audit activities are addressed in Chapter 17.

Oversight of station programs, procedures, and activities is performed by the Onsite Safety Review Organization (OSRO) and an Independent Review Body (IRB), which is responsible for review of corrective actions for significant conditions adverse to quality and the audit program. The supervisor in charge of the IRB ultimately reports to the site executive.

In the event of an unplanned reactor trip or significant power reduction, it is the responsibility of the OSRO to determine the circumstances, analyze the cause, and determine that operations can proceed safely before the reactor is returned to power.

Personnel resources of the IRB organization are shared between units. A single management organization oversees the site IRB organization.

13.1.1.2.10 Fire Protection

The station is committed to maintaining a fire protection program as described in DCD Section 9.5.1.15. Fire protection for the facility is organized and administered by the functional manager in charge of fire protection. The functional manager in charge of fire protection is responsible for development and implementation of the fire protection program including development of fire protection procedures, site personnel and fire brigade training, and inspections of fire protection systems and functions. Functional descriptions for all responsible positions are included in appropriate procedures. Station personnel are responsible for adhering to the fire protection/prevention requirements detailed in Subsection 9.5.1. The site construction executive will have the lead responsibility for overall construction site fire protection during construction. The fire brigade is described in Subsection 13.1.2.1.5.

13.1.1.2.11 Emergency Organization

The emergency preparedness organization is a matrixed organization composed of personnel who have the experience, training, knowledge, and ability necessary to implement actions to protect the public in the case of emergencies. Managers and station personnel assigned to positions in the emergency organization are responsible for supporting the emergency preparedness organization and the emergency plan as required. The staff members of the emergency planning organization administer and orchestrate drills and training to maintain qualification of station staff members, and develop procedures to guide and direct the emergency organization during an emergency. The functional manager in charge of emergency preparedness reports to the director responsible for facility safety and licensing. The site emergency plan organization is described in the Emergency Plan.

13.1.1.2.12 Outside Contractual Assistance

Contract assistance with vendors and outside suppliers is provided by the materials, procurement, and contracts organization. The functional manager in charge of materials, procurement, and contracts reports to the ~~engineering, procurement and construction (EPC) executive.~~

site support director.

the planning, scheduling, conduct, and assessment of operations and work

- Notifying radiation protection personnel promptly when radiation protection problems occur or are identified, taking corrective actions, and resolving deficiencies associated with operations, procedures, systems, equipment, and work practices
- Training site personnel on radiation protection and providing periodic retraining in accordance with 10 CFR 19 so that personnel are properly instructed and briefed for entry into restricted areas
- Periodically observing and correcting, as necessary, radiation worker practices
- Supporting radiation protection management in implementing the radiation protection program
- Maintaining exposures to site personnel As Low As Reasonably Achievable (ALARA)

~~The operating organization is further defined in Section 17.5.~~

13.1.2.1.1 Site Executive

The site executive reports to the chief nuclear officer. The site executive is directly responsible for management and direction of activities associated with the efficient, safe, and reliable operation of the nuclear station. The site executive is assisted in management and technical support activities by the plant manager, the plant safety and licensing (S&L) director, the site support director and the engineering director. Executive management establishes expectations such that a high level of quality, safety, and efficiency is achieved in aspects of plant operations and support activities through an effective management control system and an organization selected and trained to meet the above objectives.

Additionally, the site executive has overall responsibility for occupational and public radiation safety. Radiation protection responsibilities of the site executive ~~vice president, nuclear generation~~ are consistent with the guidance in RG 8.8 and RG 8.10, including the following:

- Providing management radiation protection policy throughout the plant organization
- Providing an overall commitment to radiation protection by the plant organization

necessary for safe operation and maintenance of the plant including the following:

- Training
- Licensing and emergency preparedness
- ~~Radiation protection~~
- ~~Chemistry and radiochemistry~~
- ~~Quality assurance~~

13.1.2.1.1.3 Engineering Director

The engineering director reports to the site executive, is responsible for safe operation of the plant, and has control over onsite activities necessary for safe operation and maintenance of the plant including the following:

- Design engineering
- Systems engineering
- Program engineering
- Reactor engineering
- Procurement engineering

13.1.2.1.1.4 Site Support Director

The site support director reports to the site executive, is responsible for safe operation of the plant, and has control over onsite activities necessary for safe operation and maintenance of the plant including the following:

- Fire protection
- Physical security
- Procedures and document control
- Information systems interface
- Supply chain interface

13.1.2.1.1.5 Maintenance Manager

Maintenance of the plant is performed by the maintenance department mechanical, electrical, and instrumentation and control disciplines. The functions of this department are to perform preventive and corrective maintenance, equipment testing, and implement modifications as necessary.

13.1.2.1.1.9 Outage and Planning Manager

The outage and planning manager is responsible for the support functions described in Subsection 13.1.1.2.5. This manager safely fulfills the responsibilities of planning and scheduling all plant work through a staff which includes a functional manager in each area of planning, scheduling, and outages. The outage and planning manager reports to the plant manager.

13.1.2.1.1.10 Radiation Protection Manager

The radiation protection manager has the direct responsibility for providing adequate protection of the health and safety of personnel working at the plant and members of the public during activities covered within the scope and extent of the license. This manager's radiation protection responsibilities are consistent with the guidance in RG 8.8 and RG 8.10. They include:

- Managing the radiation protection organization
- Establishing, implementing, and enforcing the radiation protection program
- Providing radiation protection input to facility design and work planning
- Tracking and analyzing trends in radiation work performance and taking necessary actions to correct adverse trends
- Supporting the plant emergency preparedness program and assigning emergency duties and responsibilities within the radiation protection organization
- Delegating authority to appropriate radiation protection staff to stop work or order an area evacuated (in accordance with approved procedures) when, in his or her judgment, the radiation conditions warrant such an action and such actions are consistent with plant safety
- Managing the radioactive waste programs

The radiation protection manager reports to the plant ~~S&L director~~ manager and is assisted by the supervisors in charge of radiation protection.

13.1.2.1.1.11 Radiation Protection Supervisors

The supervisors in charge of radiation protection are responsible for carrying out the day-to-day operations and programs of the radiation

13.1.2.1.1.13 Functional Manager in Charge of Chemistry

The functional manager in charge of chemistry is responsible for development, implementation, and direction and coordination of the chemistry, radiochemistry, and non-radiological environmental monitoring programs. This area includes overall operation of the hot lab, cold lab, emergency offsite facility lab, and non-radiological environmental monitoring. The functional manager in charge of chemistry is responsible for the development, administration, and implementation of procedures and programs which provide for effective compliance with environmental regulations. The functional manager in charge of chemistry reports to the plant ~~S&L director~~ manager via the radiation protection manager and directly supervises the chemistry supervisors.

The functional manager in charge of chemistry is responsible for assuring that a chemistry technician is on site whenever the unit is in modes other than cold shutdown or refueling.

13.1.2.1.1.14 Functional Manager in Charge of Fire Protection

The functional manager in charge of fire protection is responsible for the following:

- Fire protection program requirements, including consideration of potential hazards associated with postulated fires, knowledge of building layout, and system design
- Post-fire shutdown capability
- Design, maintenance, surveillance, and quality assurance of fire protection features (e.g., detection systems, suppression systems, barriers, dampers, doors, penetration seals, and fire brigade equipment
- Fire prevention activities (administrative controls and training)
- Fire brigade organization and training
- Pre-fire planning, including review and updating of pre-fire plans at least every two years

The functional manager in charge of fire protection reports to the director responsible for site support. Additionally, the functional manager in charge of fire protection works with the operations and engineering departments to coordinate activities and program requirements with the those organizations. In accordance with RG 1.189, the functional manager in charge of fire protection is an individual who has been

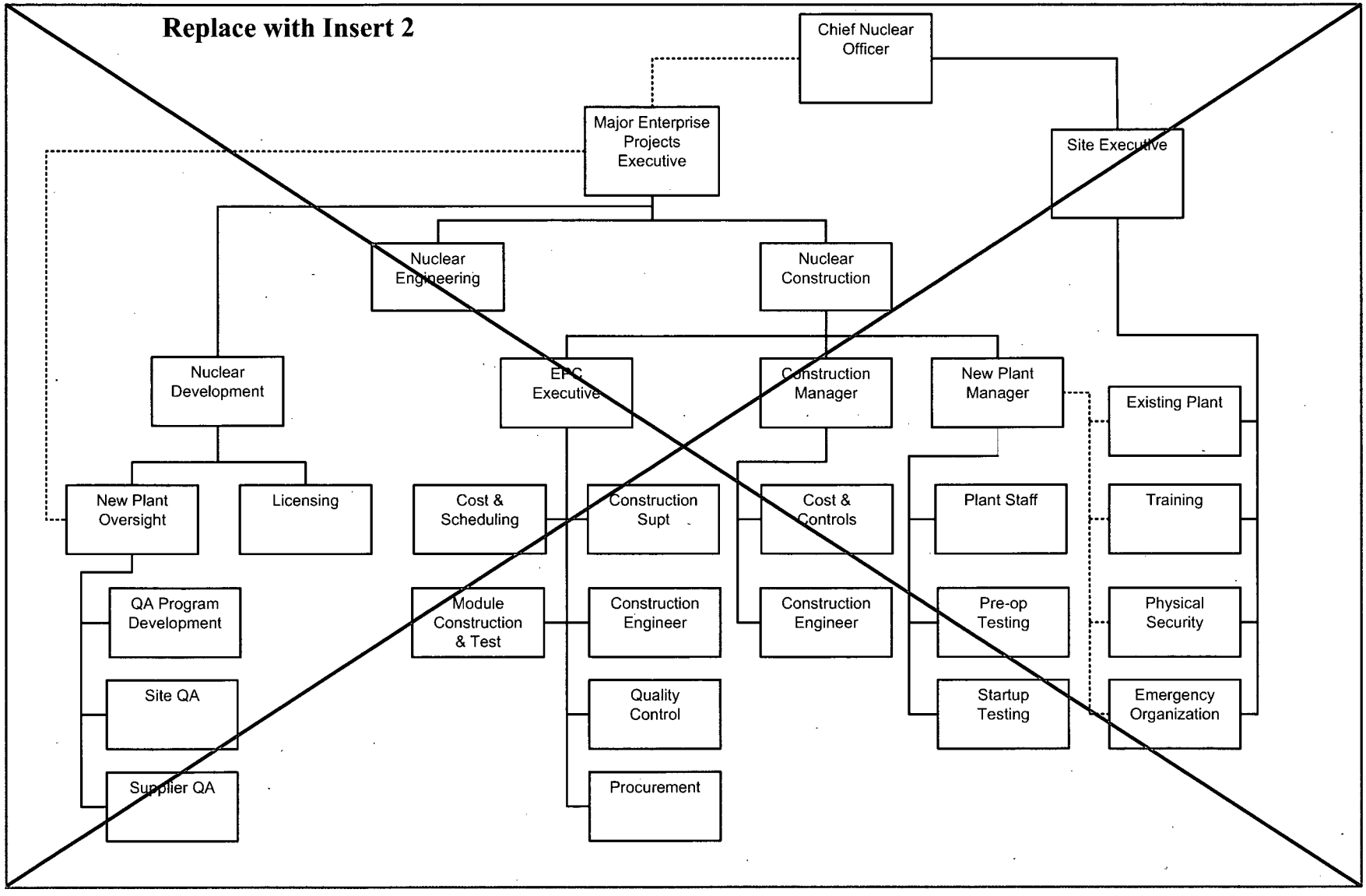
Table 13.1-201 Generic Position/Site Specific Position Cross Reference (Sheet 4 of 6) [EF3 COL 13.1-1-A]

Nuclear Function	Function Position (ANS-3.1-1993 section)	Nuclear Plant Position (Site-Specific)	Estimated Numbers of Full Time Equivalents* Design Review Phase	Construction Phase	Pre-op Phase	Operational Phase
	functional manager (4.3)	Supervisor, Planning		1	1	1
Purchasing, and contracts	functional manager (4.3)	Manager, Supply Chain Services		1***	1***	1***
~~**Quality assurance**~~	~~functional manager (QAPD)~~	~~QA Manager~~	~~1***~~	~~1***~~	~~1***~~	~~1***~~
Insert 1	QA lead auditor (QAPD)	QA Auditor	1	1	1	1
	QA internal auditor (QAPD)	QA Auditor		2	2	8***
	QC inspector (QAPD)	QC Inspector		6	6	4
	supplier auditor (QAPD)	Nuclear Quality Auditor		2	2	1***
	vendor surveillance QC inspector (QAPD)	Vendor Surveillance QC Inspector	2	6	4	4***
	nuclear fuel inspector (QAPD)	Nuclear Fuel Inspector		3***	3***	3***
Training	functional manager (4.3.1)	Manager, Training		1***	1***	1***
	supervisor operations training (4.4.4)	Supervisor, Operations Training		1	1	1
	supervisor, simulator (4.4.4)	Supervisor, Simulator & Training Support		1	1	1
	operations training instructor (4.5.4)	Operations Training Instructor		10	10	10
	supervisor tech staff training (4.4.4)	Supervisor, Tech Training		1	1	1
	supervisor maintenance training (4.4.4)	Supervisor, Maintenance Training		1	1	1

Insert 1

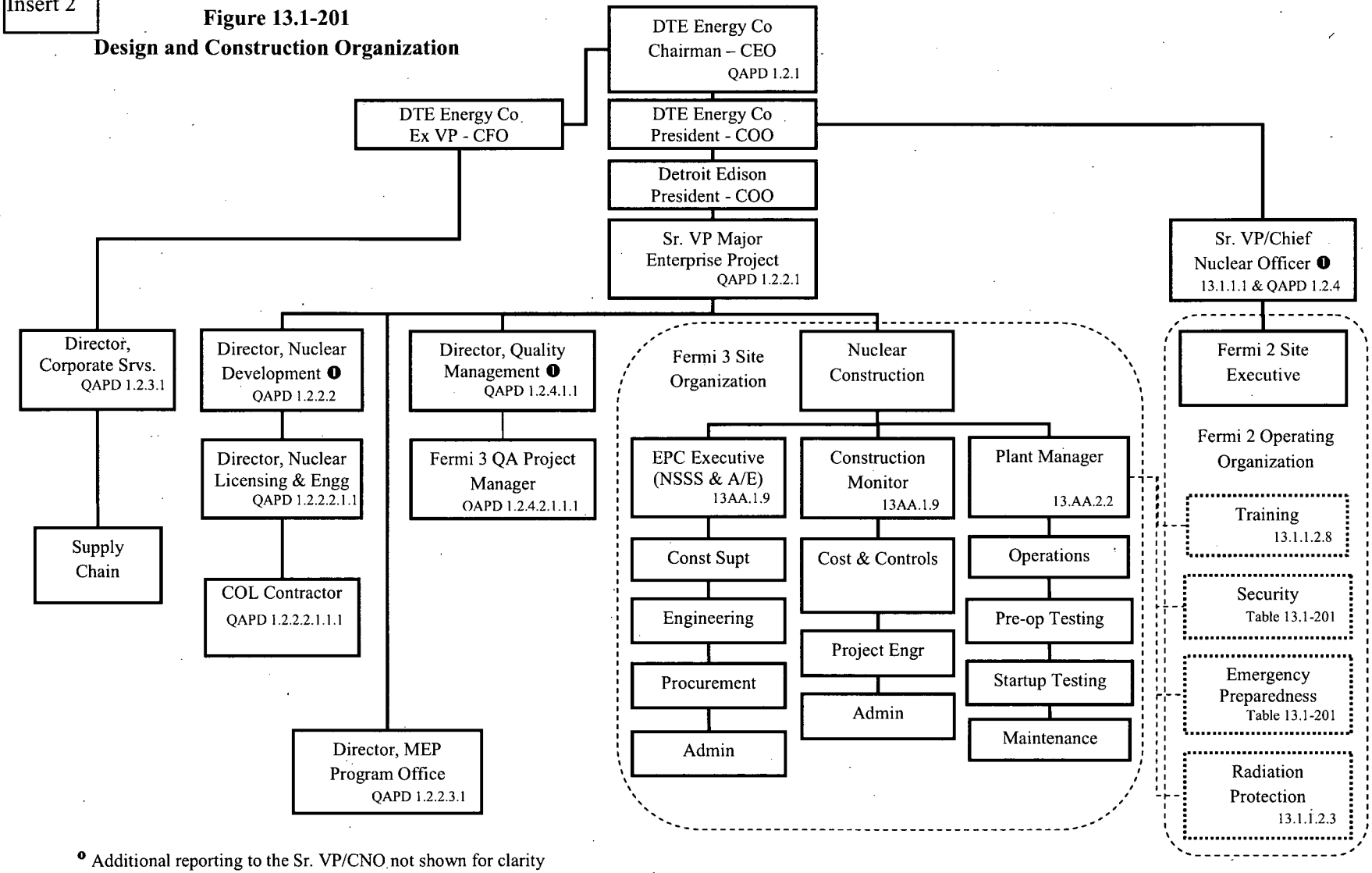
Quality Assurance	functional manager	(QAPD)	Director, Quality Assurance	1***	1***	1***	1***
	functional manager	(QAPD)	QA Manager	1	1	1	1

Figure 13.1-201 Construction Organization [EF3 COL 13.1-1-A]



Insert 2

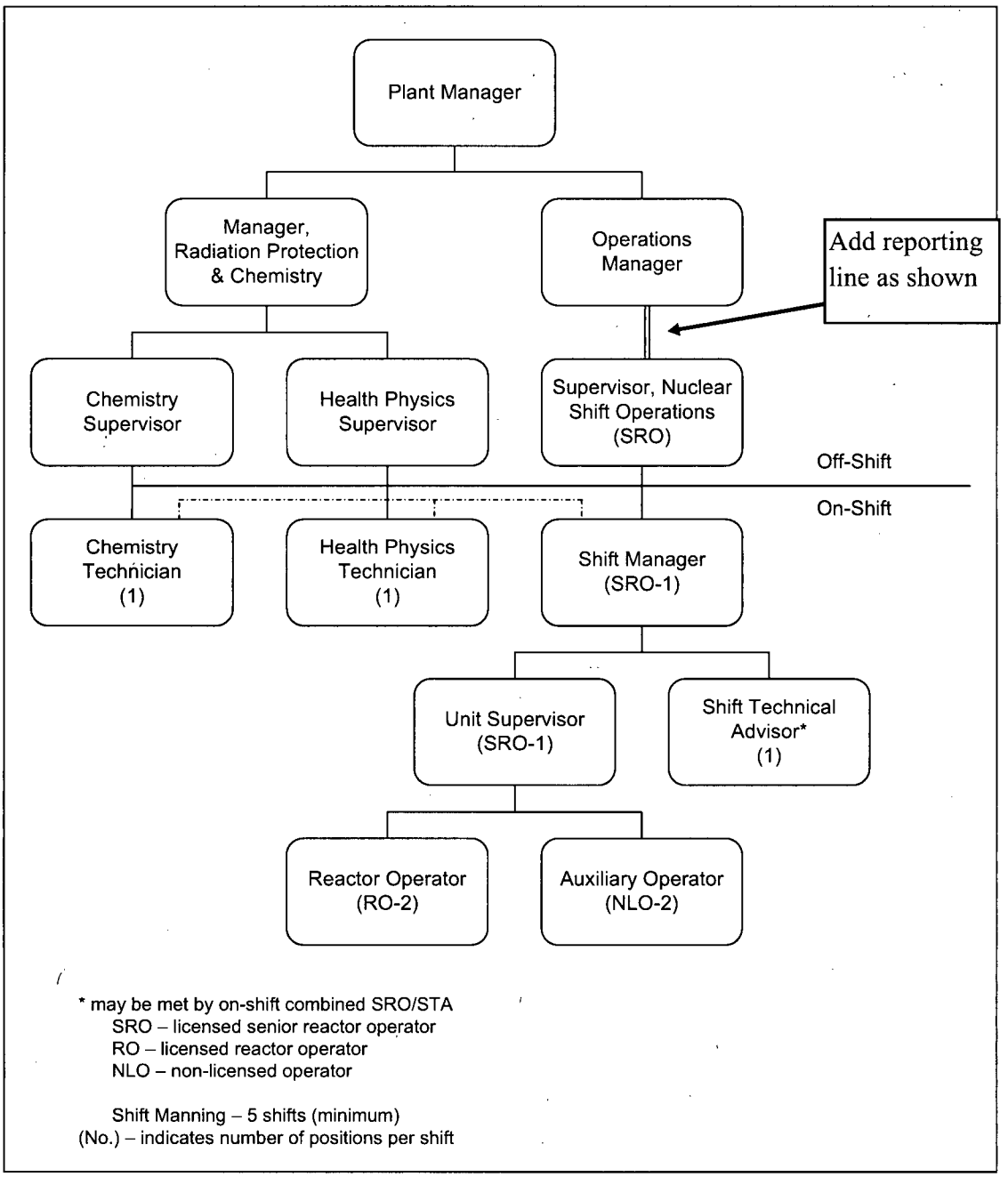
Figure 13.1-201
Design and Construction Organization



❶ Additional reporting to the Sr. VP/CNO not shown for clarity

Applicable section numbers are cross referenced above for additional detail. "QAPD" prefix represents QAPD sections; all other numbers represent FSAR Chapter 13 sections.

Figure 13.1-203 Shift Operations [EF3 COL 13.1-1-A]



adequacy of the design. Verification is performed by competent individuals or groups other than those who performed the original design. Design issues arising during construction are addressed and implemented with notification and communication of changes to the manager in charge of engineering for review. As systems are tested and approved for turnover and operation, control of design is turned over to plant staff. The manager in charge of engineering, along with functional managers and staff, assumes responsibility for review and approval of modifications, additions, or deletions in plant design features, as well as control of design documentation, in accordance with the Operational QA Program. Design control becomes the responsibility of the manager in charge of engineering prior to loading fuel. During construction, startup, and operation, changes to human-system interfaces of control room design are approved using a Human Factors Engineering evaluation addressed within DCD Chapter 18. See Figure 13.1-201, Construction Organization, and the QAPD (incorporated into Section 17.5) for reporting relationships.

, Section 13AA.1.9, Section 13AA.2.2,

13AA.1.4 Environmental Effects

Impact to the surrounding environment from construction and operating activities is fully addressed in the separately submitted Environmental Report.

13AA.1.5 Security Provisions

The Physical Security Plan is designed with provisions that meet the applicable NRC regulations. See Section 13.6 and the Security Plan, which was submitted under separate transmittal.

13AA.1.6 Development of Safety Analysis Reports

Information regarding the development of the FSAR is found in Chapter 1.

13AA.1.7 Review and Approval of Material and Component Specifications

Safety-related material and component specifications of SSCs designed by the reactor vendor are reviewed and approved in accordance with the reactor vendor quality assurance program and Section 17.1. Review and approval of items not designed by the reactor vendor are controlled for review and approval by Section 17.5 and the QAPD.

13AA.1.8 Procurement of Materials and Equipment

Procurement of materials during construction phase is the responsibility of the reactor vendor and constructor. The process is controlled by the construction QA programs of these organizations. Oversight of the inspection and receipt of materials process is the responsibility of the EPC executive.

13AA.1.9 Management and Review of Construction Activities

Major Enterprise Projects

Sr.

Management and responsibility for construction activities is assigned to the EPC executive. The EPC executive is accountable to the ~~senior~~ VP, ~~major enterprise projects~~. See Figure 13.1-201, Construction Organization.

Monitoring and review of construction activities by utility personnel is a continuous process at the plant site. Contractor performance is monitored to provide objective data to utility management in order to identify problems early and develop solutions. Monitoring of construction activities verifies that the contractors are in compliance with contractual obligations for quality, schedule, and cost. To maintain independence from the construction organization, the oversight organization has functional access to the Senior VP, Major Enterprise Projects.

Monitoring and review of construction activities is divided functionally across the various disciplines of the utility construction staff, i.e. electrical, mechanical, instrument and control, etc., and tracked by schedule based on system and major plant components/areas.

After each system is turned over to plant staff the construction organization relinquishes responsibility for that system. At that time the construction organization will be responsible for completion of construction activities as directed by plant staff and available to provide support for start-up testing as necessary.

13AA.2 Preoperational Activities

This section describes the activities required to transition the unit from the construction phase to the operational phase. These activities include turnover of systems from construction, preoperational testing, schedule management, test procedure development, fuel load, integrated startup testing, and turnover of systems to plant staff.

Attachment 6
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3346)

RAI Question No. 17.5-5

NRC RAI 17.5-5

SRP Section 17.5 part II, subsection A, "Organization," states, in part, that the applicant's QAPD should 1) contain an organizational description that addresses the organizational structure, functional responsibilities, levels of authority, and interfaces, 2) include the onsite and offsite organizational elements that function under the cognizance of the QA program, 3) clearly define the interface responsibilities for multiple organizations, and 4) require independence between the organization performing checking functions from the organization responsible for performing the functions.

The Fermi 3 QAPD (FSAR Appendix 17AA) part II, section 1, contains varying content and depth of position description information. Staff review identified that the QAPD does not appear to meet the organizational guidance of the SRP section 17.5 for all described positions. Please clarify the following for section 1 of the QAPD, or provide justification for any exceptions to the guidance provided in SRP Section 17.5 part II, subsection A:

- *Provide organizational flowcharts (e.g. NEI 06-14A figures II.1-1 and II.1-2) outlining the interrelationships between the Detroit Edison Fermi Unit 3 corporate and onsite QA organizations.*

- *Define the organizational structure, interfaces, and, where appropriate, the authorities for the Chief Nuclear Officer (CNO), new plant oversight manager, and the operations and maintenance organization.*

- *Provide a separate subsection describing the organizational structure, interfaces, functional responsibilities and authorities for the executive in charge of MEP.*

- *Clarify the QAP implementation responsibilities of the "Operations and Maintenance", "Technical Support", and "Services" organizations.*

- *Define "nuclear facility operation" and "facility operation" referenced in section 1.3.1 and 1.3.2, and*

- *Describe the QA organizational independence during construction referenced in section 1.7.*

Response

- *Provide organizational flowcharts (e.g. NEI 06-14A figures II.1-1 and II.1-2) outlining the interrelationships between the Detroit Edison Fermi Unit 3 corporate and onsite QA organizations.*

Organizational flowcharts for Fermi 3 Pre-COL, Design and Construction, and Operating organizations are contained in markups to FSAR Chapter 13 and Chapter 17 presented in the response to RAI 17.5-6, Attachment 5 of this letter.

During the Design and Construction phase, the Fermi 3 Quality Assurance Project Manager (onsite QA organization) reports to the Director, Quality Management (Detroit Edison Fermi Unit 3 corporate QA). The Director, Quality Management (DQM) reports to the Sr. Vice President, Major Enterprise Projects, who is responsible for Fermi 3 licensing, engineering, procurement, construction, startup and operational development activities, and the Sr. Vice President/CNO. If the DQM disagrees with any actions taken by the Nuclear Development organization or the Design and Construction team and is unable to obtain resolution, the DQM brings the matter to the attention of the Sr. Vice President/CNO who will determine the final disposition.

During the Operations phase, the onsite QA organization continues to report to the Director, Quality Management (Detroit Edison Fermi Unit 3 corporate QA) who directly reports to the Sr. Vice President/CNO.

- *Define the organizational structure, interfaces, and, where appropriate, the authorities for the Chief Nuclear Officer (CNO), new plant oversight manager, and the operations and maintenance organization.*

The Sr. Vice President/CNO is the ultimate management authority for establishing QA policy and responsibility for the QA function.

The Director, Quality Management, formerly called the "new plant oversight manager" in QAPD Rev 1, is responsible for the development and verification of implementation of the QAPD with the reporting interfaces described above.

During the Construction phase, the Plant Manager is responsible the operation and maintenance of systems, structures and components, or portions thereof, transferred from the contractor to the cognizant owner departments and reports to the Sr. VP, Major Enterprise Project through the Executive assigned day to day responsibility for Design and Construction of Fermi 3. During the Operations phase, the Plant Manager is responsible the operation and maintenance of Fermi 3 and reports to the Site Vice President, who reports to the Sr. Vice President/CNO.

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" and FSAR Chapter 13 will be revised to provide the organizational charts and descriptions of these relationships, as presented in the response to RAI 17.5-6, Attachment 5 of this letter.

- *Provide a separate subsection describing the organizational structure, interfaces, functional responsibilities and authorities for the executive in charge of MEP.*

The Sr. Vice President Major Enterprise Projects (Sr. VP MEP) ultimately reports to the DTE Energy President and CEO through the President and Chief Operating Officer of Detroit Edison and the President and Chief Operating Officer of DTE Energy. The Sr. VP MEP is responsible for the administration of the Fermi 3 QAPD during the pre-COL and design/construction phases. The Sr. VP MEP also directs the planning and development of the Nuclear Development staff and organization resources as well as the initial Fermi 3 staff and organization resources. The Sr. VP MEP is responsible to size the QA organization commensurate with the duties and responsibilities

assigned through construction. The Sr. VP MEP is also responsible for establishing and managing contracts for the development of new nuclear generation. The Sr. VP MEP transitions the Nuclear Development organization through the Pre-COL / Design and Construction / Operations responsibilities described in the QAPD.

NOTE: As presented in Part 1 of the COLA, Detroit Edison is a wholly owned subsidiary of DTE Energy Company (see page 5).

The Major Enterprise Projects (MEP) organization, specifically Nuclear Development, is responsible for new nuclear plant licensing, engineering, procurement, construction, startup and operational development activities necessary to deliver new nuclear generating capacity to the Sr. Vice President/CNO.

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" and FSAR Chapter 13 will be revised as necessary to provide the organizational charts and descriptions of these responsibilities and relationships, as presented in the response to RAI 17.5-6, Attachment 5 of this letter.

- *Clarify the QAP implementation responsibilities of the "Operations and Maintenance", "Technical Support", and "Services" organizations.*

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" and FSAR Chapter 13 will be revised to provide the organizational charts and responsibilities necessary to tie the QAPD to Chapter 13 for the "Operating Organization" described in FSAR Section 13.1, as presented in the response to RAI 17.5-6, Attachment 5 of this letter.

- *Define "nuclear facility operation" and "facility operation" referenced in section 1.3.1 and 1.3.2, and*

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" will be revised to reflect NEI 06-14, Revision 7. As a result, the terms "nuclear facility operation" and "facility operation" have been eliminated. The use of the terms in FSAR Appendix 17AA, Revision 1 referred to the operation and maintenance of systems, structures and components, or portions thereof to support transfer from the construction contractor to the cognizant owner departments.

- *Describe the QA organizational independence during construction referenced in section 1.7.*

FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" will be revised to reflect NEI 06-14, Revision 7. As a result, the section "Quality Assurance Organizational Independence" has been revised consistent with NEI 06-14, Revision 7.

Proposed COLA Revision

The organizational charts and descriptions of these relationships presented in this response are provided in the revision to the FSAR Appendix 17AA, Part II, Section 1, Fermi 3 QAPD "Organization" and FSAR Chapter 13 presented in the "Markup of Detroit Edison COLA" provided with the response to RAI 17.5-6, Attachment 5 of this letter.

Similarly, throughout FSAR Appendix 17AA, Part II, "new plant oversight manager" was replaced with "Director, Quality Management" to reflect the organizational structure and interfaces described above presented and is presented in the "Markup of Detroit Edison COLA" provided with RAI 17.5-6, Attachment 5 of this letter.

Attachment 7
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3347)

RAI Question No. 17.5-7

NRC RAI 17.5-7

Regulatory Guide (RG) 1.8, Revision 3, "Qualification and Training of Personnel for Nuclear Power Plants," endorses the qualification criteria described in Section 4 of ANSI/ANS-3.1-1993, with certain exceptions. The Detroit Edison Fermi 3 QAPD (FSAR Appendix 17AA) part II, section 2.7, paragraph 1.a (Independent Review Body subsection), states a qualified person, independent of the preparer, reviews proposed changes in the procedures as described in the FSAR prior to implementation of the change to determine if a technical specification change or NRC approval is required.

Please describe the qualification requirements for the independent review staff. The qualification requirements for these personnel should meet or exceed those described in Section 4.7 of ANSI/ANS-3.1-1993 and the regulatory position of Regulatory Guide 1.8, Revision 3.

Response

FSAR Appendix 17AA, Part II, Section 2.7 will be revised to provide the qualification requirements for the members of the independent review board reflecting the guidance in NEI 06-14, Revision 7.

Proposed COLA Revision

FSAR Appendix 17AA, Part II, Section 2.7 will be revised as shown in the attached markups.

Markup of Detroit Edison COLA
(Following 2 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

b. Reviews proposed tests and experiments not described in the FSAR. Changes to proposed tests and experiments not described in the FSAR that do require a technical specification change must be reviewed by the IRB prior to NRC submittal and implementation.

c. Reviews proposed technical specification changes and license amendments relating to nuclear safety prior to NRC submittal and implementation, except in those cases where the change is identical to a previously approved change.

Insert Heading "Independent Review Body"

d. Reviews violations, deviations, and reportable events that are required to be reported to the NRC in writing within 24 hours. This review includes the results of investigations and recommendations resulting from such investigations to prevent or reduce the probability of recurrence of the event.

e. Reviews any matter related to nuclear safety that is requested by the site executive, plant manager, or any IRB member,

f. Reviews corrective actions for significant conditions adverse to quality.

g. Reviews the adequacy of the audit program every 24 months.

A group may function as an IRB. In discharging its review responsibilities, the IRB keeps safety considerations paramount when opposed to cost or schedule considerations. One or more organizational units may collectively perform this function.

1. IRB reviews are supplemented as follows:

   a. A qualified person, independent of the preparer, reviews proposed changes in the procedures as described in the FSAR prior to implementation of the change to determine if a technical specification change or NRC approval is required.

   b. Audits of selected changes in the procedures described in the FSAR are performed to verify that procedure reviews and revision controls are effectively implemented.

   c. Competent individual(s) or group(s) other than those who performed the original design but who may be from the same organization verify that changes to the facility do not result in a loss of adequate design or safety margins.

2. The results of IRB reviews of matters involving the safe operation of the facility are periodically independently reviewed. This review is intended to support management in identifying and resolving issues potentially affecting safe plant operation. This review supplements the existing corrective action programs and audits.

   a. ~~The review is performed by a team consisting of personnel with experience and competence in the activities being reviewed, but independent from cost and schedule considerations and from the organizations responsible for those activities.~~

Replace Text with Insert 2

Insert 2

The review is performed by a team consisting of personnel with experience and competence in the activities being reviewed, but independent from cost and schedule considerations and from the organizations responsible for those activities. The IRB supervisor or chairman has a minimum six (6) years combined managerial and technical support experience. The members of the IRB should have a minimum of five years of experience in their own area of responsibility as applicable to the activities being reviewed (i.e., a minimum of five years of experience in one of the twelve areas listed below:

(1) Nuclear power plant operations
(2) Nuclear engineering
(3) Chemistry and radiochemistry
(4) Metallurgy
(5) Nondestructive testing
(6) Instrumentation and control
(7) Radiological safety
(8) Mechanical engineering
(9) Electrical engineering
(10) Administrative control and quality assurance practices
(11) Training
(12) Emergency plans and related procedures and equipment).

Attachment 8
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3349)

RAI Question No. 17.5-8

NRC RAI 17.5-8

Appendix B to 10 CFR Part 50 states, in part, that every applicant for a combined license under part 52 is required to include in its final safety analysis report a description of the quality assurance applied to the design, and to be applied to the fabrication, construction, and testing of the structures, systems, and components of the facility.

The NRC endorsed the Nuclear Energy Institute (NEI) QAPD template (NEI 06-14, "Template for an Industry Quality Program Description") as a method for providing a QAPD that meets the requirements of 10 CFR Part 50, Appendix B.

FSAR Chapter 17.5 states the Fermi 3 QAPD is based on NEI 06-14.

To ensure consistency with the NEI QAPD template, the following changes to the Fermi 3 QAPD (FSAR Appendix AA) part II are requested or, alternatively, please provide justification for any exceptions to the guidance provided in NEI 06-14:

- *Use "Fermi 3" vice "licensee" consistently in the QAPD (noted in sections 4 and 16),*
- *Define "corporate support" referenced in section 1, second sentence,*
- *Clarify the "COM 17AA-001" references in section 2.7,*
- *Clarify if the Fermi 3 new plant oversight manager is required to have one year of experience performing quality verification activities as referenced in section 2.6, second paragraph,*
- *Clarify the Independent Review Body responsibilities by inserting a section title "Independent Review Body" at the appropriate point in section 2.7, and*
- *Clarify if all conditions (a) through (e) in section 6.1 are required for procedure review, or if any one condition is sufficient.*

Response

- *Use "Fermi 3" vice "licensee" consistently in the QAPD (noted in sections 4 and 16).*

FSAR 17AA, Part II, Sections 4 and 16 will be revised to change "licensee" to "Fermi 3" as appropriate.

- *Define "corporate support" referenced in section 1, second sentence.*

Corporate support includes services associated with budget, planning, procurement, contract management, business performance records management, logistics, etc. These services are provided by Major Enterprise Project Program Office and Corporate Services organizational interfaces between corporate services and Fermi 3 are the responsibility of their associated directors. FSAR 17AA, Part II, Section 1 will be revised to indentify these organizations and their reporting relationships.

- *Clarify the "COM 17AA-001" references in section 2.7.*

Consistent throughout the COLA, the commitments listed in FSAR section 1.1.1.9 are indicated in the text using [START COM ## - ###] and [END COM ## - ###] where ## - ### indicates the commitment number. Commitment COM 17AA-001 reads "The independent review program shall be functional prior to initial core loading."

- *Clarify if the Fermi 3 new plant oversight manager is required to have one year of experience performing quality verification activities as referenced in section 2.6, second paragraph.*

FSAR 17AA, Part II, Section 2.6 will be revised to require the Director, Quality Management, formerly called the "new plant oversight manager" and the Fermi 3 Quality Assurance Manager, Fermi 3 QA Project Manager during the Design and Construction phase, to each to have one year of experience in performing quality verification activities consistent NEI 06-14, Revision 7.

- *Clarify the Independent Review Body responsibilities by inserting a section title "Independent Review Body" at the appropriate point in section 2.7.*

FSAR 17AA, Part II, Section 2.7 will be revised to add the heading "Independent Review Body" consistent with NEI 06-14, Revision 7.

- *Clarify if all conditions (a) through (e) in section 6.1 are required for procedure review, or if any one condition is sufficient.*

FSAR 17AA, Part II, Section 6.1 will be revised to clarify that the states procedure review is required for any single condition by the use of "or" after condition (d), consistent with NEI 06-14, Revision 7.

Proposed COLA Revision

FSAR Appendix 17AA, Part II will be revised made as indicated below:

1. Sections 4 and 16 will be revised to change "licensee" to "Fermi 3" as appropriate.
2. Section 2.6 will be revised to require the Director, Quality Management, formerly called the "new plant oversight manager" and the Fermi 3 Quality Assurance Manager to each to have one year of experience "in performing quality verification activities".
3. Section 2.7 will be revised to include a heading titled "Independent Review Body."
4. Section 6.1 will be revised to add an "or" after condition (d).

The organizational charts and descriptions for corporate services presented in this response are provided in the revision to the FSAR Appendix 17AA, Part II, Section 1 Fermi 3 QAPD "Organization" provided with RAI 17.5-6.

Markup of Detroit Edison COLA
(Following 5 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

qualification requirements may be established but will not reduce those required by Technical Specifications. Sufficient managerial depth is provided to cover absences of incumbents. When required by code, regulation, or standard, specific qualification and selection of personnel is conducted in accordance with those requirements as established in the applicable Fermi 3 procedures. Indoctrination includes the administrative and technical objectives, requirements of the applicable codes and standards, and the QAPD elements to be employed. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implement a systematic approach to training. Records of personnel training and qualification are maintained.

~~The minimum qualifications of the Fermi 3 new plant oversight manager are to hold an engineering or related science degree and have a minimum of four years of related experience (3 of the 4 years must include 2 years of nuclear power plant experience and 1 year of supervisory or management experience). One year of experience performing quality verification activities.~~ Special requirements shall include management and supervisory skills and experience or training in leadership, interpersonal communication, management responsibilities, motivation of personnel, problem analysis and decision making, and administrative policies and procedures. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications of the individuals responsible for planning, implementing and maintaining the programs for the QAPD are that each has a high school diploma or equivalent and has a minimum of one year of related experience. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

2.7 Independent Review

Activities occurring during the operational phase shall be independently reviewed on a periodic basis. **[START COM 17AA-001]** The independent review program shall be functional prior to initial core loading. **[END COM 17AA-001]** The independent review function performs the following:

a. Reviews proposed changes to the facility as described in the final safety analysis report (FSAR). The Independent Review Body (IRB) also verifies that changes do not adversely affect safety and if a technical specification change or NRC review is required.

The minimum qualifications of the Director, Quality Management, and functional QA manager *are* that *each* holds an engineering or related science degree and a minimum of four years of related experience including two years of nuclear power plant experience, one year of supervisory or management experience, and one year of the experience is in performing quality verification activities.

b. Reviews proposed tests and experiments not described in the FSAR. Changes to proposed tests and experiments not described in the FSAR that do require a technical specification change must be reviewed by the IRB prior to NRC submittal and implementation.

c. Reviews proposed technical specification changes and license amendments relating to nuclear safety prior to NRC submittal and implementation, except in those cases where the change is identical to a previously approved change.

d. Reviews violations, deviations, and reportable events that are required to be reported to the NRC in writing within 24 hours. This review includes the results of investigations and recommendations resulting from such investigations to prevent or reduce the probability of recurrence of the event.

Insert Heading "Independent Review Body"

e. Reviews any matter related to nuclear safety that is requested by the site executive, plant manager, or any IRB member,

f. Reviews corrective actions for significant conditions adverse to quality.

g. Reviews the adequacy of the audit program every 24 months.

A group may function as an IRB. In discharging its review responsibilities, the IRB keeps safety considerations paramount when opposed to cost or schedule considerations. One or more organizational units may collectively perform this function.

1. IRB reviews are supplemented as follows:

   a. A qualified person, independent of the preparer, reviews proposed changes in the procedures as described in the FSAR prior to implementation of the change to determine if a technical specification change or NRC approval is required.

   b. Audits of selected changes in the procedures described in the FSAR are performed to verify that procedure reviews and revision controls are effectively implemented.

   c. Competent individual(s) or group(s) other than those who performed the original design but who may be from the same organization verify that changes to the facility do not result in a loss of adequate design or safety margins.

2. The results of IRB reviews of matters involving the safe operation of the facility are periodically independently reviewed. This review is intended to support management in identifying and resolving issues potentially affecting safe plant operation. This review supplements the existing corrective action programs and audits.

   a. ~~The review is performed by a team consisting of personnel with experience and competence in the activities being reviewed, but independent from cost and schedule considerations and from the organizations responsible for those activities.~~

Replace Text with Insert 2

SECTION 4 PROCUREMENT DOCUMENT CONTROL

Fermi 3 has established the necessary measures and governing procedures to assure that purchased items and services are subject to appropriate quality and technical requirements. Procurement document changes shall be subject to the same degree of control as utilized in the preparation of the original documents. These controls include provisions such that:

- Where original technical or quality assurance requirements cannot be determined, an engineering evaluation is conducted and documented by qualified staff to establish appropriate requirements and controls to assure that interfaces, interchangeability, safety, fit and function, as applicable, are not adversely affected or contrary to applicable regulatory requirements.
- Applicable technical, regulatory, administrative, quality and reporting requirements (such as specifications, codes, standards, tests, inspections, special processes, and 10 CFR 21) are invoked for procurement of items and services. 10 CFR 21 requirements for posting, evaluating and reporting will be followed and imposed on suppliers when applicable. Applicable design bases and other requirements necessary to assure adequate quality shall be included or referenced in documents for procurement of items and services. To the extent necessary, procurement documents shall require suppliers to have a documented QA program that is determined to meet the applicable requirements of 10 CFR 50, Appendix B, as appropriate to the circumstances of procurements (or the supplier may work under ~~the licensees~~ Fermi 3's approved QA program).

Reviews of procurement documents shall be performed by personnel who have access to pertinent information and who have an adequate understanding of the requirements and intent of the procurement documents.

4.1 NQA-1-1994 Commitment

In establishing controls for procurement, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 4 and Supplement 4S-1, with the following clarifications and exceptions:

- NQA-1-1994, Supplement 4S-1
  - Section 2.3 of this Supplement 4S-1 includes a requirement that procurement documents require suppliers to have a documented QAP that implements NQA-1-1994, Part 1. In lieu of this requirement, Fermi 3 may require suppliers to have a documented supplier QAP that is determined to meet the applicable requirements of 10 CFR 50, Appendix B, as appropriate to the circumstances of the procurement.
  - With regard to service performed by a supplier, Fermi 3 procurement documents may allow the supplier to work under the Fermi 3 QAP, including implementing procedures, in lieu of the supplier having its own QAP.

During the operational phase, where temporary procedures are used, they shall include a designation of the period of time during which it is acceptable to use them.

6.1 Review and Approval of Documents

Documents shall be reviewed for adequacy by qualified persons other than the preparer. During the construction phase, procedures for design, construction, and installation shall also be reviewed by QA organization to ensure quality assurance measures have been appropriately applied. The documented review signifies concurrence.

During the operations phase, documents affecting the configuration or operation of the station as described in the FSAR shall be screened to identify those that require review by the IRB prior to implementation as described in SECTION 2 of this QAPD.

To ensure effective and accurate procedures during the operational phase, applicable procedures shall be reviewed, and updated as necessary, based on the following conditions:

(a) following any modification to a system ;

(b) following an unusual incident, such as an accident, significant operator error, or equipment malfunction ;

(c) when procedure discrepancies are found ;

(d) prior to use if not used in the previous two years ; or

(e) ~~QA audits are conducted in accordance with Sections 18.1 of this QAPD~~

results of QA audits conducted in accordance with Part II, Section 18.1.

Prior to issuance or use, documents including revisions thereto, shall be approved by the designated authority. A listing of all controlled documents identifying the current approved revision, or date, is maintained so personnel can readily determine the appropriate document for use.

6.2 Changes to Documents

Changes to documents, other than those defined in implementing procedures as minor changes, shall be reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated. The reviewing organization shall have access to pertinent background data or information upon which to base their approval. Where temporary procedure changes are necessary during the operations phase, changes that clearly do not change the intent of the approved procedure may be implemented provided they are approved by two members of the staff knowledgeable in the areas affected by the procedures. Minor changes to documents, such as inconsequential editorial corrections, do not require that the revised documents receive the same review and approval as the original documents. To avoid a possible omission of a required review, the type of minor changes that do

SECTION 16 CORRECTIVE ACTION

Fermi 3 has established the necessary measures and governing procedures to promptly identify, control, document, classify and correct conditions adverse to quality. Fermi 3 procedures assure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with regulatory requirements and applicable quality standards. Fermi 3 procedures require personnel to identify known conditions adverse to quality. When complex issues arise where it cannot be readily determined if a condition adverse to quality exists, Fermi 3 documents establish the requirements for documentation and timely evaluation of the issue. Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality and significant adverse trends are documented and reported to responsible management. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken.

Fermi 3

In the case of suppliers working on safety-related activities, or other similar situations, ~~the licensee~~ may delegate specific responsibilities of the Corrective Action program but ~~the licensee~~ maintains responsibility for the program's effectiveness.

Fermi 3

16.1 Reporting Program

~~Fermi 3 has in-place the necessary measures and governing procedures that implement a program to identify, evaluate and report defects and noncompliances in accordance with 10 CFR 50.55(e) and/or 10 CFR Part 21, as applicable. Such a reporting program applies to safety-related activities and services performed by Fermi 3 and/or Fermi 3 suppliers / sub-suppliers providing input to the COL application development.~~

16.2 NQA-1-1994 Commitment

In establishing provisions for corrective action, Fermi 3 commits to compliance with NQA-1-1994, Basic Requirement 16.

Fermi 3 has the necessary measures and governing procedures that implement a reporting program that conforms to the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR Part 21 during COL design and construction, and 10 CFR 21 during operations.

Attachment 9
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3354)

RAI Question No. 02.04.02-1

NRC RAI 02.04.02-1

The NRC staff request the following information in support of its review of the application:

- *The source of information used for the rainfall intensity for various return periods.*
- *Details for the derivation of the time of concentrations for the drainage subareas as shown in Table 2.4-213. The rational for choosing the 5-minute duration of PMP for calculation of the local flood should be provided for the staff review.*
- *The basis for selecting the 5-minute PMP duration (pg 2-441).*
- *A description of all assumptions used in calculating the local PMP run-off level, such as snowpack on the ground, drainage/culvert blockage, back water from Swan Creek, and any additional assumptions that were used in the calculation of run-off.*
- *The source of the multiplying factors used in Table 2.4-211 since these are different from the factors in HMR52.*
- *An evaluation of the effects of snowpack on PMP/PMF analysis. The evaluation for the PMF should include the most severe flooding condition including spring snowmelt for surrounding watershed.*
- *Information for the run-off and erosion protection for the slopes along the elevated area containing the safety related structures. The information should include pertinent information regarding the flow over the slopes and any necessary erosion protection.*
- *Data or figure representing the historical records of water levels for Lake Erie from 1860 to present. The historical records prior to 1970, are not provided or discussed in the FSAR. The FSAR should either include complete information in Section 2.4.2.1 or, If only post-1970 records are used in the derivation of the 100-year lake level for Lake Erie (Section 2.4.5.2.2.1), the applicant should provide justification that the derivation is appropriate and conservative.*

Response

The responses as well as the proposed COLA revisions are presented below in the order of the questions presented.

1. *The source of information used for the rainfall intensity for various return periods.*

US Department of Commerce Weather Bureau, "TP 25 Rainfall Intensity – Duration – Frequency Curves for Selected Stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico" (TP-25) provides rainfall intensities. TP-25 was used to obtain the Rainfall Intensity – Duration – Frequency (IDF) Curves for Detroit, Michigan. For clarity, FSAR Table 2.4-213 will be updated to include a reference to TP-25.

During this review of Table 2.4-213, it was noted that the rainfall intensities for Area S1 and the ten year storm runoff flow for Area N1were not consistent with TP-25. The rainfall intensities were determined for Area S1 and N1 based on TP-25. The flow rates were recalculated and the total discharges in Table 2.4-213 were updated. FSAR Table 2.4-214 is updated to reflect the new runoff flow rates. Section 2.4.2.3 and Table 2.4-213 are also updated to reflect site plan update represented by DTE correspondence to the NRC on August 26, 2009 via DTE letter NRC3-09-0020. The updated data support the analysis and conclusions represented in the COLA.

2. *Details for the derivation of the time of concentrations for the drainage subareas as shown in Table 2.4-213. The rational for choosing the 5-minute duration of PMP for calculation of the local flood should be provided for the staff review.*

US Department of Agriculture, "Urban Hydrology for Small Watersheds," Technical Release 55, dated June 1986, (TR-55) provides methods for determining the time of concentration. Various methods in TR-55 include equations for sheet flow, shallow concentrated flow, and streamflow. For the Fermi 3 raised area, the streamflow component was not applicable and therefore not included. Thus, the time of concentration for the onsite sub-basins was calculated using the equations from TR-55 for sheet flow and shallow concentrated flow. Consistent with TR-55, the time of concentration is determined using the sheet flow equation for the first 300 feet of the flow path. After 300 feet, the time of concentration is determined using the shallow concentrated flow method. The total time of concentration is the sum of the sheet flow and shallow concentrated flow components.

The equations used are shown below.

<u>Sheet Flow</u>

$$T_{c1} := \frac{\left[0.007 \cdot (L \cdot n)^{0.8}\right]}{\left(P2^{.5} \cdot s^{.4}\right)}$$

Where:

T_{c1}= Time of concentration, hr
n = Manning roughness coefficient (Table 3-1, Smooth Surfaces, TR-55)
L = Flow length, ft
P_2= 2-year, 24-hour rainfall, inches (US Department of Commerce Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Duration from 30 Minutes to 24 Hours and Return Periods from 1 to 100 years, dated May 1961, Isopluvial Chart 44)
s = Overland slope, ft/ft

Shallow Concentrated Flow

$$T_{c2} := \frac{L}{V}$$

Where:

T_{c2}= Shallow concentrated flow time of concentration, s
L= Flow length, ft
V= Average velocity, ft/s (Figure 3-1, Paved, TR-55)

Total Time of Concentration

$$T_t = T_{c1} + T_{c2}$$

Where:

T_{c1}= Sheet flow time of concentration, min
T_{c2}= Shallow concentrated flow time of concentration, min

The following table shows the input values used in the above equations to determine the times of concentration.

Inputs for Determining Time of Concentration

	Sheet Flow				Shallow Concentrated Flow		
Section	P2	L	n	S	L	S	V
S1	2.45	300	0.011	0.005	60	0.005	1.45
S2	2.45	300	0.011	0.005	278	0.005	1.45
S3	2.45	300	0.011	0.005	220	0.005	1.45
N1	2.45	300	0.011	0.005	165	0.005	1.45
N2	2.45	280	0.011	0.005	0	0.005	1.45
N3	2.45	300	0.011	0.005	1254	0.005	1.45

3. *The basis for selecting the 5-minute PMP duration (pg 2-441).*

Using the rational method, the time of concentration is equal to the duration. Table 2.4-213 provides the individual sub-basin time of concentrations. As shown in Table 2.4-213, all of the time of concentration values are greater than five minutes. Using a duration that is shorter than the time of concentration, results in higher rainfall intensity and higher runoff flow rates. Therefore, the five minute duration for the entire area is a conservative assumption for the time of concentration.

4. *A description of all assumptions used in calculating the local PMP run-off level, such as snowpack on the ground, drainage/culvert blockage, back water from Swan Creek, and any additional assumptions that were used in the calculation of run-off.*

As stated in FSAR section 2.4.2.3, backwater and culvert/stormdrain blockage were both considered. Backwater is discussed on page 2-440, stating:

> "Due to the minimal 0.6 percent slope within the 10.51 hectare (25.96 acre) N3 area, the storm-runoff from the local PMP storm could create a backwater scenario due to the storm runoff leaving the 8 percent slope of the safety related area."

The potential for culvert and storm drain blockage was discussed on page 2-438;

> "Figure 2.4-217 shows the distribution of flows assuming that all local underground storm drains and culverts are completely clogged."

As stated on page 2-439:

> "The area used in the rational method was the combination of the safety related area and the drainage are N3 because this total area may potentially impact the safety related structures from backwater during the local PMP storm."

This is incorporated into the analysis as follows:

- For determining the water levels due to the local PMP, it was conservatively assumed that all of the culverts and storm drains were completely clogged. Thus, all of the water runoff is assumed to flow overland.

- It was conservatively assumed that the flow rate from the local PMP is based on the entire raised elevation (Areas S1+S2+S3+N1+N2) plus Area N3. This entire flow rate is assumed to concentrate through Area N3 in an assumed rectangular channel. This results in the maximum flow rate through Area N3, resulting in the maximum predicted water elevation. As can be seen on FSAR Figure 2.4-217, the flow rates from Areas S1+S2+S3+N1+N2 do not actually combine but would flow in different directions. This is consistent with the projected flow paths that can be seen from the topographical maps.

Snowmelt is analyzed for the local PMF as described in the response to Request #6, below. To clarify, the FSAR will be updated to include discussion of the assumptions used in the local PMF analysis.

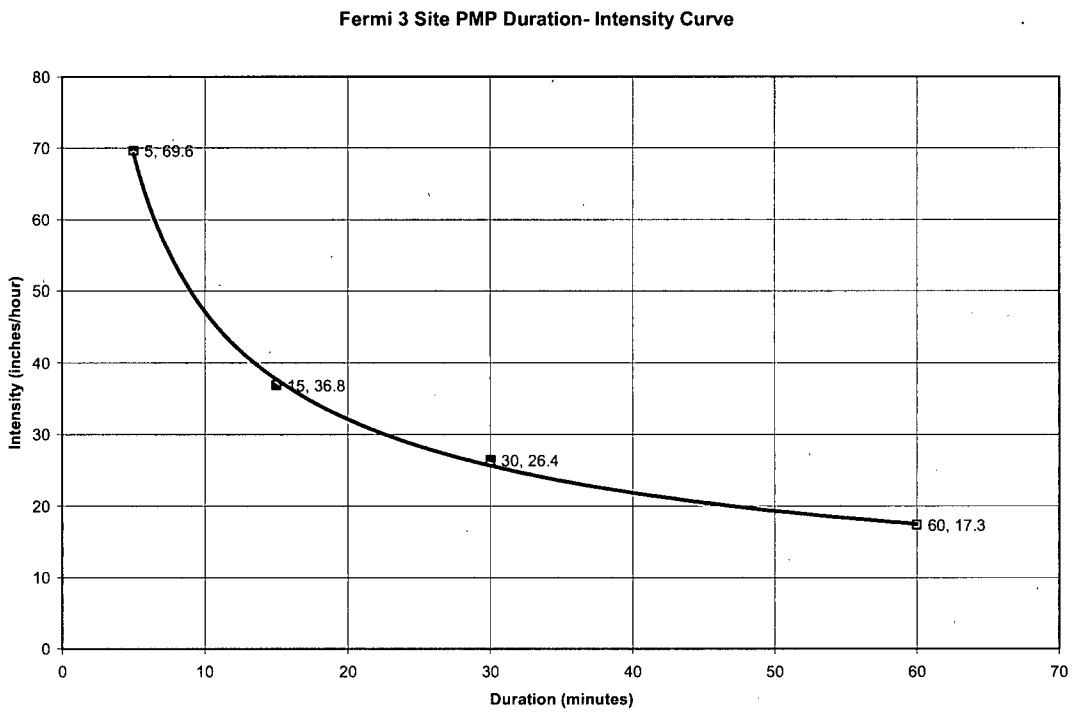
5. *The source of the multiplying factors used in Table 2.4-211 since these are different from the factors in HMR52.*

The source of the multiplying factors used in the analysis is HMR 52, Figures 36, 37 and 38. The values from HMR 52 are shown below. The rainfall intensity values for 5 and 60 minute durations in Table 2.4-211 are consistent with HMR 52. The rainfall intensity values for 15 and 30 minute durations should be updated to be consistent with HMR 52. It is noted that the 5 minute duration rainfall intensity is used in the analysis. Therefore, the analysis is not impacted. FSAR Figure 2.4-

213 should also be updated to reflect the HMR 52 values for the 30 and 60 minute durations. The updated figure is shown below.

HMR 52 Multiplying Factors

Duration (minutes)	1-Hour Multiplier	PMP Depth (inches)
60	1.000	17.3
30	0.762	13.2
15	0.530	9.2
5	0.337	5.8



6. *An evaluation of the effects of snowpack on PMP/PMF analysis. The evaluation for the PMF should include the most severe flooding condition including spring snowmelt for surrounding watershed.*

Regarding the impacts of snowmelt, FSAR Section 2.4.3.1 states:

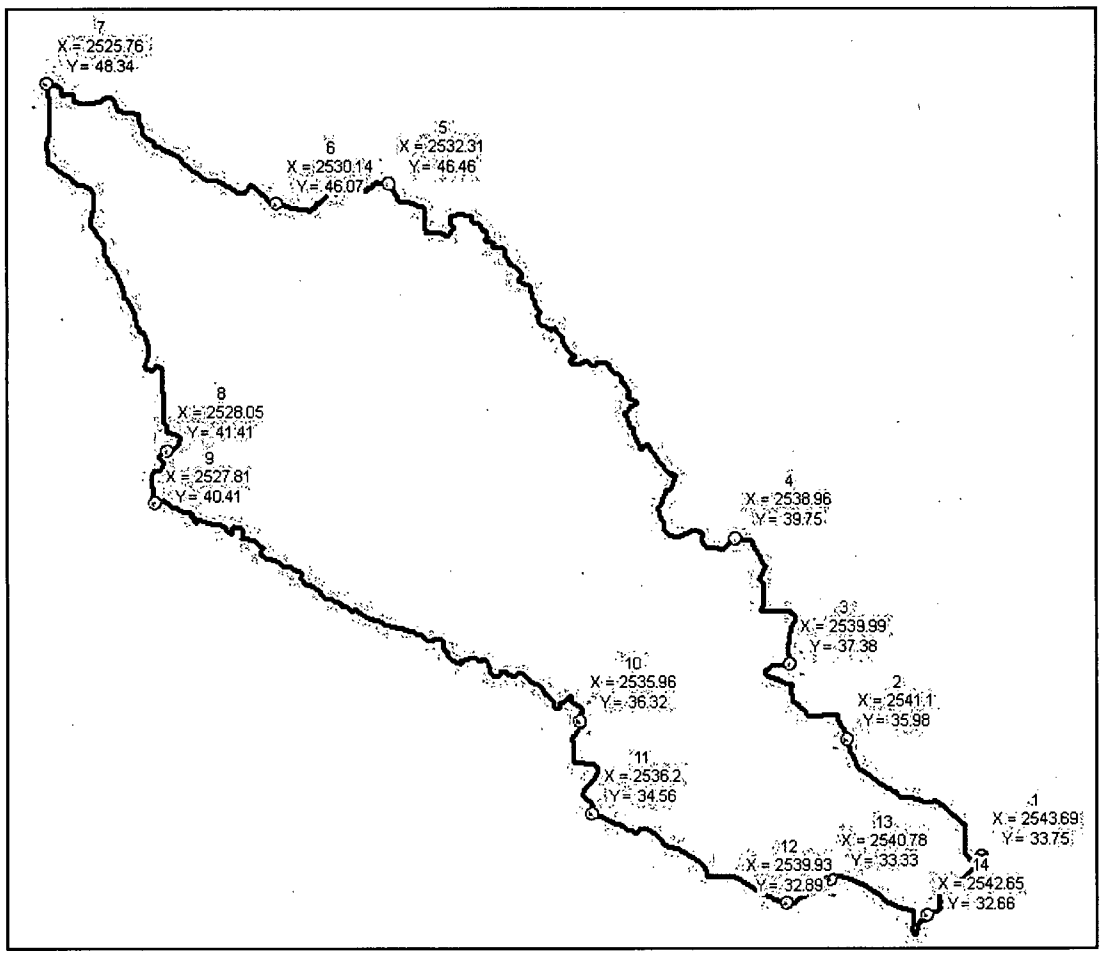
> "Snowmelt and ice effects were not evaluated in the PMP analysis. Minimal impacts due to snowmelts and ice effects are expected due to the relatively flat topography of the area, seasonal Lake Erie water level data, and the historical climatology of the region, mainly pertaining to wind currents, and temperatures."

The evaluation of the impact of snowmelt is organized around requirements stated in ANSI/ANS-2.8-1992 Sections 5.2 and 5.3. Initial snowpack is assumed to cover the whole watershed with no significant variation of temperature or snow depth. The critical sequence of meteorological factors affecting melt are described in the explanation of the equation used. Rainfall total and time distribution was calculated using the Probable Maximum Storm (HMR52) software. Loss and runoff conditions are estimated using the NRCS curve number (CN) method.

-Hourly PMP
A detailed PMP analysis was done to evaluate the impacts of snowmelt in the PMF analysis on Swan Creek Watershed. The HMR52 software package by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers was used to determine the PMP with hourly precipitation depths.

Inputs to the HMR52 software are as follows:

- The figure below shows x and y coordinates (Miles, state plane Michigan South) of the watershed boundary used as inputs.

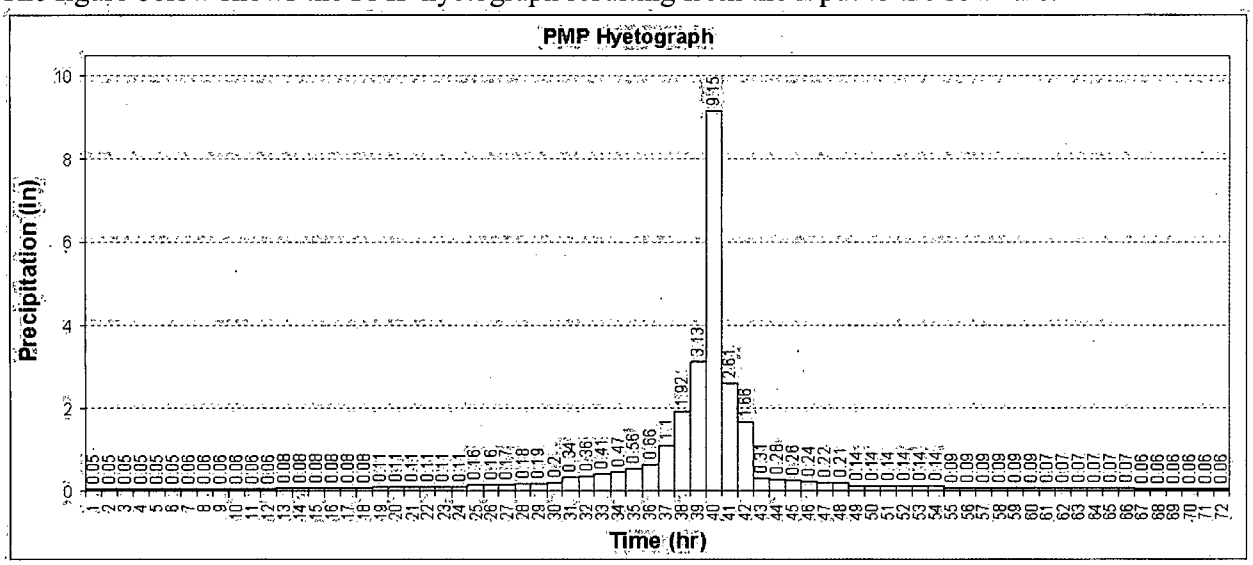


- The recommended storm orientation used was 250° (Figure 8, Ref. 2.4-a)
- Depth-Area-Duration data (Figures 16 through 47, Ref. 2.4-b) is summarized in the table below.

All Season Probable Maximum Precipitaton (inches)					
Storm Size (Mi^2)	Storm Duration (hrs)				
	6	12	24	48	72
10	25.4	28.8	31.0	33.9	35.8
200	17.8	21.2	22.7	25.5	27.3
1000	12.9	15.6	17.5	20.0	22.0
5000	7.8	10.6	12.5	15.8	16.6
10000	6.1	8.6	10.0	13.0	14.7
20000	4.4	6.6	8.4	10.9	12.5

- The SA (input) card in the software was used to steer the program to calculate the storm size and orientation that produces the maximum precipitation. As calculated iteratively these values are respectively 100 Mi^2 and 311°. These parameters were hard coded on the last run of the model.
- The 1-hr to 6-hr ratio used is 0.302 (Figure 39, Ref. 2.4-a). This value is needed to provide a 60 min (1-hr) temporal distribution of the PMP.

The figure below shows the PMP hyetograph resulting from the input to the software.



-Snowmelt

The U.S. Army Corps of Engineers EM 110-2-1406 "Runoff from Snowmelt" (Ref. 2.4-c) was used as guidance for computing snowmelt runoff. The lumped model approach was used, which assumes the progression of each variable through time can be a single computational algorithm that represents the entire basin. The sources of energy affecting snow melt include short-wave and long-wave net

radiation, convection from the air, vapor condensation, and conduction from the ground, as well as energy contained in rainfall.

Whenever sufficient energy is available, some snow (ice) will melt and form liquid water (snowmelt). Snowmelt is held as a liquid in the interstices between snow grains and will increase snow water content. Snowpack is considered "ripe" when it is isothermal at 0 degrees Celsius (32 degrees F) and saturated. Estimates of snowmelt amounts are derived through the use of energy balance equations. Generalized equations were adapted to varying degrees of forest cover. For the Fermi 3 site in Michigan the equation for open or partly forested areas was used. (Equation 5-19, Ref. 2.4-c):

$$M = (0.029+0.0084kV+0.007Pr)(T_a-32)+0.09$$

Where,
M = snowmelt, in/day
k = basin wind coefficient
V = wind velocity, miles/hr
Pr = rate of precipitation, in/day
T_a = temperature of saturated air, °F

This equation assumes constant shortwave radiation and ground melt. The atmosphere was assumed to be saturated, which allows the option to equate dew-point temperature to air temperature. This assumption would be valid under PMP conditions. For the 2-year wind speed we evaluated historical data used for the surge and seiche analysis, Section 2.4.5, and chose a max value from the hourly readings for a more conservative calculation.

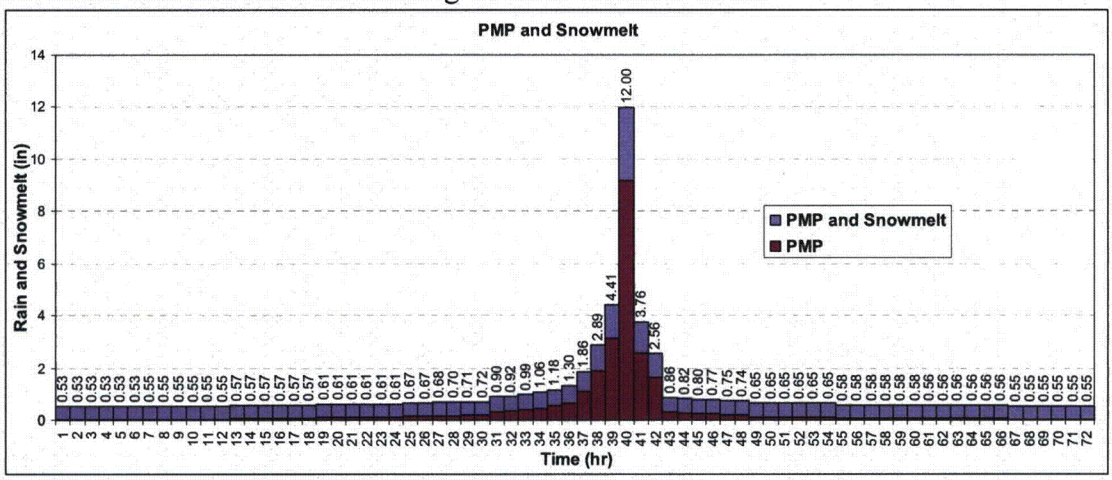
A value of one was used for the basin wind coefficient k, which represents unforested plains (some wooded areas exist in the watershed but in lieu of a detailed analysis of land cover, a conservative value of the coefficient was used). Precipitation rate was calculated from the PMP hyetograph.

A plausible scenario is that snow has fallen and temperatures remain low enough to allow snow accumulation on the ground through winter, and at the beginning of spring a saturated air mass with high temperature produces a rainfall event of the magnitude of the PMP. Inspection of historical monthly temperature averages and maxima showed that April is a month where relatively high temperatures can occur after freezing or lower temperatures have been maintained. These conditions are required for the PMP on snow to occur, so the April values were used.

The wind velocity and temperature was calculated by performing a statistical analysis of historical wind velocities and dewpoints measured in April at the Detroit Metropolitan Airport meteorological station. During a PMP event it is assumed that rainwater temperature is equal to air temperature (Ref. 2.4-c) and that dewpoints are representative of air temperature (Ref. 2.4-d). The maximum hourly windspeeds and dewpoints for the month of April were compiled for each year on record (34 years, 1961-1995). An extreme value frequency analysis was done to determine the hourly windspeed with an annual (in April) exceedance probability of 50% (2-yr hourly windspeed) and the hourly dewpoint with an annual (in April) exceedance probability of 1% (100-yr dewpoint). The

estimated max 2-yr windspeed and the 100-yr dewpoint are respectively 52.3 Km/h (32.5 mph) and 20.6 °C (69.1 °F). In lieu of a detailed analysis of temporal variations of windspeeds and dewpoints the max hourly values were assumed to be constant over the 72hr PMP (a conservative assumption).

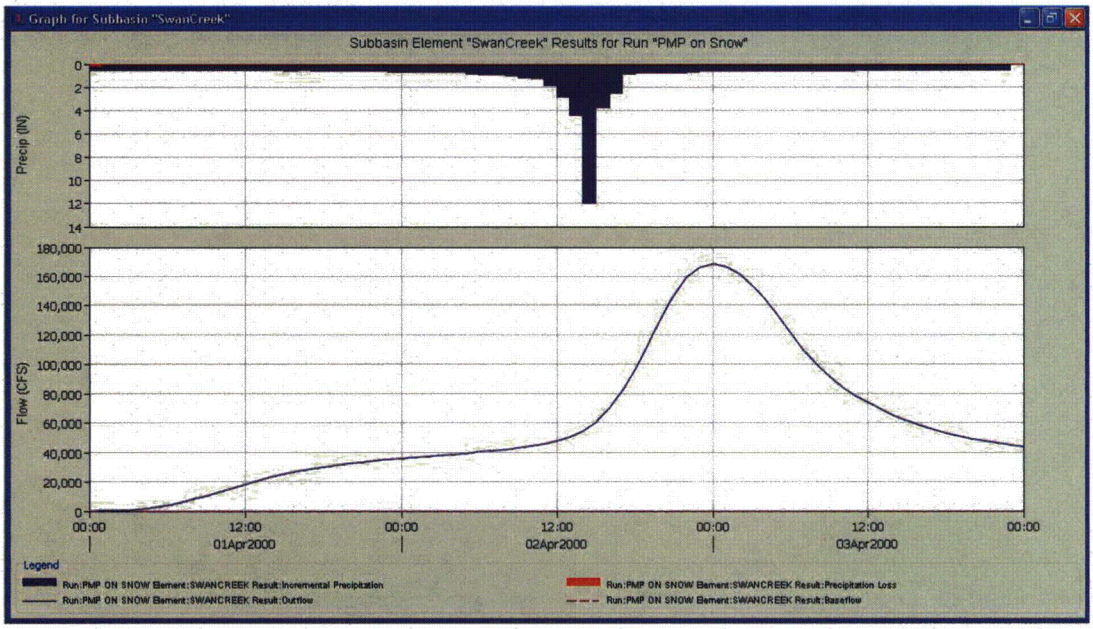
The figure below shows results of the snowmelt analysis in the form of total depth of rain and snowmelt available for runoff during the PMP on snow event.



-Runoff and Streamflow

Runoff and runoff transformation into streamflow calculations were run using HEC-HMS 3.1.0 software using the CN method. A CN of 98 was used to represent completely saturated ground conditions, a conservative but plausible situation under "ripe" snow conditions. Initial abstractions where calculated using the NRCS default (Ia = 0.2 S, where S = (1000 – 10 CN) / CN = 0.2 in). The transformation into streamflow was done using the NRCS Dimensionless Unit Hydrograph. The NRCS unit hydrograph lag time (t_{lag}) can be estimated from the time of concentration (t_c) where, $t_{lag} = 3/5\ t_c$. Using the methods discussed in FSAR Section 2.4.3.3, the time of concentration for the Swan Creek watershed was 16.4 hours, and the lag time was 9.84 hours (590.4 minutes). A time interval of 1-hr was selected for the calculations in HEC-HMS.

The estimated peak discharge at the downstream end of Swan Creek due to the PMP on snow was 4.76×10^3 m^3/s (1.68×10^5 cfs). The figure below summarizes the HEC-HMS run results.

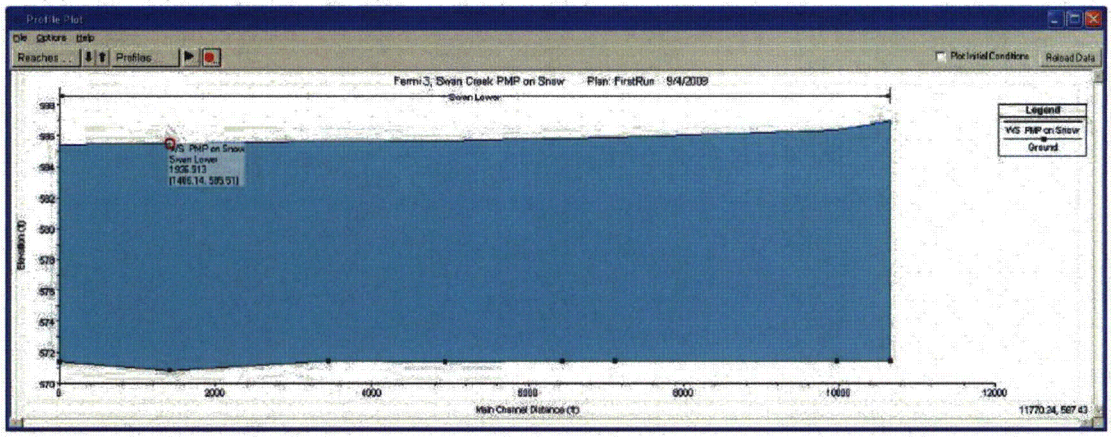


-Water Surface Elevations

The HEC-RAS model as described in FSAR section 2.4.3.5 was used to determine the water surface elevation at the plant site that would result from the PMP on snow runoff.

To evaluate the impact of the worst possible condition the downstream boundary conditions of the model were set to the maximum surge and seiche (still water elevation of 178.4 m (585.4 ft) NAVD88). This setting provides an extreme combination of conditions that would exceed the three scenarios proposed in ANSI-2.8-1992. The flow modeled was 4.76×10^3 m^3/s (1.68×10^5 cfs), resulting from PMP on snow runoff.

The modeling results show that at station 19+36.913 (Fermi 3 site) the water surface elevation would be 178.46 m (585.51 ft) NAVD88 (see figure below). The nominal plant grade of safety related structures is 179.62 m (589.3 ft) NAVD88. Therefore, the Fermi 3 nominal plant grade elevation would be approximately 1.15 m (3.8 ft) above the Swan Creek PMP on snow flood level. Accordingly, no safety related structures would be impacted by flooding due to the PMP on snow pack.



The analysis discussed in the FSAR, Section 2.4.3, determined a maximum water surface elevation of 585.4 feet NAVD88 without the contribution from snowmelt. Therefore, the contribution to the maximum water surface elevation due to snowmelt is relatively small.

-PMP on Snow at Plant Site

For local drainage on the plant site, the PMP 5-min intensity of 177 cm/hr (69.6 inches/hour) was used to estimate snowmelt. Snowmelt was estimated to be 3.92 cm (1.54 inches) during the 5-minute maximum rainfall intensity, thus producing a rainfall intensity equivalent of 47.0 cm/hour (18.5 inches/hour). The total equivalent intensity product of the PMP on snow is then 224 cm/hour (88.1 inches/hour).

Following the same procedure explained in the FSAR section 2.4.2.3 the Rational Method and Manning's equation were used respectively to calculate runoff and flow depths. When accounting for snowmelt the calculated discharge was 110 m^3/s (3,880 cfs) and the flow depth was 0.91 m (2.97 ft). The existing plant grade is at elevation 177.3 m (581.8 ft) NAVD88 and the nominal plant grade of safety related structures is at elevation 179.6m (589.3 ft) NAVD88. Therefore, the Fermi 3 nominal plant grade elevation would be approximately 1.38 m (4.53 ft) above the local PMP runoff flood level. No safety related structures would be impacted by flooding due to the local PMP runoff.

The analysis discussed in the FSAR, Section 2.4.2.3, determined a maximum water surface elevation of approximately 584.4 feet NAVD88 without the contribution from snowmelt. The contribution from snowmelt results in an increase in the maximum water surface elevation of approximately 0.4 feet. Therefore, the contribution due to snowmelt has a small increase to the maximum water surface elevation.

References

2.4-a NOAA, "Application of Probable Maximum Precipitation Estimates-United States East of the 105th Meridian" Hydrometeorological Report No. 52, August 1982

2.4-b US Army Corps of Engineers Hydrologic Engineering Standard, "Probable Maximum Storm, HMR 52 User's Manual" March 1984.

2.4-c U.S. Army Corps of Engineers, "Runoff from Snowmelt. EM 1110-2-1406" March 1998.

2.4-d American Nuclear Society, "Determining design basis flooding at power reactor sites," an American National Standard, ANSI/ANS-2.8-1992, 1992
2.4-e NOAA, "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian" Hydrometeorological Report No. 51, June 1978
2.4-f US Army Corps of Engineers Hydrologic Engineering Standard, "Probable Maximum Storm, HMR 51 User's Manual" March 1984.

7. *Information for the run-off and erosion protection for the slopes along the elevated area containing the safety related structures. The information should include pertinent information regarding the flow over the slopes and any necessary erosion protection.*

To prevent erosion on the 8% slopes of the elevated area, a storm water collection system will be designed to collect the runoff before it has a chance to reach the slopes. Figure 2.4-215 shows the conceptual storm water collection plan. The runoff will be collected in drop inlets where it will make its way to an outfall pipe at the north canal. Therefore the only runoff that the slopes will see is from direct rainfall onto the slopes. The slope area is small which will results in a small runoff. The small runoff spread over the length of the boundary of the elevated area will result in very low velocities. Erosion does not occur at very low velocities. Detailed design will incorporate best industry practices included in "The Guidebook of Best Management Practices for Michigan Watersheds" to provide added erosion protection to the slopes, even though they are receiving very little runoff. These practices include mulching, seeding, sodding, soil management, trees, shrubs, and ground covers.

8. *Data or figure representing the historical records of water levels for Lake Erie from 1860 to present. The historical records prior to 1970, are not provided or discussed in the FSAR. The FSAR should either include complete information in Section 2.4.2.1 or, If only post-1970 records are used in the derivation of the 100-year lake level for Lake Erie (Section 2.4.5.2.2.1), the applicant should provide justification that the derivation is appropriate and conservative.*

Hourly data were used in the analysis to determine the 100 year lake level for Lake Erie. Hourly data were available from 1970 for the US gauge stations and from 1966 for the Canada gauge stations. Most of the older historical data represent some type of average value. The attached table lists the monthly average water elevation for Lake Erie for the period 1918 through 2007. These data were obtained from the US Army Corps of Engineers, Detroit District web site: http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata/

As expected the monthly average data show lower peak values than the hourly data. For example, the maximum elevation recorded at the Fermi station was 576.22 ft IGLD 85 and occurred in April 1989. The value listed in the attached table for April 1989 is 571.7 ft IGLD 85. Although the values in the table cannot be directly compared to the data used to develop the 100 year lake levels they were used to compare conditions over a long time period to the more recent data used in the 100 year lake level analysis.

At the end of the attached table selected summary statistics are listed including the maximum, minimum, and average values of the period of record. Two time periods are listed; the entire period of record from 1918 through 2007 and the time period used to determine 100 year lake levels from 1970 through 2007. When these data sets are combined and compared, the peak monthly elevations are recorded in the 1970 through 2007 data set, for each month. The time period used in the analysis was selected based on the availability of data. However, this comparison of data sets provides an additional assurance that the time period used in the analysis included the highest recorded lake elevations.

Historic Average Monthly Water Levels for Lake Erie

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1918	570.5	570.3	570.9	570.9	570.8	571.2	571.3	571.2	571.2	570.9	570.9	570.9
1919	570.9	570.9	571.2	571.7	572.4	572.5	572.1	571.8	571.5	571.1	571.0	570.5
1920	569.9	569.4	569.5	570.2	571.0	571.2	571.3	571.3	571.1	570.7	570.6	570.6
1921	570.6	570.5	570.8	571.4	571.7	571.7	571.5	571.2	570.9	570.5	570.4	570.4
1922	570.1	569.8	570.0	571.0	571.4	571.5	571.4	571.1	570.9	570.5	570.0	569.7
1923	569.8	569.4	569.7	570.1	570.5	570.7	570.6	570.4	570.2	569.8	569.6	570.0
1924	570.1	569.9	569.8	570.3	570.8	571.0	571.1	570.9	570.6	570.3	569.8	569.6
1925	569.3	569.2	569.7	570.0	569.9	569.8	569.8	569.8	569.6	569.2	569.2	569.1
1926	568.8	568.6	568.7	569.6	569.9	569.9	569.9	570.0	570.1	570.4	570.3	570.1
1927	569.8	569.6	569.8	570.4	570.6	570.9	570.9	570.7	570.3	570.0	569.8	570.5
1928	570.5	570.5	570.1	570.5	570.8	571.1	571.4	571.3	570.8	570.5	570.4	570.5
1929	570.6	570.8	571.3	572.2	573.0	572.9	572.8	572.4	572.0	571.6	571.5	571.5
1930	572.1	571.9	572.2	572.6	572.6	572.4	572.2	571.7	571.4	570.9	570.5	570.4
1931	570.1	569.8	569.5	569.8	570.1	570.3	570.4	570.2	569.9	569.7	569.4	569.4
1932	570.0	570.3	570.1	570.3	570.5	570.5	570.4	570.2	569.8	569.4	569.3	569.2
1933	569.5	569.4	569.6	570.3	570.8	570.7	570.5	570.1	569.7	569.3	568.9	568.8
1934	568.7	568.3	568.2	568.8	569.0	569.1	569.1	569.0	568.8	568.6	568.2	568.2
1935	568.3	568.2	568.5	568.9	569.3	569.5	569.6	569.6	569.2	568.8	568.8	568.7
1936	568.4	568.2	568.8	569.6	569.9	569.8	569.8	569.5	569.3	569.2	569.0	568.8
1937	569.4	570.0	569.9	570.3	570.9	571.1	571.3	571.1	570.5	569.9	569.6	569.3
1938	569.3	569.7	570.1	570.8	570.8	570.9	571.0	571.0	570.6	570.3	569.9	569.8
1939	569.7	569.7	570.1	570.6	571.0	571.1	571.0	570.9	570.5	570.1	569.9	569.8
1940	569.4	569.3	569.4	570.1	570.5	570.9	570.9	570.8	570.6	570.3	569.9	570.0
1941	570.3	569.9	569.8	570.0	570.1	570.3	570.3	570.0	569.8	569.5	569.3	569.3
1942	569.2	569.4	569.6	570.5	570.8	571.2	571.2	571.1	570.9	570.6	570.5	570.4
1943	570.8	570.5	570.7	571.2	572.1	572.7	572.7	572.5	572.0	571.7	571.4	571.1
1944	570.6	570.5	570.6	571.4	571.9	572.1	571.9	571.6	571.3	570.9	570.7	570.5
1945	570.3	570.1	570.7	571.4	571.8	572.3	572.4	572.1	571.8	571.9	571.6	571.3
1946	571.3	570.9	571.2	571.4	571.6	572.0	572.1	571.8	571.3	570.9	570.7	570.4

Historic Average Monthly Water Levels for Lake Erie

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1947	570.3	570.3	570.2	571.5	572.4	573.0	572.8	572.5	572.2	571.7	571.4	571.2
1948	571.1	570.8	571.3	572.1	572.5	572.5	572.4	572.1	571.7	571.1	570.8	570.6
1949	570.7	570.9	571.1	571.3	571.4	571.4	571.3	571.0	570.6	570.3	569.8	569.8
1950	570.5	571.1	571.1	571.9	572.0	571.9	571.7	571.3	571.2	571.0	570.8	571.2
1951	571.2	571.2	571.9	572.4	572.6	572.6	572.5	572.2	571.9	571.5	571.4	571.6
1952	572.0	572.7	572.8	573.3	573.4	573.3	573.1	572.8	572.5	571.9	571.5	571.5
1953	571.7	571.7	571.9	572.1	572.4	572.7	572.6	572.4	572.0	571.6	571.3	571.1
1954	570.9	570.8	571.3	572.2	572.5	572.4	572.2	572.0	571.7	571.9	571.9	571.9
1955	572.1	571.9	572.4	572.7	572.7	572.6	572.4	572.2	571.8	571.4	571.1	570.9
1956	570.5	570.0	570.6	571.1	572.0	572.2	572.2	572.1	571.8	571.3	570.7	570.6
1957	570.4	570.4	570.6	571.3	571.6	571.7	571.9	571.5	571.1	570.7	570.3	570.4
1958	570.5	569.9	570.0	570.2	570.4	570.5	570.7	570.7	570.5	570.1	569.8	569.5
1959	569.4	569.8	570.2	570.7	571.2	571.1	570.9	570.6	570.3	570.2	569.9	570.2
1960	570.5	570.6	570.6	571.2	571.6	571.9	572.0	571.9	571.6	571.2	570.7	570.4
1961	570.2	570.2	570.9	571.5	572.2	572.1	571.9	571.8	571.6	571.0	570.6	570.4
1962	570.2	570.1	570.4	570.8	570.9	571.0	571.0	570.8	570.5	570.4	570.3	570.1
1963	569.8	569.6	569.8	570.4	570.6	570.6	570.4	570.2	569.9	569.6	569.4	569.2
1964	569.1	569.2	569.5	570.1	570.3	570.2	570.1	569.9	569.7	569.2	568.9	568.9
1965	569.1	569.3	569.8	570.2	570.5	570.5	570.3	570.1	570.0	569.8	569.7	569.8
1966	570.0	570.1	570.4	570.7	571.1	571.1	571.1	570.9	570.6	570.0	570.0	570.5
1967	570.5	570.5	570.6	571.1	571.5	571.5	571.6	571.5	571.2	570.9	570.8	571.1
1968	571.2	571.5	571.5	571.8	571.8	572.0	572.0	571.9	571.6	571.1	571.0	571.0
1969	571.2	571.6	571.6	572.1	572.7	572.9	573.1	572.9	572.4	571.9	571.7	571.7
1970	571.2	571.1	571.3	571.8	572.0	572.2	572.3	572.1	571.8	571.6	571.5	571.6
1971	571.5	571.4	571.9	572.1	572.3	572.4	572.3	572.1	572.0	571.8	571.4	571.4
1972	571.6	571.5	571.9	572.4	572.9	572.9	573.0	572.9	572.7	572.6	572.7	573.0
1973	573.0	573.1	573.4	573.9	573.9	574.1	573.9	573.6	573.1	572.7	572.4	572.4
1974	572.6	572.9	573.5	573.8	573.9	573.8	573.7	573.4	572.9	572.4	572.3	572.5
1975	572.5	572.7	573.1	573.2	573.2	573.4	573.2	573.0	573.1	572.7	572.4	572.3

Historic Average Monthly Water Levels for Lake Erie

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	572.3	572.3	573.4	573.5	573.5	573.4	573.4	573.2	572.7	572.3	571.7	571.4
1977	571.1	570.8	571.4	572.1	572.5	572.3	572.3	572.2	572.1	571.9	571.7	571.8
1978	571.9	571.8	571.9	572.9	573.0	572.8	572.6	572.2	571.9	571.6	571.4	571.2
1979	571.1	571.0	571.5	572.3	572.7	572.8	572.8	572.7	572.6	572.3	572.0	572.1
1980	572.3	572.1	572.2	573.0	573.1	573.1	573.0	573.2	572.9	572.4	571.9	571.7
1981	571.3	571.3	571.8	572.0	572.4	572.7	572.8	572.6	572.5	572.3	572.1	571.9
1982	571.9	571.8	572.3	573.0	572.9	572.9	572.8	572.4	572.0	571.7	571.7	572.0
1983	572.1	572.0	572.1	572.6	573.1	573.1	573.2	573.1	572.6	572.2	572.2	572.5
1984	572.1	572.1	572.6	572.9	572.8	573.2	573.1	572.9	572.6	572.4	572.2	572.0
1985	572.4	572.4	573.5	574.1	573.9	573.8	573.6	573.3	573.0	572.7	573.2	573.4
1986	573.1	573.4	573.8	574.0	574.0	574.3	574.2	574.0	573.6	574.0	573.7	573.8
1987	573.7	573.4	573.3	573.6	573.5	573.4	573.4	573.1	572.8	572.3	572.0	572.1
1988	572.0	572.0	572.0	572.4	572.4	572.2	571.9	571.7	571.4	571.0	571.0	570.9
1989	571.1	571.1	571.1	571.7	571.9	572.6	572.5	572.1	571.9	571.4	571.1	570.8
1990	570.8	571.4	571.9	572.0	572.2	572.3	572.2	572.1	572.1	571.8	571.6	571.7
1991	572.3	572.1	572.3	572.4	572.6	572.6	572.3	572.0	571.7	571.2	571.0	571.0
1992	571.1	571.3	571.6	571.9	572.2	572.2	572.4	572.5	572.5	572.2	572.3	572.3
1993	572.8	572.6	572.7	573.2	573.1	573.0	573.0	572.6	572.2	571.9	571.7	571.8
1994	571.6	571.5	571.8	572.4	572.6	572.6	572.8	572.6	572.2	571.9	571.7	571.6
1995	571.7	571.7	571.8	572.1	572.3	572.4	572.3	572.2	571.7	571.4	571.2	571.1
1996	571.0	571.1	571.4	571.6	572.3	572.8	572.9	572.7	572.6	572.4	572.2	572.4
1997	572.5	572.6	573.5	573.6	573.6	574.2	574.0	573.6	573.3	572.9	572.5	572.5
1998	572.9	573.0	573.3	573.7	573.7	573.4	573.2	572.8	572.4	571.8	571.3	571.0
1999	570.9	571.2	571.5	571.7	571.8	571.8	571.6	571.4	571.0	570.8	570.6	570.4
2000	570.3	570.1	570.3	570.7	571.1	571.5	571.8	571.6	571.2	570.9	570.5	570.3
2001	570.1	570.4	570.7	571.0	571.0	571.2	571.0	570.7	570.3	570.3	570.2	570.5
2002	570.4	570.8	571.0	571.6	571.9	572.0	571.7	571.4	571.0	570.7	570.4	570.3
2003	570.3	570.0	570.2	570.8	571.2	571.5	571.5	571.5	571.0	570.6	570.4	570.5
2004	570.7	570.4	570.7	571.3	571.6	572.1	572.0	571.9	571.7	571.1	570.9	570.9

Historic Average Monthly Water Levels for Lake Erie

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	571.7	571.8	571.9	572.1	572.2	571.9	571.6	571.4	571.1	570.9	570.5	570.4
2006	570.8	571.1	571.3	571.4	571.6	571.7	571.8	571.7	571.4	571.2	571.2	571.4
2007	571.9	571.6	571.8	571.9	572.0	571.8	571.4	571.3	571.2	570.7	570.2	570.4

Entire Period of Record (1918 - 2007)												
Record High	573.7	573.4	573.8	574.1	574.0	574.3	574.2	574.0	573.6	574.0	573.7	573.8
Record Low	568.3	568.2	568.2	568.8	569.0	569.1	569.1	569.0	568.8	568.6	568.2	568.2
Average	570.8	570.8	571.1	571.6	571.8	571.9	571.9	571.7	571.4	571.1	570.8	570.8

Recent Record (1970 - 2007)												
Record High	573.7	573.4	573.8	574.1	574.0	574.3	574.2	574.0	573.6	574.0	573.7	573.8
Record Low	570.1	570.0	570.2	570.7	571.0	571.2	571.0	570.7	570.3	570.3	570.2	570.3
Average	571.7	571.7	572.0	572.4	572.6	572.7	572.6	572.4	572.1	571.8	571.6	571.6

Proposed COLA Revision

1. *The source of information used for the rainfall intensity for various return periods.*

FSAR Table 2.4-213 will be updated to include a reference to TP-25. Table 2.4-213 will also be updated to reflect the rainfall intensity values for area S1 from TP-25. Table 2.4-214 is updated to reflect the new runoff values. A proposed mark-up is attached.

2. *Details for the derivation of the time of concentrations for the drainage subareas as shown in Table 2.4-213. The rational for choosing the 5-minute duration of PMP for calculation of the local flood should be provided for the staff review.*

Section 2.4.2.3, page 2-439, of the FSAR will be updated to include additional detail regarding the methods used to determine the time of concentration values. A proposed mark-up is attached.

3. *The basis for selecting the 5-minute PMP duration (pg 2-441).*

Section 2.4.2.3, of the FSAR will be updated to describe the conservativeness of the 5-minute duration. A proposed mark-up is attached.

4. *A description of all assumptions used in calculating the local PMP run-off level, such as snowpack on the ground, drainage/culvert blockage, back water from Swan Creek, and any additional assumptions that were used in the calculation of run-off.*

Clarification will be added to the FSAR section 2.4.2.3 as to the assumptions that are used in calculating the local PMP. A proposed mark-up is attached.

5. *The source of the multiplying factors used in Table 2.4-211 since these are different from the factors in HMR52.*

Table 2.4-211 will be updated in the FSAR to reflect the multiplier factors from HMR 52. In addition, Figure 2.4-213 will also be updated to reflect the changes to Table 2.4-211. A proposed mark-up is attached.

6. *An evaluation of the effects of snowpack on PMP/PMF analysis. The evaluation for the PMF should include the most severe flooding condition including spring snowmelt for surrounding watershed.*

Section 2.4.2.3 will be updated to reflect the new local snowmelt analysis. Section 2.4.3 will be updated to reflect the new Swan Creek Water snowmelt analysis. A proposed mark-up is attached.

7. *Information for the run-off and erosion protection for the slopes along the elevated area containing the safety related structures. The information should include pertinent information regarding the flow over the slopes and any necessary erosion protection.*

Explanation will be added with respect to erosion control to FSAR section 2.4.2.3, including the appropriate reference document. A proposed mark-up is attached.

8. *Data or figure representing the historical records of water levels for Lake Erie from 1860 to present. The historical records prior to 1970, are not provided or discussed in the FSAR. The FSAR should either include complete information in Section 2.4.2.1 or, If only post-1970 records are used in the derivation of the 100-year lake level for Lake Erie (Section 2.4.5.2.2.1), the applicant should provide justification that the derivation is appropriate and conservative.*

No update is required to the FSAR.

Markup of Detroit Edison COLA
(Following 26 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

canal which then enters the North Lagoon. The North Lagoon will discharge to Swan Creek which feeds Lake Erie, and the South Lagoon will discharge directly to Lake Erie. Figure 2.4-214 and Figure 2.4-215 show the distribution of flows for typical storm events on the existing site area and the final grade area, respectively. Figure 2.4-217 shows the distribution of flows assuming that all local underground storm drains and culverts are completely clogged. The drainage areas for storm water conveyance facilities around the Fermi 3 site are less than 2.6 km^2 (1 mi^2).

Add Insert 1 Here

PMP is defined as the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year, as defined by Hydro-Meteorological Report (HMR) No. 55A. The PMP values for the 275 km^2 (106 mi^2) Swan Creek watershed were developed using HMR No. 51 and No. 52, which were published by NOAA (Reference 2.4-227). These regional PMP values are presented in Subsection 2.4.3. HMR No. 52 lists the multiplying factors to convert the 26 km^2 (10 mi^2) area PMP values to relative 2.6 km^2 (1 mi^2) PMP values. The derived PMP depths and durations are shown in Table 2.4-211. The corresponding PMP intensity duration curve is shown in Figure 2.4-213.

The specific flow-rate for the Fermi 3 site was calculated using the PMP intensity duration curve with the rational method. The rational method is used to determine peak runoff rates from specified areas. The rational method is given by Equation 1:

$$Q = k * C * I * A \qquad \text{[Eq. 1]}$$

where:

Q = runoff in cfs
k = constant = 1 for English units
C = unitless coefficient of runoff
I = intensity in inches/hour
A = drainage area in acres

Rainfall duration is assumed to be equal or greater than the time of concentration for each site drainage area. The corresponding intensity is determined using Figure 2.4-213. The coefficient of runoff, C, is assumed to equal 1.0 in order to conservatively estimate runoff and account for saturated antecedent conditions.

Insert 1

The following assumptions were used in the local PMP analysis. Further explanation can be found later in this section.

- All culverts and storm drains are completely clogged.
- The entire raised elevation (Areas S1+S2+S3+N1+N2) plus Area N3 concentrates through Area N3.
- A rectangular channel will collect the concentrated flow in Area N3 creating a backwater effect.

The backwater effect caused by the local PMP was considered and is discussed later in this section. The effect of snowmelt on the local PMP was considered and is discussed later in this section as well.

Add Insert 2 Here

Storm runoff results for typical design storms, such as the 10-, 25-, 50-, and 100-year storms, are shown in Table 2.4-212 and Table 2.4-213 for the existing sub-basin drainage area and the final grade area, respectively. Table 2.4-214 compares the runoff of the existing site drainage area and the final grade site area for each design storm event. The additional runoff from the typical storm events will have a minimal impact on the site due to the size and slope of the outfall pipe, the final grade design storm flow distribution, and local site topography.

The NRCS Dimensionless Unit Hydrograph Method was also used to calculate the one-hour unit hydrograph and the composite flood hydrograph for the 2.6 km^2 (1 mi^2) drainage area of the Fermi 3 site. This hydrograph is shown on Figure 2.4-216.

Manning's Equation was used to estimate a boundary channel depth that will be required to receive the local runoff from the PMP storm (Reference 2.4-227, Reference 2.4-229 through Reference 2.4-231). Manning's Equation is given by Equation 2, as follows:

$$Q = (k * A * R^{2/3} * s^{1/2}) / n \qquad \text{[Eq. 2]}$$

where:

Q = discharge in cfs
k = constant equal to 1.49 for English units
r = hydraulic radius = A/P_w
A = cross sectional flow area in square ft
P_w = wetted perimeter in ft
s = slope of hydraulic grade line in ft/ft
n = Manning's roughness coefficient for open channel flow

Table 2.4-213 shows that the time of concentration (duration) are all greater than 5 minutes. Therefore, the 5 minute duration for the entire site is conservative.

The channel characteristics used for the Manning's Equation were a bottom width of 23 m (75 ft), vertical sides, a slope of 0.006, and a roughness coefficient of 0.013.

Development of the local PMP runoff water level used a PMP depth at five minutes duration, corresponding to an intensity of 177 cm/hr (69.6 inches/hr) (Figure 2.4-213). The most conservative method of calculation evaluates the potential impact on the safety related area of ~~7.32~~ 7.59 hectares ~~(18.09~~ 18.76 acres), which is the final grade area without considering discharge section N3 (Table 2.4-213). The area used in the rational method was the combination of the safety related area and drainage area N3 because this total area may potentially impact the safety related structures from backwater during the local PMP storm.

Insert 2

US Department of Agriculture, "Urban Hydrology for Small Watersheds," Technical Release 55 (TR-55), dated June 1986, (Reference 2.4-299) provides methods for determining the time of concentration. Various methods in TR-55 include equations for sheet flow, shallow concentrated flow, and streamflow. For the Fermi 3 raised area, the streamflow component was not applicable and therefore not included. Thus, the time of concentration for the onsite subbasins was calculated using the equations from TR-55 for sheet flow and shallow concentrated flow. Consistent with TR-55, the time of concentration is determined using the sheet flow equation for the first 300 feet of the flow path. After 300 feet, the time of concentration is determined using the shallow concentrated flow method. The total time of concentration is the sum of the sheet flow and shallow concentrated flow components.

The equations used are shown below.

Sheet Flow

$$T_{c1} := \frac{\left[0.007 \cdot (L \cdot n)^{0.8}\right]}{\left(P2^{.5} \cdot s^{.4}\right)}$$

Where:

T_{c1}= Time of concentration, hr
n = Manning roughness coefficient (Table 3-1, Smooth Surfaces, FSAR Reference 2.4-299)
L = Flow length, ft
P_2= 2-year, 24-hour rainfall, inches (Reference 2.4.307, Isopluvial Chart 44)
s = Overland slope, ft/ft

Shallow Concentrated Flow

$$T_{c2} := \frac{L}{V}$$

Where:

T_{c2}= Shallow concentrated flow time of concentration, s
L= Flow length, ft
V= Average velocity, ft/s (Figure 3-1, Paved, Reference 2.4-299)

Total Time of Concentration

$$T_t = T_{c1} + T_{c2}$$

Where:

T_{c1}= Sheet flow time of concentration, min
T_{c2}= Shallow concentrated flow time of concentration, min

18.10 hectares (44.72 acres)

This total area is ~~17.83 hectares (44.05 acres)~~. Due to the minimal 0.6 percent slope within the 10.51 hectare (25.96 acre) N3 area, the storm-runoff from the local PMP storm could create a backwater scenario due to the storm runoff leaving the 8 percent slope of the safety related area at a higher velocity than the 0.6 percent slope of the N3 drainage area. Using the rational method, the corresponding runoff for this area is ~~86.8~~ 88.1 m^3/s (~~3,066~~ 3112 cfs). For this discharge, Manning's equation predicts a runoff depth of ~~0.78 m (2.55 ft)~~ 0.79 m (2.59 ft), using the channel characteristics described above. This depth is the local PMP runoff ~~water level~~.

Add Insert 3 Here

Given that the existing plant grade is at elevation 177.3 m (581.8 ft) NAVD 88, the most conservative water level due to PMP runoff at the Fermi 3 site is approximately ~~178.1 m (584.4 ft)~~ 178.2m (584.67) NAVD 88. The nominal Fermi 3 plant grade of safety related structures is 179.6 m (589.3 ft) NAVD 88. Therefore, the Fermi 3 nominal plant grade elevation is approximately ~~1.5 m (4.9 ft)~~ 1.4m (4.5ft) above the local PMP runoff flood level. Accordingly, no safety related structures will flood due to PMP runoff.

Add Insert 4 Here

EF3 COL 2.0-14-A

2.4.3 Probable Maximum Flood on Streams and Rivers

This section determines the PMF of the Swan Creek Watershed, which is located hydrologically above Fermi 3. The guidance of ANSI/ANS-2.8-1992, which is the latest available standard, was used in determining the PMF (Reference 2.4-235).

The Swan Creek Watershed is shown on Figure 2.4-208 (Reference 2.4-260). It has a drainage area of approximately 275 km^2 (106 mi^2). Swan Creek, the main outlet for this watershed and a minor tributary of the western basin of Lake Erie, is located approximately 1.6 km (1 mi) northeast of Fermi 3. Swan Creek is currently ungauged. Consequently, there is no recorded flow data pertaining to historical storm events. However, historical flow rates have been estimated by the Michigan Department of Environmental Quality (MDEQ). The lowest 95 percent and 50 percent exceedance, the harmonic mean, and the 90-day once in 10-year flow (90Q10) for Swan Creek are estimated to be 0, 0.08, 0.13, and 0.03 m^3/s (0, 2.8, 4.6, and 0.9 cfs), respectively. Monthly 50 percent and 95 percent exceedance flows and monthly mean flows are shown on Table 2.4-215.

The MDEQ has estimated Swan Creek's flow rates during typical storm events using the Drainage-Area Ratio (DAR) method on Plum Brook

Insert 3

The effects of snowmelt on the local drainage were also evaluated. For local drainage on the plant site, the PMP 5-min intensity of 177 cm/hr (69.6 inches/hour) was used to estimate snowmelt. Snowmelt was estimated to be 3.92 cm (1.54 inches) during the 5-minute maximum rainfall intensity, thus producing a rainfall intensity equivalent of 47.0 cm/hour (18.5 inches/hour). The total equivalent intensity product of the PMP on snow is then 224 cm/hour (88.1 inches/hour).

Following the same procedure explained earlier in this section, the Rational Method and Manning's equation were used respectively to calculate runoff and flow depths. When accounting for snowmelt the calculated discharge was 110 m^3/s (3,880 cfs) and the flow depth was 0.91 m (2.97 ft). The existing plant grade is at elevation 177.3 m (581.8 ft) NAVD88 and the nominal plant grade of safety related structures is at elevation 179.6m (589.3 ft) NAVD88. Therefore, the Fermi 3 nominal plant grade elevation would be approximately 1.38 m (4.53 ft) above the local PMP runoff flood level. No safety related structures would be impacted by flooding due to the local PMP runoff.

Insert 4

To prevent erosion on the 8% slopes of the elevated area, a storm water collection system will be designed to collect the runoff before it has a chance to reach the slopes. Figure 2.4-215 shows the conceptual storm water collection plan. The runoff will be collected in drop inlets where it will make its way to an outfall pipe at the north canal. Therefore the only runoff that the slopes will see is from direct rainfall onto the slopes. The slope area is small which will results in a small runoff. The small runoff spread over the length of the boundary of the elevated area will result in very low velocities. Erosion does not occur at very low velocities. **[START COM FSAR-2.4-002]** Detailed design will incorporate best industry practices included in "The Guidebook of Best Management Practices for Michigan Watersheds" to provide added erosion protection to the slopes, even though they are receiving very little runoff. These practices include mulching, seeding, sodding, soil management, trees, shrubs, and ground covers. **[END COM FSAR-2.4-002]**

on historical rainfall events and the land characteristics of the watershed. During the first 24 to 30 hours of rainfall, the infiltration and storage capacity factors have a greater effect on rainfall water-flow than after 30 hours, so sequencing the maximum 24 hour period before 30 hours is not conservative. Moreover, sequencing the maximum 24 hour period at the end of the 72-hour rainstorm is not conservative due to the time of concentration of the watershed. The most conservative sequence is shown on Table 2.4-217. This sequence includes the maximum rainfall between 30 to 54 hours of the 72-hour storm.

Add Insert 5 Here

~~Snowmelts and ice effects were not evaluated in the PMP analysis. Minimal impacts due to snowmelts and ice effects are expected due to the relatively flat topography of the area, seasonal Lake Erie water level data, and the historical climatology of the region, mainly pertaining to wind currents and temperature. The local and regional impacts of ice effects are further discussed in Subsection 2.4.7.~~

2.4.3.2 Precipitation Losses

Estimates of precipitation losses for the Swan Creek Watershed are required to determine the direct runoff hydrograph. Surface soils in the Swan Creek drainage area are largely comprised of lacustrine clays, which have a low infiltration capacity. Winter initial losses typically vary from 0 to 0.5 cm (0 to 0.2 inches), and winter infiltration losses typically vary from 0.03 to 0.5 cm/hr (0.01 to 0.2 inches/hr). Summer initial losses typically vary from 1.3 to 3.1 cm (0.5 to 1.2 inches), and minimum summer infiltration losses are approximately 0.1 cm/hr (0.05 inches/hr).

In determining the PMF, the initial loss was calculated to be 0.97 cm (0.38 inches). This was derived from a storage capacity of 4.75 cm (1.87 inches). The average infiltration rate was calculated to be 0.08 cm/hr (0.03 inches/hr) for the entire 72-hour probable maximum storm. These precipitation losses for the 72-hour period specify the general soil behavior of lacustrine clays within the region during wet antecedent conditions, when the moisture capacity of the topsoil is essentially saturated.

2.4.3.3 Runoff and Stream Course Models

ANSI/ANS-2.8-1992 lists the three pertinent alternative combinations to be evaluated in determining the PMF level.

The evaluation of the impact of snowmelt is organized around requirements stated in ANSI/ANS-2.8-1992 Sections 5.2 and 5.3. Initial snowpack is assumed to cover the whole watershed with no significant variation of temperature or snow depth. The critical sequence of meteorological factors affecting melt are described in the explanation of the equation used. Rainfall total and time distribution was calculated using the Probable Maximum Storm (HMR52) software. Loss and runoff conditions are estimated using the NRCS curve number (CN) method.

-Hourly PMP

A detailed PMP analysis was done to evaluate the impacts of snowmelt in the PMF analysis on Swan Creek Watershed. The HMR52 software package by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers was used to determine the PMP with hourly precipitation depths.

Inputs to the HMR52 software are as follows:

- Figure 2.4-XX-1 shows the watershed boundary, including the x and y coordinates (Miles, state plane Michigan South).
- The recommended storm orientation used was 250° (Figure 8, Ref. 2.4-302)
- Depth-Area-Duration data (Figures 16 through 47, Ref. 2.4-303) is summarized in table 2.4-XX-1.
- The SA (input) card in the software was used to steer the program to calculate the storm size and orientation that produces the maximum precipitation. As calculated iteratively these values are respectively 100 Mi^2 and 311°. These parameters were hard coded on the last run of the model.
- The 1-hr to 6-hr ratio used is 0.302 (Figure 39, Ref. 2.4-302). This value is needed to provide a 60 min (1-hr) temporal distribution of the PMP.

Figure 2.4-XX-2 shows the PMP hyetograph resulting from the input to the software.

-Snowmelt

The U.S. Army Corps of Engineers EM 110-2-1406 "Runoff from Snowmelt" (Ref. 2.4-304) was used as guidance for computing snowmelt runoff. The lumped model approach was used, which assumes the progression of each variable through time can be a single computational algorithm that represents the entire basin. The sources of energy affecting snow melt include short-wave and long-wave net radiation, convection from the air, vapor condensation, and conduction from the ground, as well as energy contained in rainfall.

Whenever sufficient energy is available, some snow (ice) will melt and form liquid water (snowmelt). Snowmelt is held as a liquid in the interstices between snow grains and will increase snow water content. Snowpack is considered "ripe" when it is isothermal at 0 degrees Celsius (32 degrees F) and saturated. Estimates of snowmelt amounts are derived through the use of energy balance equations. Generalized equations were

adapted to varying degrees of forest cover. For the Fermi 3 site in Michigan the equation for open or partly forested areas was used. (Equation 5-19, Ref. 2.4-304):

$$M = (0.029+0.0084kV+0.007Pr)(T_a-32)+0.09$$

Where,

M = snowmelt, in/day
k = basin wind coefficient
V = wind velocity, miles/hr
Pr = rate of precipitation, in/day
T_a = temperature of saturated air, °F

This equation assumes constant shortwave radiation and ground melt. The atmosphere was assumed to be saturated, which allows the option to equate dew-point temperature to air temperature. This assumption would be valid under PMP conditions. For the 2-year wind speed we evaluated historical data used for the surge and seiche analysis, Section 2.4.5, and chose a max value from the hourly readings for a more conservative calculation.

A value of one was used for the basin wind coefficient k, which represents unforested plains (some wooded areas exist in the watershed but in lieu of a detailed analysis of land cover, a conservative value of the coefficient was used). Precipitation rate was calculated from the PMP hyetograph (Figure 2.4-XX-2).

A plausible scenario is that snow has fallen and temperatures remain low enough to allow snow accumulation on the ground through winter, and at the beginning of spring a saturated air mass with high temperature produces a rainfall event of the magnitude of the PMP. Inspection of historical monthly temperature averages and maxima showed that April is a month where relatively high temperatures can occur after freezing or lower temperatures have been maintained. These conditions are required for the PMP on snow to occur, so the April values were used.

The wind velocity and temperature was calculated by performing a statistical analysis of historical wind velocities and dewpoints measured in April at the Detroit Metropolitan Airport meteorological station. During a PMP event it is assumed that rainwater temperature is equal to air temperature (Ref. 2.4-304) and that dewpoints are representative of air temperature (Ref. 2.4-226). The maximum hourly windspeeds and dewpoints for the month of April were compiled for each year on record (34 years, 1961-1995). An extreme value frequency analysis was done to determine the hourly windspeed with an annual (in April) exceedance probability of 50% (2-yr hourly windspeed) and the hourly dewpoint with an annual (in April) exceedance probability of 1% (100-yr dewpoint). The estimated max 2-yr windspeed and the 100-yr dewpoint are respectively 52.3 Km/h (32.5 mph) and 20.6 °C (69.1 °F). In lieu of a detailed analysis of temporal variations of windspeeds and dewpoints the max hourly values were assumed to be constant over the 72hr PMP (a conservative assumption).

Figure 2.4-XX-3 shows results of the snowmelt analysis in the form of total depth of rain and snowmelt available for runoff during the PMP on snow event.

-Runoff and Streamflow

Runoff and runoff transformation into streamflow calculations were run using HEC-HMS 3.1.0 software using the CN method. A CN of 98 was used to represent completely saturated ground conditions, a conservative but plausible situation under "ripe" snow conditions. Initial abstractions where calculated using the NRCS default (Ia = 0.2 S, where S = (1000 – 10 CN) / CN = 0.2 in) The transformation into streamflow was done using the NRCS Dimensionless Unit Hydrograph. The NRCS unit hydrograph lag time (t_{lag}) can be estimated from the time of concentration (t_c) where, t_{lag} = 3/5 t_c. Using the methods discussed in FSAR Section 2.4.3.3, the time of concentration for the Swan Creek watershed was 16.4 hours, and the lag time was 9.84 hours (590.4 minutes). A time interval of 1-hr was selected for the calculations in HEC-HMS.

The estimated peak discharge at the downstream end of Swan Creek due to the PMP on snow was 4.76 x 10^3 m^3/s (1.68 x 10^5 cfs). Figure 2.4-XX-4 summarizes the HEC-HMS run results.

-Water Surface Elevations

The HEC-RAS model as described in FSAR section 2.4.3.5 was used to determine the water surface elevation at the plant site that would result from the PMP on snow runoff.

To evaluate the impact of the worst possible condition the downstream boundary conditions of the model were set to the maximum surge and seiche (still water elevation of 178.4 m (585.4 ft) NAVD88). This setting provides an extreme combination of conditions that would exceed the three scenarios proposed in Reference 2.4-226. The flow modeled was 4.76 x 10^3 m^3/s (1.68 x 10^5 cfs), resulting from PMP on snow runoff.

The modeling results show that at station 19+36.913 (Fermi 3 site) the water surface elevation would be 178.46 m (585.51 ft) NAVD88 (Figure 2.4-XX-5). The nominal plant grade of safety related structures is 179.62 m (589.3 ft) NAVD88. Therefore, the Fermi 3 nominal plant grade elevation would be approximately 1.15 m (3.8 ft) above the Swan Creek PMP on snow flood level. Accordingly, no safety related structures would be impacted by flooding due to the PMP on snow pack.

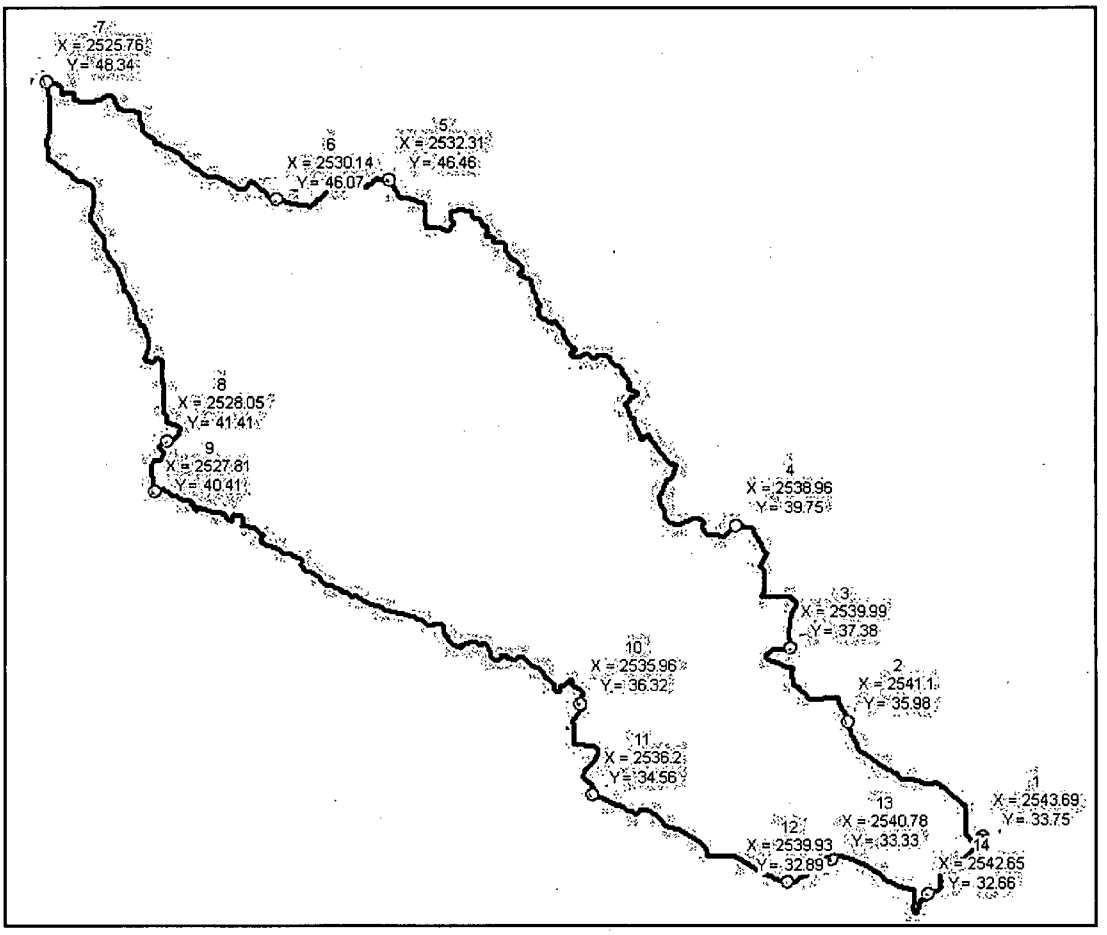
Table 2.4-XX-1, Depth-Area-Duration Data

All Season Probable Maximum Precipitaton (inches)					
Storm Size (Mi^2)	Storm Duration (hrs)				
	6	12	24	48	72
10	25.4	28.8	31.0	33.9	35.8
200	17.8	21.2	22.7	25.5	27.3
1000	12.9	15.6	17.5	20.0	22.0
5000	7.8	10.6	12.5	15.8	16.6
10000	6.1	8.6	10.0	13.0	14.7
20000	4.4	6.6	8.4	10.9	12.5

Source: Reference 2.4-303

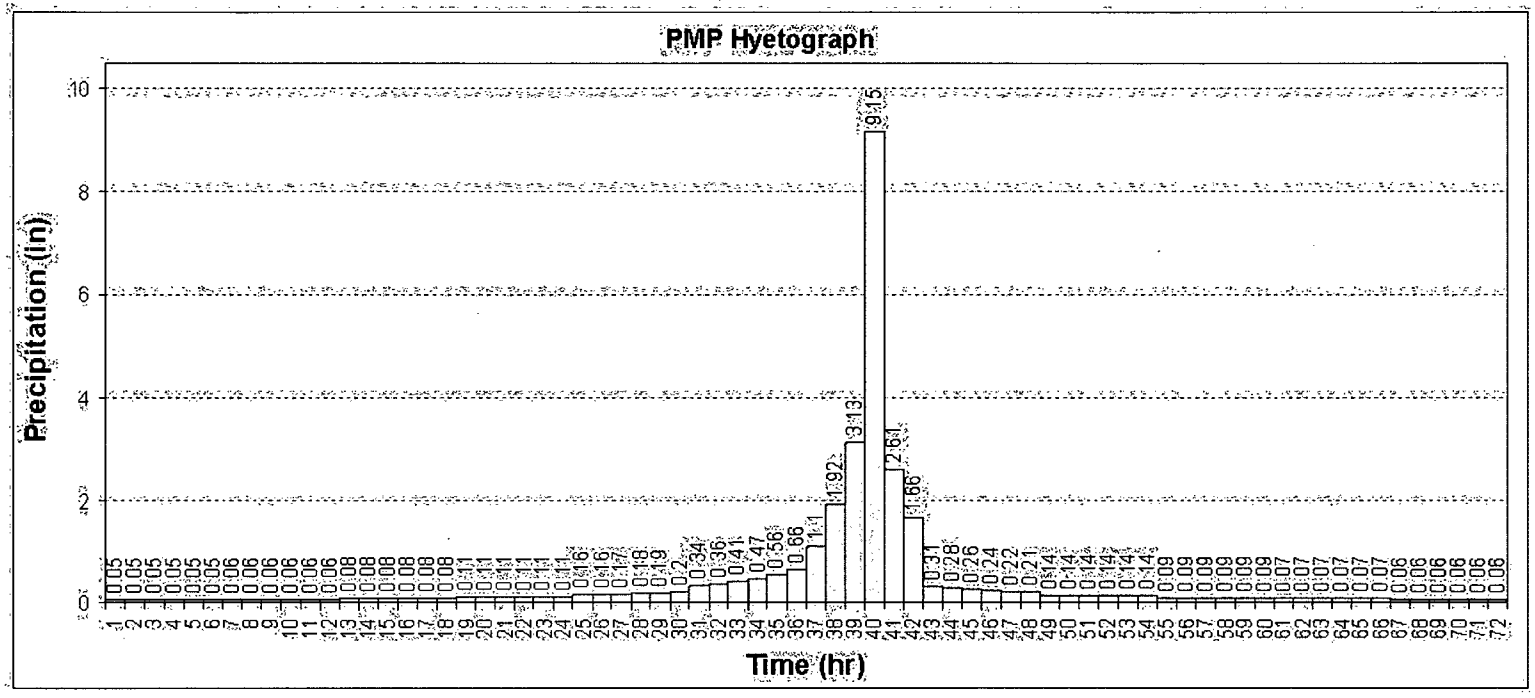
Insert 5, Page 5 of 9

Figure 2.4-XX-1, Watershed Boundary



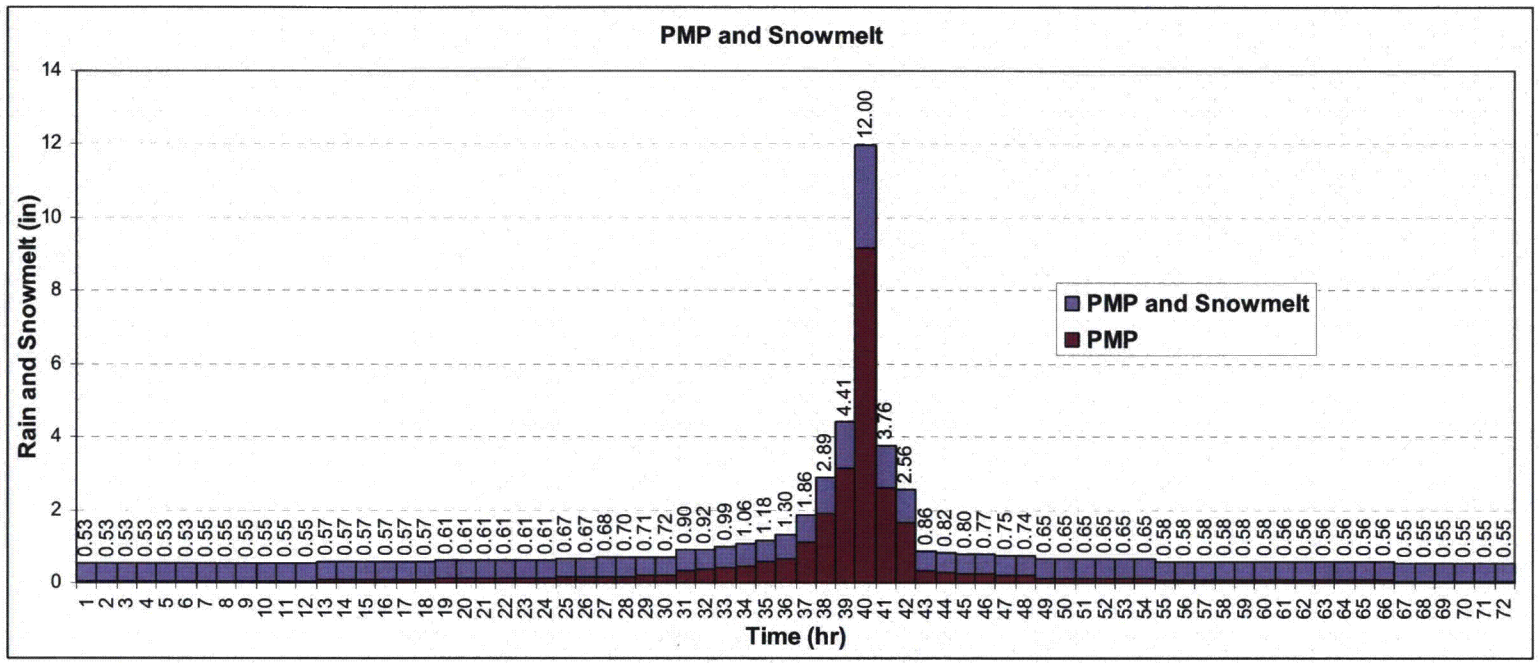
Insert 5, Page 6 of 9

Figure 2.4-XX-2, PMP Hyetograpł



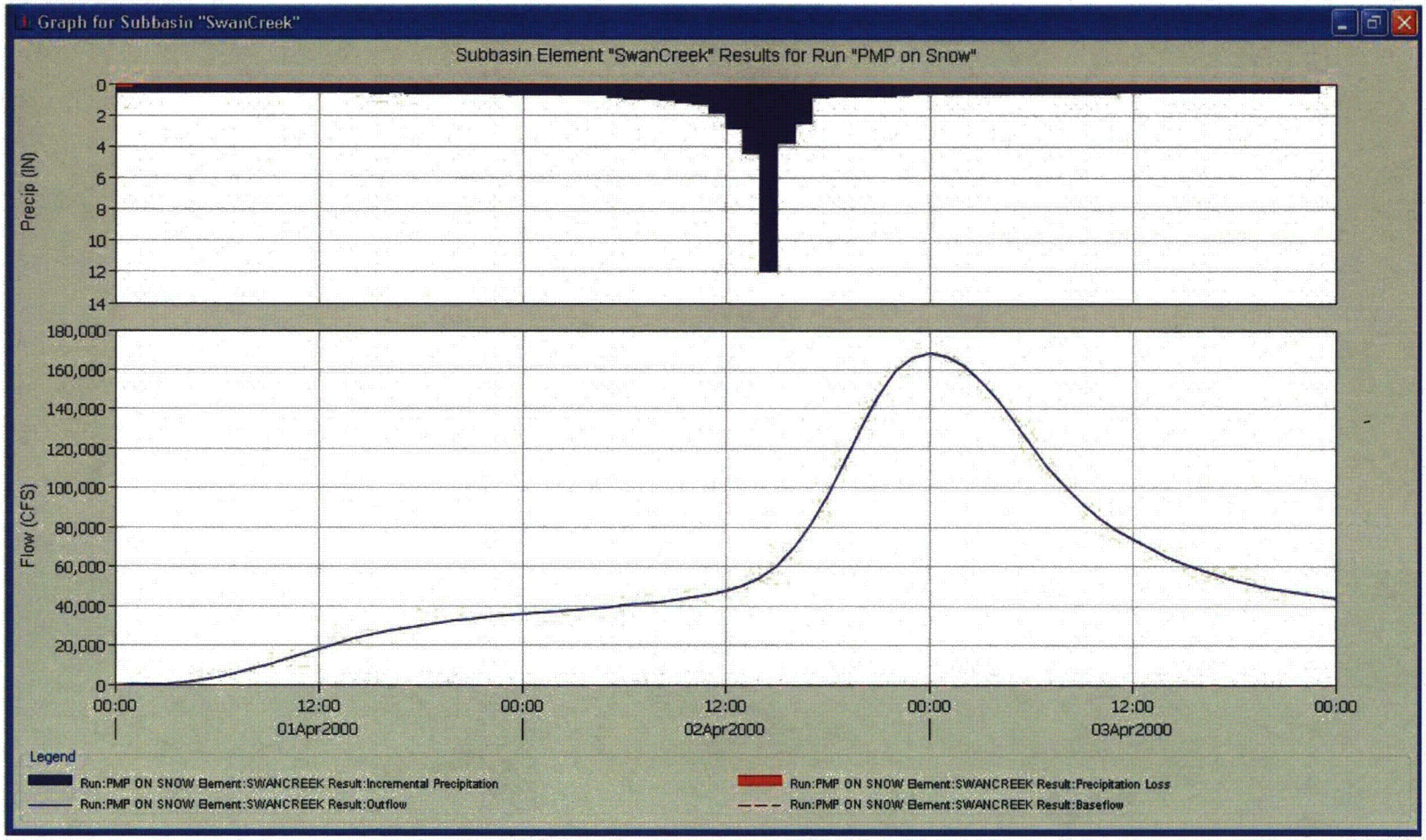
Insert 5, Page 7 of 9

Figure 2.4-XX-3, Results of the Snowmelt Analysis - Total Depth of Rain and Snowmelt Available for Runoff



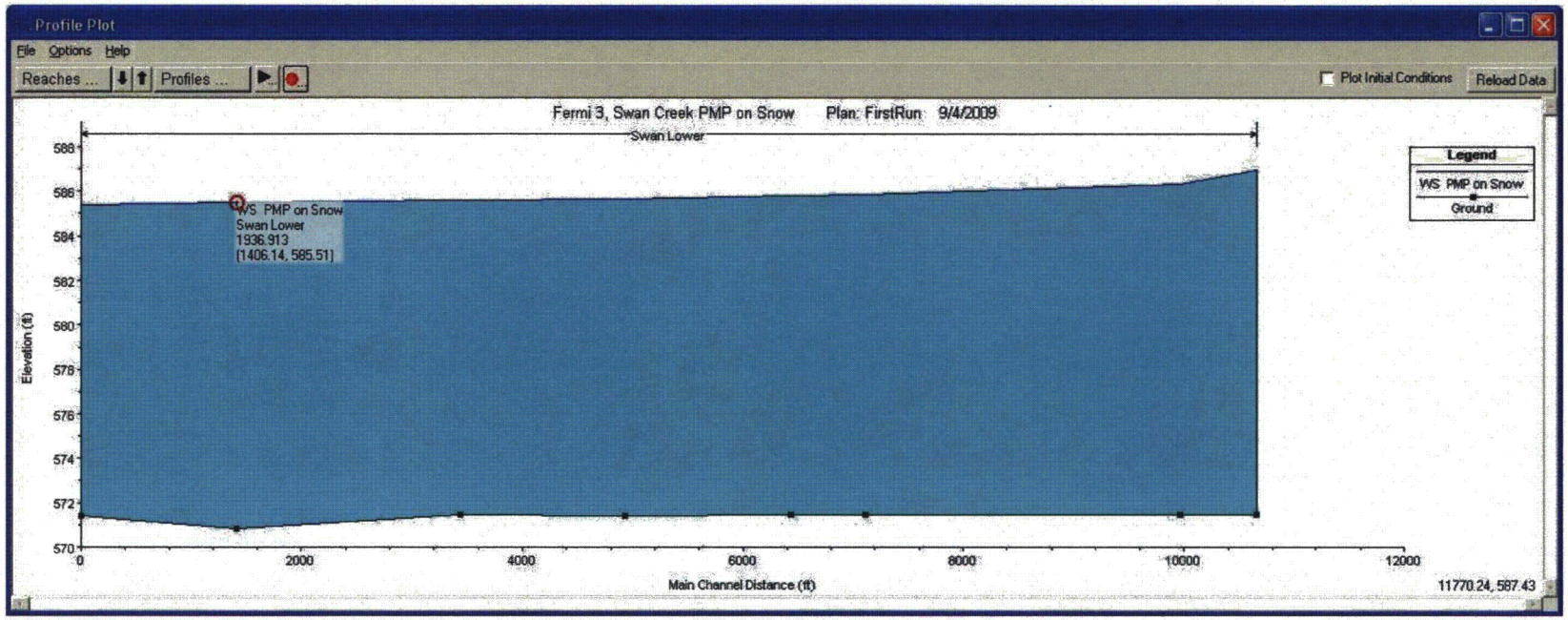
Insert 5, Page 8 of 9

Figure 2.4-XX-4, Summary of HEC-HMS Results



Insert 5, Page 9 of 9

Figure 2.4-XX-5, Water Surface Elevation at Plant



2.4-293 Konikow, L. F., and J. D. Bredehoeft, Computer Model of Two-Dimensional Solute Transport and Dispersion in Ground Water, Chapter C2, Book 7, Techniques of Water-Resources Investigations of the United States Geological Survey, 1978.

Add Insert 6 Here

Insert 6

2.4-298 US Department of Commerce Weather Bureau, "TP 25 Rainfall Intensity – Duration – Frequency Curves for Selected Stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico."

2.4-299 US Department of Agriculture, "Urban Hydrology for Small Watersheds," Technical Release 55, June 1986.

2.4-300 Michigan DEQ Surface Water Quality Division. "Guidebook of Best Management Practices for Michigan Watersheds," Reprinted October 1, 1998.

2.4-302 NOAA, "Application of Probable Maximum Precipitation Estimates-United States East of the 105th Meridian" Hydrometeorological Report No. 52, August 1982.

2.4-303 US Army Corps of Engineers Hydrologic Engineering Standard, "Probable Maximum Storm, HMR 52 User's Manual" March 1984.

2.4-304 U.S. Army Corps of Engineers, "Runoff from Snowmelt. EM 1110-2-1406" March 1998.

2.4-305 NOAA, "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian" Hydrometeorological Report No. 51, June 1978

2.4-306 US Army Corps of Engineers Hydrologic Engineering Standard, "Probable Maximum Storm, HMR 51 User's Manual" March 1984.

3.4-307 US Department of Commerce Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Duration from 30 minutes to 24 hours and return periods from 1 to 100 years. May 1961.

Table 2.4-213 Discharge (Q) from Final Grade Locations Calculated with the Rational Method [EF3 COL 2.0-13-A]

From Detroit, Michigan Rainfall-Intensity Curves

C = Dimensionless coefficient of discharge

A (acres) = Area

T_t (min) = Time of concentration

I_{10} (in/hr) = 10-year storm intensity

I_{25} (in/hr) = 25-year storm intensity

I_{50} (in/hr) = 50-year storm intensity

I_{100} (in/hr) = 100-year storm intensity

Q (cfs) = Storm runoff flow

Add "Insert 7" Here

Section	C	A	T_t	I_{10}	I_{25}	I_{50}	I_{100}	Q_{10}	Q_{25}	Q_{50}	Q_{100}
S1	1	3.85	6.31	3.00	4.00	4.25	4.90	11.55	15.40	16.36	18.87
S2	1	4.79	9.00	5.40	6.50	7.10	8.00	25.87	31.14	34.01	38.32
S3	1	4.15	8.33	5.50	6.60	7.50	8.00	22.83	27.39	31.13	33.20
N1	1	3.98	7.70	5.60	6.80	7.50	8.25	9.00	27.06	29.85	32.84
N2	1	1.32	5.49	6.50	7.50	8.00	9.00	8.58	9.90	10.56	11.88
N3	1	25.96	20.22	3.75	4.50	5.00	5.50	97.35	116.82	129.80	142.78

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Total Discharges

Destination	Q_{10}	Q_{25}	Q_{50}	Q_{100}
North Outfall (S1, S2, S3, N1, N2)	77.82	110.89	121.91	135.10
NW Sump (N3)	97.35	116.82	129.80	142.78
Total	175.17	227.71	251.71	277.88

Insert 7

Section	C	A	T_t	I_{10}	I_{25}	I_{50}	I_{100}	Q_{10}	Q_{25}	Q_{50}	Q_{100}
S1	1	4.48	~~6.31~~ 6.50	~~3.00~~ 6.00	~~4.00~~ 7.00	~~4.25~~ 8.00	~~4.90~~ 8.90	~~13.43~~ 26.88	~~17.90~~ 31.36	~~19.02~~ 35.84	~~21.93~~ 39.84
S2	1	4.60	9	5.40	6.50	7.10	8.00	24.87	29.93	32.69	36.84
S3	1	4.38	8.33	5.50	6.60	7.50	8.00	24.08	28.89	32.83	35.02
N1	1	3.98	7.7	5.60	6.80	7.50	8.25	~~9.00~~ 22.29	27.06	29.85	32.84
N2	1	1.32	5.49	6.50	7.50	8.00	9.00	8.58	9.90	10.56	11.88
N3	1	25.96	20.22	3.75	4.50	5.00	5.50	97.35	116.82	129.80	142.78

Source: Reference 2.4-298

Insert 8

Total Discharges

Destination	Q10	Q25	Q50	Q100
North Outfall (S1, S2, S3, N1, N2)	~~79.95~~ 106.70	~~113.09~~ 127.14	~~124.95~~ 141.77	~~138.50~~ 156.45
NW Sump (N3)	97.35	116.82	129.80	142.78
Total	~~177.30~~ 204.05	~~230.51~~ 243.96	~~254.75~~ 271.57	~~281.28~~ 299.23

Table 2.4-214 Existing Site and Final Grade Runoff Comparison [EF3 COL 2.0-13-A]

	Total Discharges			
	Q_{10}	Q_{25}	Q_{50}	Q_{100}
Existing	131.11	155.45	171.56	189.75
Final Grade	175.17	227.71	251.71	277.88
Additional Runoff	44.06 (33.6%)	72.26 (46.5%)	80.13 (46.7%)	88.13 (46.4%)

Q is storm runoff flow-rate with values of cubic feet per second (cfs)

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204.05 243.96 271.57 299.23

Total Discharges

	Q10	Q25	Q50	Q100
Existing	131.11	155.45	171.56	189.75
Final Grade	~~177.30~~	~~230.51~~	~~254.75~~	~~281.28~~
Additional Runoff	~~46.19 (35.2%)~~	~~73.06 (46.3%)~~	~~83.19 (48.5%)~~	~~91.53 (48.2%)~~

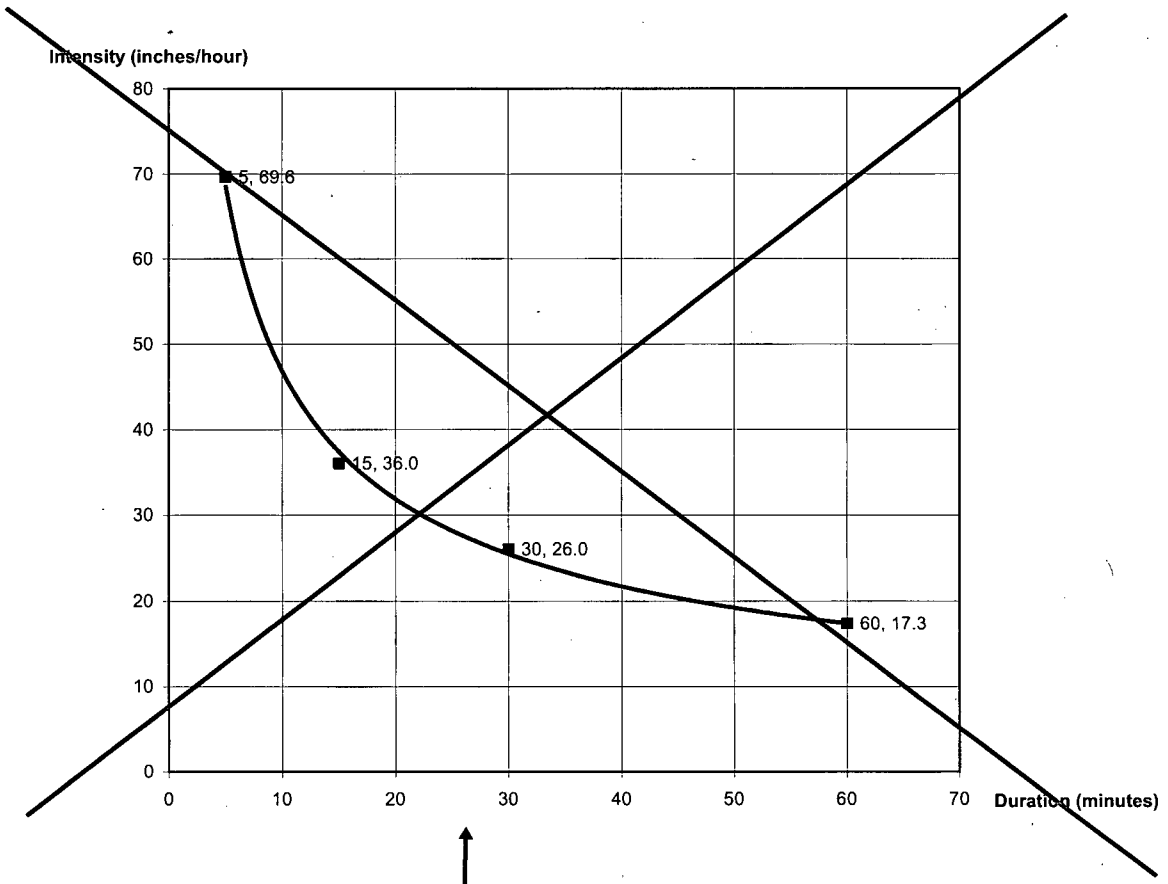
Q is storm runoff flow-rate with values of cubic feet per second (cfs)

72.94 (55.6%) 88.51 (56.9%) 100.01 (58.3%) 109.48 (57.7%)

Table 2.4-211 Local Intense PMP Depth Duration [EF3 COL 2.0-13-A]

	Duration (minutes)	1-Hour Multiplier	PMP Depth (inches)	
	~~720~~	~~1.468~~	~~25.4~~	
	60	1.000	17.3	
0.762	~~30~~	~~0.749~~	~~13.0~~	13.2
0.530	~~15~~	~~0.522~~	~~9.0~~	9.2
0.337	~~5~~	~~0.333~~	5.8	

Figure 2.4-213 Fermi 3 Site PMP Duration-Intensity Curve [EF3 COL 2.0-13-A]



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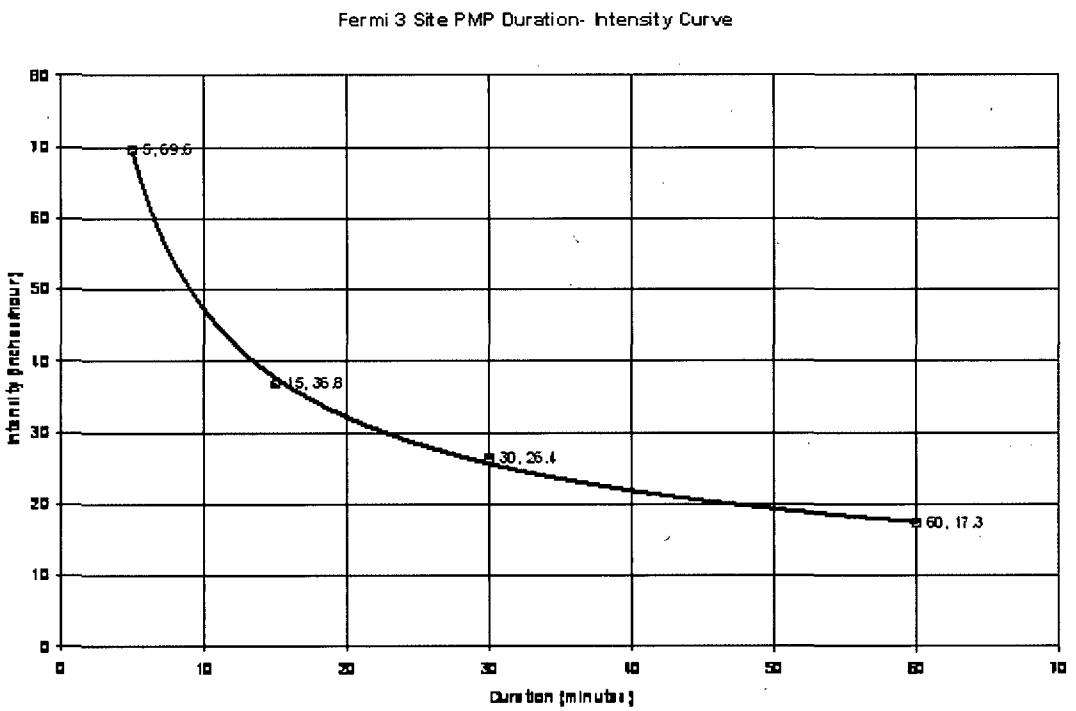
Fermi 3 Site PMP Duration- Intensity Curve
Intensity [inches/hour]
Duration [minutes]
5, 69.6
15, 36.8
30, 26.4
60, 17.3
0
10
20
30
40
50
60
70
80

Attachment 10
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3355)

RAI Question No. 02.04.03-1

NRC RAI 02.04.03-1

The staff has reviewed FSAR Section 2.4.3, Probable Maximum Flood on Streams and Rivers. In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request the applicant provide additional information including the following:

- *Additional information concerning the source of data used to develop several topographic cross-sections of Swan Creek (Figures 2.4-220 to 2.4-228) and additional information discussing the applicant's development and delineation of the creek on Figure 2.4-218. The source of the information to derive the cross-sections at locations of Swan Creek is not discussed. The Swan Creek boundary in the figure is not clear.*

- *Additional information on flow rates and basin characteristics for nearby, gauged streams that were used to estimate the flow rates of various return periods for Swan Creek. On pages 2-442 and 2-443, the Plum Brook watershed near Utica was used to estimate the 10%, 2%, 1%, 0.5% and 0.2% peak flows of Swan Creek. The applicant should provide justification for the use of Plum Brook to make the estimation and the process used to apply gauged stream estimates to Swan Creek. Additionally, the applicant should provide an updated estimate of the flow rates for Swan Creek after the gauged steam(s) is selected.*

- *Information on the calculations for precipitation losses and the discussion of the determination of composite CN value for the Swan Creek watershed used in the PMF calculation. The application does not clearly identify if precipitation losses (initial losses and constant rate losses) were considered in deriving the excess flows of Swan Creek using the NRCS method. The applicant should provide the details used to make the determination of CN.*

- *Provide information on the justification for ice jam determination for local area and lake. The applicant claimed that no historical ice jam was observed along Swan Creek during the audit although no basis was provided. The applicant should demonstrate that a reasonable search has been conducted.*

Response

The responses as well as the proposed COLA revisions are presented below in the order of the questions presented.

1. *Additional information concerning the source of data used to develop several topographic cross-sections of Swan Creek (Figures 2.4-220 to 2.4-228) and additional information discussing the applicant's development and delineation of the creek on Figure 2.4-218. The source of the information to derive the cross-sections at locations of Swan Creek is not discussed. The Swan Creek boundary in the figure is not clear.*

USGS 10 m DEM data was used to delineate the HEC-RAS cross-sections. Please refer to DTE response provided in NRC RAI Letter 8 (RAI 02.04-1) for response to other items in this request.

2. *Additional information on flow rates and basin characteristics for nearby, gauged streams that were used to estimate the flow rates of various return periods for Swan Creek. On pages 2-442 and 2-443, the Plum Brook watershed near Utica was used to estimate the 10%, 2%, 1%, 0.5% and 0.2% peak flows of Swan Creek. The applicant should provide justification for the use of Plum Brook to make the estimation and the process used to apply gauged stream estimates to Swan Creek. Additionally, the applicant should provide an updated estimate of the flow rates for Swan Creek after the gauged steam(s) is selected.*

FSAR Section 2.4.3 states: "The MDEQ has estimated Swan Creek's flow rates during the typical storm events using the DAR method on Plum Brook gauge 04163500..." The Plum Brook watershed data was used to generate the monthly flows for Swan Creek. Peak flow data utilized by the MDEQ for Swan Creek was obtained from the Federal Emergency Management Agency (FEMA) Flood Insurance Study for Monroe County, Michigan, April 20, 2000. Page 12 of this study states that the Swan Creek hydrologic analysis was carried out using TR-20, a computer program that utilizes the parameters of land use, soil types, topography, and precipitation in the development of peak flow rates. The precipitation parameter is based on statistical analysis of historic rainfall records. The drainage-area ratio method was not used to estimate the peak flow rates.

3. *Information on the calculations for precipitation losses and the discussion of the determination of composite CN value for the Swan Creek watershed used in the PMF calculation. The application does not clearly identify if precipitation losses (initial losses and constant rate losses) were considered in deriving the excess flows of Swan Creek using the NRCS method. The applicant should provide the details used to make the determination of CN.*

FSAR Section 2.4.3.3 states: "The land use of the area is estimated as follows: 30 percent small grain, 30 percent forage and pasture, 25 percent row crops, and 15 percent wooded land and buildings." The CN for each, as used in the associated calculation, was 82, 89, 82, and 83 respectively. This yielded a composite CN value of 84.25. The soil type was assumed to be classified as Soil Type D. Even though precipitation losses were calculated, they were not applied to the resultant hydrograph. Essentially the analysis was performed assuming a completely impervious watershed. This produces a more conservative peak flow.

In response to RAI 3354, to address the impacts due to snowmelt, a different approach was taken for the losses. As described in the response to RAI 3354 (Attachment 9 of this letter), a CN of 98 was used to represent a completely saturated ground condition, a conservative, but plausible situation under "ripe" snow conditions. Initial abstractions were calculated using the NRCS default ($Ia = 0.2\ S$, where $S = (1000 - 10\ CN) / CN = 0.2$ in). These losses were applied to the hydrology model to obtain the final PMF.

4. *Provide information on the justification for ice jam determination for local area and lake. The applicant claimed that no historical ice jam was observed along Swan Creek during the audit although no basis was provided. The applicant should demonstrate that a reasonable search has been conducted.*

Historical information regarding ice jams is available from the Corps of Engineers Ice Jam Database: https://rgis.crrel.usace.army.mil/apex/f?p=273:3:1818914186479561

An evaluation was performed of the information in the Corps of Engineers Ice Jam Database and no evidence was found to show ice/snow blockage along the surrounding areas of Fermi 3. Figures 1 through 3 provide screen shots from the Corps of Engineers Ice Jam Database. Figure 1 shows that the closest documented ice jams are along the River Raisin which is approximately 10 miles south of Fermi 3 and doesn't intersect waterways affecting the project site. Figures 2 and 3 show that there are more ice jams on the east side of Lake Erie than on the west side of Lake Erie.

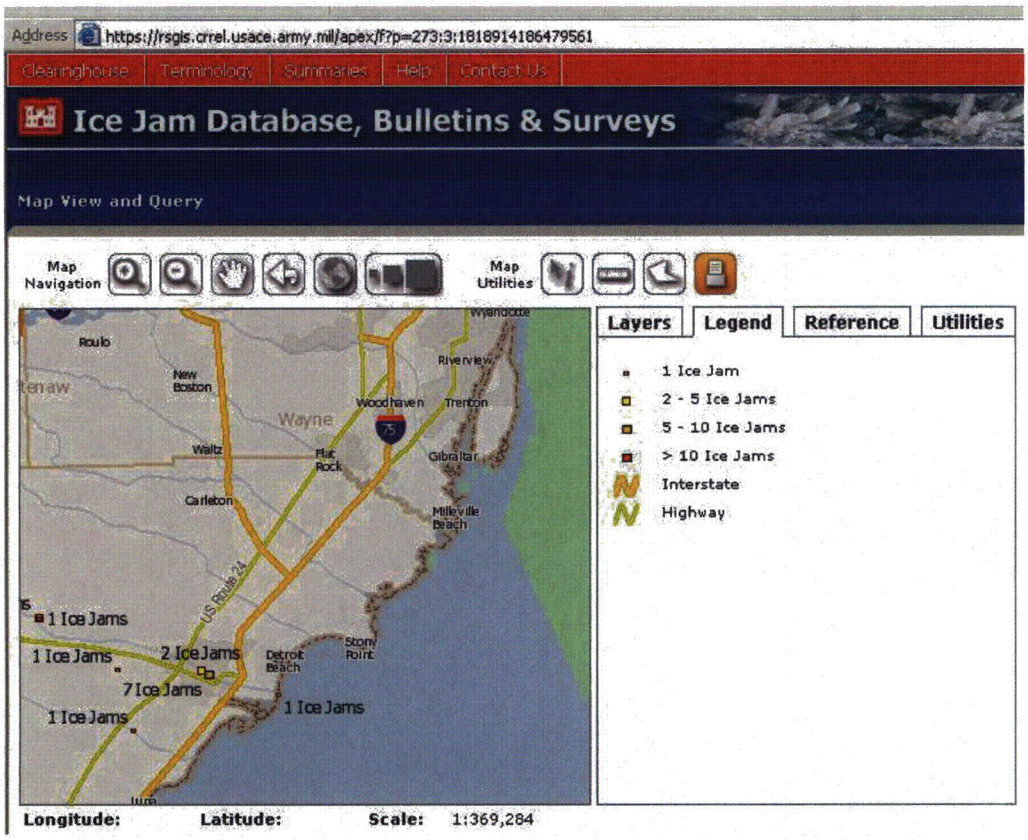

Figure 1
Ice Jams along Raisin River 10 miles from Fermi 3 Site

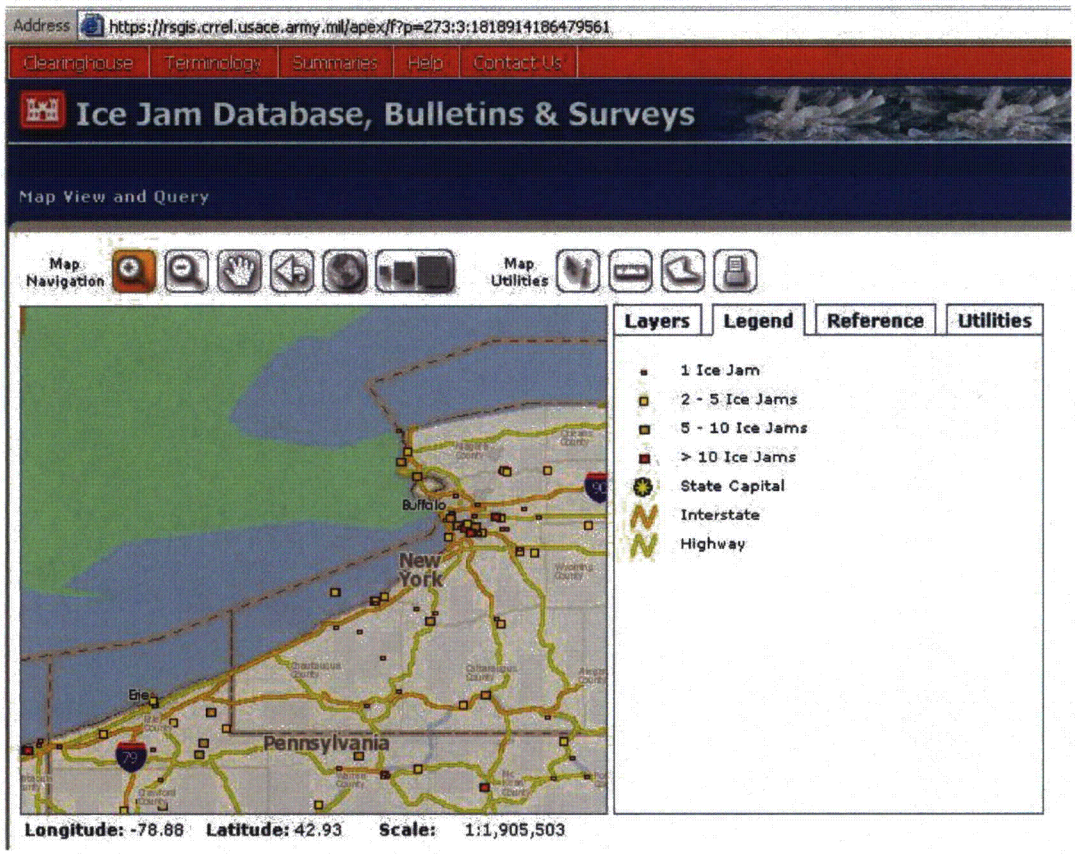

Figure 2
Ice Jams along Eastern Side of Lake Erie

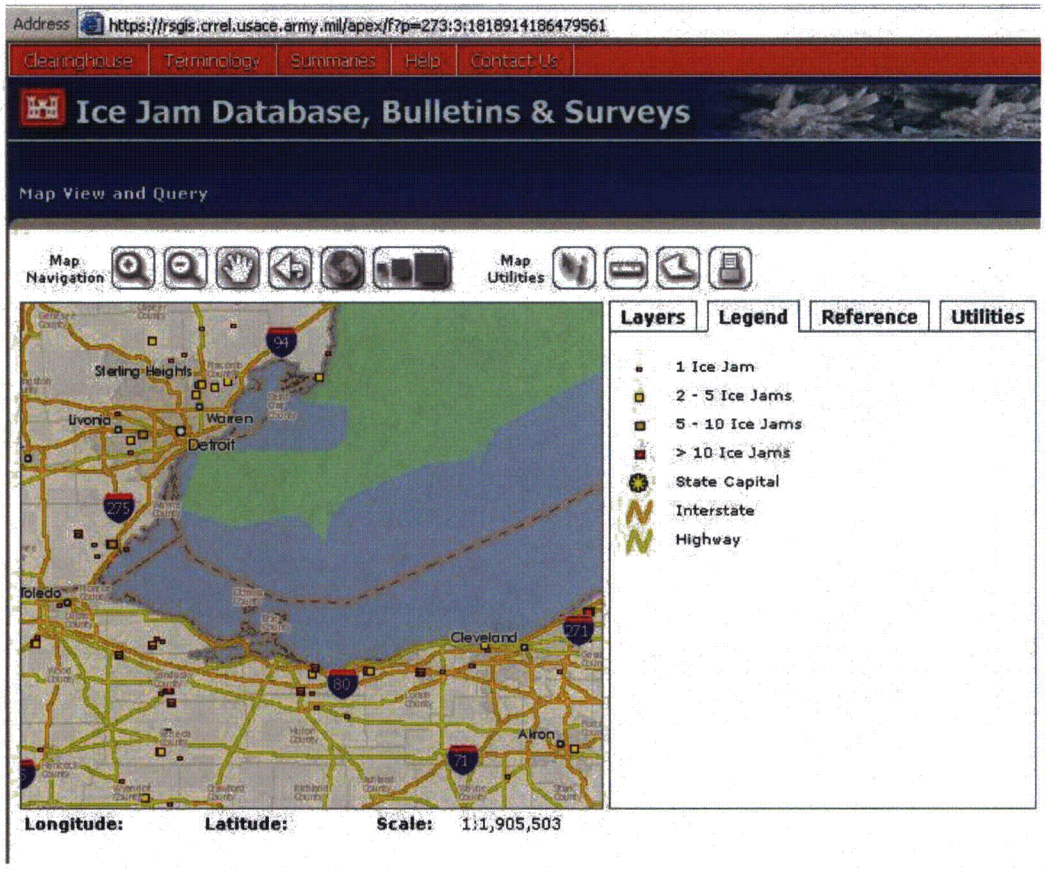

Figure 3
Ice Jams along Western Side of Lake Erie

Proposed COLA Revision

1. *Additional information concerning the source of data used to develop several topographic cross-sections of Swan Creek (Figures 2.4-220 to 2.4-228) and additional information discussing the applicant's development and delineation of the creek on Figure 2.4-218. The source of the information to derive the cross-sections at locations of Swan Creek is not discussed. The Swan Creek boundary in the figure is not clear.*

No update to the FSAR required.

2. *Additional information on flow rates and basin characteristics for nearby, gauged streams that were used to estimate the flow rates of various return periods for Swan Creek. On pages 2-442 and 2-443, the Plum Brook watershed near Utica was used to estimate the 10%, 2%, 1%, 0.5% and 0.2% peak flows of Swan Creek. The applicant should provide justification for the use of Plum Brook to make the estimation and the process used to apply gauged stream*

estimates to Swan Creek. Additionally, the applicant should provide an updated estimate of the flow rates for Swan Creek after the gauged steam(s) is selected.

FSAR Section 2.4.3 will be updated to reflect the above information. A reference to the FEMA flood insurance report will be added. The reference to Plum Brook and the drainage-area-ratio method will be removed and further explanation as to how the peak flow rates were obtained will be added. A proposed mark-up is attached.

3. *Information on the calculations for precipitation losses and the discussion of the determination of composite CN value for the Swan Creek watershed used in the PMF calculation. The application does not clearly identify if precipitation losses (initial losses and constant rate losses) were considered in deriving the excess flows of Swan Creek using the NRCS method. The applicant should provide the details used to make the determination of CN.*

FSAR Section 2.4.3.2 will be updated to reflect the above information. Discussion will be added providing more clarification on the curve numbers used and how the losses were applied. A proposed mark-up is attached.

As part of the response to RAI 3354 (Attachment 9 of this letter), additional discussion will be added describing the losses for the snowmelt analysis, including the new curve number for the area as well as the initial abstraction results.

4. *Provide information on the justification for ice jam determination for local area and lake. The applicant claimed that no historical ice jam was observed along Swan Creek during the audit although no basis was provided. The applicant should demonstrate that a reasonable search has been conducted.*

Section 2.4.7 will be updated to add the above reference to the Corps of Engineers Ice Jam Database as the basis for the discussion in this section. A proposed mark-up is attached.

Markup of Detroit Edison COLA
(Following 9 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

This total area is 17.83 hectares (44.05 acres). Due to the minimal 0.6 percent slope within the 10.51 hectare (25.96 acre) N3 area, the storm-runoff from the local PMP storm could create a backwater scenario due to the storm runoff leaving the 8 percent slope of the safety related area at a higher velocity than the 0.6 percent slope of the N3 drainage area. Using the rational method, the corresponding runoff for this area is 86.8 m^3/s (3,066 cfs). For this discharge, Manning's equation predicts a runoff depth of 0.78 m (2.55 ft), using the channel characteristics described above. This depth is the local PMP runoff water level.

Given that the existing plant grade is at elevation 177.3 m (581.8 ft) NAVD 88, the most conservative water level due to PMP runoff at the Fermi 3 site is approximately 178.1 m (584.4 ft) NAVD 88. The nominal Fermi 3 plant grade of safety related structures is 179.6 m (589.3 ft) NAVD 88. Therefore, the Fermi 3 nominal plant grade elevation is approximately 1.5 m (4.9 ft) above the local PMP runoff flood level. Accordingly, no safety related structures will flood due to PMP runoff.

EF3 COL 2.0-14-A

2.4.3 Probable Maximum Flood on Streams and Rivers

This section determines the PMF of the Swan Creek Watershed, which is located hydrologically above Fermi 3. The guidance of ANSI/ANS-2.8-1992, which is the latest available standard, was used in determining the PMF (Reference 2.4-235).

The Swan Creek Watershed is shown on Figure 2.4-208 (Reference 2.4-260). It has a drainage area of approximately 275 km^2 (106 mi^2). Swan Creek, the main outlet for this watershed and a minor tributary of the western basin of Lake Erie, is located approximately 1.6 km (1 mi) northeast of Fermi 3. Swan Creek is currently ungauged. Consequently, there is no recorded flow data pertaining to historical storm events. However, historical flow rates have been estimated by the Michigan Department of Environmental Quality (MDEQ). The lowest 95 percent and 50 percent exceedance, the harmonic mean, and the 90-day once in 10-year flow (90Q10) for Swan Creek are estimated to be 0, 0.08, 0.13, and 0.03 m^3/s (0, 2.8, 4.6, and 0.9 cfs), respectively. Monthly 50 percent and 95 percent exceedance flows and monthly mean flows are shown on Table 2.4-215.

Add Insert 1 Here

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~~The MDEQ has estimated Swan Creek's flow rates during typical storm events using the Drainage Area Ratio (DAR) method on Plum Brook~~

~~gauge 04163500, which is a 61.6 km^2 (23.8 mi^2) watershed near Utica, MI. Data recorded from 1954 through 1966 was used for these estimates.~~ The Swan Creek 10 percent, 2 percent, 1 percent, 0.5 percent, and 0.2 percent peak flow rates are estimated to be 70, 100, 120, 130, and 140 m^3/s (2500, 3700, 4100, 4600, and 5000 cfs), respectively (Reference 2.4-244).

Other streams and rivers near the Fermi site include Stony Creek, about 5 km (3 mi) southwest, the River Raisin about 9.6 km (6 mi) southwest, and the Huron River about 9.25 km (5.75 mi) north. These water bodies are far enough away from the site that even the most severe flooding would not cause a potential hazard to Fermi 3.

On site flooding due to runoff is covered in Subsection 2.4.2. Seismic information is discussed in detail in Subsection 2.5.1. Seismic events are not expected to have an impact on flooding at the site.

2.4.3.1 Probable Maximum Precipitation

The PMF of Swan Creek was determined based on PMP estimates. The PMP was developed according to the procedures outlined in Hydrometeorological Reports (HMR) No. 51, No. 52, and No. 53 (Reference 2.4-236). The PMP values were estimated based on the size and shape of the Swan Creek Watershed drainage area, in accordance with the procedures outlined in HMR No. 52.

HMR No. 51 data used to generate depth-area-duration curves consisted of historical precipitation maps based on 6 to 72-hour rainfall storms for various watershed areas located east of the 105th meridian. The evaluated watershed areas ranged from 26 to 26,000 km^2 (10 to 10,000 mi^2). The Swan Creek Watershed depth-area-duration curves from 6 to 72-hour rainfall storms were produced by interpolating this data.

As indicated in ANSI/ANS-2.8-1992, an antecedent storm condition was assumed. Furthermore, the isohyetal pattern was oriented over the watershed to obtain the maximum precipitation volume over the entire drainage area. The evaluation yielded a PMP of 79.8 cm (31.4 inches) for the watershed. Table 2.4-216 presents the PMP values for the Swan Creek Watershed.

Guidance from ANSI/ANS-2.8-1992 was followed in determining the time distribution of the PMP. The incremental PMP values were grouped in a critical time sequence that represented the most significant potential rainfall impact within the watershed. This sequence was chosen based

Insert 1

using the Drainage Area Ratio (DAR) method on Plum Brook watershed, gauge 04163500, near Utica, MI.

Insert 1a

The MDEQ estimated the Swan Creek peak flow rates from the FEMA Flood Insurance study for Monroe County, Michigan (Reference 2.4-301). The hydrology analysis, as stated in Reference 2.4-301, page 12, was carried out using TR-20, a computer program that utilizes the parameters of land use, soil types, topography, and precipitation in the development of peak flow rates.

on historical rainfall events and the land characteristics of the watershed. During the first 24 to 30 hours of rainfall, the infiltration and storage capacity factors have a greater effect on rainfall water-flow than after 30 hours, so sequencing the maximum 24 hour period before 30 hours is not conservative. Moreover, sequencing the maximum 24 hour period at the end of the 72-hour rainstorm is not conservative due to the time of concentration of the watershed. The most conservative sequence is shown on Table 2.4-217. This sequence includes the maximum rainfall between 30 to 54 hours of the 72-hour storm.

Snowmelts and ice effects were not evaluated in the PMP analysis. Minimal impacts due to snowmelts and ice effects are expected due to the relatively flat topography of the area, seasonal Lake Erie water level data, and the historical climatology of the region, mainly pertaining to wind currents and temperature. The local and regional impacts of ice effects are further discussed in Subsection 2.4.7.

2.4.3.2 Precipitation Losses

Estimates of precipitation losses for the Swan Creek Watershed are required to determine the direct runoff hydrograph. Surface soils in the Swan Creek drainage area are largely comprised of lacustrine clays, which have a low infiltration capacity. Winter initial losses typically vary from 0 to 0.5 cm (0 to 0.2 inches), and winter infiltration losses typically vary from 0.03 to 0.5 cm/hr (0.01 to 0.2 inches/hr). Summer initial losses typically vary from 1.3 to 3.1 cm (0.5 to 1.2 inches), and minimum summer infiltration losses are approximately 0.1 cm/hr (0.05 inches/hr).

Add Insert 2 Here

~~In determining the PMF, the initial loss was calculated to be 0.97 cm (0.38 inches). This was derived from a storage capacity of 4.75 cm (1.87 inches). The average infiltration rate was calculated to be 0.08 cm/hr (0.03 inches/hr) for the entire 72-hour probable maximum storm. These precipitation losses for the 72-hour period specify the general soil behavior of lacustrine clays within the region during wet antecedent conditions, when the moisture capacity of the topsoil is essentially saturated.~~

2.4.3.3 Runoff and Stream Course Models

ANSI/ANS-2.8-1992 lists the three pertinent alternative combinations to be evaluated in determining the PMF level.

Insert 2

In determining the PMF, the NRCS method was used in calculating the losses. The curve number (CN) for each type of landuse (30 percent small grain, 30 percent forage and pasture, 25 percent row crops, and 15 percent wooded land and building) of the watershed was determined assuming a soil type of Type D. The CN for each landuse was 82, 89, 82, and 83 respectively. The composite curve number for the watershed was 84.25. This value was used to calculate a storage capacity of 4.75 cm (1.87 inches). The storage capacity was used to calculate an initial abstraction of 0.97 cm (0.38 inches). The average infiltration rate was calculated to be 0.08 cm/hr (0.03 inches/hr) for the entire 72-hr probable maximum storm. These precipitation losses for the 72-hour period specify the general soil behavior of lacustrine clays within the region during wet antecedent conditions, when the moisture capacity of the topsoil is essentially saturated.
Even though these losses were calculated, they were not applied to the Swan Creek watershed PMF hydrograph. Essentially the watershed was assumed to be completely impervious. This produced a more conservative peak flow rate for the PMF.

A separate analysis was performed for the effects of snowmelt on the PMP. To represent completely saturated ground conditions caused by snow cover a SCS curve number of 98 was assumed in the calculation of the losses. The initial abstraction was calculated to be 0.1 cm (0.04 inches) using the NRCS method.

the site (Reference 2.4-258). These events are further discussed in Subsection 2.4.5.

Therefore, there are no potential tsunamis or tsunami-like waves which could affect safety-related structures or components at Fermi 3.

EF3 COL 2.0-18-A

2.4.7 Ice Effects

The emergency cooling system for Fermi 3 is provided by the Ultimate Heat Sink (UHS) which does not rely on water sources external to the plant and is not affected by ice conditions. This is further described in Subsection 9.2.5. Therefore, there are no safety-related systems, structures, or components impacted by ice formations.

Add Insert 3 Here

EF3 COL 2.0-19-A

2.4.8 Cooling Water Canals and Reservoirs

As described in Subsection 2.4.1, Fermi 3 uses a natural draft cooling tower for rejecting heat from the CIRC. The Plant Service Water System (PSWS) rejects heat from station heat loads via the CIRC or the two Auxiliary Heat Sink (AHS) mechanical draft cooling towers. Make-up water for the CIRC and PSWS cooling towers are supplied from Lake Erie. Blowdown discharge from the CIRC is returned to Lake Erie via a discharge pipe outfall into the lake.

The Ultimate Heat Sink (UHS) for Fermi 3 is described in Subsection 9.2.5. The IC/PCCS pools contain a separate water supply in place during Fermi 3 operation for safety-related cooling in the event that use of the UHS is required. Lake Erie is not used for safety-related water withdrawal for Fermi 3.

Discussion of the probable maximum flood (PMF) level at the site is provided in Subsection 2.4.3. The effects of probable maximum surge and seiche flooding and ice effect flooding are addressed in Subsection 2.4.5 and Subsection 2.4.7, respectively.

As described above, cooling water canals and reservoirs are not used for safety related functions by Fermi 3. Therefore, the water level effects due to failures of such structures are not applicable to Fermi 3.

Insert 3

Based on information in Reference 2.4-297, there is no evidence to indicate ice/snow blockage along the surrounding areas of Fermi 3. From Reference 2.4-297, the closest documented ice jams are along the Raisin River, which is approximately 10 miles south and does not intersect waterways affecting the Fermi 3 site. Therefore, flooding due to ice jam blockage is not anticipated to impact Fermi 3.

2.4-293 Konikow, L. F., and J. D. Bredehoeft, Computer Model of Two-Dimensional Solute Transport and Dispersion in Ground Water, Chapter C2, Book 7, Techniques of Water-Resources Investigations of the United States Geological Survey, 1978.

Add Insert 4 Here.

Insert 4:

2.4 -297 Corps of Engineers Ice Jam Database https://rgis.crrel.usace.army.mil/apex/f?p=273:3:1818914186479561, accessed September 2, 2009.

2.4-301 Federal Emergency Management Agency. Flood Insurance Study Monroe County, Michigan. April 20, 2000.

Attachment 11
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3356)

RAI Question No. 02.04.04-1

NRC RAI 02.04.04-1

The staff has reviewed FSAR Section 2.4.4, Potential Dam Failures. In accordance with 100.20c and 52.79(a)(1)(iii), the NRC staff request the applicant provide additional information on the justification for the statement regarding dams in the watershed. In section 2.4.3.4, the second paragraph states that "There are no dams existing within the Swan Creek watershed..." The applicant should demonstrate that a reasonable search of records or applicable databases has been conducted to support its conclusion.

Response

Regarding the potential for a dam failure to impact Fermi 3, FSAR Section 2.4.4, 2nd paragraph, states:

> "Fermi 3 is located within the Swan Creek watershed. The Swan Creek watershed contains no dams upstream or downstream within the vicinity of Fermi 3. Thus, there are no dam failures that could result in flooding to the Fermi 3 site."

Based on information available from the Corps of Engineers National Inventory of Dams (NID) website, https://nid.usace.army.mil, there are no dams in the Swan Creek watershed.

Proposed COLA Revision

Section 2.4.4 will be updated to add the above reference to the Corps of Engineers National Inventory of Dams as the basis for the discussion in this section. A proposed mark-up is attached.

Markup of Detroit Edison COLA
(Following 3 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Table 2.4-220 shows the resulting water levels at the various stations along Swan Creek for the 500-year flood analysis (Alternative I). The maximum flood elevation at the Fermi 3 site, determined under this scenario, is 176.59 m (579.39 ft) NAVD 88. This flood elevation is 3.0 m (9.9 ft) below the Fermi 3 finished grade elevation of 179.6 m (589.3 ft) NAVD 88. Therefore, safety related structures are not susceptible to flooding from a 500-year storm event. The Swan Creek water surface profile for this scenario is shown on Figure 2.4-223. Water surface profiles shown along the two cross sections most critical to the Fermi 3 site are shown on Figure 2.4-224 and Figure 2.4-225.

Table 2.4-221 shows the resulting water levels at the various stations along Swan Creek for the Probable Maximum Surge and Seiche analysis (Alternative III). The maximum Swan Creek flood elevation at the Fermi 3 site, determined under this scenario, is 178.4 m (585.4 ft) NAVD 88. This flood elevation is 1.2 m (3.9 ft) below the Fermi 3 finished grade. Therefore, safety related structures are not susceptible to flooding from a Probable Maximum Surge and Seiche Flooding event. The Swan Creek water surface profile for this scenario is shown on Figure 2.4-226. Water surface profiles shown along the two cross sections most critical to the Fermi 3 site are shown on Figure 2.4-227 and Figure 2.4-228.

2.4.3.6 Coincident Wind Wave Activity

Subsection 2.4.5 analyzes the wave run-up of Lake Erie induced by Probable Maximum Windstorm (PMWS) winds. Wave run-up and potential overtopping rates were calculated with the Automated Coastal Engineering System (ACES) model. Wave run-up on the slope to the Fermi 3 finished grade was analyzed, and it was determined that waves will break on the berm that is between the onshore flat area and the Fermi 3 finished grade. Therefore, waves will not overtop the slope and will not directly impact Fermi 3. See Subsection 2.4.5 for details.

EF3 COL 2.0-15-A

2.4.4 Potential Dam Failures

The water supply for Fermi 3 is from Lake Erie. The outflow from Lake Erie is not regulated. The outflow from Lake Erie is controlled exclusively by the hydraulic characteristics of the outlet rivers (Reference 2.4-247). Thus, there are no dam failures that could impact the water supply for Fermi 3.

Fermi 3 is located within the Swan Creek watershed. The Swan Creek watershed contains no dams upstream or downstream within the vicinity of Fermi 3. Thus, there are no dam failures that could result in flooding to the Fermi 3 site. Additionally, there are no water control structures erected on the Fermi site whose failure would cause potential flooding.

Therefore, there are no potential dam failures that could affect Fermi 3 safety-related structures or components. (Reference 2.4-296)

EF3 COL 2.0-16-A

2.4.5 Probable Maximum Surge and Seiche Flooding

This section discusses the development of the hydrometeorological design basis to ensure that any potential hazard to the safety-related facilities due to the effects of probable maximum surge and seiche are considered in the plant design. The analyses discussed in this section are based on ANSI/ANS-2.8-1992 (Reference 2.4-248). ANSI/ANS-2.8-1992, Section 9.2.3, describes the combined events criteria for an enclosed body of water, which is appropriate for analyzing postulated flooding at the Fermi 3 power reactor site due to wind and wave conditions in Lake Erie. Specifically, ANSI/ANS-2.8-1992, Section 9.2.3.1, states that the following combination of flood causing events provides an adequate design base for shore locations.

1. Probable maximum surge and seiche with wind-wave activity.
2. 100-year or maximum controlled level in water body, whichever is less.

These event combinations are addressed in the following discussion.

2.4.5.1 Probable Maximum Winds and Associated Meteorological Parameters

According to Section 7.2.2.1 of ANSI/ANS-2.8-1992, for the area of the Great Lakes in the vicinity of the site, the probable maximum surge and seiche is calculated from the PMWS (Reference 2.4-248). Section 7.2.2.3.1 of ANSI/ANS-2.8-1992 further indicates that parameters of the PMWS should be determined by a meteorological study, and in lieu of a study, the following may be used:

1. Set maximum over-water wind speed at ~ 160 km/hr (100 mph).
2. Set lowest pressure within the PMWS to ~950 mbar.

Add new Reference:

2.4-296 CorpsMap, National Inventory of Dams, https://nid.usace.army.mil, accessed September 2, 2009.

Attachment 12
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3357)

RAI Question No. 02.04.09-1

NRC RAI 02.04.09-1

The staff has reviewed the FSAR Section 2.4.9, Channel Diversions. In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request that the applicant provide justification or evidence that the possibility of a diversion along Swan Creek from ice, landslide or other mechanism is unlikely.

Response

The topography surrounding Swan Creek slopes gently toward the creek, with the creek sloped to drain in a well established channel into Lake Erie. As identified in FSAR Sections 2.5.1 and 2.5.4, the natural geology consists of lacustrine deposits overlying stronger glacial till (see FSAR Section 2.5.4, Table 2.5.4-202), which overlies bedrock. The increase of strength with depth of the subsurface soil and bedrock minimizes the possibility of a block-type failure of a stronger layer on a shallow failure plane in a weaker underlying layer; therefore, shallow large area landslides into Swan Creek are not envisioned as a plausible scenario. The shallow slope of the land surface toward the creek combined with the lack of a weak soil layer at depth also reduces the potential for the occurrence of a large area landslide into the creek. Along the incised banks of Swan Creek, local slope failures of the creek bank are part of the natural creek erosion process, however the size of these slope failures would be limited to near bank events which would not result in diversion of Swan Creek.

Refer to Section 2.4.7 and the response to NRC RAI 02.04.03-01, Attachment 10 of this letter, for discussion on ice jams. Ice jams are not expected to cause a diversion of Swan Creek.

Detroit Edison has managed the Fermi site from 1957 to the present and has no record or knowledge of any human induced or natural diversions of Swan Creek occurring during that time or prior to 1957. The lack of past events suggests that it is unlikely Swan Creek would be diverted by a future event.

As the area surrounding Swan Creek is relatively well established, it is anticipated that future human-induced diversions of Swan Creek that would impact the Fermi 3 site are unlikely.

The Fermi 3 site is not expected to be impacted by channel diversions.

Proposed COLA Revision

FSAR Section 2.4.9 will be updated to include the above discussion. A proposed mark-up is attached.

Markup of Detroit Edison COLA
(Following 2 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

EF3 COL 2.0-20-A

2.4.9 Channel Diversions

No safety-related systems, structures, or components are impacted.

Fermi 3 site and facilities are discussed in Subsection 2.4.1. The water supply for Fermi 3 is not obtained from channels; therefore, this subsection is not applicable. ~~No safety-related systems, structures, or components are impacted.~~

from a water supply perspective.

Insert 1 Here.

EF3 COL 2.0-21-A

2.4.10 Flooding Protection

The maximum design basis Lake Erie flood elevation, presented in Subsection 2.4.5, is 178.4 m (585.4 ft) NAVD 88, corresponding to 178.8 m (586.6 ft) plant grade datum. This elevation is below the Fermi 3 site grade elevation of 179.6 m (589.3 ft) NAVD 88 that meets the site parameters required in DCD Table 2.0-1. Furthermore, the maximum Swan Creek flood elevation at the Fermi 3 site is also calculated to be 178.4 m (585.4 ft) NAVD 88 in Subsection 2.4.3.5. The Fermi 3 site grade is above all flood water levels that can possibly occur from the probable maximum storm events within the Swan Creek watershed, which encompasses the safety-related structures, systems, and components of Fermi 3. Rip-rap protection of the slope embankment at the make-up water intake location on Lake Erie will prevent wave activity from eroding the embankment near the on-shore structure.

The effects of intense local precipitation are considered in the design of drainage structures for Fermi 3, as mentioned in Subsection 2.4.2. These facilities are designed such that the peak discharge from the local PMP will not produce flood elevations that pose a flooding hazard to any safety-related structure, system, and component of Fermi 3. Additionally, the design of the drainage facilities incorporate measures to ensure that Fermi 2 safety-related facilities are not subject to flooding during the construction or operation of Fermi 3. Applicable NRC, Federal, State, and local storm water management regulations are followed in the design of all drainage facilities for both the existing and the proposed site.

All safety-related components and structures are designed to withstand combinations of flood conditions as discussed in Subsection 2.4.2, Subsection 2.4.3, and Subsection 2.4.5. Flood protection of safety-related structures, systems, and components, at an elevation of 179.6 m (589.3 ft) NAVD 88, are not necessary since the probable maximum surge still-water elevation only reaches 178.4 m (585.4 ft) NAVD 88.

Insert 1

The topography surrounding Swan Creek slopes gently toward the creek, with the creek sloped to drain in a well established channel into Lake Erie. As identified in FSAR Sections 2.5.1 and 2.5.4, the natural geology consists of lacustrine deposits overlying stronger glacial till (see FSAR Section 2.5.4, Table 2.5.4-202), which overlies bedrock. The increase of strength with depth of the subsurface soil and bedrock minimizes the possibility of a block-type failure of a stronger layer on a shallow failure plane in a weaker underlying layer; therefore, shallow large area landslides into Swan Creek are not envisioned as a plausible scenario. The shallow slope of the land surface toward the creek combined with the lack of a weak soil layer at depth also reduces the potential for the occurrence of a large area landslide into the creek. Along the incised banks of Swan Creek, local slope failures of the creek bank are part of the natural creek erosion process, however the size of these slope failures would be limited to near bank events which would not result in diversion of Swan Creek.

Refer to Section 2.4.7 and the response to NRC RAI 02.04.03-01, Attachment 10 of this letter, for discussion on ice jams. Ice jams are not expected to cause a diversion of Swan Creek.

Detroit Edison has managed the Fermi site from 1957 to the present and has no record or knowledge of any human induced or natural diversions of Swan Creek occurring during that time or prior to 1957. The lack of past events suggests that it is unlikely Swan Creek would be diverted by a future event.

As the area surrounding Swan Creek is relatively well established, it is anticipated that future human-induced diversions of Swan Creek that would impact the Fermi 3 site are unlikely.

The Fermi 3 site is not expected to be impacted by channel diversions.

Attachment 13
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3361)

RAI Question No. 02.04.05-1

NRC RAI 02.04.05-1

The staff has reviewed the Section 2.4.5, Probable Maximum Surge and Seiche Flooding. In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request that the applicant provide the additional information including:

- *Provide all hourly lake-level data that were used to calculate the 100-year lake level. The information would be used to verify the applicant's calculation results.*

- *Provide lake level updates of Lake Erie to include the maximum hourly water levels observed at Fermi 3 station and Bar Point station (about 9 miles north of Fermi 3). During the site audit, the applicant states that the maximum recorded lake level is approximately 1 ft higher than the calculated 100year lake level.*

- *Revise the title of Table 2.4-210 to clarify the nature of the data listed in the table. Staff also found that the nature of the data listed in Table 2.4-210 is not clear, it could be read as: maximum monthly lake level, maximum daily lake level in a month, or maximum hourly lake level in a month.*

- *Provide the calculated results of surge for Lake Erie by US Army Corps of Engineers. The requested information could be used for comparison and verification.*

Response

The responses as well as the proposed COLA revisions are presented below in the order of the questions presented.

- *Provide all hourly lake-level data that were used to calculate the 100-year lake level. The information would be used to verify the applicant's calculation results.*

The requested hourly lake level data for both the Fermi site and Bar Point Station are provided on the enclosed CD, see Appendix A of this letter.

- *Provide lake level updates of Lake Erie to include the maximum hourly water levels observed at Fermi 3 station and Bar Point station (about 9 miles north of Fermi 3). During the site audit, the applicant states that the maximum recorded lake level is approximately 1 ft higher than the calculated 100year lake level.*

In addition to the information provided on the enclosed CD, the maximum hourly water levels observed at the Fermi station are provided in Table 2.4-210. Table 2.4-210 lists the maximum hourly water level observed during each year from 1970 through 2007. According to the NOAA web site, (Reference 2.4-228) the maximum water level during the period of record was 576.22 (IGLD 85) or 576.48 (NAVD 88). This was recorded on April 14, 1998 at 1400. The period of record of verified data at this site is January 1, 1970 through August 1, 2009. The maximum hourly water level recorded at Bar Point was 175.72 m (576.5 ft) IGLD 85 and was recorded on June 17,

1973 at 0300. The period of record for this station is June 1, 1966 through the present. Note that the term "hourly water level" means that an observation is recorded every hour. As such, these readings represent an instantaneous water level observation, not an average over a one hour interval.

The recorded data include the effects of surges and seiches in addition to lake level changes. To calculate the 100 year lake level it was necessary to use undisturbed lake level data that did not include the effects of surges and seiches. To remove these effects, the historical lake levels were determined by calculating a weighted average of the hourly lake levels of individual gauges located around the Lake Erie. The weight of each gauge was based on the area of influence of the individual gauge. The area of influence was determined using Thiessen polygons. The 100 year lake level was determined to be 175.2 m (574.8 ft) IGLD 85, corresponding to 175.3 m (575.1 ft) NAVD 88.

As indicated in the RAI, the maximum recorded lake level is higher than the calculated 100 year lake level by 1.4 ft. However, the maximum recorded lake level includes the effects of storm surge while the 100 year lake level does not. After adding the calculated storm surge to the 100 year lake level, the still water level would be 178.4 m (585.4 ft) NAVD 88. This is almost 9 ft higher than the maximum recorded lake level at the Fermi site.

The need to separate short duration water level rises such as those induced by wind from maximum undisturbed lake levels is described in the U.S. Army Corps of Engineers "Revised Report on Great Lakes Open-Coast Flood Levels", page 11 (Reference 1). Methods in this Corps report (Ref 2.4-a) for determining average water levels at specific stations were used to calculate the average 100-yr lake level.

References

1. U.S. Army Corps of Engineers. "Revised Report on Great Lakes Open-Coast Flood Levels" Phase I, April 1988.

- *Revise the title of Table 2.4-210 to clarify the nature of the data listed in the table. Staff also found that the nature of the data listed in Table 2.4-210 is not clear, it could be read as: maximum monthly lake level, maximum daily lake level in a month, or maximum hourly lake level in a month.*

The word monthly should be removed from the title of Section 2.4.2.1, Table 2.4-210, and Figure 2.4-212. The title for Table 2.4-210 and Figure 2.4-212 should read "Extreme Lake Levels for the Western Basin of Lake Erie". Table 2.4-210 and Figure 2.4-212 were developed from data available on the NOAA Web site referenced at the end of the table (Reference 2.4-228) which lists extreme water levels for each month. The original data set comprises readings taken every hour at the Fermi Plant. These extreme monthly values were examined to determine the extreme values for each year. Therefore, Table 2.4-210 and Figure 2.4-212 show the highest observed water levels for each year.

- *Provide the calculated results of surge for Lake Erie by US Army Corps of Engineers. The requested information could be used for comparison and verification.*

During a conference phone call with the NRC staff on August 27, 2009, the staff indicated that this issue was resolved and that further information was not needed.

Proposed COLA Revision

Section 2.4.2.1, Table 2.4-210 and Figure 2.4-212 will be updated to clarify the nature of the data that is presented. A proposed mark-up is attached.

Markup of Detroit Edison COLA
(Following 4 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Subsection 2.4.2.3 describes the model used to estimate the local PMP runoff water levels, describes the capacity of drainage facilities, and shows that safety related facilities are adequately protected.

2.4.2.1 Flood History

Due to its proximity to the site, Lake Erie is the primary surface-water body to potentially impact Fermi 3. The Fermi site is located outside the realm of significant impact due to the flooding of local streams and rivers. The PMF of Swan Creek is discussed in Subsection 2.4.3. Following is a description of historical flooding of Lake Erie and other bodies of water surrounding Fermi 3.

Lake Erie

Lake Erie is in the Lake Erie Drainage Basin, which is a sub-basin of the Great Lakes Drainage Basin. The Lake Erie Drainage Basin is shown on Figure 2.4-203. The western basin of Lake Erie, along which Fermi 3 is located, is a very shallow basin with an average depth of 7.4 m (24 ft) and is partially restricted from the rest of Lake Erie by a chain of barrier beaches and islands.

Approximately 80 percent of Lake Erie's total inflow is from the Detroit River, 11 percent from precipitation, and the remaining 9 percent from tributaries flowing through watersheds in Michigan, Ohio, Pennsylvania, New York, and Ontario. Outflows from Lake Erie are not regulated; rather, outflows are controlled by the hydraulic characteristics of its outlet rivers.

The topography of the site is flat to gentle rolling plain and is located in the Swan Creek watershed, which is the smallest drainage basin within the region. The Swan Creek watershed has an elliptical-shaped basin, trending northwest-southeast, and generally distributes a small flow of water when compared to the capacity of Lake Erie. E

The water levels of Lake Erie have been recorded from 1860 to the present by the Great Lakes Environmental Research Laboratory (GLERL). ~~Maximum monthly~~ extreme water levels, obtained from the Fermi Power Plant gauging station (ID 9063090), from 1967 to 2007, are shown on Figure 2.4-212. The data for these ~~maximum monthly~~ extreme water levels are shown on Table 2.4-210. The highest recorded water level of these ~~maximum monthly~~ extremes is 175.71 m (576.48 ft) NAVD 88, occurring in April of 1998. Table 2.4-210 also lists the lowest recorded water level, of 171.9 m (563.9 ft) NAVD 88, which occurred in 1967 (Reference 2.4-228, Reference 2.4-234).

Table 2.4-210 Extreme ~~Monthly~~ Lake Levels for the Western Basin of Lake Erie at the Fermi Site (ID 9063090) (Sheet 1 of 2) [EF3 COL 2.0-13-A]

	NAVD 88		IGLD 85	
Year	**Max (ft)**	**Min (ft)**	**Max (ft)**	**Min (ft)**
*1967		563.90		**563.64**
1970	573.26	569.02	**573.00**	**568.76**
1971	573.05	568.73	**572.79**	**568.47**
1972	574.28	568.51	**574.02**	**568.25**
1973	575.11	570.84	**574.85**	**570.58**
1974	575.10	570.77	**574.84**	**570.51**
1975	574.52	570.59	**574.26**	**570.33**
1976	574.59	570.42	**574.33**	**570.16**
1977	573.62	569.05	**573.36**	**568.79**
1978	574.26	569.79	**574.00**	**569.53**
1979	573.37	568.61	**573.11**	**568.35**
1980	574.09	569.98	**573.83**	**569.72**
1981	573.49	570.51	**573.23**	**570.25**
1982	573.89	569.53	**573.63**	**569.27**
1983	574.10	570.53	**573.84**	**570.27**
1984	574.30	570.75	**574.04**	**570.49**
1985	574.82	569.97	**574.56**	**569.71**
1986	575.46	572.21	**575.20**	**571.95**
1987	574.65	570.35	**574.39**	**570.09**
1988	573.08	569.51	**572.82**	**569.25**
1989	573.36	568.86	**573.10**	**568.60**
1990	573.12	569.83	**572.86**	**569.57**
1991	573.72	569.26	**573.46**	**569.00**
1992	573.71	569.79	**573.45**	**569.53**
1993	574.52	570.60	**574.26**	**570.34**
1994	573.59	569.71	**573.33**	**569.45**
1995	573.70	569.10	**573.44**	**568.84**
1996	573.41	570.79	**573.15**	**570.53**
1997	575.59	569.33	**575.33**	**569.07**
1998	576.48	566.62	**576.22**	**566.36**
1999	574.45	567.63	**574.19**	**567.37**

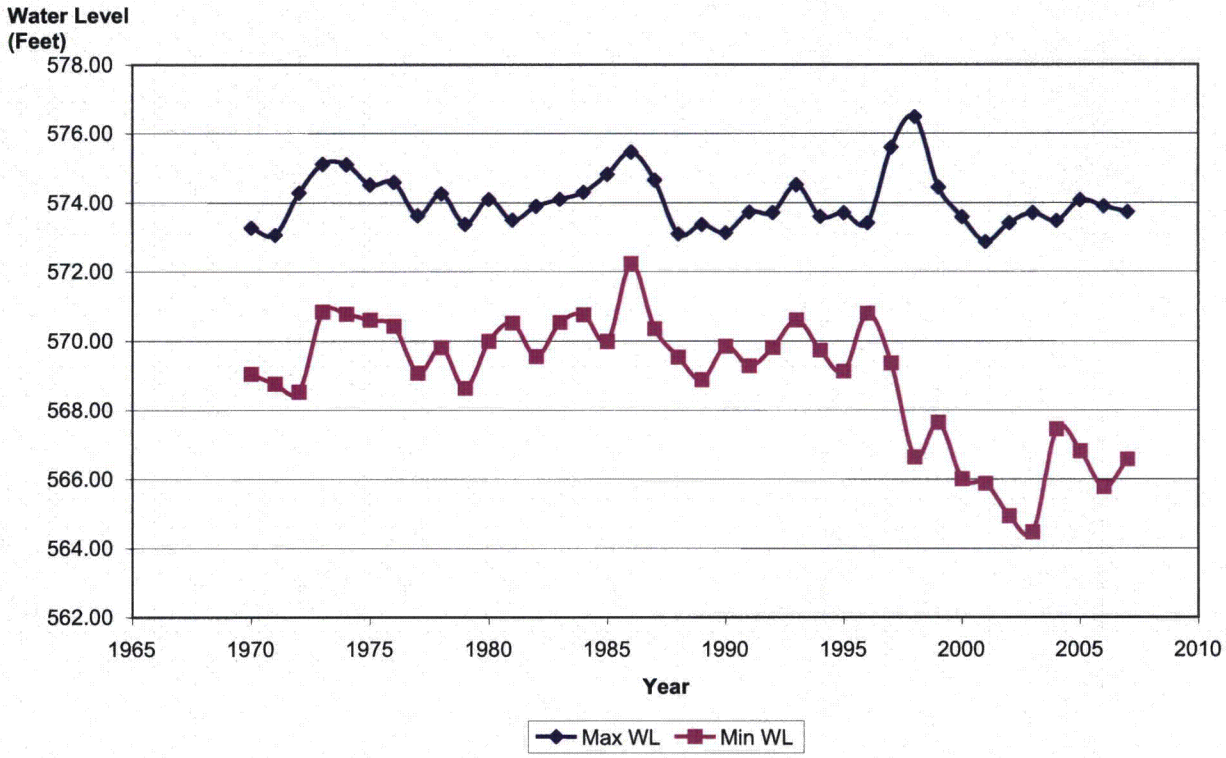
Table 2.4-210 Extreme ~~Monthly~~ Lake Levels for the Western Basin of Lake Erie at the Fermi Site (ID 9063090) (Sheet 2 of 2) [EF3 COL 2.0-13-A]

	NAVD 88		IGLD 85	
Year	**Max (ft)**	**Min (ft)**	**Max (ft)**	**Min (ft)**
2000	573.58	565.99	**573.32**	**565.73**
2001	572.85	565.86	**572.59**	**565.60**
2002	573.41	564.92	**573.15**	**564.66**
2003	573.70	564.45	**573.44**	**564.19**
2004	573.47	567.43	**573.21**	**567.17**
2005	574.07	566.80	**573.81**	**566.54**
2006	573.89	565.75	**573.63**	**565.49**
2007	573.73	566.56	**573.47**	**566.30**

* The lowest elevation recorded was noted on a Nuclear Generation Memorandum NP-00-0064 dated August 16, 2000. Elevation has been confirmed by NOAA on 02/07/2008

Source: Reference 2.4-228, Reference 2.4-234

Figure 2.4-212 Lake Erie Extreme ~~Monthly~~ Water Levels (1970-2007) NAVD 88 [EF3 COL 2.0-13-A]



Source: Reference 2.4-228, Reference 2.4-234

Attachment 14
NRC3-09-0027

Response to RAI Letter No. 10
(eRAI Tracking No. 3421)

RAI Question No. 02.04.12-1

NRC RAI 02.04.12-1

The staff has reviewed the FSAR Section 2.4.12, Groundwater. In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request that the applicant provide information on the assumed release point of potential radioactive contaminants and its justification in the pathway analysis. This information was not explicitly provided in the application.

Response

The text in FSAR Sections 2.4.12.3.1 and 2.4.12.3.2 is intended to broadly address the rate of groundwater migration to potential discharge locations closest to Fermi 3 rather than addressing the transport of any specific contaminant. As written, the sections were not intended to infer that radioactive contamination was being considered. In response to NRC RAI Letter No. 2 (February 16, 2009 NRC3-09-0001, as supplemented by letter dated September 1, 2009 NRC3-09-0026), updated analyses of the transport of radioactive contaminants in the groundwater has been performed and provided as an update to FSAR Section 2.4.13. The update addresses release and transport, including distances, of radioactive contamination from specific locations of the Rad Waste Building.

As FSAR Sections 2.4.12.3.1 and 2.4.12.3.2 address groundwater transport in lieu of transport of specific contaminants, these sections are being updated to address only the rate of groundwater migration, without any reference to contamination.

In FSAR Section 2.4.12.3.1, the center of the reactor building is used as a representative point of reference to estimate the lengths of the groundwater flow pathways to potential discharge locations. The center of the reactor building was selected, because it is a central location within in the power block. Using this central location provides groundwater flow pathways, with resultant flow times, that are indicative of what can be expected for flow from Fermi 3 to potential groundwater discharge locations. It is understood that travel distances and times from other locations on the Fermi 3 site will be longer or shorter than estimated in the FSAR, depending on the actual location considered.

Proposed COLA Revision

FSAR Sections 2.4.12.3.1 and 2.4.12.3.2 will be updated as indicated in the response. Additionally, the text for Section 2.4.12.3.2 will be modified to reflect updated information regarding the porosity to be consistent with the update provided to FSAR Section 2.4.13 in the response to NRC RAI Letter No. 2. A proposed mark-up is attached.

Markup of Detroit Edison COLA
(Following 6 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

glacial till. However, there is no onsite use of Bass Islands aquifer groundwater, so there is no significant consequence should this local recharge feature be temporarily affected.

Groundwater

groundwater

2.4.12.3 Subsurface Pathways

This subsection presents an evaluation of subsurface pathways for ~~a release at~~ Fermi 3 to ~~the groundwater. The subsection focuses on advective groundwater flow.~~

potential groundwater discharge locations

Groundwater

2.4.12.3.1 Potential ~~Contaminant~~ Pathways

Insert 1 Here

~~As discussed in Subsection 2.4.12.1.1, the geology beneath the site consists of native glacial deposits and imported fill, overlying Bass Islands Group dolomite. This subsection discusses possible subsurface pathways in groundwater through the overburden and bedrock.~~

~~If a release was to enter the groundwater within the overburden, the water supply receptor for this scenario is considered to be Lake Erie or other contiguous surface water features such as the overflow canal. The distance from the center of the reactor building to the overflow canal is the shortest pathway to a potential receptor. The gradient in the vicinity of Fermi 3 is very low, and as a result may actually display changes in direction during different months. A westward gradient toward the overflow canal is observed during several months, so this pathway is possible. The distance is about 250 m (820 ft).~~

~~If a release was to enter~~ the Bass Islands aquifer, potential pathways are considered for the following two conditions:

- The documented present day condition, in which the groundwater flow direction in the Bass Islands aquifer is westward off-site.
- A possible future condition in which the flow direction has returned to flow toward Lake Erie.

For groundwater in

discharge

The documented groundwater flow direction beneath the Reactor Building is consistently south by southwest, with the flow direction changing to west by northwest as the groundwater flows offsite (Figure 2.4-248). The nearest ~~exposure~~ point offsite along this flow path is household well 58000002901, listed in the state database as a bedrock well with a depth of 22.6 m (74 ft) and use type of household. The well is located immediately west of the corner of Fermi Drive and Toll Road (Figure 2.4-236). The distance from the Reactor Building to this well is approximately 1450 m (4756 ft) along the flowpath. (Reference 2.4-274)

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is to

As discussed in Subsection 2.4.12.2.5, the possibility exists for a return to flow toward Lake Erie in the Bass Islands aquifer should all quarry dewatering in the county come to a halt. In this case the most direct pathway toward a potential receptor (Lake Erie) is approximately 450 m (1476 ft) to the east. This assumes that Lake Erie and the Bass Islands aquifer are in hydraulic communication at the shoreline, which is a conservative assumption.

Insert 2 Here

Groundwater Travel Times to Discharge Locations

2.4.12.3.2 **Advective Transport**

Advective transport assumes that any release to the groundwater travels at the same velocity as groundwater flow. The groundwater flow velocity (or seepage velocity) is calculated from the following equation (Reference 2.4-287):

$$V = Ki/ n_e \qquad \text{[Eq. 8]}$$

where:

V = Average linear velocity (ft/day)
K = Hydraulic Conductivity (ft/day)
i = Hydraulic gradient (ft/ft)
n_e = Effective porosity (dimensionless)

a discharge location

The travel time from the source to the receptor is calculated by:

$$T = D/V \qquad \text{[Eq. 9]}$$

where:

center of Reactor Building

T = Travel time (days)
D = Distance from source to receptor (ft).
V = Average linear groundwater velocity (ft/day)

discharge location

3

Groundwater velocity is locally dependent on hydraulic conductivity, hydraulic gradient, and porosity. Hydraulic conductivity is estimated from slug test and packer test data collected during the Fermi subsurface investigation, and is discussed in Subsection 2.4.12.2.4.1 and Subsection 2.4.12.2.4.2. Hydraulic gradient is estimated from Fermi 3 potentiometric surface maps (November water level maps were selected as being representative of site conditions). No porosity field data was collected, so literature values were used. Seepage velocity calculations were performed using the high and low range estimates of porosity (10-25 percent for glacial till, 25 percent for rock fill, 1-20 percent for limestone/dolomite) to bracket the range of possible results (Reference 2.4-287, Reference 2.4-288).

Insert 3 Here

~~For a direct release to the rock fill overburden at Fermi 3, the following~~ conditions are assumed. Hydraulic conductivity is 357 m/day (1170 ft/day) based on the P-385S slug test. The gradient is 0.0007, based on the November water table map (Appendix 2.4BB), and porosity is 25 percent for the rock fill. This results in a calculated flow velocity of 0.996 m/day (3.27 ft/day). Applying this velocity to the pathway distance of 250 m (820 ft) to the overflow canal, the travel time is calculated to be 0.69 years (250 days). This assumes instantaneous delivery to the water table (i.e., no time to travel through the vadose zone from the surface).

For a direct release to the Bass Islands aquifer under present day potentiometric surface conditions, the following conditions are assumed:

- The average gradient along the flowpath from Fermi 3 to the point that it leaves the site to the west is 0.002.
- ~~Porosity~~ is assumed to be one percent, the most conservative ~~estimate.~~

The highest hydraulic conductivity estimate for a packer test that did not indicate vertical leakage to adjacent zones was 5.4 m/day (17.57 ft/day) (MW-395D at 11 m (37 ft): it should be noted that this boring is near the cooling towers, not along the flowpath). The lowest hydraulic conductivity for a valid packer test is 0.034 m/day (0.11 ft/day) (MW-383D at 20 m [67 ft]). Based on the maximum hydraulic conductivity estimate, the calculated velocity is 1.1 m/day (3.5 ft/day). Based on the minimum hydraulic conductivity estimate, the calculated velocity is 0.006 m/day (0.02 ft/day). Based on a pathway distance of 1450 m (4756 ft), the two velocity estimates yield travel time estimates along this pathway to the offsite well west of the site ranging from 3.7 years to 652 years.

groundwater

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To evaluate the pre-development groundwater flow gradient, Figure 2.4-239 was reviewed and an eastward gradient of 0.001 was estimated near the Fermi plant. ~~For a direct release to the Bass Islands formation under~~ pre-development conditions ~~with~~ this gradient and the range of hydraulic conductivities discussed in the previous paragraph, calculated groundwater velocities range from 0.003 to 0.5 m/day (0.01 to 1.76 ft/day). Based on this range of velocities, the estimated travel time for the ~~1476 ft~~ pathway east to Lake Erie ranges from 2.3 years to 368 years.

Under

,

(1,476 ft)

groundwater

2.4.12.4 Groundwater Monitoring

A limited groundwater level monitoring program at Fermi 2 is currently performed as part of the Radiological Environmental Monitoring Program

Insert 1

As discussed in Subsection 2.4.12.1.1, the geology beneath the site consists of native glacial deposits and imported fill, overlying Bass Islands Group dolomite. This subsection discusses possible subsurface pathways of groundwater through the overburden and bedrock. The center of the Reactor Building is used as a representative point of reference to estimate the lengths of the groundwater flow pathways to potential discharge locations. The center of the Reactor Building is selected, as it is a central location within the power block, which results in groundwater flow pathways that are indicative of what can be expected for flow from Fermi 3 to potential groundwater discharge locations. For other locations within the Fermi 3 site, travel distances may be different than estimated herein.

For groundwater within the overburden, the potential discharge locations are considered to be Lake Erie or other contiguous surface water features such as the overflow canal. The distance from the center of the Reactor Building to the overflow canal is the shortest pathway for groundwater discharge. The gradient in the vicinity of Fermi 3 is very low, and as a result may actually display changes in direction during different months. A westward gradient toward the overflow canal is observed during several months, so this pathway is possible. The distance is about 250 m (820 ft).

Insert 2

The travel time of groundwater from the center of the Reactor Building to the potential discharge location is dependent of the flow path length and the groundwater flow velocity.

Insert 3

No porosity field data was collected, so literature values were used. For the rock fill, only total porosity values were identified in literature; therefore, the total porosity was used to estimate the groundwater flow velocity in the rock fill. Total porosity for the rock fill was estimated to be 25 percent, which is typical of coarse gravel (Reference 2.4-287 and 2.4-288). For the Bass Islands dolomite, effective and total porosity estimates were located in literature. In Otsego County, Michigan, the total porosity of the Bass Islands is estimated to range from 13 to 21 percent (Reference 2.4-295). In the Milwaukee, Wisconsin area, the effective porosity of dolomite overlain by glacial till was estimated to be 1 percent (Reference 2.4-291).

For flow in the rock fill overburden at Fermi 3, the following conditions are assumed:

- Hydraulic conductivity is 357 m/day (1,170 ft/day) based on the P-385S slug test.
- The gradient is 0.0007, based on the November water table map (Appendix 2.4BB).
- Porosity is 25 percent of the rock fill.

This results in a calculated flow velocity of 0.996 m/day (3.27 ft/day). Appling this velocity to the pathway distance of 250 m (820ft) to the overflow canal, the groundwater travel time is calculated to be 0.69 years (250 days).

For flow in the Bass Islands aquifer under present day potentiometric surface conditions, the following conditions are assumed:

- The average gradient along the flowpath from Fermi 3 to the point that it leaves the site to the west is 0.002.
- Effective porosity is assumed to be 1 percent.