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Scientific Notebook No. 593: Development of Nearby Industrial and Military Facilities Identification Tool for the Proposed Repository at Yucca Mountain (10/09/2003 through 09/28/2006)

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

CNWRA
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Project Name: Development of Nearby Industrial and Military Facilities Identification Tool for the Proposed Repository at Yucca Mountain

Project Account Number: 20.06002.01.102

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INITIAL ENTRIES

Scientific Note Book: # 593

Issued to: Amitava Ghosh/Mark Silliman

Project Title: Development of Nearby Industrial and Military Facilities Identification Tool for the Proposed Repository at Yucca Mountain (20.06002.01.102)

Project Staff: Amitava Ghosh/Mark Silliman

Objective: Objective of this task is to develop a software tool for identifying any industrial and military facilities near the proposed repository at Yucca Mountain, Nevada, that may pose a potential hazard to the repository surface facilities. This tool is named as Nearby Industrial and Military facilities Hazard Identification Tool (NIMHIT) and will provide a capability to the U.S. Nuclear Regulatory Commission (NRC) and the Center for Nuclear Waste Regulatory Analyses (CNWRA) staff to conduct an independent analysis and review of the DOE preclosure safety analysis. As part of the license application for construction authorization and the subsequent amendment of the license to receive and possess the waste at the proposed repository, the DOE must conduct and present results of a preclosure safety analysis for the period until permanent closure. As a part of this evaluation, DOE must analyze whether activities at the nearby industrial and military facilities have the potential to become an initiating event for the proposed repository so that the subsequent event sequences should be considered in the preclosure safety analysis. The NIMHIT will be used to collect and analyze information on facilities in the vicinity of the proposed repository to assess whether potential hazards have been appropriately considered in DOE's analysis. Output from this tool will be input to the PCSA Tool for event sequence probability analysis and, if necessary, eventual estimation of consequence. The NIMHIT will feature a graphical user interface between the database and the utility tools.

Personnel Qualifications: Personnel qualifications and skills are risk engineering, hazard analyst, computer science/engineering.

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Software Requirements Description Nearby Industrial and Military Facilities Hazards Identification Tool (Version 1.0)

Prepared for

U.S. Nuclear Regulatory Commission
Contract NRC–02–97–009

Prepared by

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July 2003

Approval
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8-5-03
Date

10/9/2003

1.0 INTRODUCTION

The Nearby Industrial and Military Facilities Hazards Identification Tool (NIMHIT), version 1.0, is under development to provide a capability to the U.S. Nuclear Regulatory Commission (NRC) and the Center for Nuclear Waste Regulatory Analyses (CNWRA) staff to conduct an independent analysis and review of the DOE preclosure safety analysis for a proposed repository at Yucca Mountain, Nevada. As part of the license application for construction authorization and the subsequent amendment of the license to receive and possess the waste at the proposed repository, the DOE must conduct and present results of a preclosure safety analysis for the period until permanent closure. As a part of this evaluation, DOE must analyze whether activities at the nearby industrial and military facilities have the potential to become an initiating event for the proposed repository so that the subsequent event sequences should be considered in the preclosure safety analysis. The NIMHIT will be used to collect and analyze information on facilities in the vicinity of the proposed repository to assess whether potential hazards have been appropriately considered in DOE's analysis. Output from this tool will be input to the PCSA Tool for event sequence probability analysis and, if necessary, eventual estimation of consequence. The NIMHIT will feature a graphical user interface between the database and the utility tools. This Software Requirements Description document describes the overall functions of the NIMHIT.

2.0 Technical Basis

The scope of NIMHIT is based on the requirements of 10 CFR Part 63 for preclosure safety analysis of the geologic repository operations area. To satisfy the requirements of §63.112(a)–(d), DOE will conduct an analysis for any potential hazards from the nearby industrial and military facilities. The NRC and CNWRA staff will review the analysis to assess whether

(1) an identification and systematic analysis of hazards generated from nearby industrial and military facilities, including a comprehensive identification of potential event sequences have been presented [§63.112(b)];

(2) data pertaining to the Yucca Mountain site, and the surrounding region to the extent necessary, have been used to identify hazards generated from nearby industrial and military facilities [§63.112(c)]; and

(3) the technical basis for either inclusion or exclusion of specific hazards generated from nearby industrial and military facilities in the safety analysis is acceptable [§63.112(d)].

NIMHIT, version 1.0, will assist the reviewer by providing a user-friendly tool to assess whether the first two aspects have been met in the DOE's analysis of potential hazards from the nearby industrial and military facilities. Additionally, a part of this information may be used to assess the adequacy of the DOE's analysis to fulfill the third requirement [§63.112(d)]. The tool will have a database of potential activities at different facilities within a radius of 160 km [100 mi] of the surface facilities of the proposed repository at Yucca Mountain. Information that will be stored in the database will include facility name, facility description, facility location (latitude and longitude, or other suitable coordinate system), facility physical characteristics, materials produced, materials stored, materials transported,

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potential hazards and their characteristics (such as, chemical, high explosive, nuclear, etc.), amount of source material(s), frequency of operations, etc. In addition, reference materials from which the information has been acquired and incorporated into the database will be stored. Each record for the reference materials will have information about the title; author(s) (if available); company/publishers; report number (if applicable); revision number (if applicable); and date of publication, city and state. Information in this database needs to be updated as and when new information about any facilities in the vicinity of the proposed repository at Yucca Mountain is obtained.

The tool will have a Graphical User Interface (GUI) to search the database of potential hazards at facilities located within a radius of approximately 160 km [100 mi] of the surface facilities of the proposed repository at Yucca Mountain. For easy reference for the user, a terrain map of the region will be displayed. The tool will allow the user to easily view the map of a selected region including the ability to zoom into a specified smaller sized area. Additionally, the tool will allow the user to quickly view information of potential hazards associated with any facility located within any selected region and analyze the information. Users will also be able to save a map with any identified facility, displaying location and affected regions of any given hazard, as an image file. In addition to displaying the results of the analysis as a graphical report (in terms of a customized map), user will be able to generate a text report of the analysis.

3.0 Computational Approach

NIMHIT will have the following features:

- Form layout: The tool will have a user friendly form layout allowing the user to complete all necessary tasks easily and efficiently.
- Database architecture: The tool will have a suitable database structure allowing queries to easily search the database. The structure should be suitable for a wide range of data allowing the program to be used for different types of facilities.
- Map viewing interface (Zoom, Coordinate Calculations): The tool will have algorithms to convert between pixels and actual coordinates.
- Image conversion: The tool will have capabilities to load common image file formats [Joint Photographic Experts Group (JPG) and Graphical Interchange Format (GIF)] and then converted to Bit Map (BMP) format (the necessary format for this software).
- Distance calculations: The tool will be able to calculate the distance between a particular facility and the surface facilities at the proposed repository or another facility.
- Hazard identification algorithm: The tool will search the database for hazards which meet user specified criteria (i.e., type of hazard or distance from the proposed repository).
- Customizable drawing on image file: The tool will allow the users to superimpose specific information about a particular hazard, its location(s), and other items on the

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map. This creates a graphical view of the database. Additionally, the image file will be saved in a printable format.

- Printable text reports: The tool allows the user to print the results of an analysis using the database (limited by user specified quarries).

3.1 Data Flow and User Interface

Once the software is started, the GUI will be loaded which, in turn, will load the image map of the site, as shown in Figure 1. The image map will be loaded in both the "main viewer" and in the "zoom viewer." Zoom view will allow the user to zoom into a particular region of the image for more detailed information.

NIMHIT (version 1.0) will search the database with the following methods:

Search by user specified area: Allows the users to select a circular area or a path on the map. All hazards in the area will be shown.

Search by user specified site: Allows the user to specify a site. The coordinates (longitude and latitude or other suitable coordinate system) are determined from a database (or can be entered by the user, if known). The user specifies a search radius and all facilities which are located within the given radius from the surface facilities of the proposed repository are selected.

All searches can be restricted by what type of hazards the user wants to include in the search. Advanced user will be allowed to query the database directly and will be able to graph the results on the terrain map.

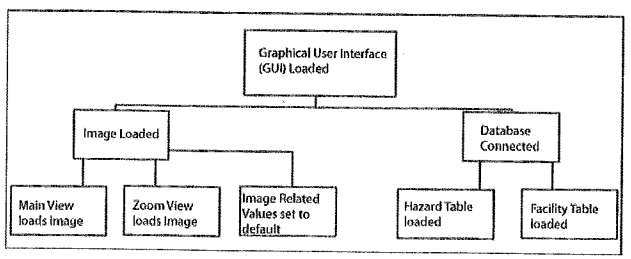

Figure 1. Flow chart illustrating loading sequence.

3.2 Hardware and Software Requirements

Programming Language :	Visual Basic 6.0 (interacting with a Microsoft Access database)
Target Platform :	PC
Target Operating System :	Windows XP
Compatible with :	Windows 2000 and Windows NT

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Ram Requirement:	Minimum 256 Mb of Random Access Memory (RAM) (depending on images being used by application, more RAM may be necessary)
Processor:	Pentium 3 or faster

3.3 Graphics and Reporting Requirements

There are no special graphics requirements for this software. This software will produce a report summarizing the results.

3.4 Pre- and Post-Processors

The pre- or post-processors will be integral parts of the software to develop input data and display results.

3.5 Software Validation

In compliance with the requirements of CNWRA Technical Operating Procedure TOP-018, NIMHIT (version 1.0) will be validated. The completion of validation testing of this software is scheduled for June, 2004.

4.0 References

Ghosh, A., D. Brogan, and D.J. Pomerening. Development of a Hazard Identification Database for Nearby Military and Industrial Facilities of the Proposed Repository at Yucca Mountain–Preliminary Report. Center for Nuclear Waste Regulatory Analyses. San Antonio, TX: September 2001.

Re: [Fwd: Software Requirement Description Document for Nearby Facilities]

Subject: Re: [Fwd: Software Requirement Description Document for Nearby Facilities]
Date: Wed, 08 Oct 2003 08:16:26 -0400
From: Banad Jagannath <BNJ@nrc.gov>
To: AGHOSH@cnwra.swri.edu, Mysore Nataraja <MSN1.twf4_po.TWFN_DO@nrc.gov>
CC: Banad Jagannath <BNJ.twf4_po.TWFN_DO@nrc.gov>,
N King Stablein <NKS.twf4_po.TWFN_DO@nrc.gov>

The attached Software Requirements Description for including a data base and capability to identify Nearby Industrial and Military facilities' hazard in the PCSA Tool is approved.

Software Requirements Description for nearby industrial and military hazard identification 2003.wpd

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I have reviewed this scientific notebook and find it in agreement with QAP-001.

9-28-06

GEOSCIENCES AND ENGINEERING DIVISION

SCIENTIFIC NOTEBOOK REVIEW CHECKLIST RECORD

Scientific Notebook No.: 593 Date Turned In: 9-28-06

Accomplished

✓	1. Initial entries per QAP-001
✓	2. Dating of entries
✓	3. Corrections (crossed out, one line through w/initials/date)
✓	4. No White out used
✓	5. Page number visible on copy or original notebook
✓	6. In process entries per QAP-001
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