ABANDONED URANIUM MINES AND THE NAVAJO NATION

Navajo Nation AUM Screening Assessment Report
and
Atlas with Geospatial Data

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August 2007

ACKNOWLEDGEMENT

Many individuals and organizations assisted in reconstructing the history of uranium mining on the Navajo Nation, and in developing the geospatial datasets presented in this report and Atlas.

The authors would like to extend their appreciation to William Chenoweth, Consulting Geologist, whose personal knowledge of the history of uranium mining on the Navajo Nation proved invaluable.

Special recognition is also extended to Glynn R. Alsup in honor of his tireless efforts on behalf of the United States Army Corps of Engineers and his devotion, commitment, and dedicated service to improving conditions on the Navajo Nation.

Report contributors from TerraSpectra Geomatics included Elaine Ezra, David Brickey, Larry Tinney, Teresa Bell, Ronald Ezra, Katahdin Withnall, Joseph Scepan, and Rick Van Remortel.

The following is a list of the organizations who generously shared knowledge, identified where to seek data, contributed data, and/or provided critical reviews and evaluations. Their contributions are gratefully acknowledged.

Áhéhee'

THANK YOU

Diné College Uranium Education Program
Navajo Abandoned Mine Lands Reclamation Program
Navajo Area Indian Health Service
Navajo Department of Data Resources
Navajo Department of Water Resources
Navajo Land Department - GIS Section
Navajo Nation Environmental Protection Agency - Navajo Superfund Program
Navajo Nation Environmental Protection Agency - Surface and Ground Water Protection Department
Navajo Tribal Utility Authority
Southwest Research Information Center (SRIC)
Sustainable Energy Solutions at Northern Arizona University
U.S. Army Corps of Engineers, Los Angeles District
U.S. Army Corps of Engineers, Albuquerque District
U.S. Bureau of Indian Affairs
U.S. Department of Energy
U.S. Environmental Protection Agency, Region 9
U.S. Fish and Wildlife Service
U.S. Geological Survey, USGS Navajo Nation Studies Program
U.S. Geological Survey, Flagstaff
U.S. Geological Survey, Albuquerque

This report is dedicated to Navajo Miners and their families.

Photo of Navajo Miners Working at the King Tutt Point Mine Plot 2, East Reservation Lease taken by Kenneth Hatfield, 1953. Photo courtesy William Chenoweth.

CONTENTS

Page Number

PART 1 - NAVAJO NATION AUM SCREENING ASSESSMENT

EXECUTIVE SUMMARY vii

COMMUNITY INTRODUCTION 1
- Environment 1
- Health 1

BACKGROUND 3
- Mission Statements 3
  - Navajo Nation Environmental Protection Agency 3
  - Navajo Abandoned Mine Lands Reclamation Program 4
  - United States Environmental Protection Agency 4

GEOGRAPHIC INFORMATION SYSTEM (GIS) 5

REPORT ORGANIZATION 7
- Part 1. Navajo Nation AUM Screening Assessment Report 7
- Part 2. Atlas and Geospatial Data 7
  - Mining History and Mine Site Information 7
  - Mine Waste Characteristics 7
  - Environmental Setting 7
  - Geospatial Data 7

PURPOSE 8

PROJECT APPROACH 8
- Contaminants and Exposure Pathways 9

NAVAJO NATION AUM REGIONS 10
- North Central AUM Region 10
- Northern AUM Region 10
- Western AUM Region 10
- Central AUM Region 10
- Southern AUM Region 11
- Eastern AUM Region 11

METHODOLOGY 12
- Hazard Ranking System (HRS) Derived Model 12
- Data 13

RESULTS 14
- Soil Pathway and Air Pathway 14
- Ground Water Pathway 15
- Surface Water Pathway 16
- Combined Pathways 17

DISCUSSION 78
- North Central AUM Region Screening Assessment Score Results 78
- Northern AUM Region Screening Assessment Score Results 79
- Western AUM Region Screening Assessment Score Results 80
- Central AUM Region Screening Assessment Score Results 81
- Southern AUM Region Screening Assessment Score Results 82
- Eastern AUM Region Screening Assessment Score Results 83

RECOMMENDATIONS 84
- Additional Possible Scoring Factors 84
- Non-Potable Water Samples with Uranium Exceeding Maximum Contaminant Levels 85
- Perched or Shallow Water Tables 87
- Mine Water Extraction 87
- AUMs with Surface Water Pathways to Water Sources 89
- Mine Subsidence in the Eastern AUM Region 89
- Exploration Drilling 89
- Aerial Radiation Survey Excess Bismuth-214 Areas 91

REFERENCES 91

FIGURES

- Figure 1. Points, Lines, and Polygons Displayed on Raster Imagery 5
- Figure 2. Using Attributes to Symbolize Information 5
- Figure 3. Using Buffer Analyses 6
- Figure 4. Developing Spatial Models 6
- Figure 5. Superfund Process 8
- Figure 6. Location of AUM Regions on the Navajo Nation Map 11
- Figure 7. Example Photographs of Modified HRS Scoring Factors 13
- Figure 8. Potential Air Pathway 14
- Figure 9. Example Comparison of Wells Data Used in March 2006 and Updated May 2007 15
- Figure 10. Surface Water Drainages Downstream from AUM Sites 16
- Figure 11. Crownpoint ISL and Section 29 - Conoco AUMs Combined Pathways Factors 18
- Figure 12. North Central AUM Region Combined Pathways - Map Figure Index 29
- Figure 13. Combined Pathways in the Monitor Mesa Area Map 30
- Figure 14. Combined Pathways in the Mexican Hat Area Map 31

CONTENTS (continued)

Page Number

Figure 15. Combined Pathways in the North Nokai Mesa Area Map 32
Figure 16. Combined Pathways in the Oljato Area Map 33
Figure 17. Combined Pathways in the South Nokai Mesa Area Map 34
Figure 18. Combined Pathways in the South El Capitan Flat Area Map 35
Figure 19. Combined Pathways in the Monument Valley Area Map 36
Figure 20. Combined Pathways in the Cane Valley Area Map 37

Figure 21. Northern AUM Region Combined Pathways - Map Figure Index 38
Figure 22. Combined Pathways in the North Central Aneth Area Map 39
Figure 23. Combined Pathways in the Northwest Red Mesa Area Map 40
Figure 24. Combined Pathways in the North Teec Nos Pos Area Map 41
Figure 25. Combined Pathways in the South Red Mesa Area Map 42
Figure 26. Combined Pathways in the Tse Tah Area Map 43
Figure 27. Combined Pathways in the Northeast Carrizo Area Map 44
Figure 28. Combined Pathways in the Southwest Sweetwater Area Map 45
Figure 29. Combined Pathways in the West Carrizo Area Map 46
Figure 30. Combined Pathways in the East Carrizo Area Map 47
Figure 31. Combined Pathways in the Shiprock Area Map 48
Figure 32. Combined Pathways in the Lukachukai Area Map 49
Figure 33. Combined Pathways in the Chuska Area Map 50

Figure 34. Western AUM Combined Pathways - Map Figure Index 51
Figure 35. Combined Pathways in the Echo Cliffs Region 52
Figure 36. Combined Pathways in the Southeastern Bodaway/Gap Area Map 53
Figure 37. Combined Pathways in the Cameron Area Map 54
Figure 38. Combined Pathways in the Adeii Eechii Cliffs Area Map 55
Figure 39. Combined Pathways in the Southern Little Colorado Area Map 56
Figure 40. Combined Pathways in the East Black Falls Area Map 57

Figure 41. Central AUM Region Combined Pathways - Map Figure Index 58
Figure 42. Combined Pathways in the Rough Rock Area Map 59
Figure 43. Combined Pathways in the Tachee Area Map 60
Figure 44. Combined Pathways in the Chinle Area Map 61

Figure 45. Southern AUM Region Combined Pathways - Map Figure Index 62
Figure 46. Combined Pathways in the Cedar Springs Area Map 63
Figure 47. Combined Pathways in the Bidahochi Area Map 64
Figure 48. Combined Pathways in the Greasewood Area Map 65

Figure 49. Eastern AUM Region Combined Pathways - Map Figure Index 66
Figure 50. Combined Pathways in the Northwest Church Rock Area Map 67
Figure 51. Combined Pathways in the Northeast Church Rock Area Map 68
Figure 52. Combined Pathways in the Nahodishgish Area Map 69
Figure 53. Combined Pathways in the Becenti Area Map 70
Figure 54. Combined Pathways in the Church Rock Area Map 71
Figure 55. Combined Pathways in the Iyanbito Area Map 72
Figure 56. Combined Pathways in the Mariano Lake Area Map 73
Figure 57. Combined Pathways in the Crownpoint Area Map 74
Figure 58. Combined Pathways in the Western Haystack Area Map 75
Figure 59. Combined Pathways in the Ambrosia Lake Area Map 76
Figure 60. Combined Pathways in the Haystack Area Map 77

Figure 61. North Central AUM Region Combined Pathways Map With Three Score Ranges 78
Figure 62. Northern AUM Region Combined Pathways Map with Three Score Ranges 79
Figure 63. Western AUM Region Combined Pathways Map With Three Score Ranges 80
Figure 64. Central AUM Region Combined Pathways Map With Three Score Ranges 81
Figure 65. Southern AUM Region Combined Pathways Map With Three Score Ranges 82
Figure 66. Eastern AUM Region Combined Pathways Map With Three Score Ranges 83
Figure 67. Non-Potable Water Sample Locations on the Navajo Nation with Elevated Uranium 87
Figure 68. Bootjack Mine Surface and Underground Workings and Proximal Areas with Excess Bismuth 214 88
Figure 69. Plan Map of the Underground Workings and Surface Features of the Bootjack Uranium Mine 88
Figure 70. Whirlwind Mine on the South Bank of Lake Powell 89
Figure 71. Mexican Hat Stockpile 89
Figure 72. Exploration Drilling in the Tracts 10 and 11 Area of the North Central AUM Region 90
Figure 73. Exploration Areas in the North Central AUM Region 90
Figure 74. Cove Transfer Station 91

TABLES

Table 1. Selected Attributes for the Water Source Dataset 5
Table 2. Possible Pathways, Exposure Routes, and Human and Ecological Receptors 8
Table 3. MAP-ID Correspondence to Figure Number 17
Table 4. North Central AUM Region Combined Pathway Scores 19
Table 5. Northern AUM Region Combined Pathway Scores 20
Table 6. Western AUM Region Combined Pathway Scores 24
Table 7. Central AUM Region Combined Pathway Scores 26
Table 8. Southern AUM Region Combined Pathway Scores 26
Table 9. Eastern AUM Region Combined Pathway Scores 27
Table 10. USACE Water Samples with Elevated Uranium 85
Table 11. NNEPA Water Samples with Elevated Gross Alpha 86
Table 12. USGS Water Samples with Elevated Uranium 86
Table 13. AUMs With Uranium Ore Deposits Below the Water 88

PART 2 - ATLAS WITH GEOSPATIAL DATA

The Table of Contents for the Atlas with Geospatial Data is provided at the beginning of Part 2

From Testimony of the Navajo Nation Before the Subcommittee on Oversight and Investigations and the Subcommittee on Native American Affairs Regarding Abandoned Uranium Mines on the Navajo Nation - November 4, 1993:

"From the 1920s to the early 1970s, uranium ore was mined on the Navajo reservation for the U.S. atomic energy program. The primary purchaser and beneficiary of this mining activity was the U.S. government and the development of uranium resources was entrusted to the Atomic Energy Commission.

As a result of this mining, the Navajo Nation has been left with at least 1,104 known abandoned uranium mines and tons of hazardous radioactive uranium mine waste scattered across our lands.

Many Navajo people live and work in close proximity to highly contaminated soil, and breathe and drink contaminated air and water. Some residents live within a few hundred feet of highly radioactive wastes. Sheep and livestock - the basis for our subsistence - graze on contaminated vegetation and drink contaminated water. Often, Navajo homes are built with radioactive mine waste rocks and children play daily in the vicinity of mines and on mill tailing piles."

Based on a review of production records it is estimated that approximately 14% of the uranium used for the United States World War II and Cold War nuclear weapons and energy programs were mined from the Navajo Nation.

EXECUTIVE SUMMARY

The Navajo Nation covers over 27,000 square miles in portions of three states: Arizona, New Mexico, and Utah. There has been widespread uranium mining on the Navajo Nation, beginning in the early 1900's. Peak uranium mining occurred between the 1940's and 1960's in support of the U.S. Government's defense programs. Substantial amounts of land throughout the Navajo Nation were disturbed by surface and underground mining. Over 1,200 mine features (e.g., portals, prospects, rim strips, pits, vertical shafts or waste piles) associated with abandoned uranium mines (AUMs) have been identified. More than 600 AUM sites or related areas have been mapped throughout and within one mile of the Navajo Nation.

In November 1993, U.S. Congressional Subcommittee hearings were conducted in which the Navajo Nation presented testimony about AUMs on the Navajo Nation and requested assistance to determine if the AUMs posed a health risk to Navajo residents. Shortly thereafter, in 1994, the U.S. Environmental Protection Agency (EPA) Region 9 initiated the Navajo Abandoned Uranium Mines (NAUM) Project.

This *Abandoned Uranium Mines and the Navajo Nation* report documents NAUM Project data collection and screening results for all known AUMs on the Navajo Nation. The report has two parts: the *Navajo Nation AUM Screening Assessment Report* and the accompanying *Atlas with Geospatial Data.*

In 2002, the EPA Region 9 Superfund Site Assessment and Technical Support Team developed a custom set of Hazard Ranking System (HRS) screening criteria to assess AUMs on the Navajo Nation for possible remedial actions. The large geographic area covered by the Navajo Nation is beyond the normal scope for the HRS, so a custom model was developed to fit these unique circumstances. The method used to prioritize the AUM sites is based on a limited subset of the locational-distance criteria in the HRS. It does not include the complete set of criteria and factors built into the full HRS model. The scoring is not intended to identify actual risks, but rather to identify and prioritize areas for future investigation and response decisions.

The HRS-derived model used for this study was developed based on the presence of downstream surface water drainages and the numbers of structures and wells proximal to AUM sites. A Geographic Information System (GIS) database was developed for the study and included the following geospatial datasets for the analysis: 1) locations of all known abandoned uranium mines on and within 1 mile of the Navajo Nation, 2) structures within 1 mile of an AUM, 3) drinking water sources within 4 miles of an AUM, and 4) surface drainages 15 miles downstream from an AUM. The GIS was used to compare the individual AUM sites by distance from the human receptors. The *Navajo Nation AUM Screening Assessment Report* presents the analysis results from the model in data tables and maps. Based on the results of this broad-based screening process, EPA will consult with the Navajo Nation about the recommended follow-up investigations or cleanup responses that require attention.

The *Atlas with Geospatial Data* portion of this report describes the geospatial datasets used for the screening analysis. Due to the limited subset of criteria used in the HRS-derived model, the analysis resulted in some cases where AUM sites with little to no waste (e.g., a prospect with no uranium production) scored high due to close proximity to structures and wells. Conversely, some AUM sites with high volumes of waste scored low due to their remote locations with few structures or wells in close proximity. The prioritization process can be enhanced by the addition of more factors, criteria, and data into the model.

The EPA, Navajo Nation Environmental Protection Agency (NNEPA), Navajo Abandoned Mine Lands Reclamation Program (NAMLRP) and U.S. Army Corps of Engineers collectively developed a list of key data needed for the further assessment of AUMs. In order to minimize redundancy and costs, an important aspect of this effort was the systematic collection and review of existing data suitable for use in preliminary assessments and for model refinement. The list focused on data related to contaminant sources and their transport pathways, such as air, soil, ground water and surface water. The NAUM Project Team then carefully examined existing data sources, including those from other federal, state, Navajo agencies, and universities to identify data that could assist with providing answers to questions about the AUMs and the transport of potential contaminants on a Navajo Nationwide level.

The *Atlas and Geospatial Data* includes readily available regional scale data that were compiled for the Navajo Nation. The *Atlas and Geospatial Data* portion of the report is organized into three Sections: Section 1 - *Mining History and Mine Site Information;* Section 2 - *Mine Waste Characteristics; and* Section 3 - *Environmental Setting.* The Sections generally follow an Atlas format, with a text description of the dataset and a facing page with a map example. Referenced documents have been scanned and are provided in digital format on Digital Versatile Disks (DVDs), along with the report, all geospatial datasets used, and associated metadata.

This report can support improved decision-making and provides the following:

- Final documentation and distribution of GIS data, analyses, and maps generated for the screening phase of the NAUM study.
- Compilation of regional GIS data that will support the NNEPA and NAMLRP with further assessment of priority AUM sites.

The target audience of this report is broad, ranging from residents and Chapter Officials, students and teachers, community groups, and technical specialists in various Navajo Nation, State and Federal government agencies, and academic institutions. The content ranges from introductory tutorials to discipline-specific discussions related to environmental assessments.