U.S. DEPARTMENT OF ENERGY

USE OF AUTHORIZED LIMITS DURING DECONTAMINATION AND DEMOLITION PHASE

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By Dihel, D., Cypret, O.W., Vazquez, G., Williams, W.A.
Portsmouth/Paducah Project Office

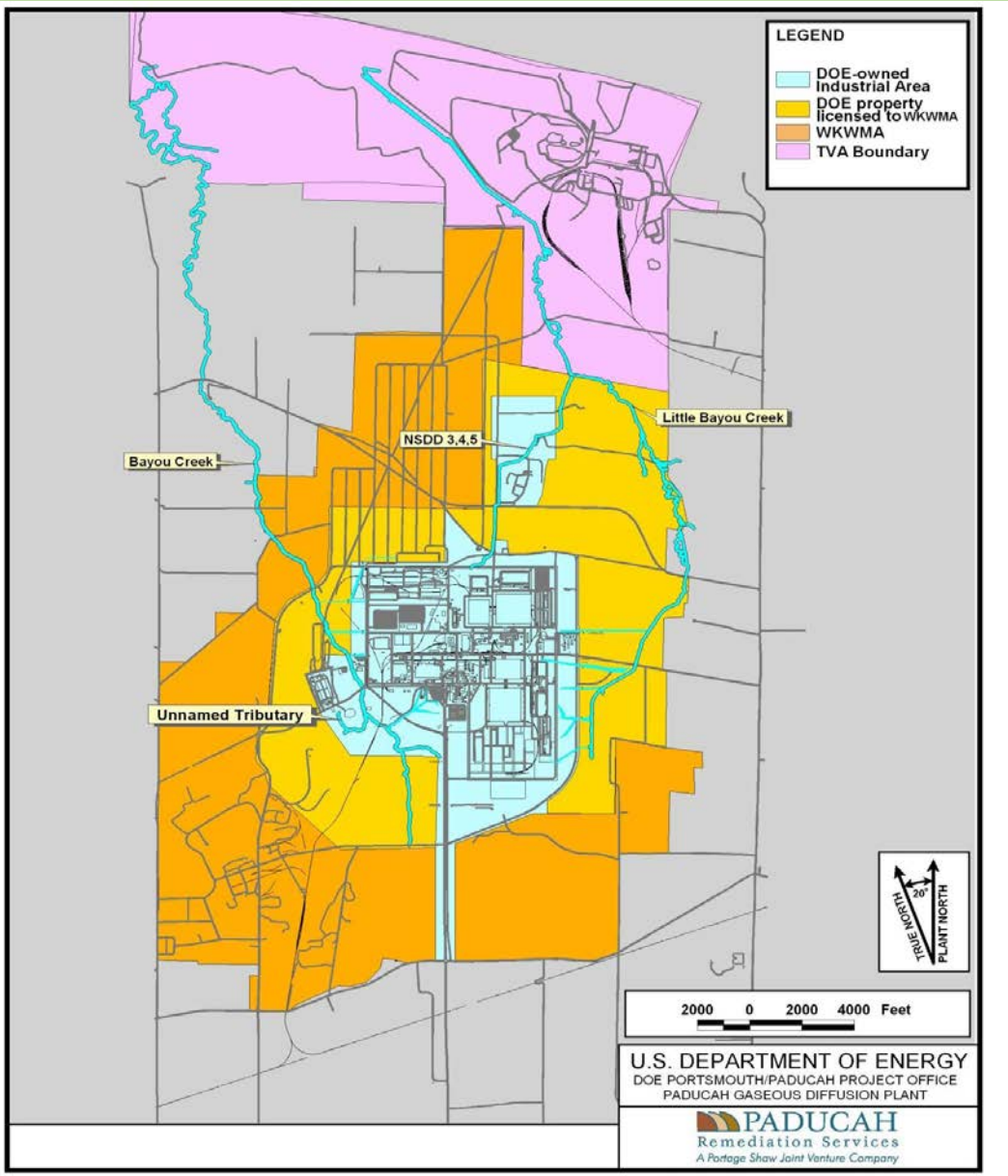
PPPO Mission

- The Portsmouth/Paducah Project Office (PPPO) mission is to accomplish the following at the Paducah Site.
  - Environmental Remediation
  - Waste Management
  - Decontamination and Decommissioning
  - Depleted Uranium Hexafluoride (DUF_6) Conversion

Paducah Gaseous Diffusion Plant

Paducah Gaseous Diffusion Plant Site Description

- Construction began 1950
- Operated since about 1952
- Owned by US government
- ~800 acres in Controlled Area
- Uranium enrichment by Gaseous Diffusion privatized in 1994 by Act of Congress
  - Operating portion leased by Lockheed-Martin Utility Systems, later United States Energy Corporation
  - Operated under NRC regulatory with Certificate of Operation
  - In process of shutting down operations and terminating lease



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What is an Authorized Limit?

- DOE Order 458.1, admin change 3, "Radiation Protection of the Public and the Environment";
  - Authorized limits are defined as:

    "A limit on the concentration or quantity of residual radioactive material on the surfaces or within property that has been derived consistent with DOE directives including the ALARA process requirements. An authorized limit may also include conditions or measures that limit or control the disposition of property."
  - Authorized limits apply to residual radioactive material

10CFR835 Requirement

- 10CFR835 rarely applicable since it is applies to occupational dose, i.e., "…conduct of DOE activities".
- Exclusion per 10CFR835.1(b)(6)
  - Radioactive material on or within material, equipment, and real property which is approved for release when the radiological conditions of the material, equipment, and real property have been documented to comply with the criteria for release set forth in a DOE authorized limit which has been approved by a Secretarial Officer in consultation with the Chief Health, Safety and Security Officer.
- But, some dose considerations may apply per 10CFR835.1(c)

Authorized Limit Development and Approval Process

- Basis for development from DOE O 458.1(4.k)
- Property control and clearance processes must be developed and implemented in accordance with the dose limits in paragraph 4.b. under any plausible use of the property and the ALARA process requirements in paragraph 4.d. of the Order must be met before property is cleared.
- Dose Constraints:
  - (a) Real property – a TED of 25 mrem (0.25 mSv) above background in any calendar year;
  - (b) Personal property - a TED of 1 mrem (0.01 mSv) above background in any calendar year.

Possible Authorized Limit Scenarios

- Possible scenarios for evaluation
  - Onsite Resident Farmer
  - Offsite Resident Farmer
  - Resident Gardener (not most limiting, not evaluated)
  - Landfill Worker
  - Outdoor Worker (WKWMA Worker)
  - Teen Recreational User
  - Trespasser
  - Shipper
  - Transport Driver

Authorized Limit Scenario Details

- Resident farmer
  - Adult (onsite and/or offsite)
  - 365 days/yr, 20 yrs at site
  - 8 hrs/day outside, 16 hrs/day inside
  - Exposure pathways include:
    - Incidental soil ingestion
    - Home-grown fruits & vegetables
    - Meat and dairy products
    - Drinking water
    - Dust inhalation
    - External gamma

Authorized Limit Scenarios (continued)

- Recreational User
  - Teen
  - 5 hrs/day, 140 days/yr, 12 yrs
  - Exposure pathways include:
    - Incidental soil ingestion
    - Dust inhalation
    - External gamma

Authorized Limit Scenarios (continued)

- Wildlife Worker
  - Adult
  - 8 hrs/day, 185 days/yr, 25 yrs
  - Exposure pathways include:
    - Incidental soil ingestion
    - Dust inhalation
    - External gamma

Authorized Limit Approval Process

- Approval Process:
  - Requires a application containing:
    - A description of the property.
    - Specific limits proposed for each radionuclide or group of radionuclides and/or external radiation exposure, surrogate metrics, or conditions used to limit radionuclides.
    - Potential collective dose to the exposed population and the potential dose to a member of the public most likely to receive the highest dose for both:
      - actual or likely future use, and
      - plausible future use of the property.
    - Detailed ALARA evaluation
    - List of restrictions or conditions on future use

Authorized Limit Approval Process (cont.)

- Approval
  - Authorized Limits must be approved in writing
    - Pre-Approved Authorized Limits are approved by the Field Element Manager
    - Authorized Limits for real property require Field Element Manager approval in consultation with the Cognizant Secretarial Officer
- Depending on the situation, Authorized Limits are approved:
    - by the Field Element Manager (for personal property) or
    - by the Cognizant Secretarial Officer in consultation with the Chief Health, Safety and Security Officer in conjunction with the Field Element Manager (for real property).

Environmental Model

- Must be based on the applicable dose constraint, supported by a complete exposure pathway analysis using appropriate methodologies, techniques, parameters and models (such as the RESRAD family of codes) that meet DOE quality assurance requirements.
- RESRAD is complex, complicated, and its use is best left to people who are familiar with it.
- Probably the most widely used and accepted model.

ALARA Assessment

- A documented ALARA process must be implemented to optimize control and management of radiological activities so that doses to members of the public (both individual and collective) and releases to the environment are kept as low as reasonably achievable.
- The ALARA process must: consider DOE sources, modes of exposure, and all pathways which potentially could result in the release of radioactive materials into the environment, or exposure to the public; use a graded approach; and to the extent practical and when appropriate, be coordinated with the 10 CFR Part 835 ALARA process.

Authorized Limits developed by PPPO

- Lubricating Oil
- Transformer Oil
- Off-spec HF
- On-site Landfill
  - Authorized Limits in place and implemented
- Bulk Survey For Release
  - Under consideration
- TCE from C-400 Interim Remedial Action
- Land Transfer

MARSSIM/MARSAME use for development of Survey Release Program

- DOE O 458.1 requires surveys in support of clearance to be sufficient to meet measurement objectives, e.g., MARSSIM or MARSAME
- MARSSIM
  - Consensus document jointly prepared by several federal agencies
  - Applies primarily to real property
- MARSAME
  - Subdocument of MARSSIM
  - Applies primarily to Material and Equipment
- Both methodologies require a rigorous, statistics-based approach

Most Efficient if Independent Verification Team is Involved during Entire Process

- Identify independent verification (IV) requirements and actions early
- Graded approach commensurate with scope, complexity, and risk
- Incorporate IV actions and considerations during Authorized Limits development and planning
- Purpose is to verify requirements of the Authorized Limits are being met and assumptions used in their development are valid

Projected (Calculated) Impact at Paducah Gaseous Diffusion Plant using Authorized Limits

- On-site DOE Landfill
  - Projected Waste Volume exceeding previous Authorized Limits over first 10 years of operation: ~3.8×10^6 ft^3
  - Projected Waste Volume exceeding current Authorized Limits over first 10 years of operation: ~0.4×10^6 ft^3
  - Annual Dose to MEI using previous Authorized Limits for first 10 years of operation: 9.7 mrem
  - Annual Dose to MEI using current Authorized Limits for first 10 years: 0.35 mrem
  - Cumulative exposure to general public, previous Authorized Limits: 1500 person-rem/yr for first 10 years of operation
  - Cumulative exposure to general public, current authorized Limits: 55 person-rem/yr for first 10 years of operation

Possible Future Authorized Limits for PPPO

- Freon disposition
  - Large quantity of Freon used for industrial equipment cooling
  - Residual uranium & progeny contamination
  - Significant after-market value?
- Establish cleanup levels inside Limited Area
  - Several hundred acres surround the Limited Area
  - Isolated areas with residual uranium & progeny contamination
  - Have worked with state radiological health organization for concurrence with Authorized Limits for transfer of the land from DOE ownership to state ownership.
  - Authorized Limits would be used as decision factors guiding remediation actions of the isolated areas.

Demolition of C-340 Metals Plant

- Completed demolition of C-340 complex, known as the Metals Plant
- Encompassed about 1.5 million cubic feet, the volume of a football field roughly three stories tall
- Demolition of a single-story section was completed in mid-December, followed by removal of a four-story section. A seven-story, 120-foot-high section– the tallest building at the site–was the last to be taken down and that was completed in March 2013.
- Demolition waste was disposed under AL to the C-746-U landfill.

Demolition of C-340 Metals Plant

Questions?

For further information, please contact Don Dihel at 270-441-6824.