

# *Idaho Cleanup Project*

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## Sodium Bearing Waste Treatment Project – Integration of Safety in Design

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Waste Management 07  
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# *Project Scope*

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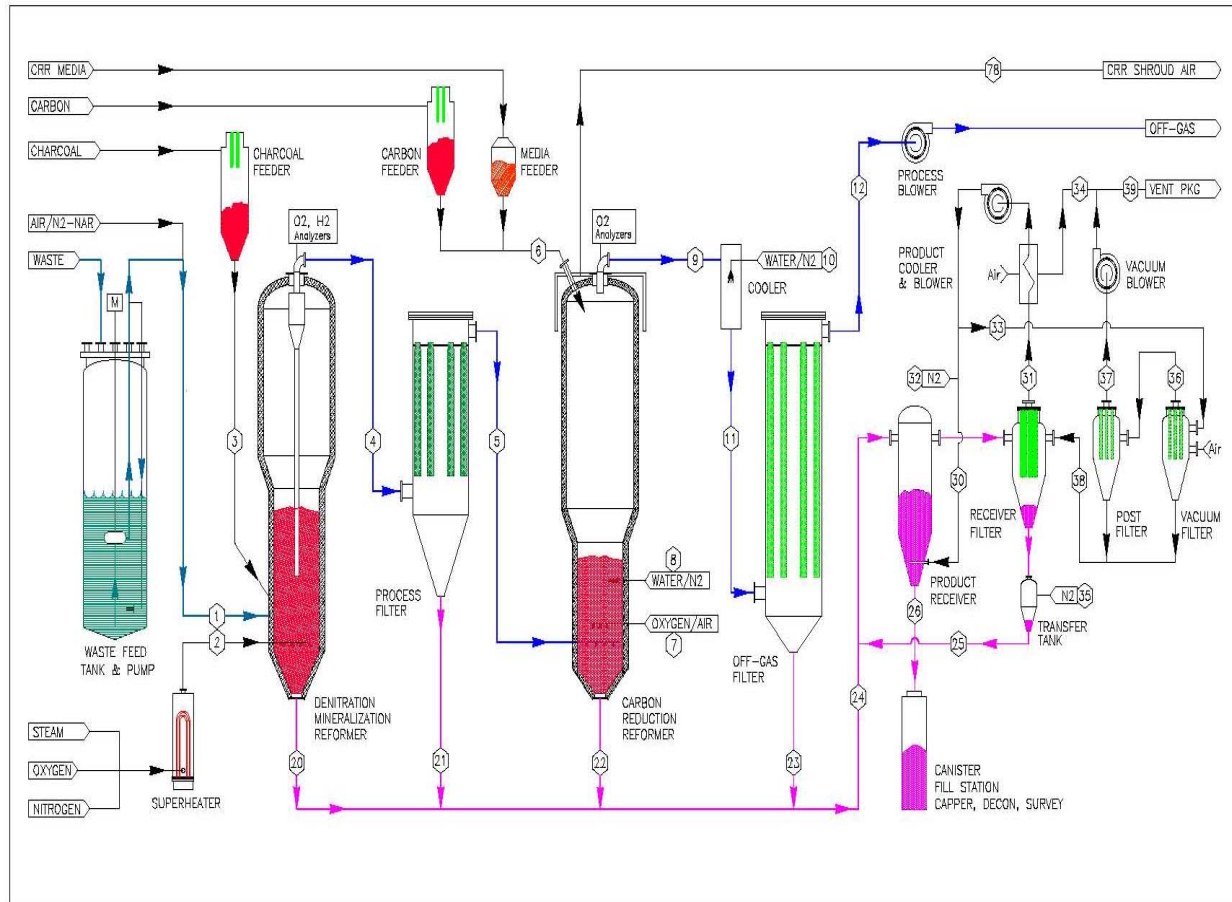
- Project mission is to provide treatment of approximately 900,000 gallons of liquid tank waste stored at the Idaho Tank Farm Facility to a stable waste form for disposition at the Waste Isolation Pilot Plant.
- Project a Line Item Capital Project within the Idaho Cleanup Project (ICP) contract awarded to CH2M\*WG, LLC on March 23, 2005
- Steam Reforming is the treatment technology (December 2005 Record of Decision)
- Project Performance Baseline (Critical Decision-2) approved in December 2006
- Total Project Cost is estimated at \$461 M (Includes \$80 M of management reserve/contingency)



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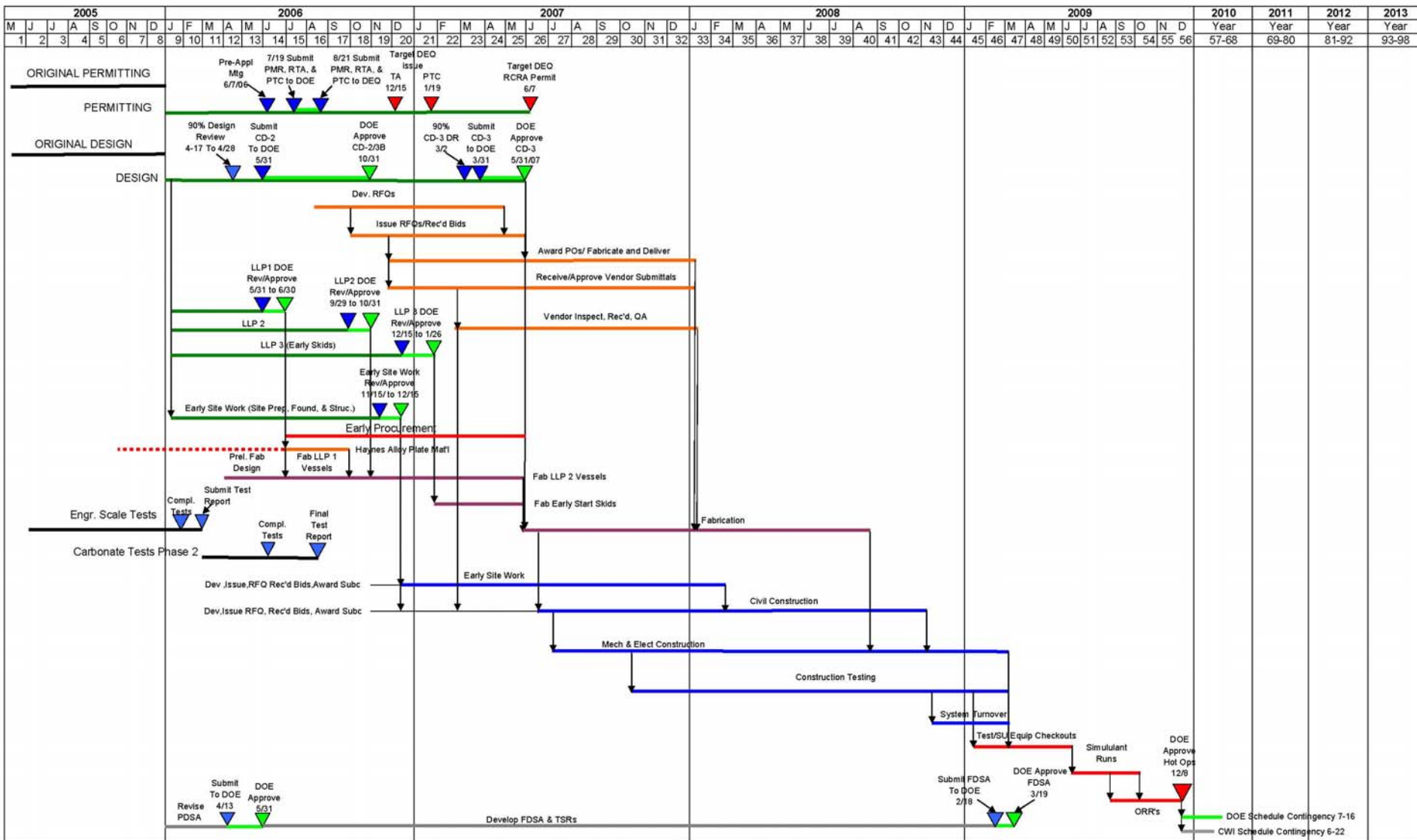
# Steam Reforming Process



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# SBW Project – Baseline Schedule



# *SBW Treatment Facility Location*



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# *Dimensions of Safety Integration*

- **Analysis and Design**
- **Operations History**
- **Personnel Experience**



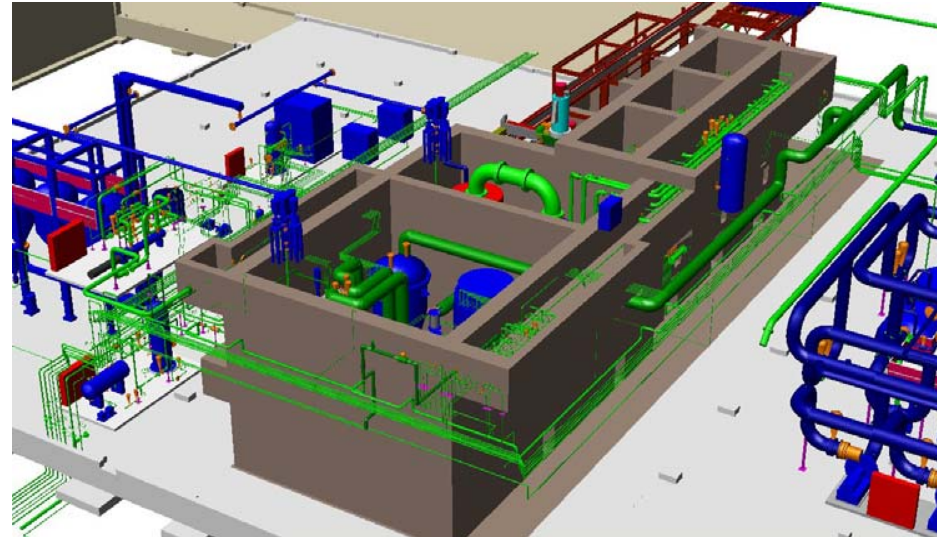
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# *Analysis and Design Applications*

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- **Preliminary Documented Safety Analysis (PDSA):**
  - **PDSA Development Process implemented using DOE guidance**
    - ◆ Conservative application of DOE-STD-3009, 1120, 1027, and Order 420.1A/B
  - **DNFSB input fully considered**
    - ◆ Recommendation 2004-2 considered
    - ◆ Switched to MACCS2 computer code
    - ◆ Jofu Mishima review of ARFs/RFs
  - **Integrated DOE & Contractor Reviews**
    - ◆ PDSA 'Cross Table Review'
    - ◆ Early
      - Routinely



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# *Consolidated Hazards Analysis Integrates the Issues Early*

- **Implemented at early Pilot Plant test program,** November 05
- **Formal CHAP review conducted during Prelim Design,** March 06
  - **Included multi-discipline reviews**
- **Initial assumption for IWTU process safety evaluation,** May 05
  - ◆ Nuclear Safety, Operations
  - ◆ Industrial Safety, Industrial Hygiene
  - ◆ Fire Protection, Radiation Control, Environmental
  - ◆ Process Engineering and Design Engineering
- Findings were incorporated into PDSA and Preliminary Design



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# *Consolidated Hazards Analysis Benefits*

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- Hazard Elimination
  - Off gas line rerouted to eliminate air/O2 infiltration
- Engineering
  - No Safety Class SSCs required
  - Safety significant SSCs were identified early
    - Shielding
    - RH-TRU Canisters
    - Backup Cooling System
    - Mercury confinement
    - Emergency Shutdown System
- Earthquake Criteria
  - Storage Vaults required to meet PC-3 for safety
  - All other SSCs required to meet PC-2 for safety
  - Process cells are being upgraded to PC-3 in consideration of future missions (e.g. potential Calcine processing)



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# *Integrating Safety Early in Design Process*

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## Environmental and permitting considerations:

- RCRA and Air Permit requirements have been incorporated in early design (Design Basis & Technical and Functional Requirements) with benefits:
  - Identified secondary containment of liquid wastes
  - Identified emissions controls and tolerance limits
  - Engineered inspection devices to limit personnel exposure
  - Prevention of run-on/run-off from hazardous waste treatment units
- Permitting requirements, in conjunction with Emergency Management, provides for:
  - Facility layout and evacuation routes
  - **Location of alarms, personnel notification devices and emergency equipment**
  - **Emergency & Contingency Procedure w/Planning**



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# *Operations History*

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- **New Waste Calcine Operational Safety, Organization, and Protocols**
  - Contributing over twenty years of safe operational history
- **Pilot plant testing runs witnessed by trained personnel & operators**
  - 1 Supervisor, 4 operators, and Trainer witnessed testing
  - Facility Ops Mgr provided comments and input to vender operators
  - Lessons retrieved as basis for field testing and upcoming plant ops
- **Hazen operational facility procedures used as test plant guidelines**
  - Expected heat-up rates, expected operating range temperatures and pressures
  - Expected pilot plant shutdown procedures
  - All validated with pilot plant shake down testing
- **Environmental sampling witnessed and improved with IDEQ**
  - Sample integrity might assured - corrected on the spot
  - Procedures were corrected and techniques will be incorporated at INTEC



# *Personnel Experience*

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- **INTEC process safety expectations used as input to pilot plant test procedures, with demonstrated feedback to Ops procedures**
- **Incorporated DOE/INL ALARA radiation requirements and expectations into design**
- **Initiated early and safe Training and Qualifications Program foundations**
- **Identified weather and operating experience lessons applied learned to design, operability, constructability, maintainability**
- **Industrial Safety improvements passed back to INTEC operations**
  - **Lessons learned on PPE from chemical splash**
  - **Lessons learned on sample valve position error, resulting in plant shutdown**



## *Key Project Interactions*

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- Independent Red Team Review for original CD-2 submittal, September 2005
- Project briefing to EM-3 on proposal for DOE Risk Mitigation, December 2005
- Dae Chung meeting to access risk mitigation approach, January 2006
- DNFSB Briefing, design and safety basis approach, March 2006
- DOE Assessment on implementing safety into design, March/April 2006
- CWI Preliminary Design review, with DNFSB Staff observing, April 2006
- IWTU ISM and Design implementation, DNFSB Staff review, May 2006
- DOE Independent review of testing and technology integration, July 2006
- DNFSB Briefing including ISMS in Project Implementation, July 2006
- Dae Chung project review, September 2006
- Ongoing DNFSB Staff interactions



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# *Lessons Learned*

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- Active and engaged Integrated Project Team
- Early integration of Safety, Design, Testing, and QA
- Pilot test demonstration program built from lessons learned
  - Prior small scale testing by DOE
  - Successful operating facility in Erwin, TN
  - Rigorous safety plan in place with selected vendor
- Dedicated Nuclear Safety Function on Project Team
- Dedicated QA manager assigned for overall QA integration
- Qualified Nuclear Facility Manager assigned to project team
- Formal QA program established and implemented during preliminary design
  - Execution, surveillance and Quality plans in place
- Project team ensures coordinated reviews of design inputs and outputs
  - By Industrial Hygiene, Radiological Controls, and Environmental
  - By Operations and Nuclear Safety
- Key Project Interactions with others improves our products



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