U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

# Repository Design Status

Presented to:
**Nuclear Waste Technical Review Board**

Presented by:
**Richard Craun**
**Office of Repository Development**
**U.S. Department of Energy**

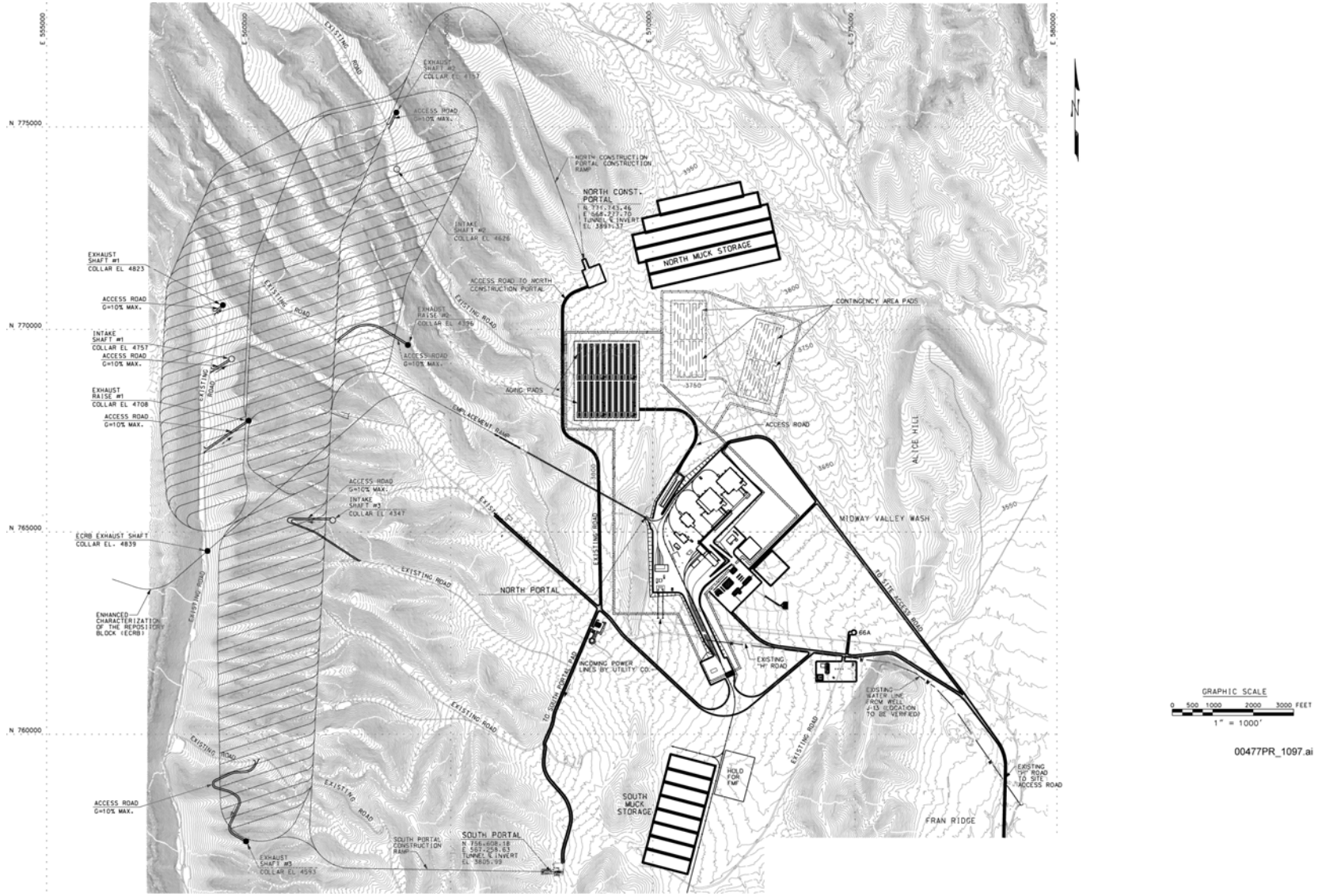
**September 20, 2004**
**Las Vegas, Nevada**

**PREDECISIONAL DRAFT**

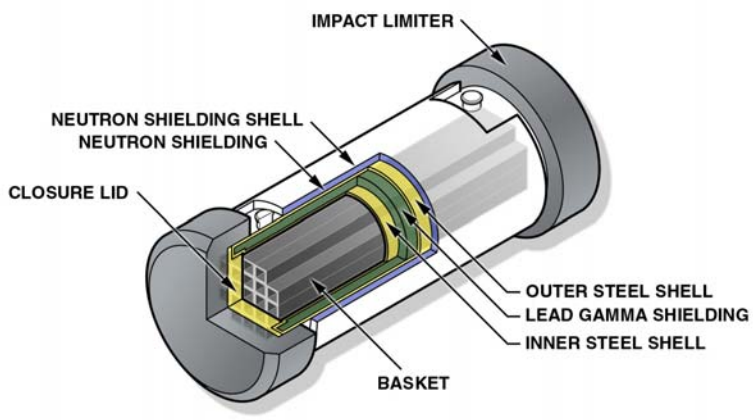
# Introduction

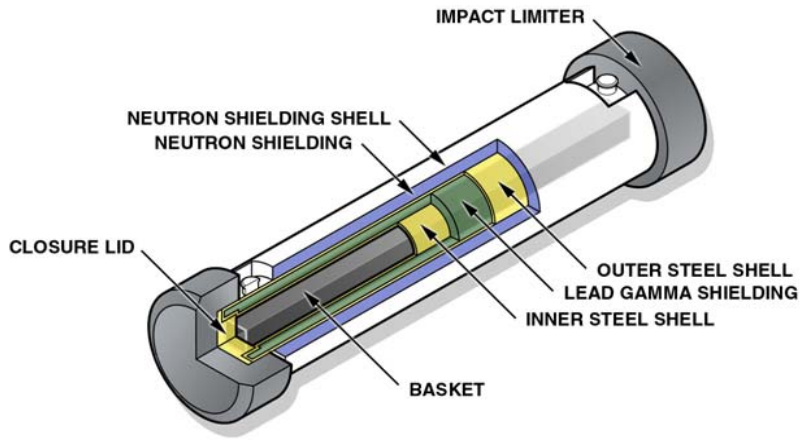
- **Update on repository design for License Application**
  - **Surface facilities, including ITS design features**
  - **Subsurface facilities, including ITS design features**
  - **Waste package and associated components design, including ITS design features**

# Site Plan


NORTH MUCK STORAGE
NORTH CONST. PORTAL
NORTH CONSTRUCTION PORTAL CONSTRUCTION RAMP
CONTINGENCY AREA PADS
ACCESS ROAD TO NORTH CONSTRUCTION PORTAL
ACCESS ROAD
ALICE HILL
MIDWAY VALLEY WASH
NORTH PORTAL
EXISTING ROAD
EMPLACEMENT RAMP
ECRB EXHAUST SHAFT COLLAR EL. 4839
ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK (ECRB)
INCOMING POWER LINES BY UTILITY CO.
EXISTING "H" ROAD
EXISTING WATER LINE FROM WELL J-13 (LOCATION TO BE VERIFIED)
EXISTING "H" ROAD TO SITE ACCESS ROAD
SOUTH MUCK STORAGE
HOLD FOR EMP
FRAN RIDGE
SOUTH PORTAL
SOUTH PORTAL CONSTRUCTION RAMP
EXHAUST SHAFT #3 COLLAR EL 4593
GRAPHIC SCALE
0 500 1000 2000 3000 FEET
1" = 1000'
00477PR_1097.ai

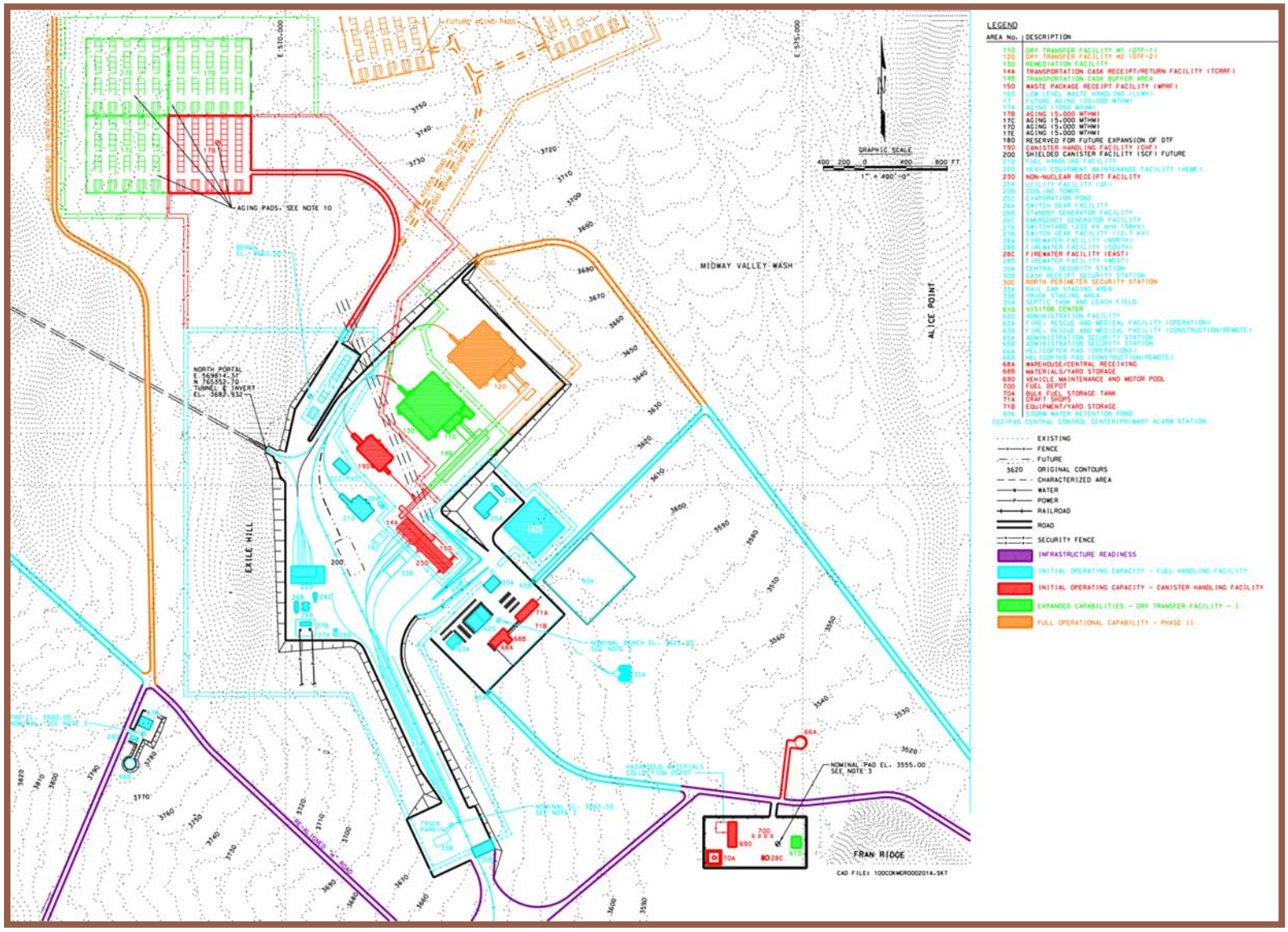
# Surface Facility Waste Handling Operations Transportation Casks




- **Casks are large, heavy, robust, sealed metal containers**
- **Multiple layers of radiation shielding**
- **Cask sizes:**
  - **Rail casks weigh ~100 to 165 tons and are up to ~27 ft long and ~11 ft in diameter with impact limiters installed**
  - **Truck casks weigh ~24 tons and are ~16 ft long and ~4 ft in diameter**

# Surface Facility Description



# Preclosure Safety Analysis Process

- **Internal and external hazards analyses identify hazards**
- **Screening and assessment analyses estimate frequency of event sequences**
- **Consequence analyses estimate doses to public and workers from event sequences**
- **Classification analyses identify systems, structures, and components that are important to safety (ITS)**
- **Nuclear safety design basis document captures design requirements**

# Implementation of Preclosure Safety Analysis in Design

- **Repository is designed to prevent event sequences where possible; mitigate those not preventable**
- **Structures, systems, and components that prevent or mitigate Category 1 or 2 event sequences are ITS**
- **Results show Category 1 event sequences driven by handling large numbers (approximately 221,000) of individual commercial spent nuclear fuel (CSNF) assemblies**
- **Category 2 event sequences driven by handling of casks, canisters, and waste packages**

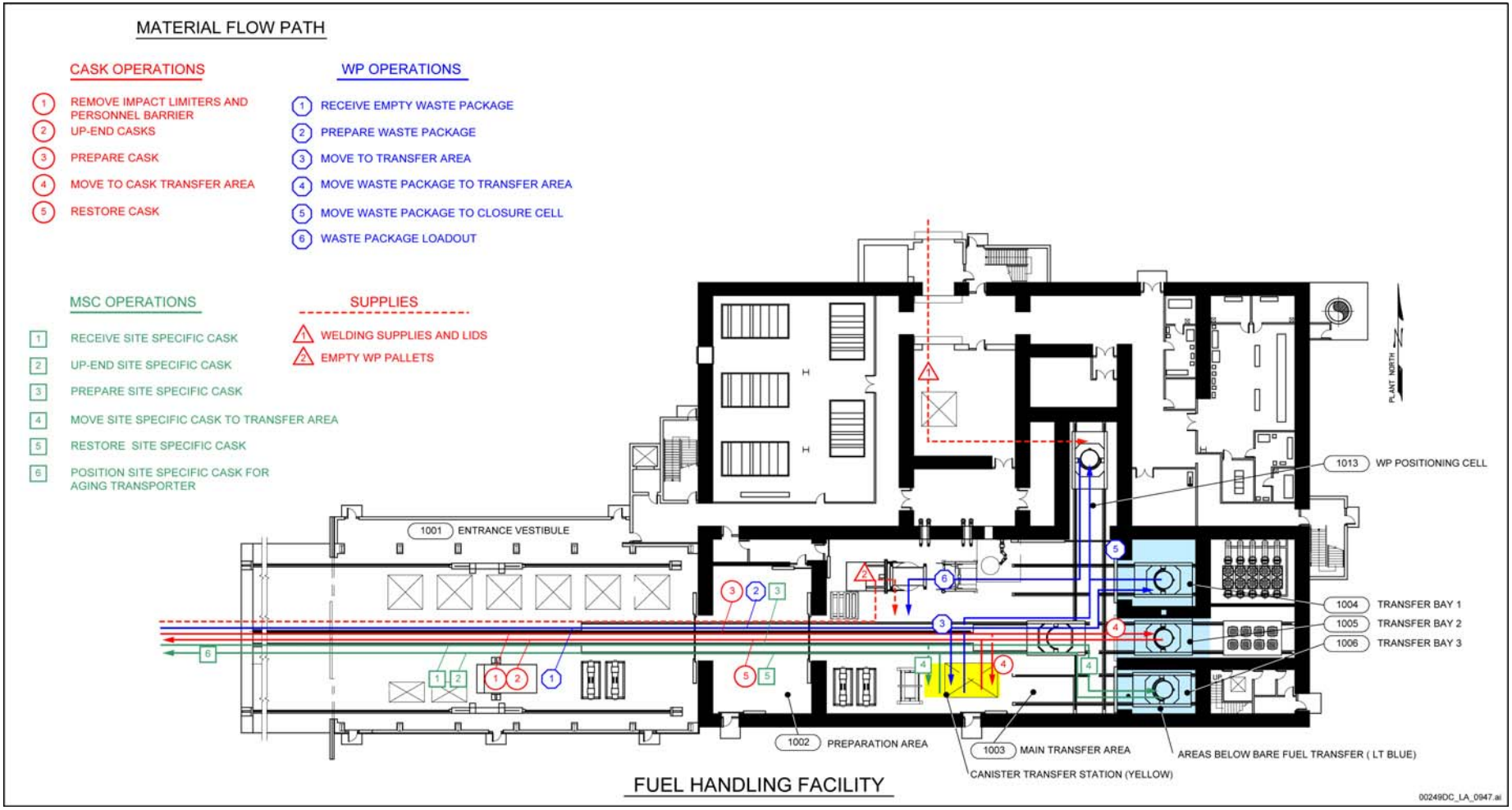
# Implementation of Preclosure Safety Analysis in Design

(Continued)

- **Category 1 Event Sequences**
  - **Two event sequences (Fuel Handling Facility [FHF] and Dry Transfer Facility [DTF] only)**
    - **Drop of individual CSNF assembly**
    - **Collision of individual CSNF assembly**
- **Category 2 Event Sequences**
  - **Three event sequences bound about 30 total**
    - **Drop and breach of transportation cask with 74 boiling water reactor (BWR) or 36 PWR CSNF assemblies**
    - **Drop and breach of transportation cask with five high-level waste (HLW) canisters**
    - **Drop and breach of one naval canister**

# Fuel Handling Facility

# Fuel Handling Facility - Sketch



# Fuel Handling Facility:
## Important to Safety Structures, Systems or Components

**Mitigation ITS SSCs**

FHF Structure (confinement, shielding)

HVAC Primary Confinement (confinement, filtration)

Electrical (support HVAC)

**Prevention ITS SSCs**

FHF Structure (hazards protection)

WP Tilting Machine (drop)

WP Turntable (drop)

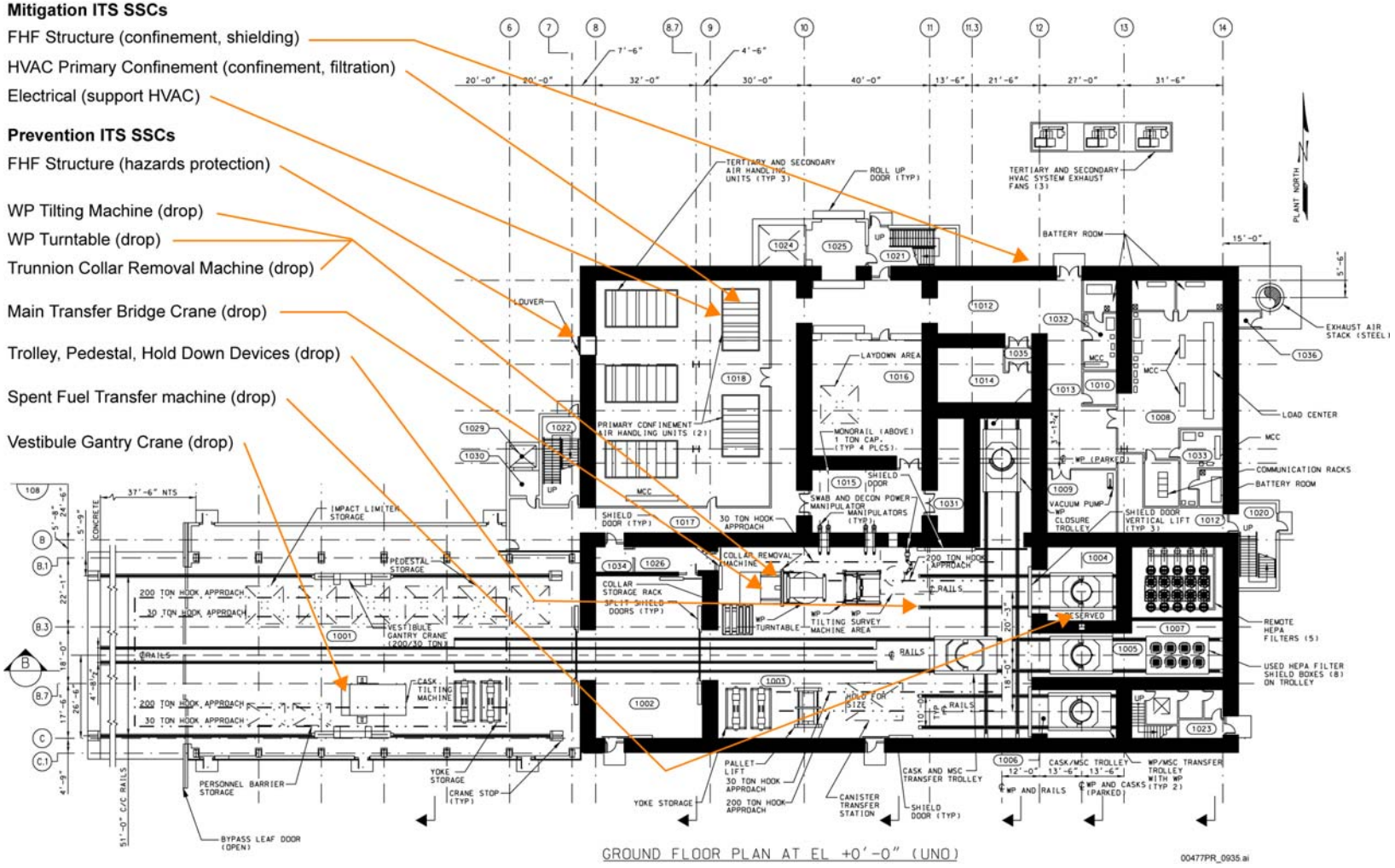
Trunnion Collar Removal Machine (drop)

Main Transfer Bridge Crane (drop)

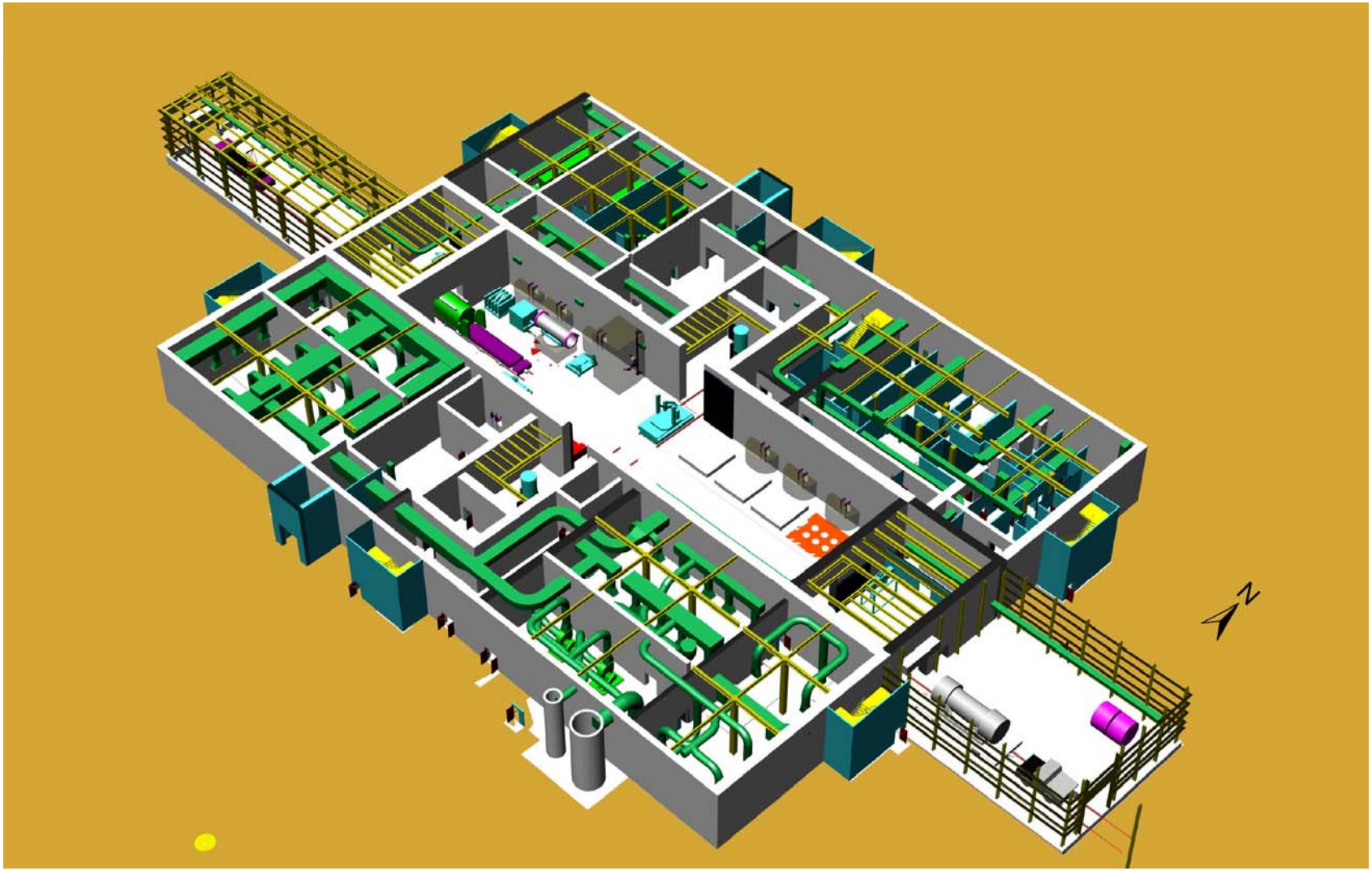
Trolley, Pedestal, Hold Down Devices (drop)

Spent Fuel Transfer machine (drop)

Vestibule Gantry Crane (drop)



# Canister Handling Facility



# Canister Handling Facility-Sketch

**TRANSPORTATION CASK OPERATIONS**

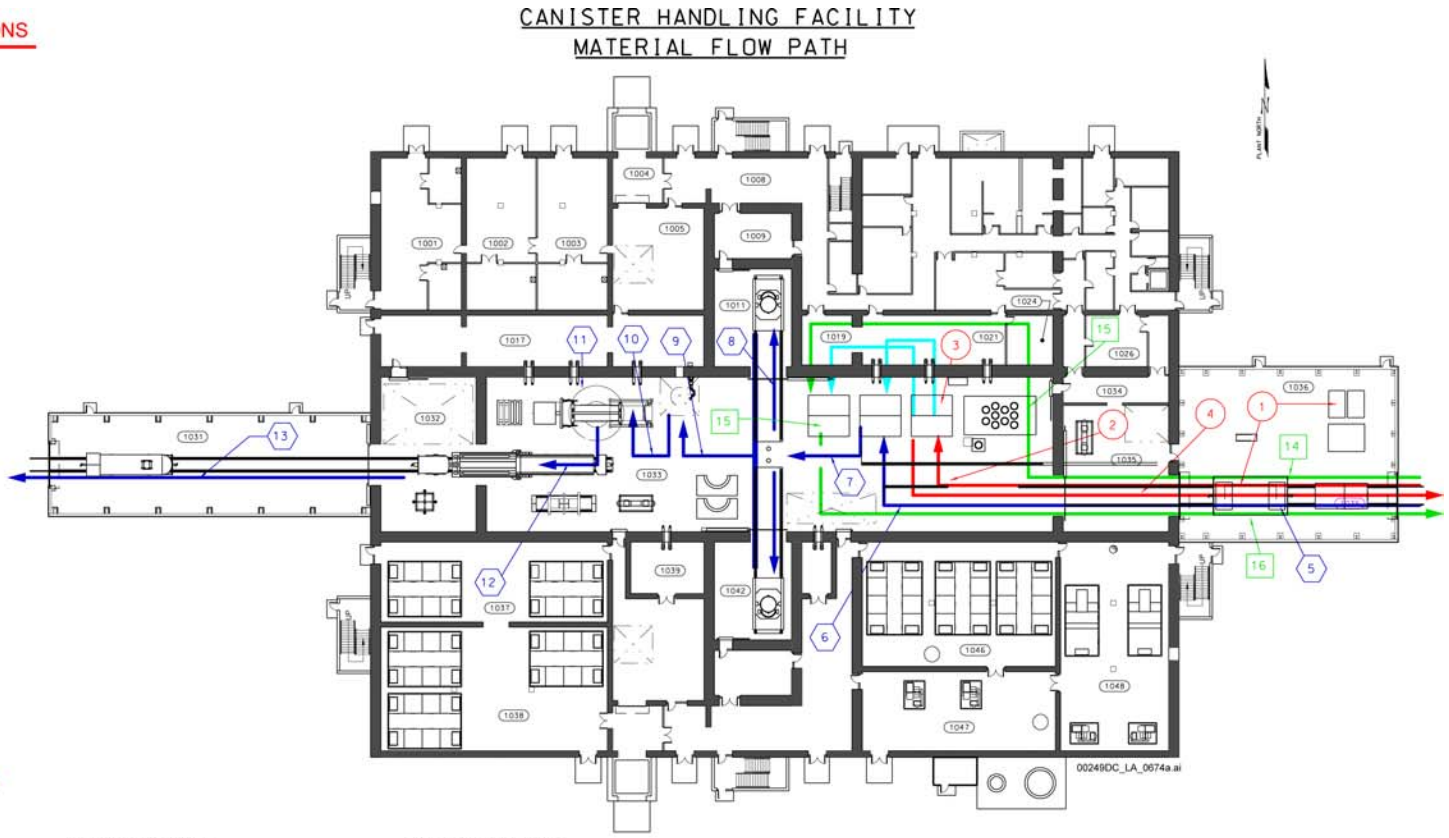
1. Remove Impact Limiters and Personnel Barrier
2. Upend Cask
3. Transfer Cask to Pit
4. Return Cask

**WASTE PACKAGE OPERATIONS**

5. Receive Empty WP
6. Transfer WP to Pit
7. Transfer WP to WP Trolley
8. Transfer WP to WP Positioning Cell
9. Transfer Welded WP to Survey Station
10. Transfer to Tilt Station and Down End WP on to WP Pallet
11. Remove WP Trunnions (Both Ends)
12. Transfer Wp to WP Transporter
13. Transfer WP To Emplacement

**SITE SPECIFIC CASK OPERATIONS**

14. Receive Site Specific Casks
15. Transfer Site Specific Cask to Pit
16. Transfer Loaded Site Specific Casks



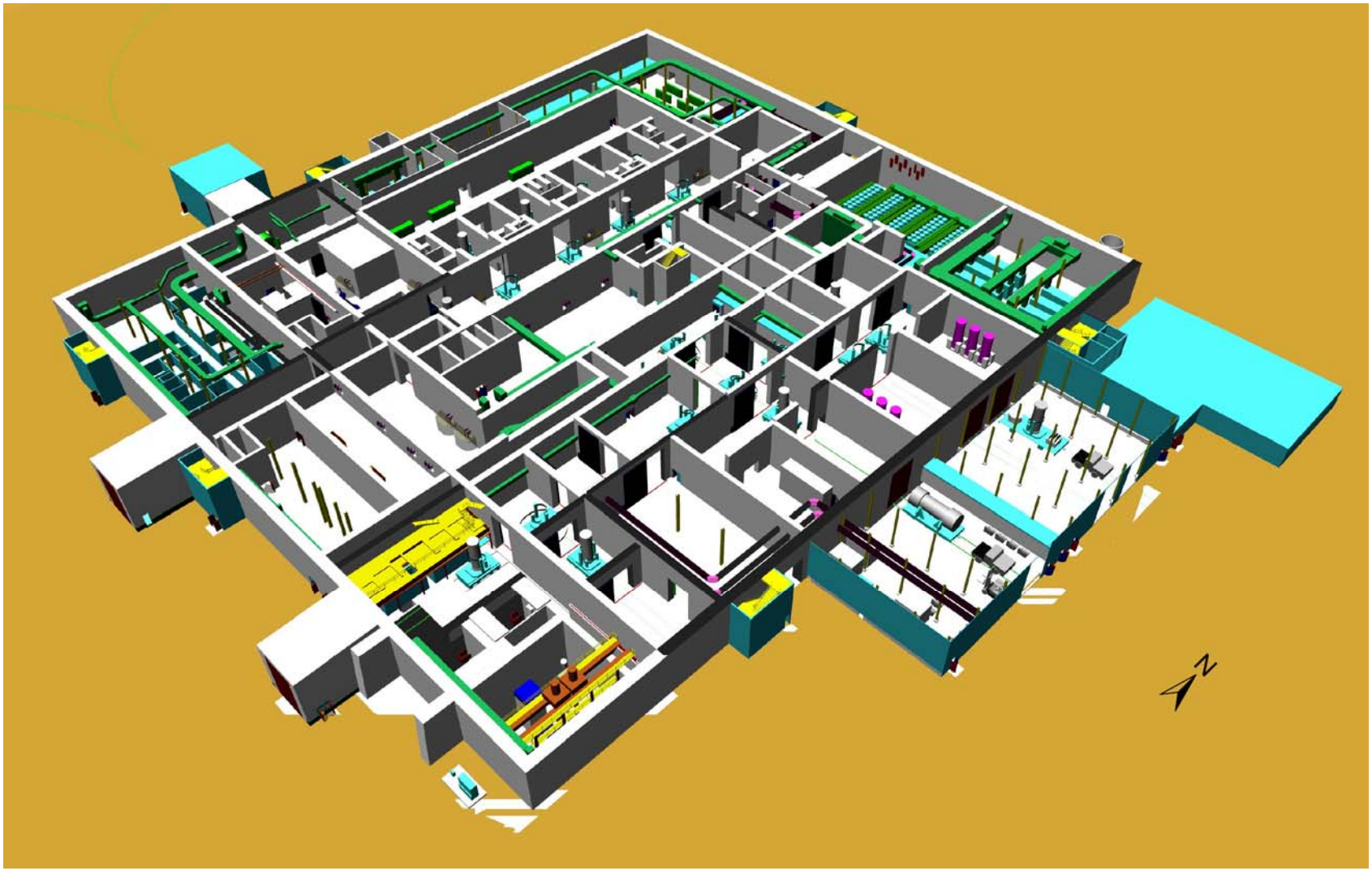

**THROUGHPUT**

Up to 180 waste packages/year

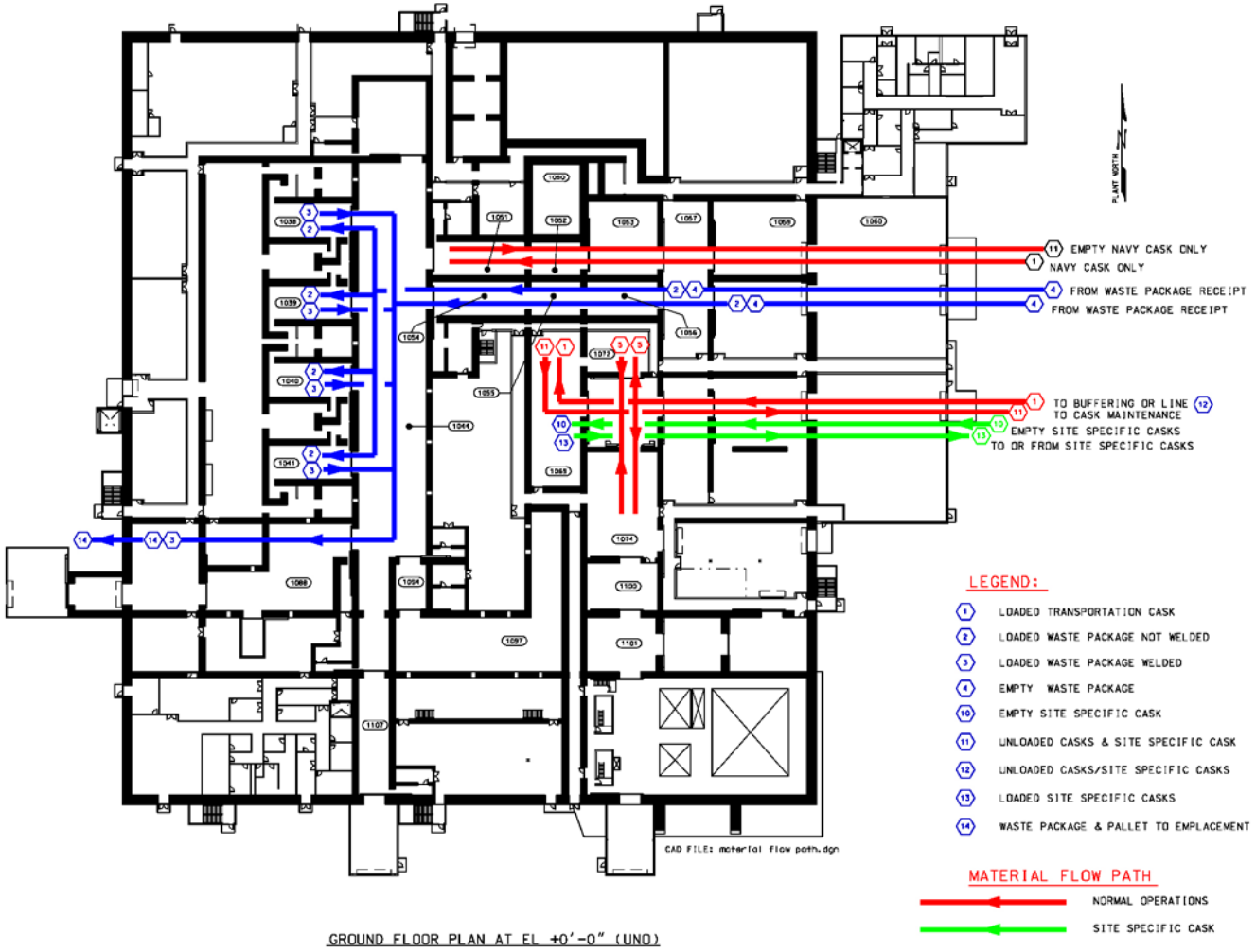
**WASTE FORMS**

DOE HLW
DOE SNF

# Dry Transfer Facility



# Dry Transfer Facility - Sketch




GROUND FLOOR PLAN AT EL +0'-0" (UNO)

**THROUGHPUT**

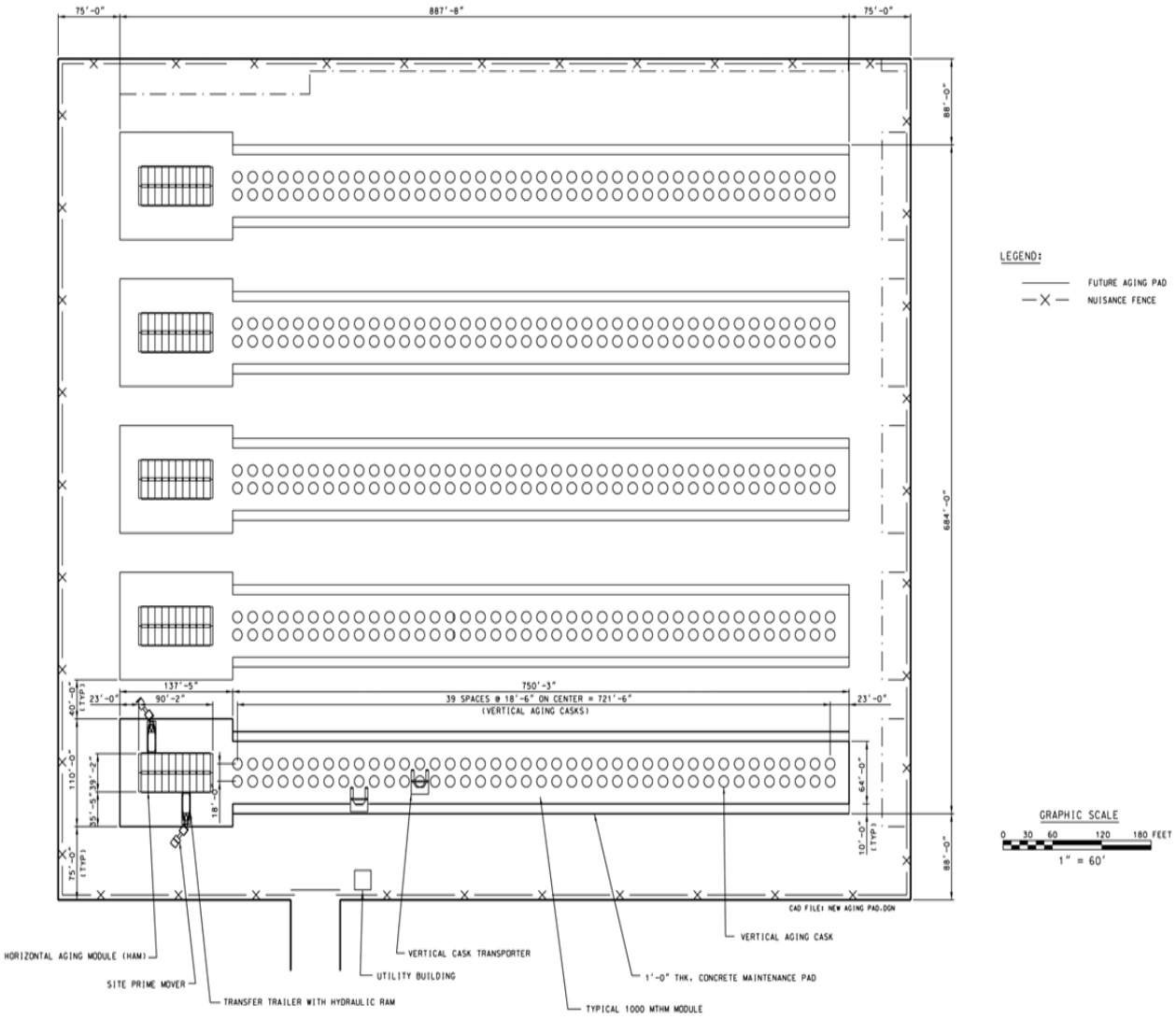
Up to 180 waste packages/year

**WASTE FORMS**

Bare CSNF
Canistered CSNF (OPC)
DOE SNF
DOE HLW
Remediation

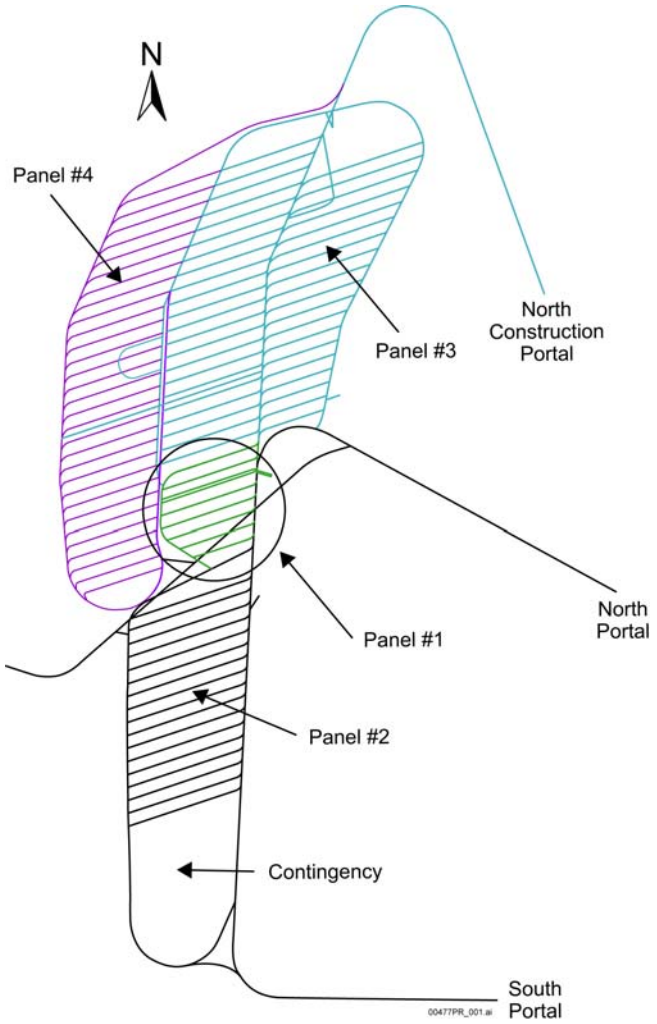
# Aging Transporter

# Aging Pad

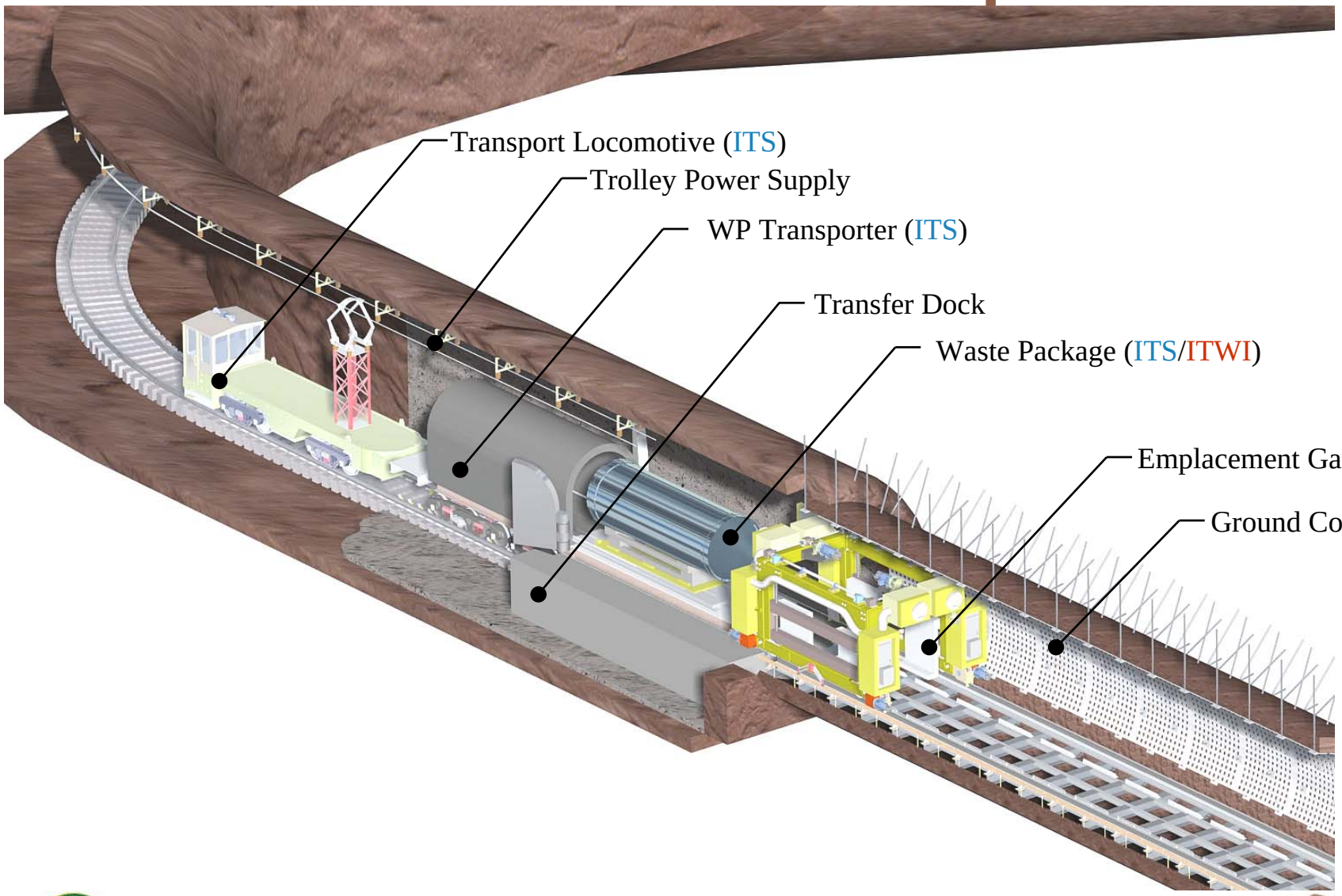

75'-0"
887'-8"
75'-0"
88'-0"
684'-0"
88'-0"
137'-5"
750'-3"
39 SPACES @ 18'-6" ON CENTER = 721'-6"
(VERTICAL AGING CASKS)
23'-0"
90'-2"
23'-0"
40'-0" (TYP)
110'-0"
35'-9"
39'-2"
18'-0"
64'-0"
10'-0" (TYP)
75'-0" (TYP)
CAD FILE: NEW AGING PAD.DGN
LEGEND:
FUTURE AGING PAD
NUISANCE FENCE
GRAPHIC SCALE
0 30 60 120 180 FEET
1" = 60'
HORIZONTAL AGING MODULE (HAM)
SITE PRIME MOVER
TRANSFER TRAILER WITH HYDRAULIC RAM
VERTICAL CASK TRANSPORTER
UTILITY BUILDING
TYPICAL 1000 MTHM MODULE
1'-0" THK. CONCRETE MAINTENANCE PAD
VERTICAL AGING CASK

# Subsurface Configuration

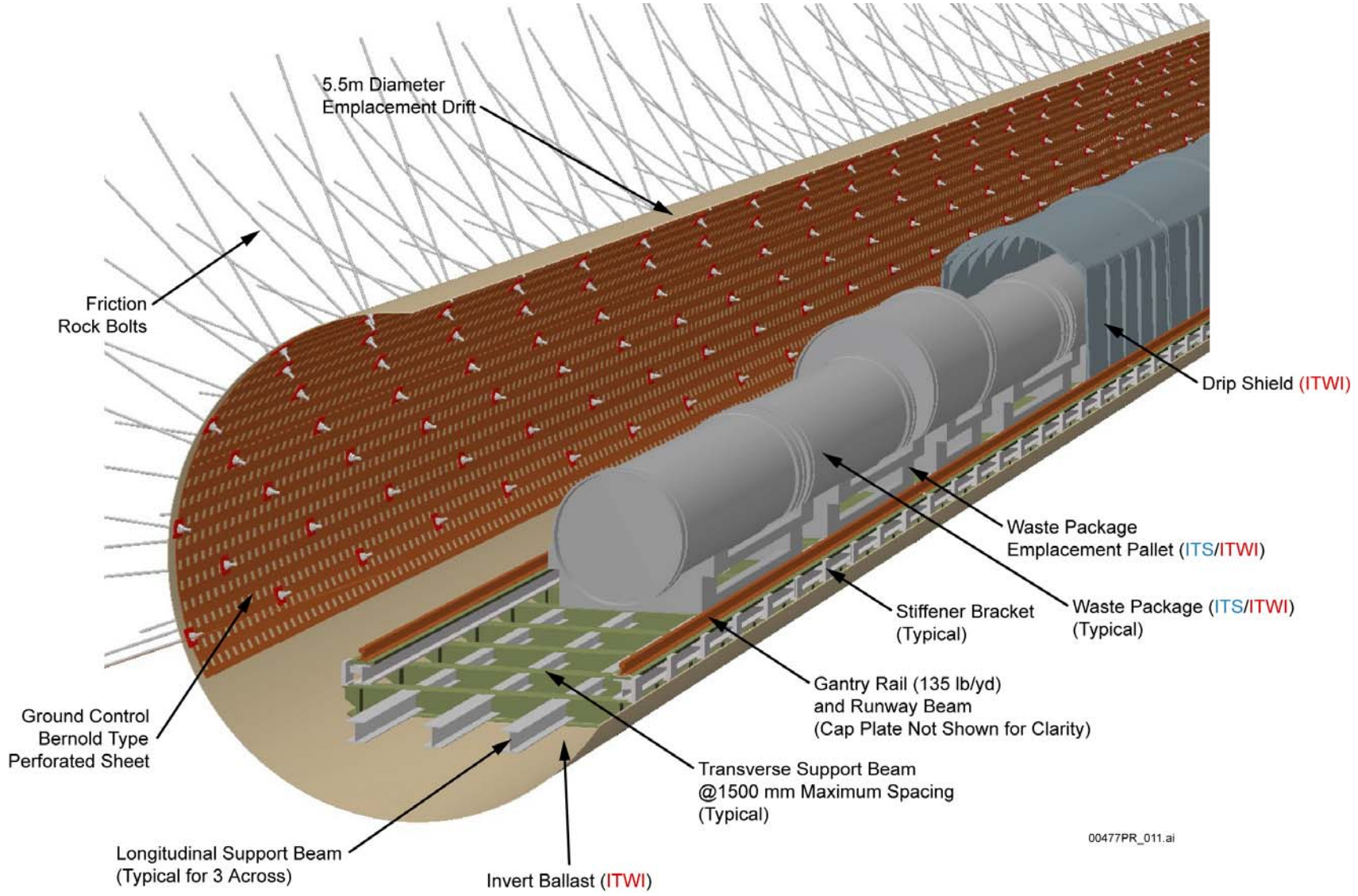
- Panel numbers represent the proposed emplacement sequence
- Sequence:
  - Panel 1, Phase 1 for 2010
    - Develop initial emplacement drifts
  - Panel 1, Phase 2
    - Complete panel 1 drifts (8 total)
  - Panel 2
    - 17 drifts total
- Total emplacement length available is approximately 41 miles (65 km)
- Available contingency of 11 - 13.5 % for the 70,000 MTHM case



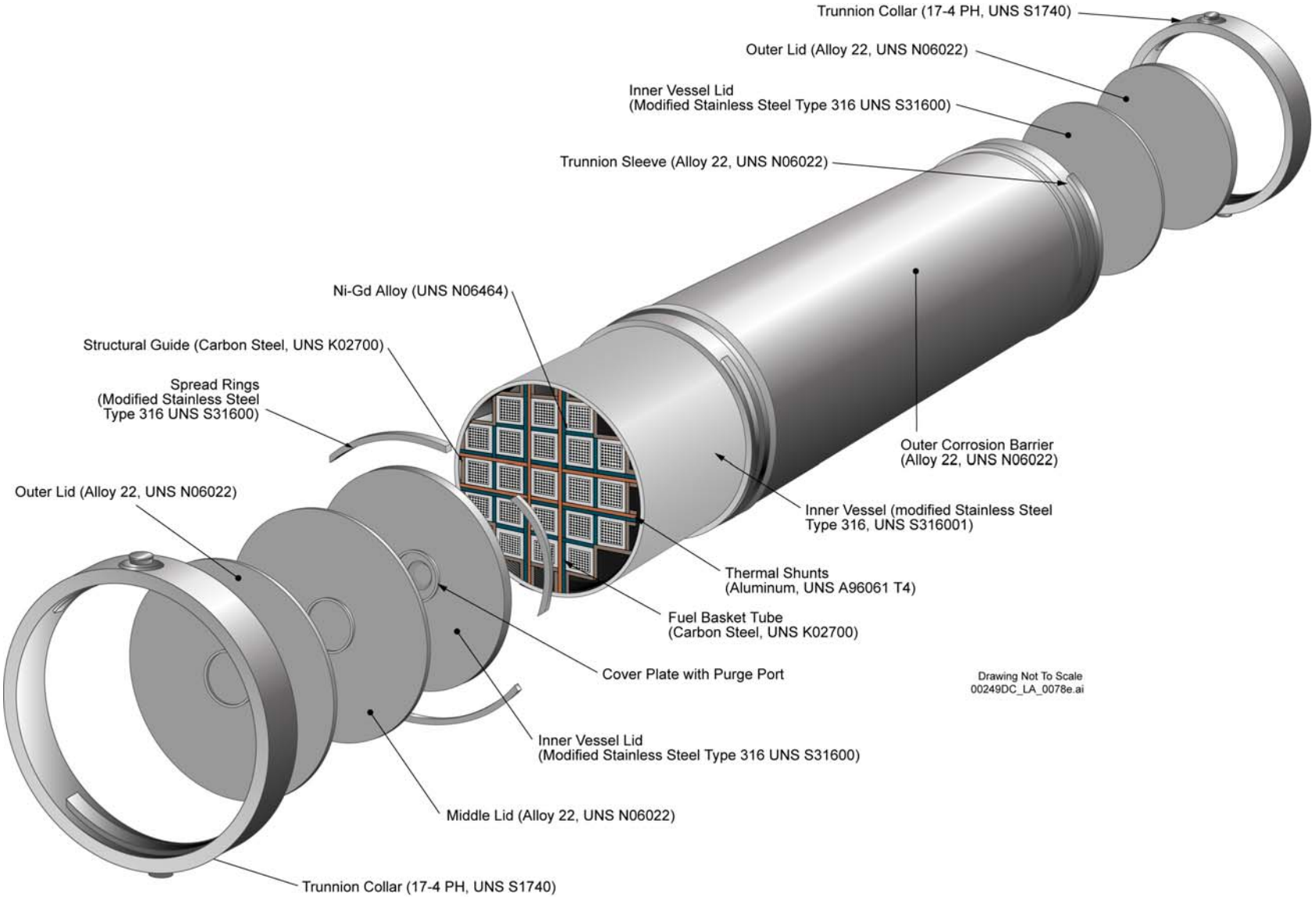
# Emplacement Drift Transfer Dock Rail Based Transport



# Emplacement Drift



# Waste Package(ITS/ITWI)



# Drip Shield (ITWI)