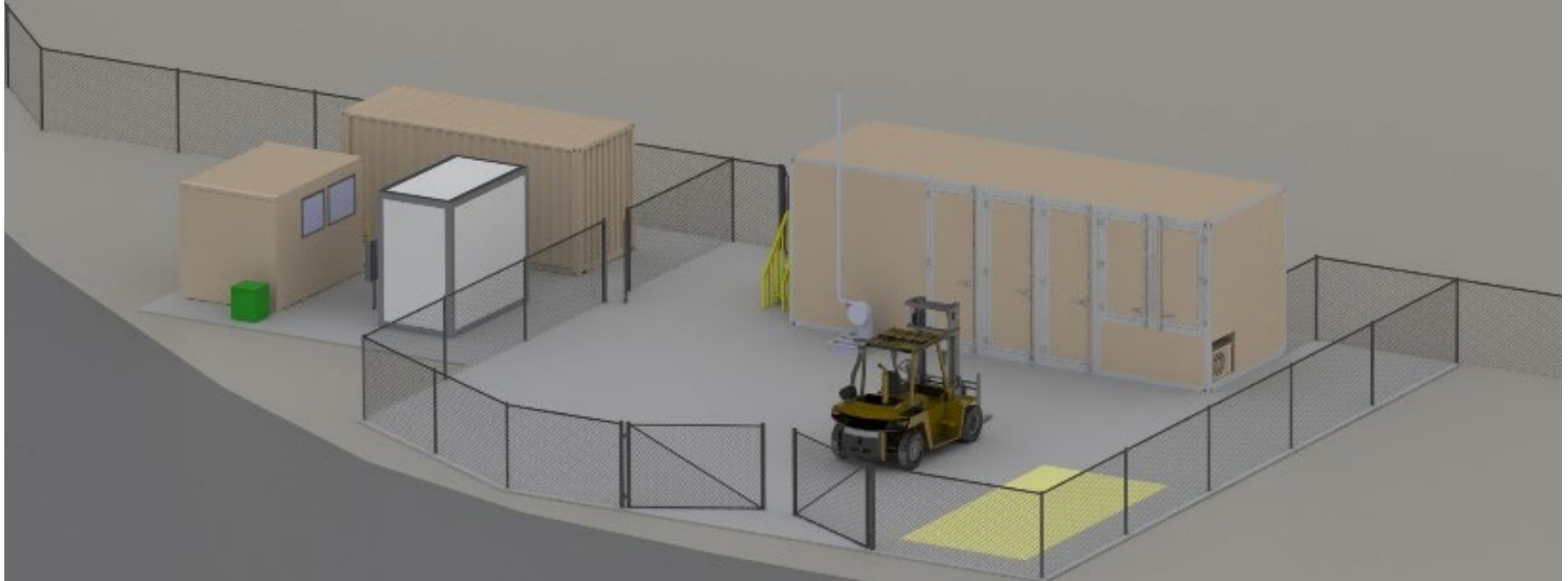


TANK SIDE CESIUM REMOVAL



DFLAW PROJECTS ENGINEERING

Blake Chamberlain

May 7, 2019

Background

- DFLAW Projects Engineering Organization
- TSCR Origin

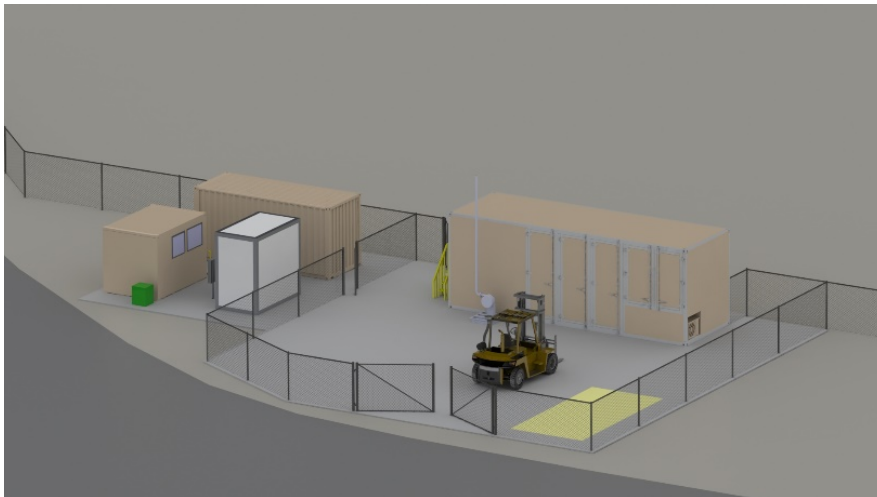
Waste Feed Delivery (WFD)

- WFD = Tank Side Cesium Removal (TSCR) + Tank Farm Upgrades
 - Where are we & where are we going to be by the end of the FY?
- TSCR Technical Details
- Tank Farm Upgrades Technical Details

- Why Created
 - Needed an organization that could provide consistent and integrated engineering support to TFC DFLAW Projects
 - Tank Farm Upgrades to feed TSCR and WTP
 - TSCR
 - LAWPS Future Facility
 - Other various projects
- What We Do
 - Provide technical expertise, DA and Project Engineering support for the above projects

- 2017 External Independent Review Team recommended two-phased pretreatment strategy
 - Tank side cesium removal system as a “first feed” solution
 - Optimized LAWPS for long-term LAW Vitrification feed
- ORP issued RFP for Technology Demonstration of TSCR capability
 - Provide system to meet LAW Vit waste acceptance criteria
 - Enable WTP LAW Vit to complete hot commissioning by 12/2021
 - Enable initial LAW Vit operations until LAWPS becomes operational
 - Use relevant information from Savannah Rivers tank closure cesium removal (TCCR) demonstration
 - Leverage experience from commercial nuclear waste cleanup projects
- IX Column design does not need to meet DOT requirements (storage pad is in the TSCR DSA amendment)
- Non-elutable resin (CST)

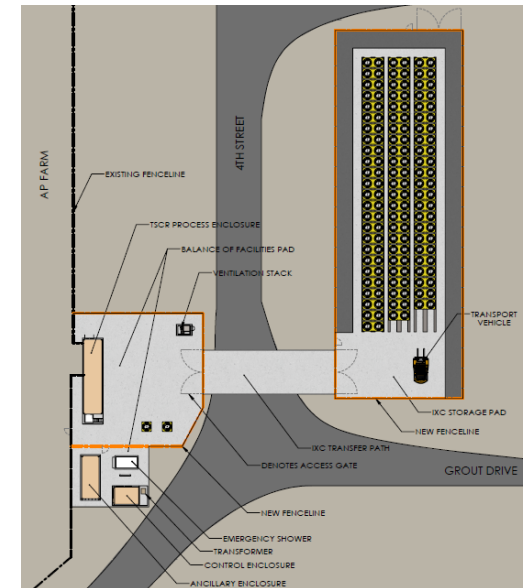
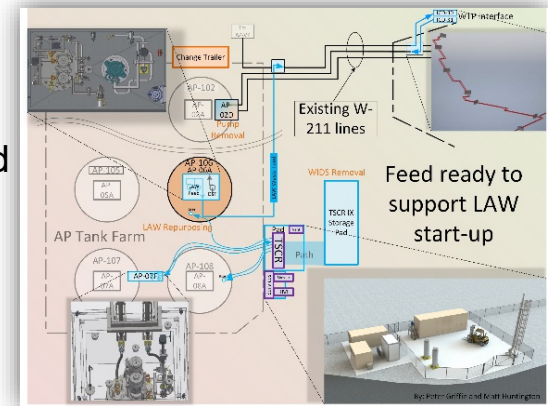
- TSCR (90 day look ahead)
 - Approve CGDs, release SS material procurements (April 2019)
 - Start TSCR LLE fabrication (May 2019)
 - Submit RCRA permit modification application (April 2019)
 - Complete TSCR 90% Design Review (May 2019)
 - Final Design Complete (June 2019)



Culminates in the following by end of FY:

- **Deliver Equipment from SC to WA**
- **Set-up for FAT Testing in Richland**

- Tank Farm Upgrades to Feed TSCR and WTP
 - TSCR Infrastructure Upgrades
 - Adds WT pumps in AP-107 and HIHTLs between TSCR and AP tanks
 - 60% Design complete & reviewed
 - 90% Design complete June 2019
 - Upgrades to support Treated Waste Feed to WTP
 - Adds WT pumps in AP-106, new pipe-in-pipe, utilizes/qualifies for use existing W-211 lines
 - 60% Design complete & reviewed
 - 90% Design complete in May 2019
 - TSCR IXC Storage Pad
 - IXC interim storage, installation of TSCR infrastructure, IXC forklift
 - 60% Design complete in April 2019
 - 90% Design complete in July 2019



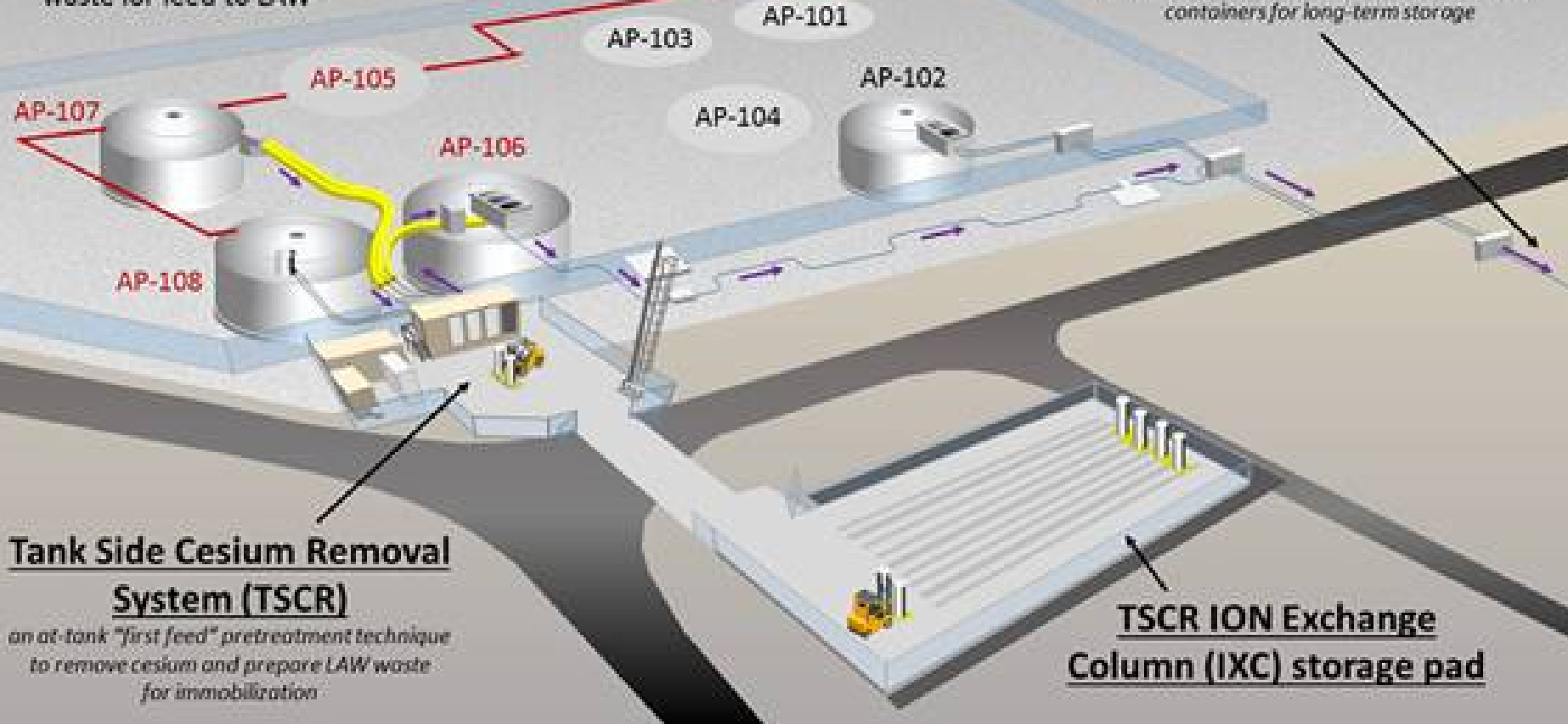
Culminates in a CD-2/3 Package submittal in April for approval by end of FY (September)

AP-Tank Farm

AP-105/AP-106/AP-107/AP-108 feeds untreated tank waste to cesium removal systems and prepares waste for feed to LAW

To Low Activity Waste (LAW) Facility

Mixes LAW feed with glass-forming materials; produces vitrified waste-form in stainless steel containers for long-term storage

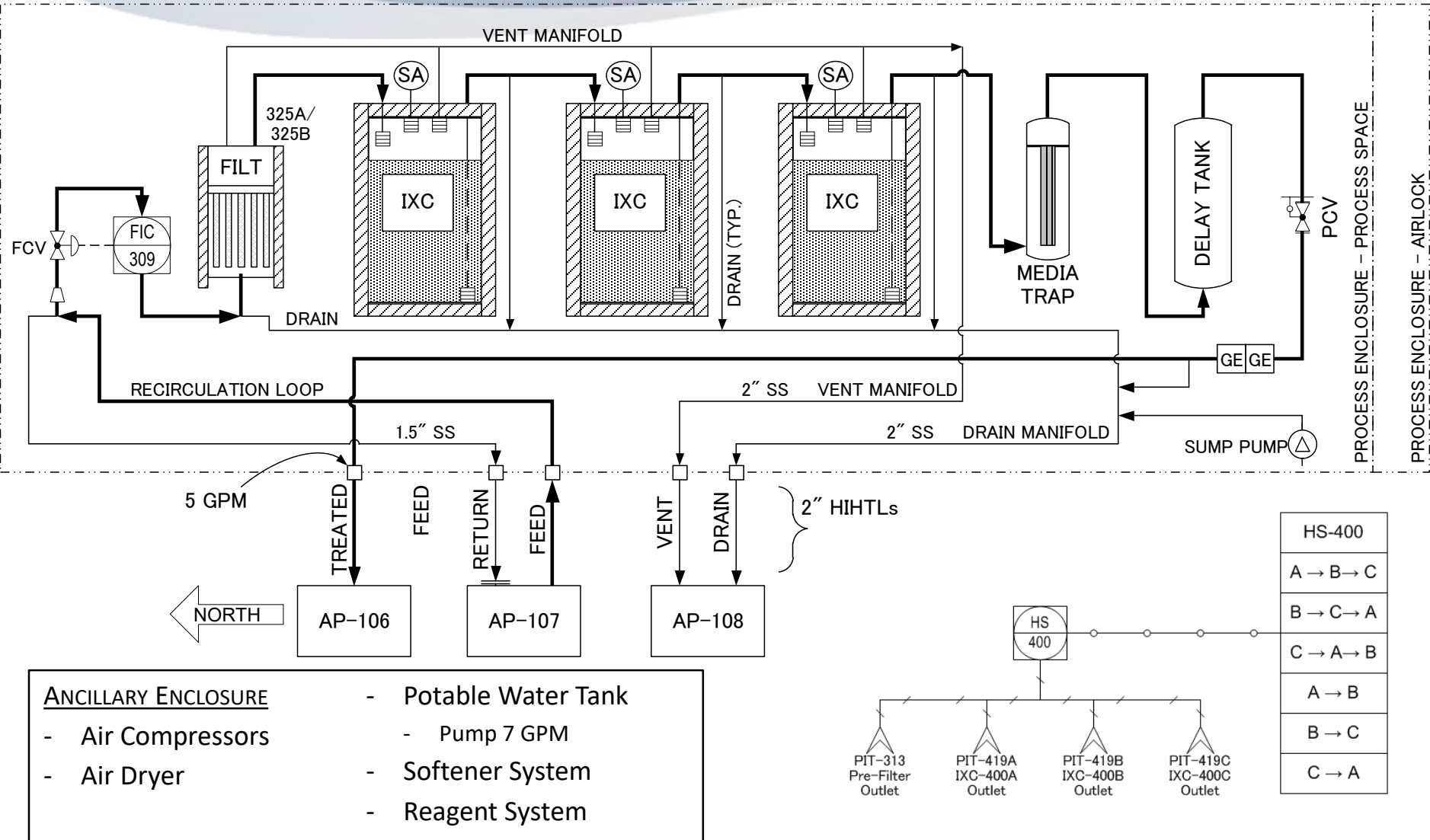


Tank Side Cesium Removal System (TSCR)

an at-tank "first feed" pretreatment technique to remove cesium and prepare LAW waste for immobilization

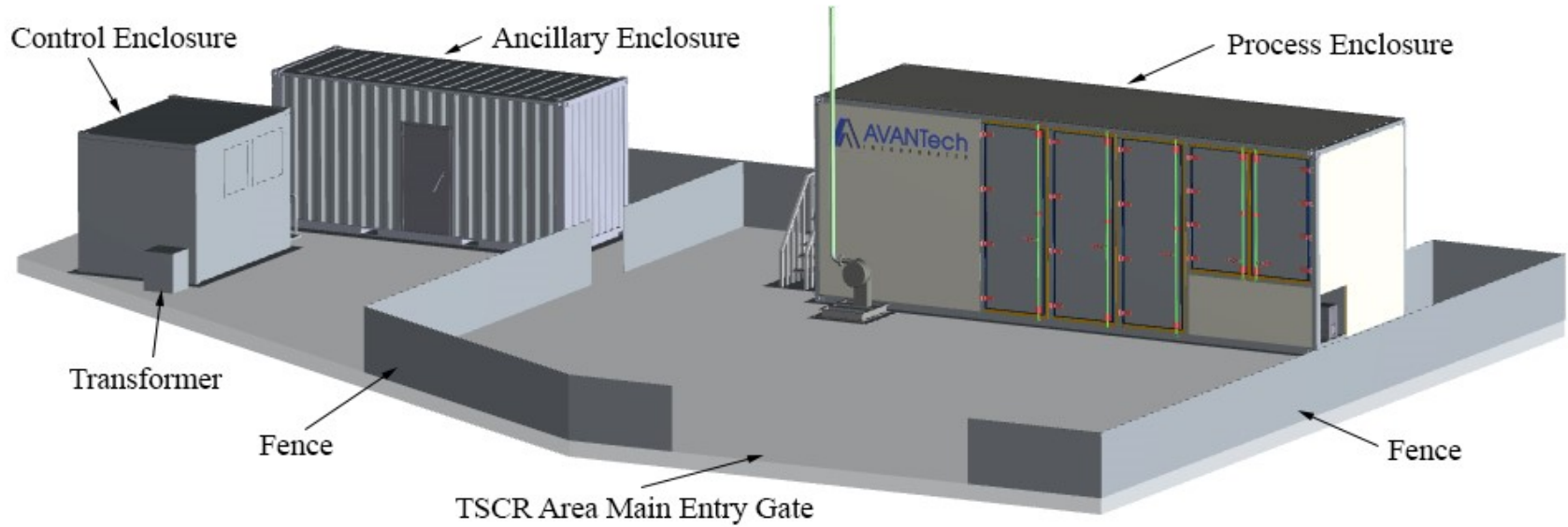
TSCR ION Exchange Column (IXC) storage pad

TSCR Simplified PFD

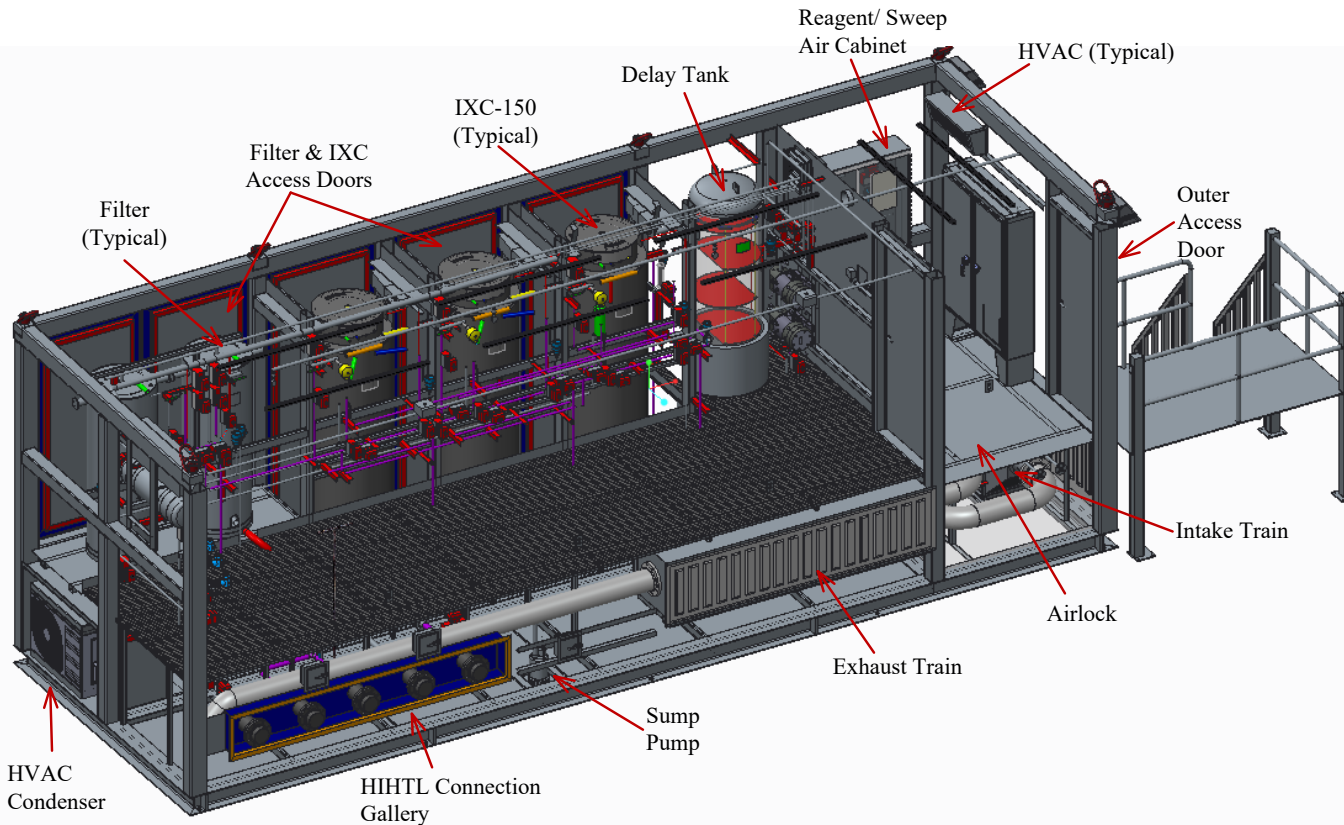




TSCR 60% Design



TSCR Process Enclosure



Key Metrics:

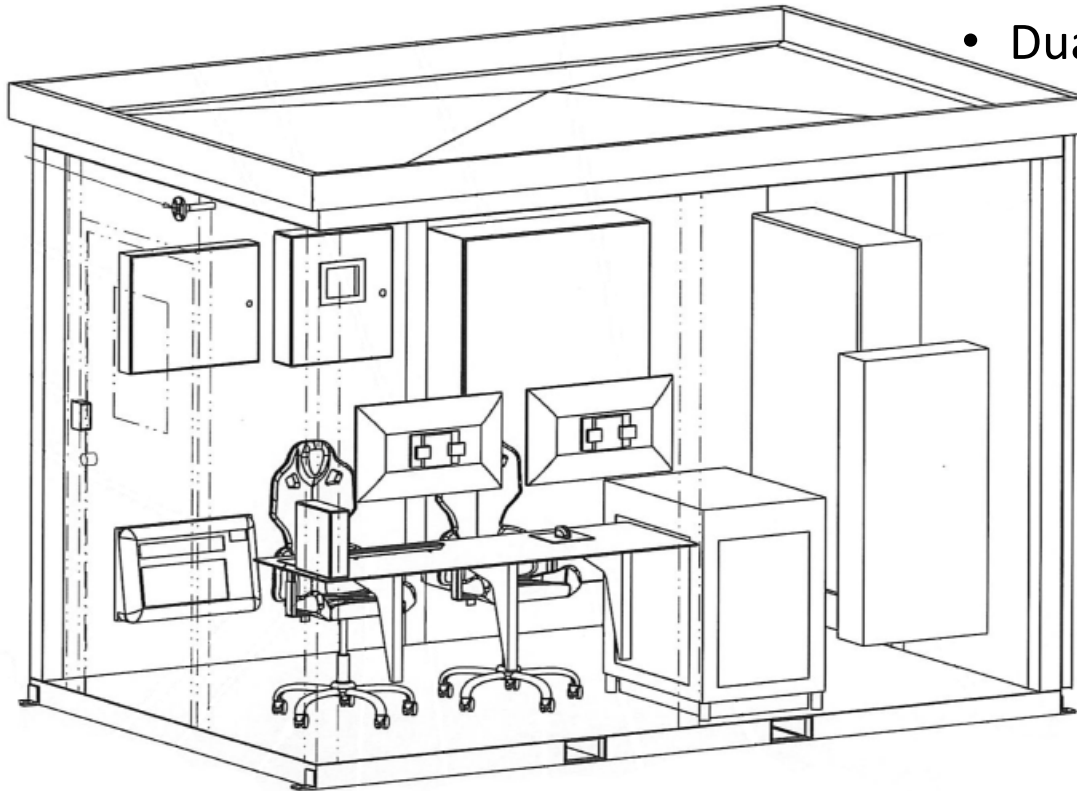
- 5-gpm
- 5.6M Na⁺ Waste
- 200 ppm UDS
- 68 to 95°F
- 0.163 Ci/L ¹³⁷Cs (process)
- 0.30 Ci/L ¹³⁷Cs (safety)

Performance

- ¹³⁷Cs DF of ≈ 1000
- H₂ < 25% LFL
- No boiling at Atm
- Sys Availability > 70%

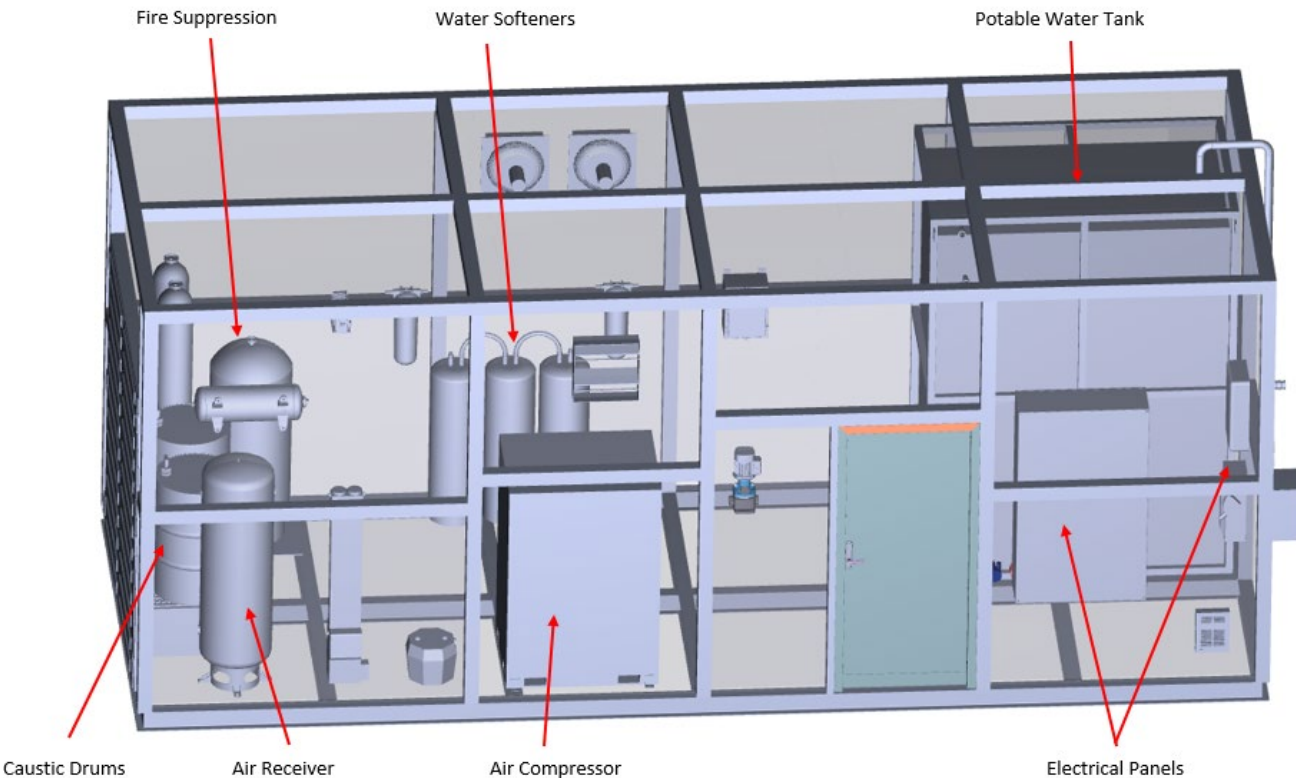
Operational control of the TSCR system

- Continuous occupancy
- Climate controlled



- Dual work station

- TFMCS / OSI Pi / HLAN connections
- Interior dimensions
 - 7.5' wide x 11.5' long



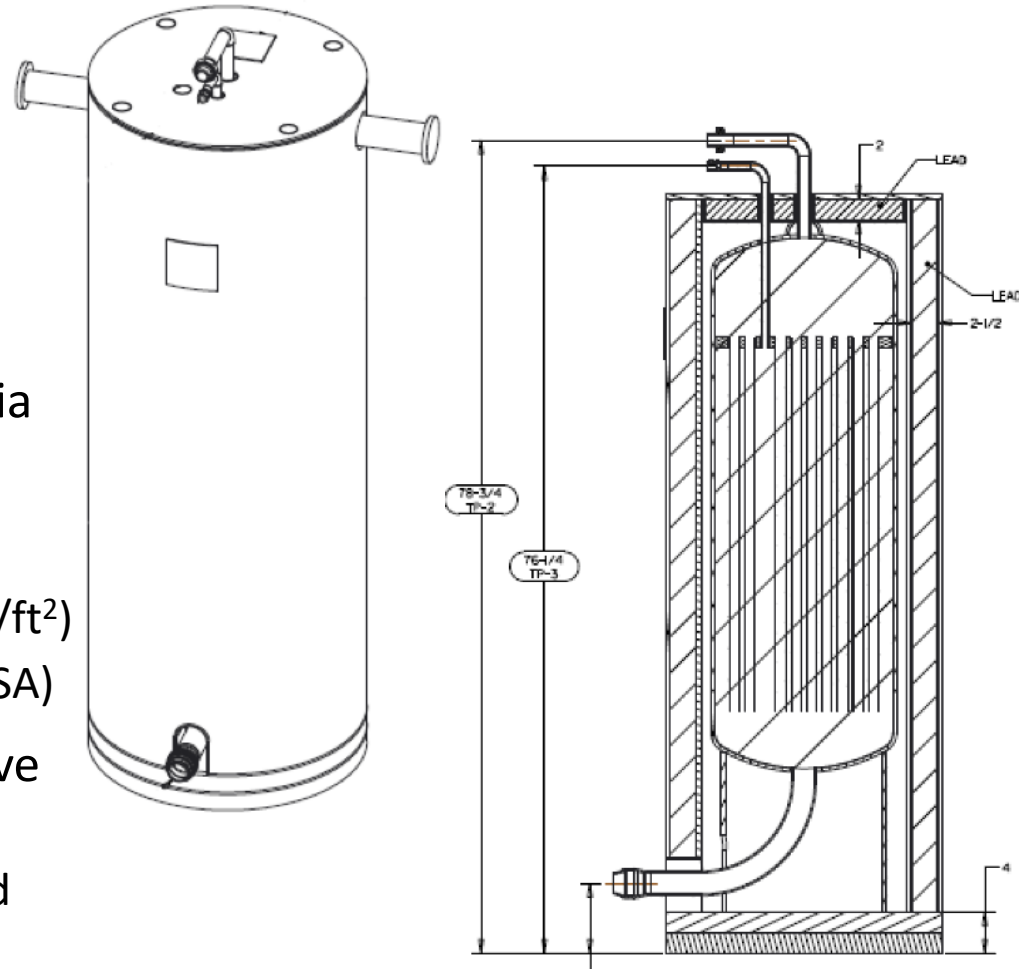
Key Components:

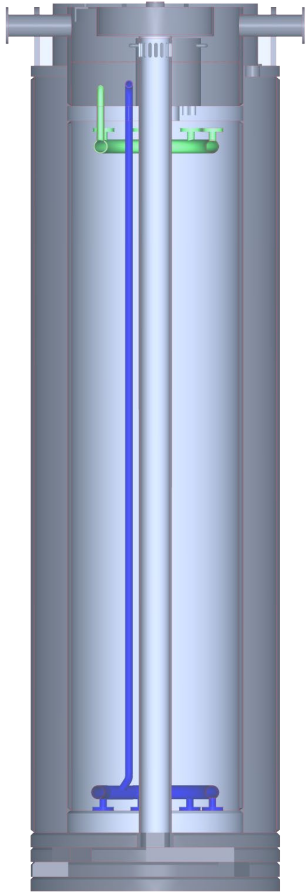
- Air Compressors
- Air Dryer
- Receiver Tanks
- Potable Water Tank & Pump
- Potable Water System
- Sodium Hydroxide (Reagent)
- Caustic Metering Pump
- Fire Suppression

Features

- Insulated/ Heated
- Ventilated for Cooling
- Side Personnel Door
- Rear Cargo Door

- Dimensions
 - 6.5' Tall
 - 26" Diameter
- Flow Path
 - Bottom Feed
- Sintered Stainless Steel Filter Media
 - Mott Grade 5
- Filter Metrics
 - Low Flux at 93.5 GFD (0.065 gpm/ft²)
 - 98 filters – 1" OD x 36" Lg (77 ft² SA)
- Air Receiver (20 gal) supplies motive force for backwash (70 psig)
 - Empties filter housing and related piping into AP-108





IX Column Internals

- Even distribution through media
- 150 μm wedge-wire slots prevents media passage
- Effective bulk dewatering

Cooling Core

- Eliminates high temperature center-line region
- Convective air flow for cooling

Integral Shielding

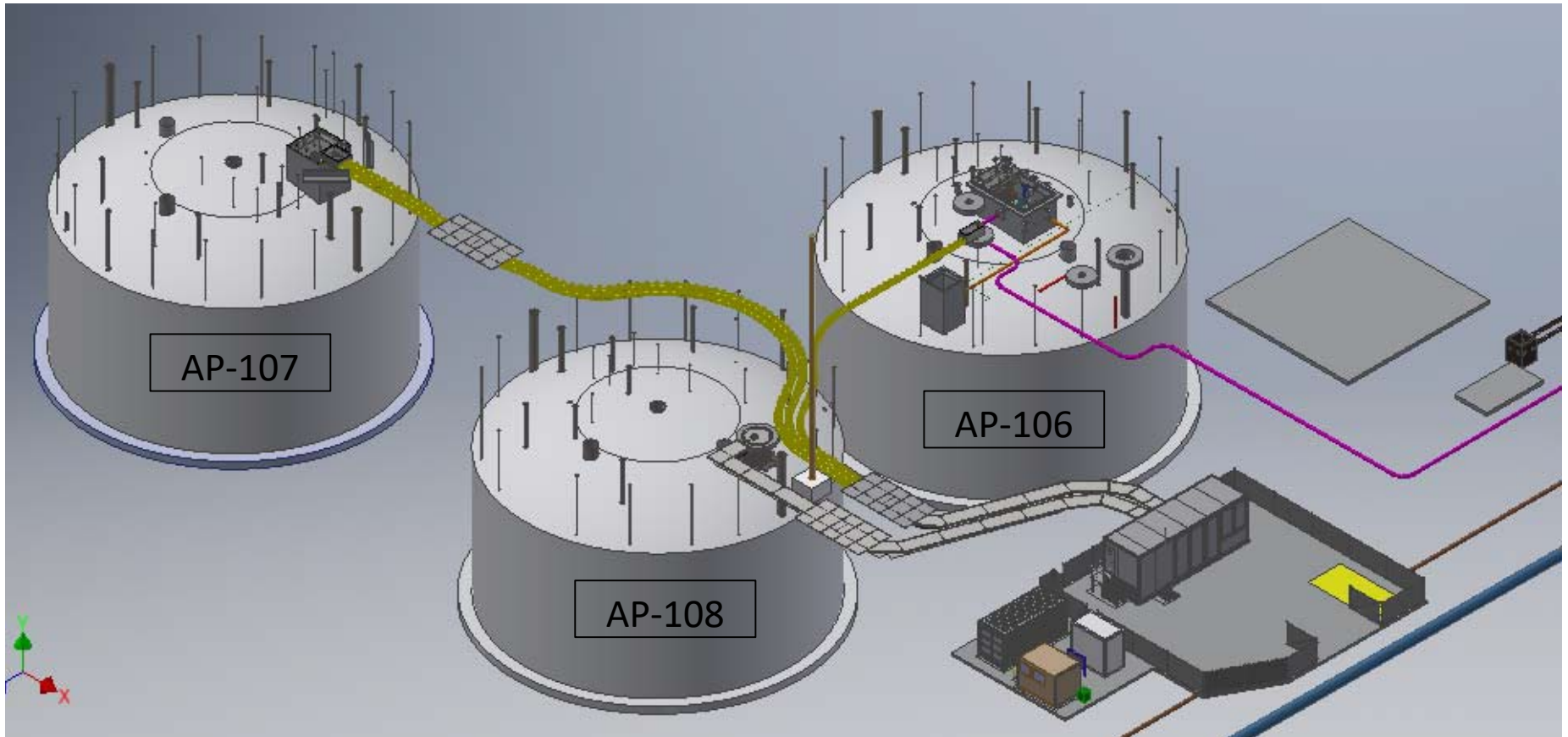
- Reduces dose rates to < 5 mrem/hr
- ≈ 5 in. lead equivalent

Simplified Handling

- Contact handled
- Compatible with forklift or overhead hoist

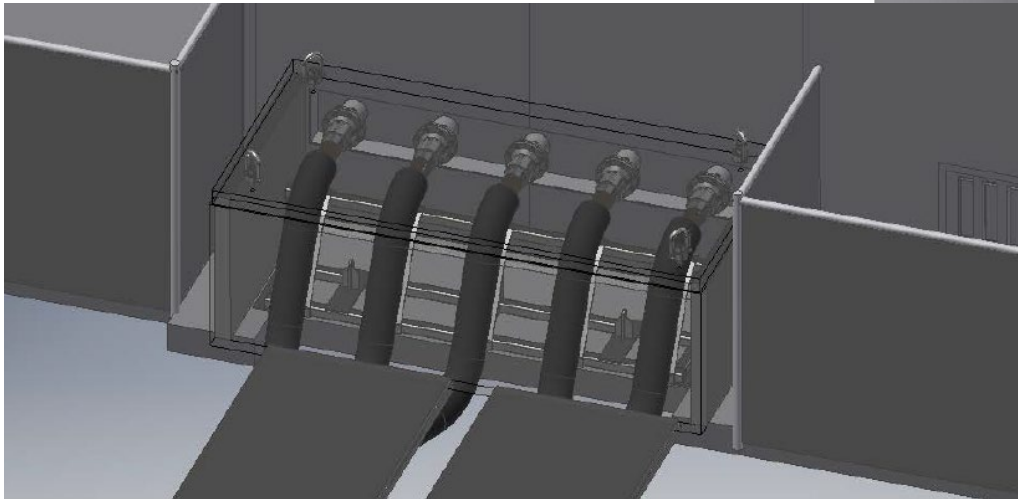
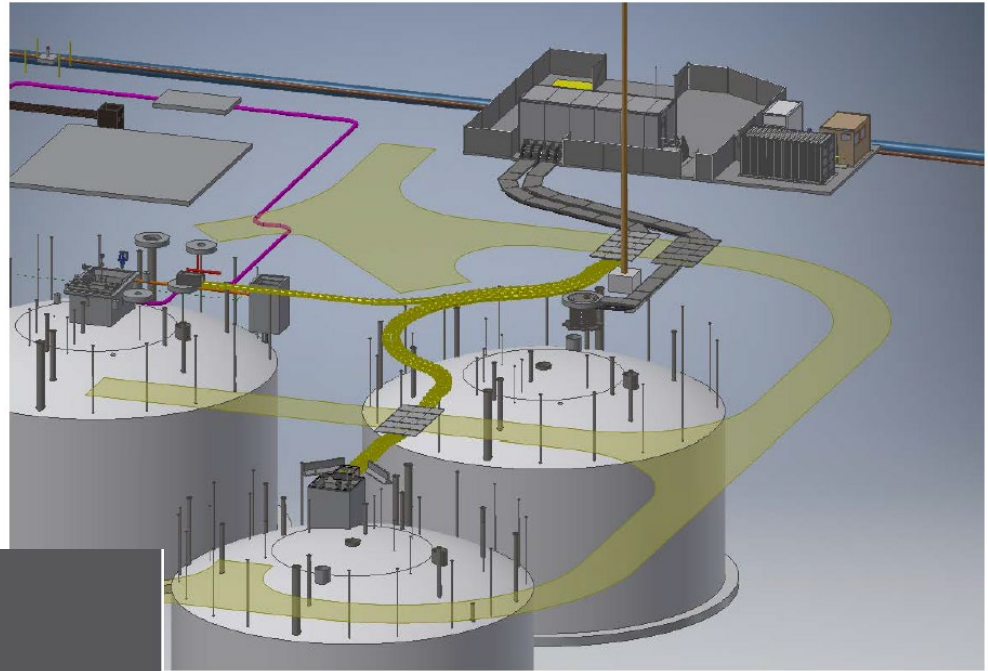
Materials of Construction

- All Stainless Steel
- 316 Wetted/ 304 Structural
- ≥ 50 -yr outdoor storage life

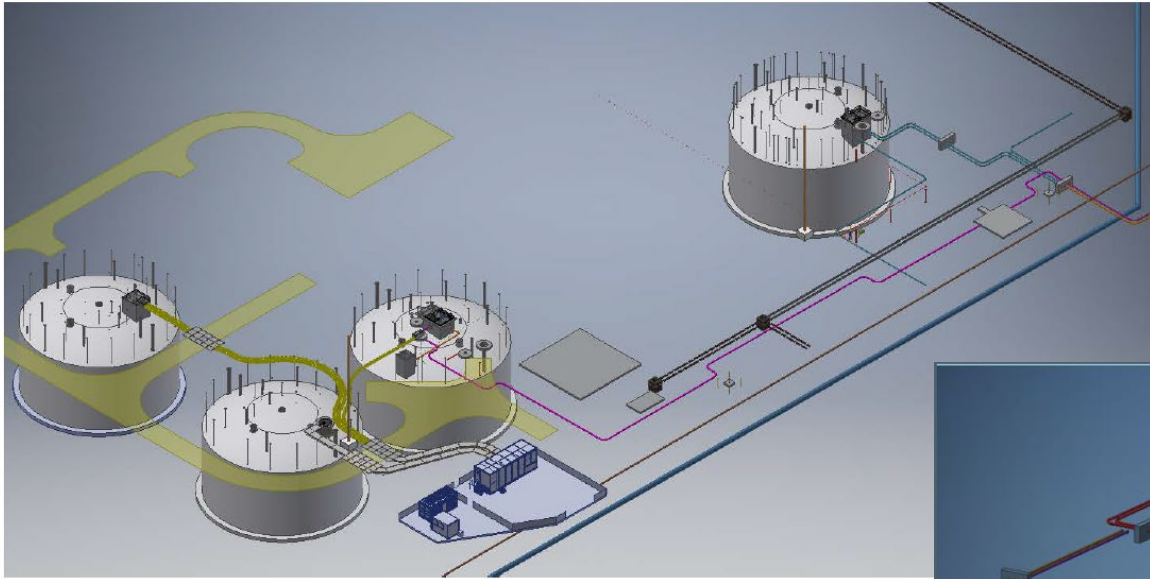


Hose-in-Hose Transfer Line

- Feed from AP-07 to TSCR
- Return from TSCR to AP-07
- Product from TSCR to AP-06
- Drain from TSCR to AP-08
- Vent from TSCR to AP-08

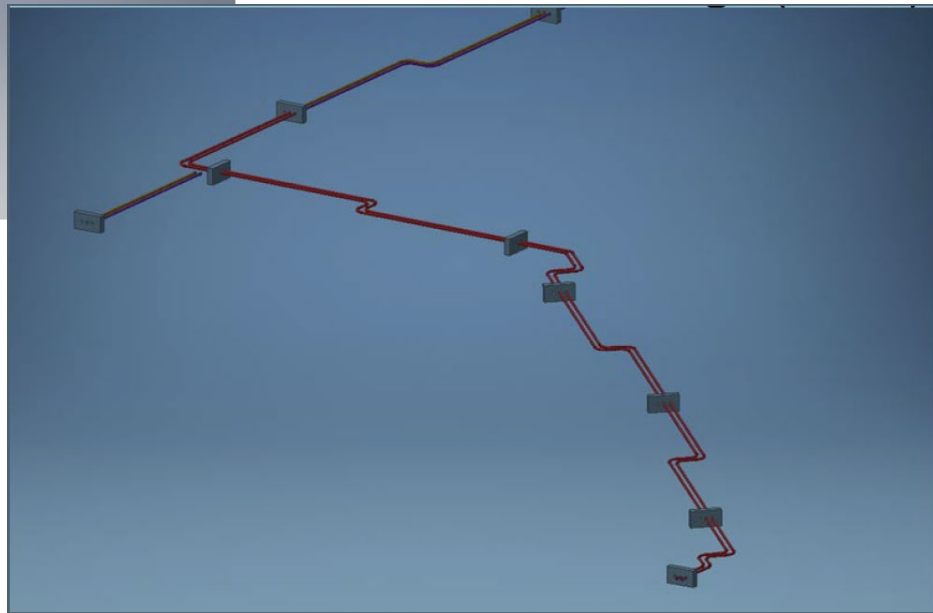


WFD – Transfer Lines 60% Design



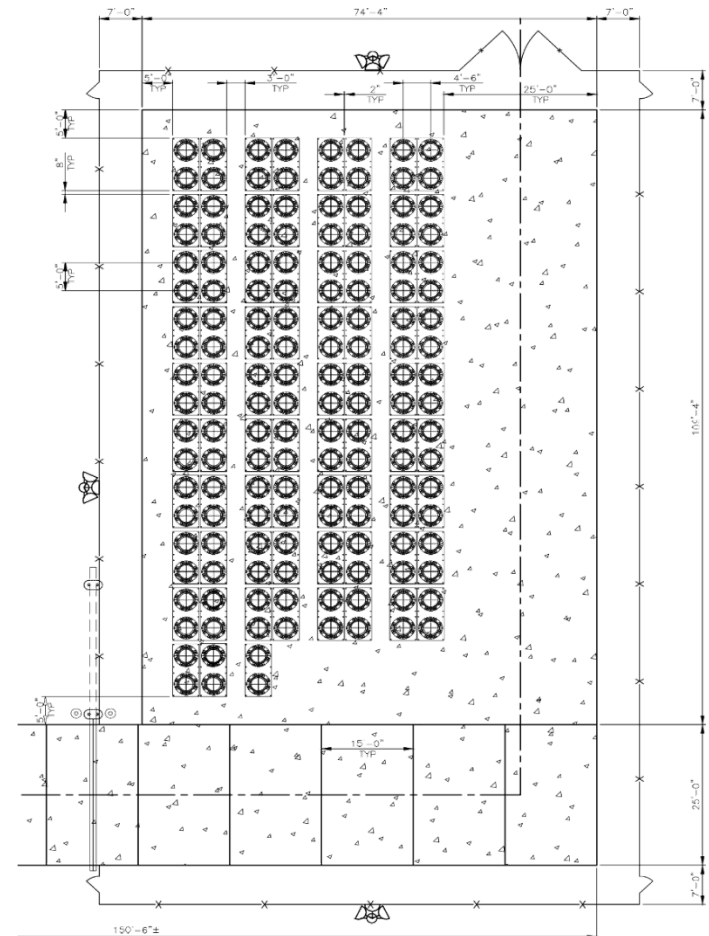
New Transfer Lines

- AP-06A to SN-637 Tie-In
- SN-637 and SN-700 Re-Route to ICD 30/31 (WTP)



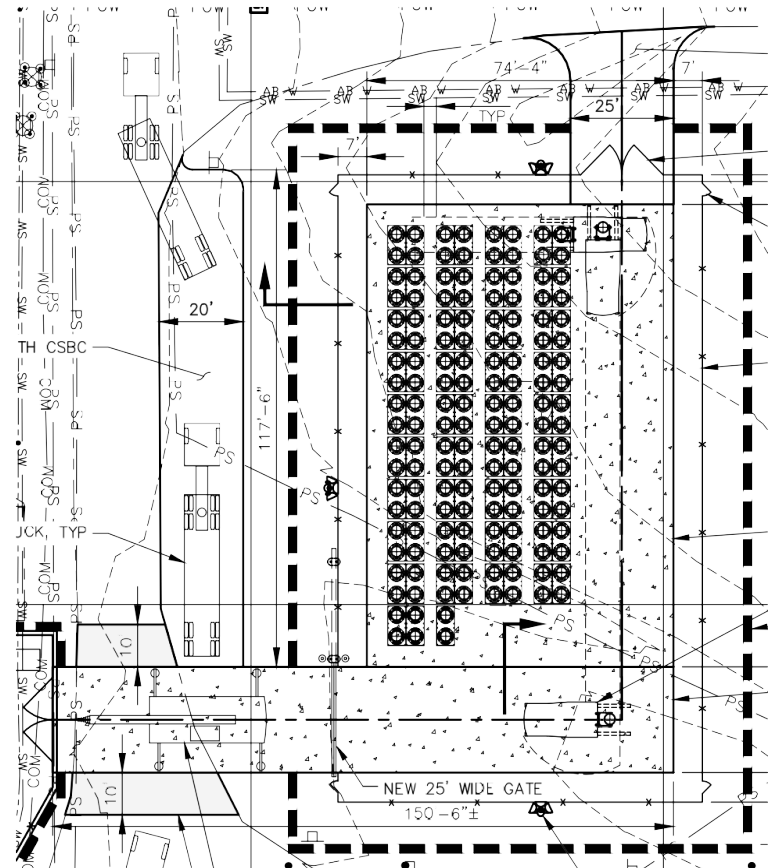
IXC Storage Pad Key Characteristics

- Holds 150 IXCs
- 30" minimum spacing between rows (2 IXCs max per row)
- Sufficient spacing such that forklift can easily maneuver to each IXC
- SDC-3 seismic loading on IXCs with IXCs anchored to pad
- IXCs will be placed in a first-in, last-out manner



Haul Path Key Characteristics

- Concrete
- Space for IXC delivery and off-loading via crane or forklift
- Integration with storage pad to allow IXC placement locations



BOF Pad Key Characteristics

- TSCR Equipment Supported
 - Process Enclosure
 - Ancillary Enclosure
 - Control Enclosure
 - Safety Shower
 - Fencing around Process Enclosure
 - Vehicle Impact Barriers

