

# *Mobile Arm Retrieval System (MARS)*

PRESENTATION AT  
2010 DOE OFFICE OF  
WASTE PROCESSING  
TECHNICAL  
EXCHANGE...ATLANTA, GA

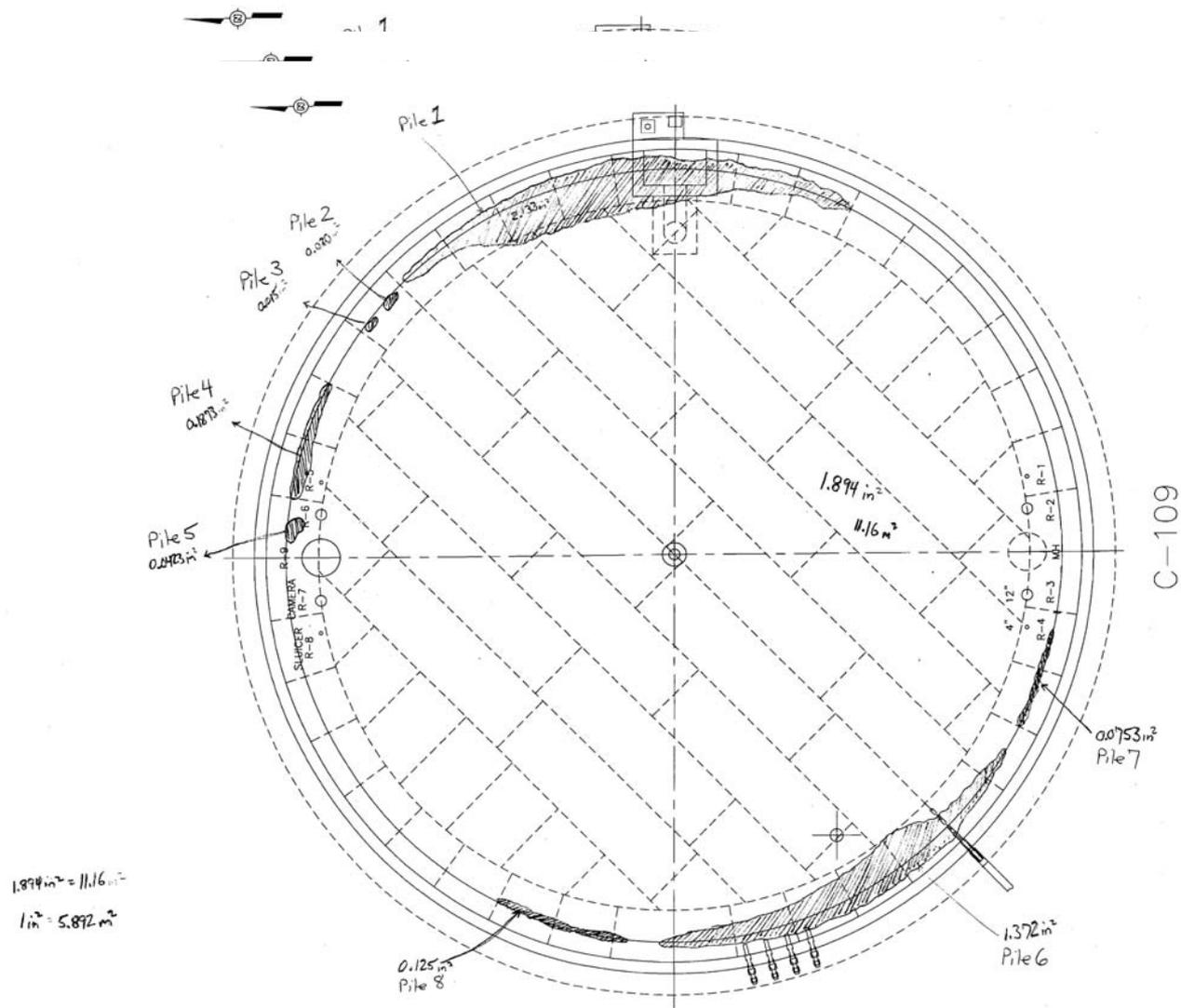
November 16, 2010



- Background
- Sluice-Mode (Sound Tank MARS)
- Vacuum-Mode (Assumed Leaking Tank MARS)
- Q & A

- DST Space is Limited Until WTP is On Line
  - C-Farm, A-Farm, AX-Farm
- Use of Sluicing for Bulk Retrieval has been Effective, however:
  - Hard Heel and Residuals remain ~ 10% of starting volume
- Required to remove key radionuclides to the maximum extent technically and economically practical (DOE M 435.1-1)
- Method of Retrieving Waste from Assumed Leakers

# Background- Sludge Mounds in C-109

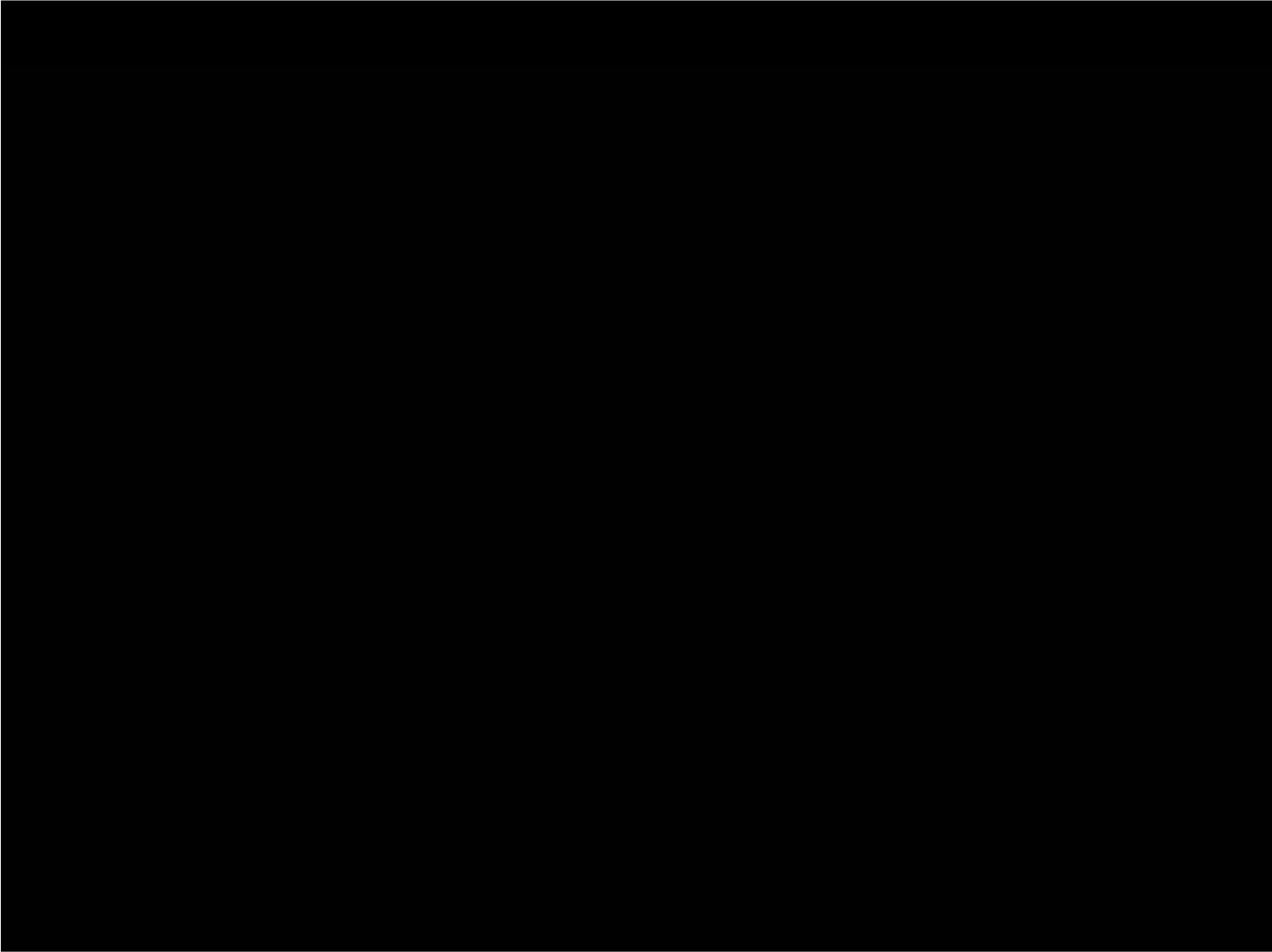


## Schedule

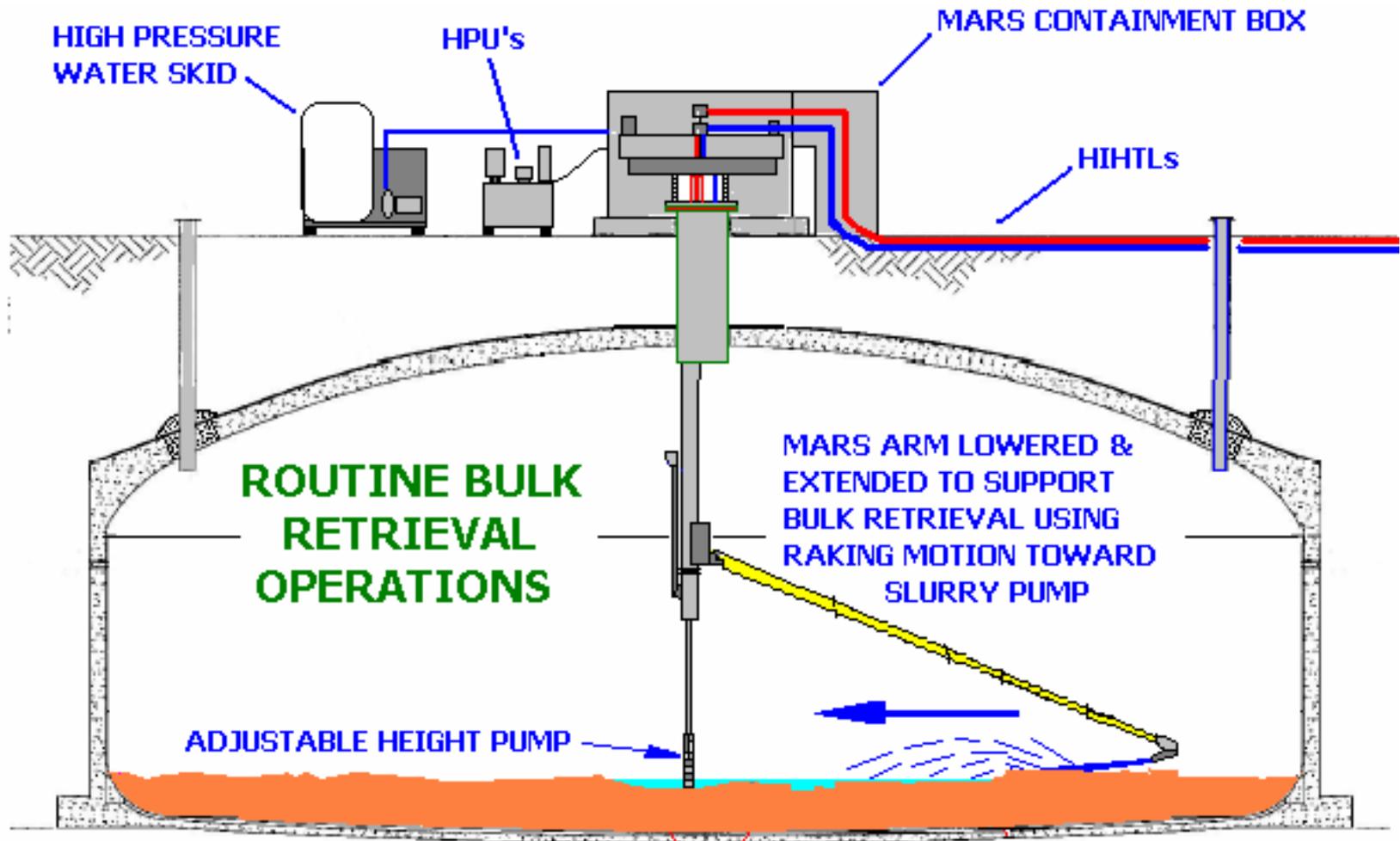
- Concept identified in TOC Proposal- Decision to deploy in C-107
- Completed MARS design: August 2009
- Completed MARS Qualification testing: September 2009
- Install Large Riser (48-inch) on C-107: December 2010
- Complete MARS ATP at Columbia Energy Test Facility (CEC): December 2010
- Complete MARS Operator training and operational readiness activities: January 2010
- Install MARS in C-107 June 2011



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# MARS - Sound Tank System (Bulk Retrieval)

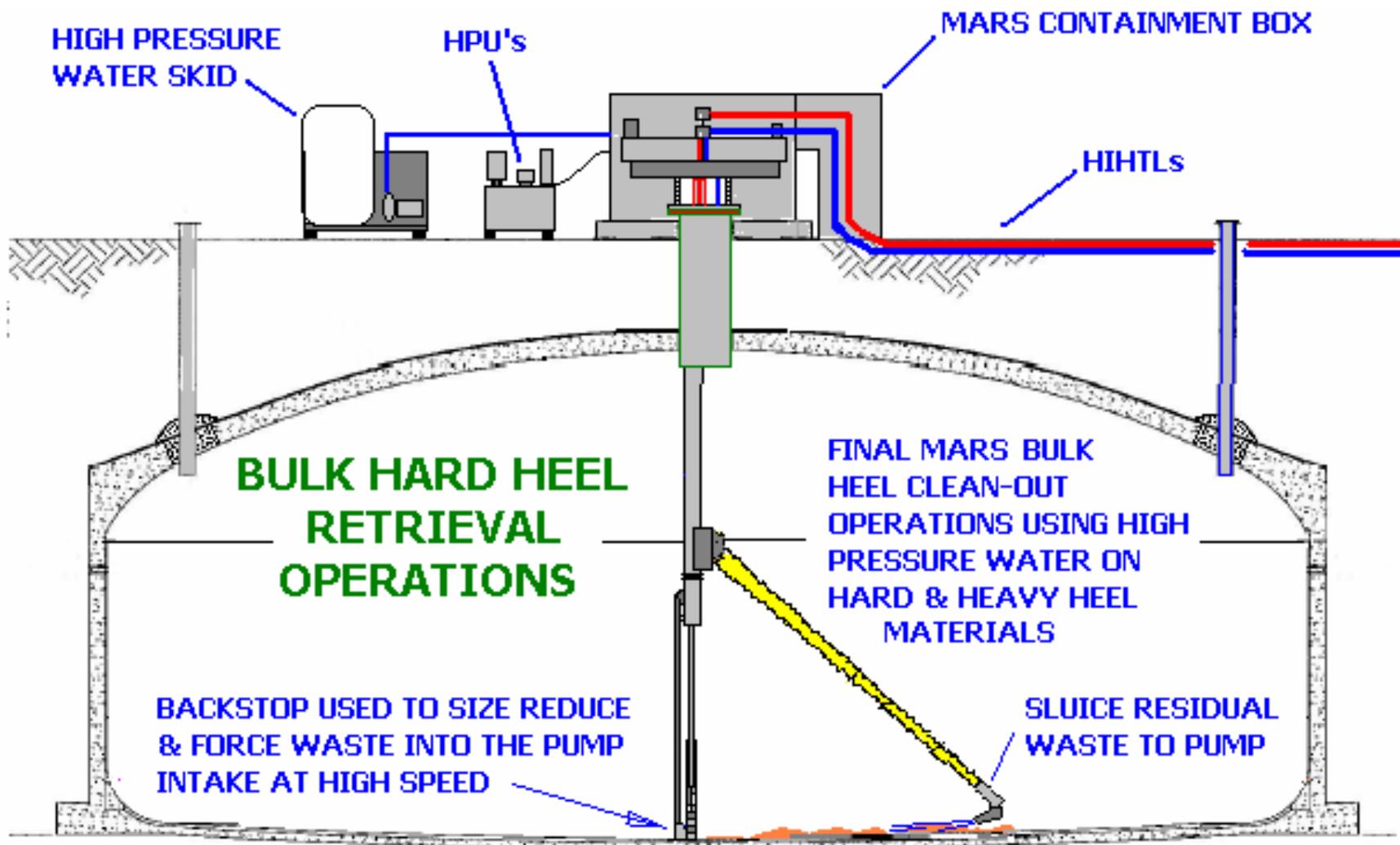


**C FARM SINGLE-SHELL TANK**



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# MARS - Sound Tank System (Hard Heel Retrieval)



**C FARM SINGLE-SHELL TANK**



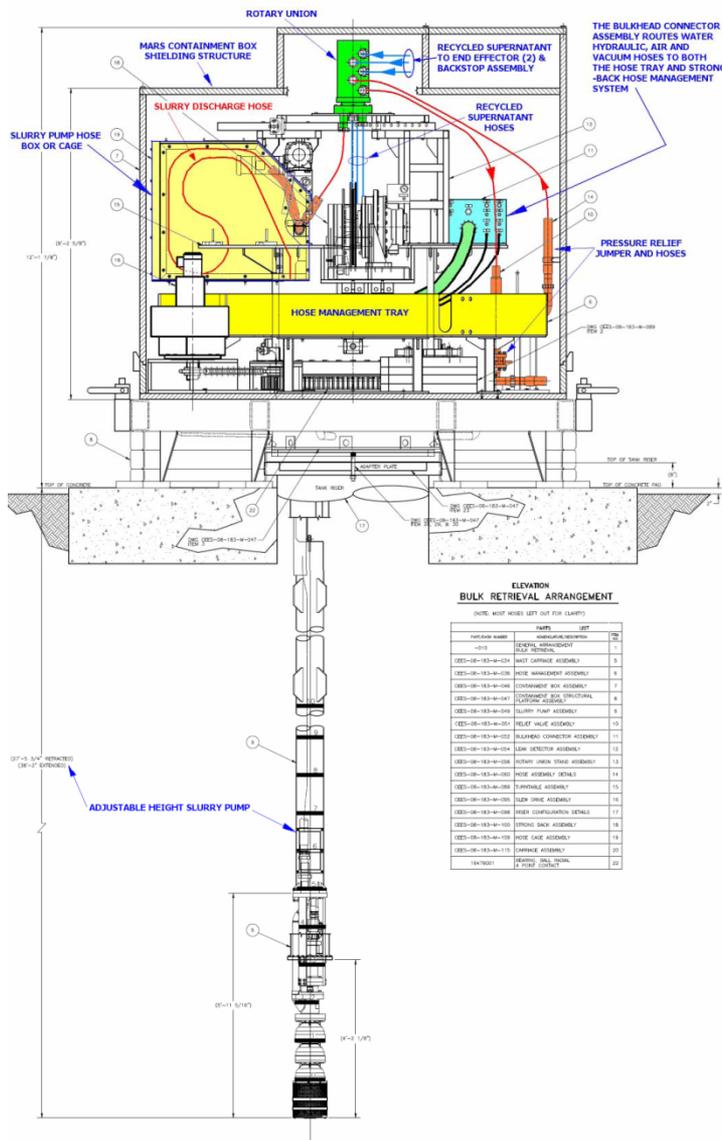
- Since Phase II MARS testing completed in September, 2009:
  - Modifications/improvements of MARS equipment identified during Phase II testing
  - Procurement/Dedication/Installation of Safety Significant Equipment
  - Fabrication of Shielding Components (Portable Instrument & Valve Box, Turntable Shielding Enclosure & Transition Shielding)
  - Resolution of retrieval pump issues identified during Phase II testing



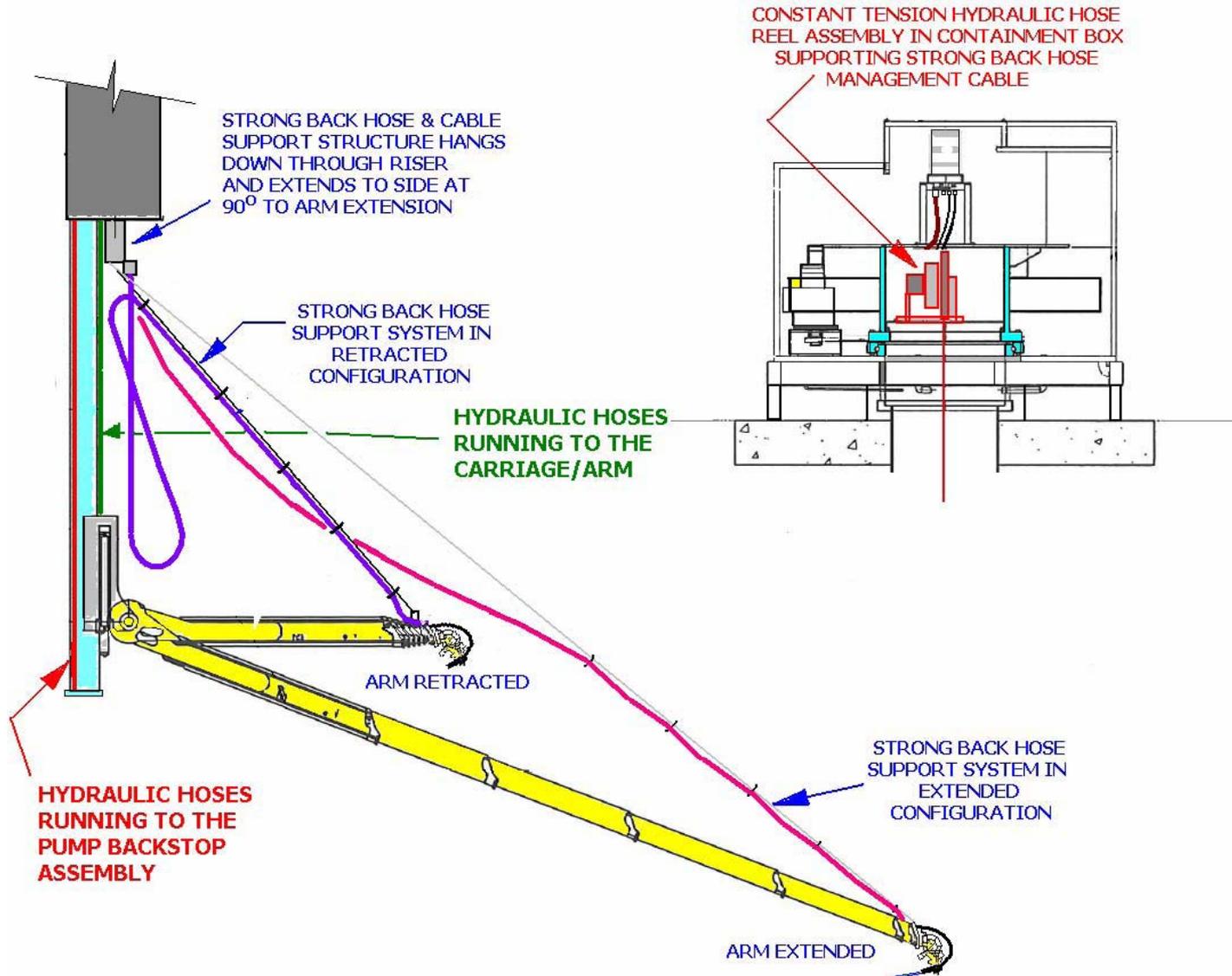
## *Sound-Tank MARS- Recent Activities*

- Modifications/improvements of MARS equipment identified during Phase II testing
  - Backstop deployment improvements
  - Strengthened Mast in areas as identified in analysis
  - Replaced the Constant Tension hoist for the In-Tank hose management system, on the Strongback...to improve operation
  - Improved wrist/end-effector design
  - Worked on “bundling” hoses in-tank to help with installation and removal, as well as contamination control
- Parallel effort to MARS development activity, to begin field design for installation of MARS in C-107. Largest activities in this effort are:
  - Equipment removal
  - Ventilation upgrades, and
  - Large Riser installation

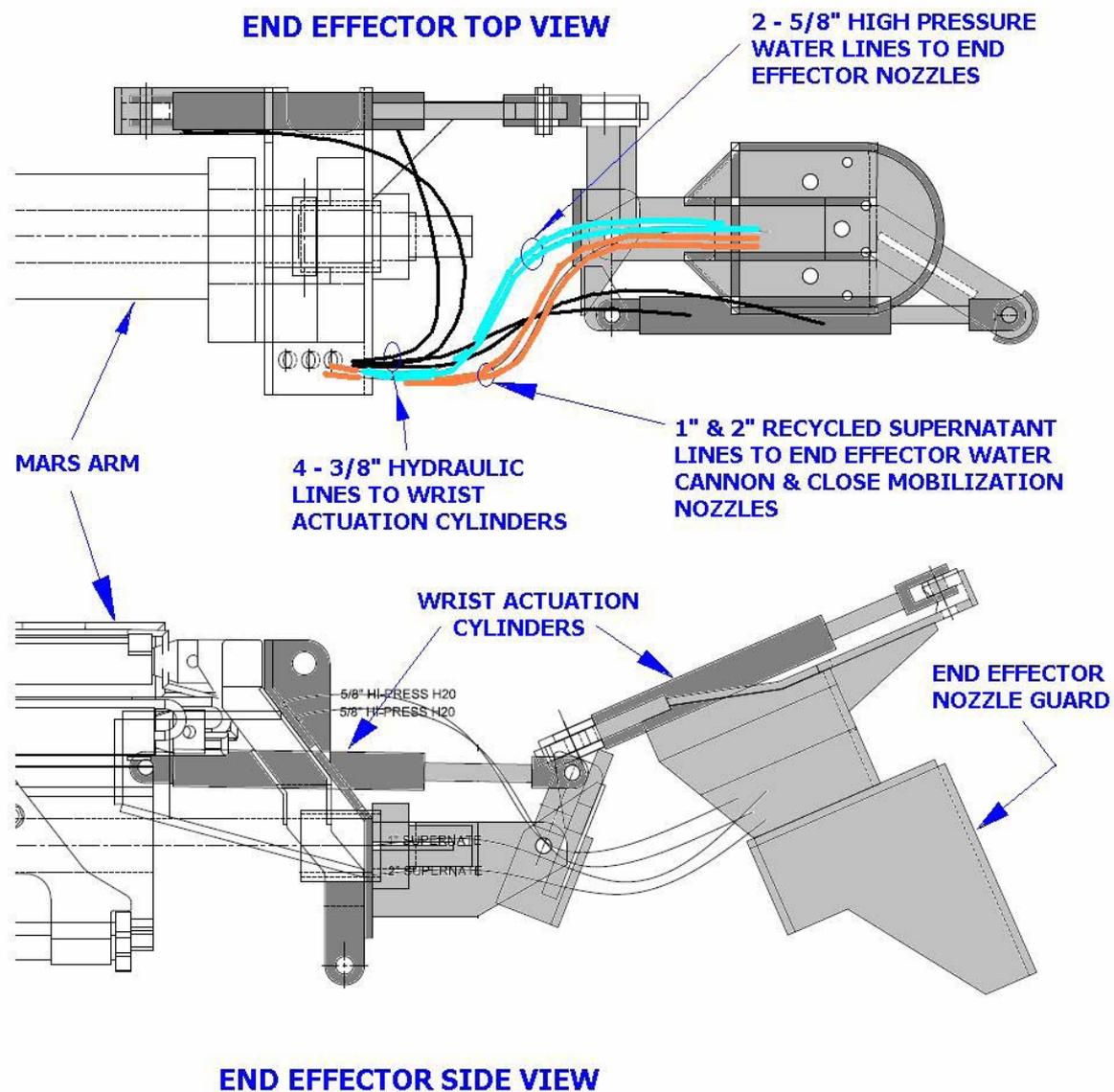
# Sound-Tank MARS Overall System



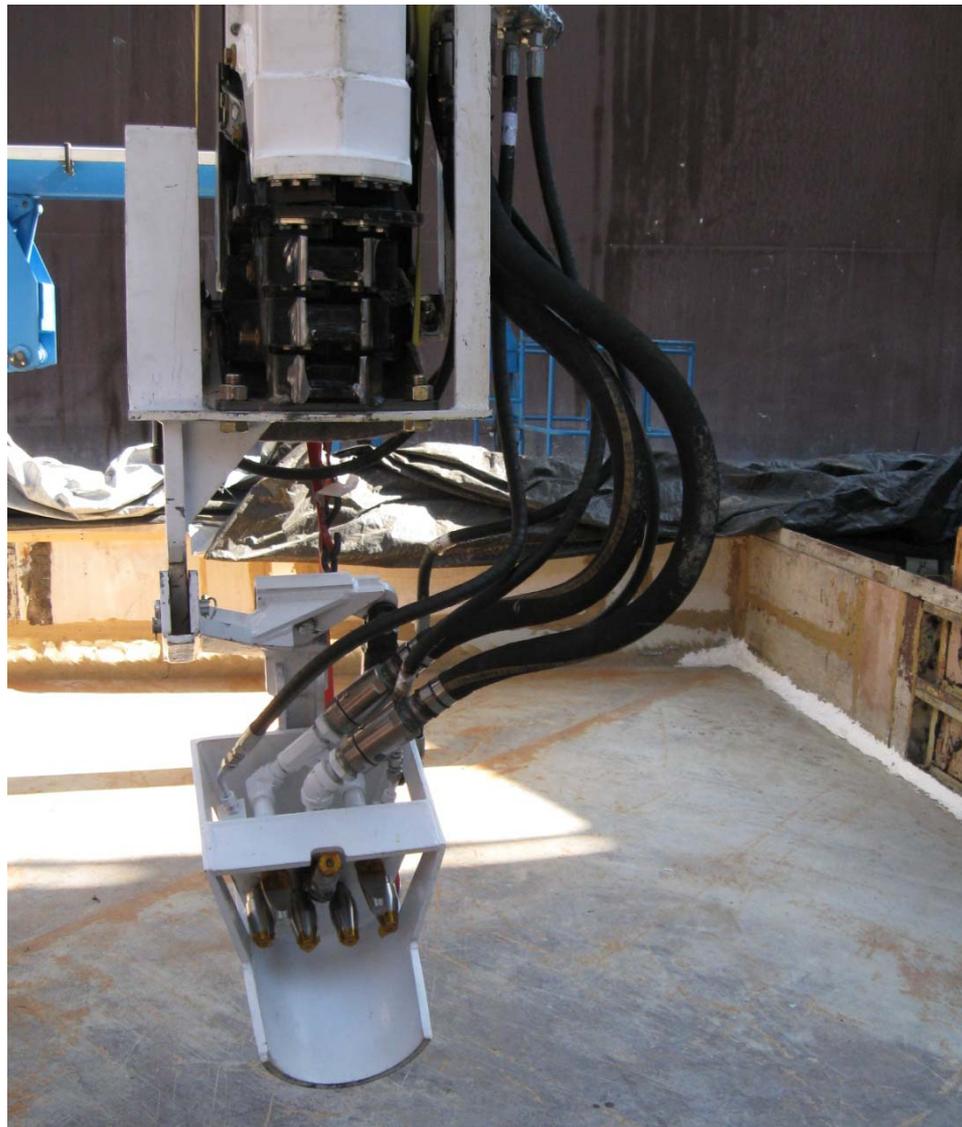
# Sound-Tank MARS- In-Tank Hose Management



# Sound-Tank MARS- Wrist/End Effector



# *Sound-Tank MARS- Wrist/End Effector*





## Sound-Tank MARS- Recent Activities

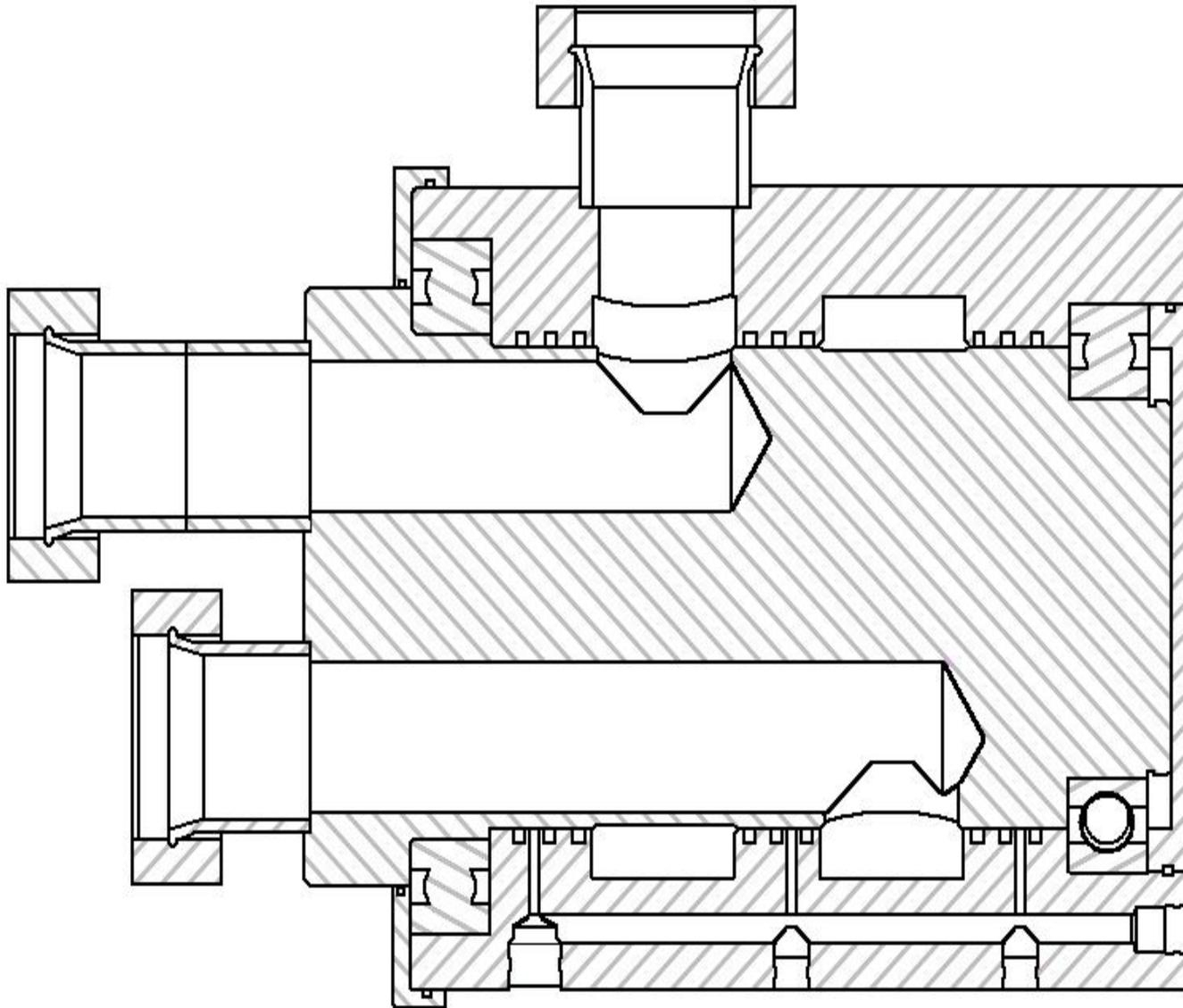
PROCESS STREAM	FLOW RATE(GPM)	PRESSURE RANGE (PSI)
End-effector high-pressure water waste mobilization/size reduction nozzles (4 nozzles at up to 5.0 gpm each)	0 to 19	1,000 to 4,950
High-pressure water to backstop size reduction nozzles (4 nozzles at up to 4.5 gpm each)	0 to 19	1,000 to 4,950
End-effector recycled supernatant at a distance waste mobilization nozzle (1 nozzle at up to 90 gpm)	0 to 90	100
End-effector recycled supernatant close proximity mobilization nozzles (2 fan nozzles at up to 32 gpm each)	0 to 64	100
Backstop assembly recycled supernatant waste mobilization nozzles (2 nozzles at up to 32 gpm each)	0 to 64	100



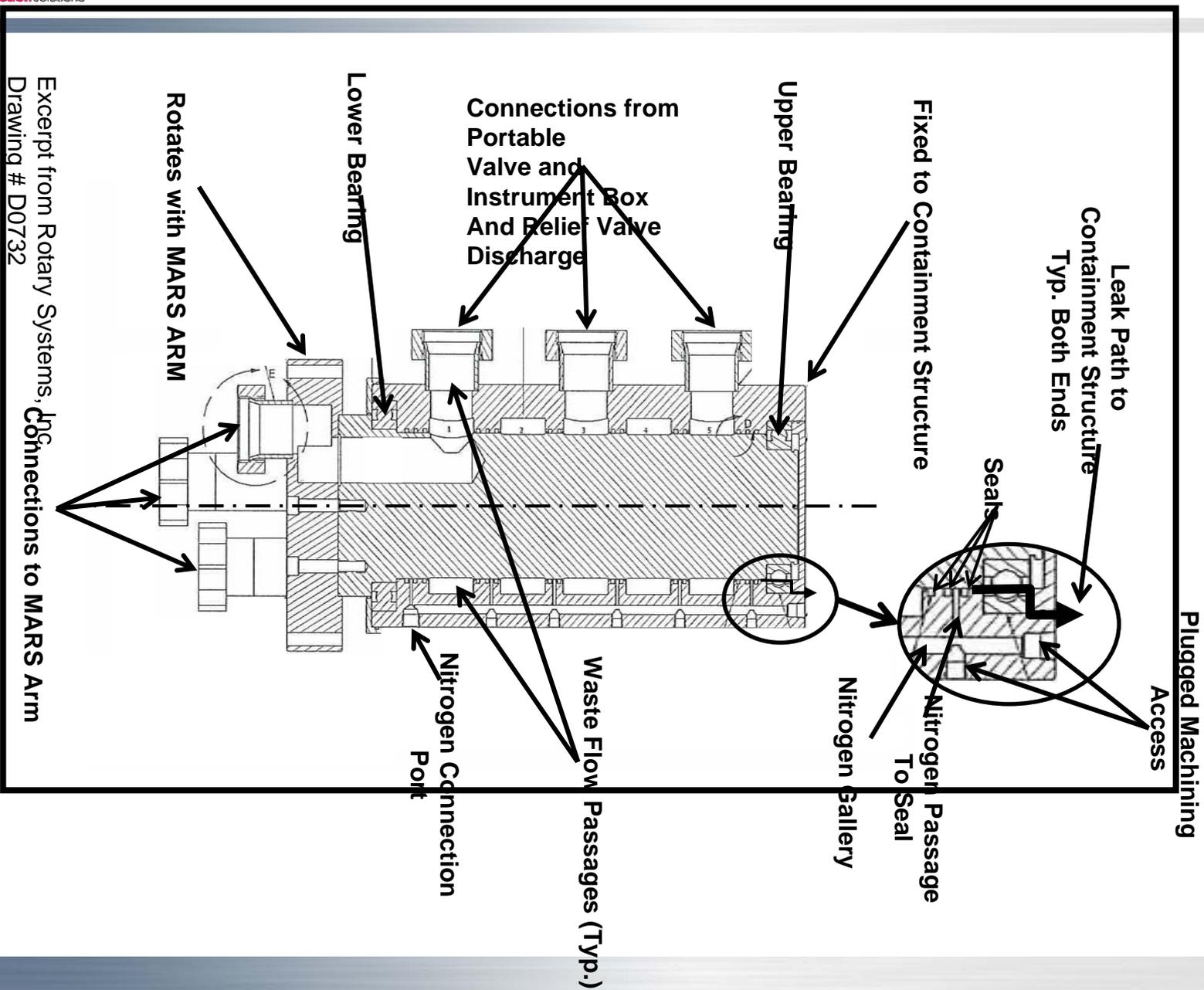
## Procurement/Dedication/Installation of Safety Significant Equipment:

- Rotary Union
- PIVB Instrumentation
  - Krohne Mass Flow Meters
  - ABB Flow Meters
  - Flow Tek Valves
- Pressure Relief Valve (PRV)
- Hoses and Hose-in-Hose Transfer Lines (HIHTLs)

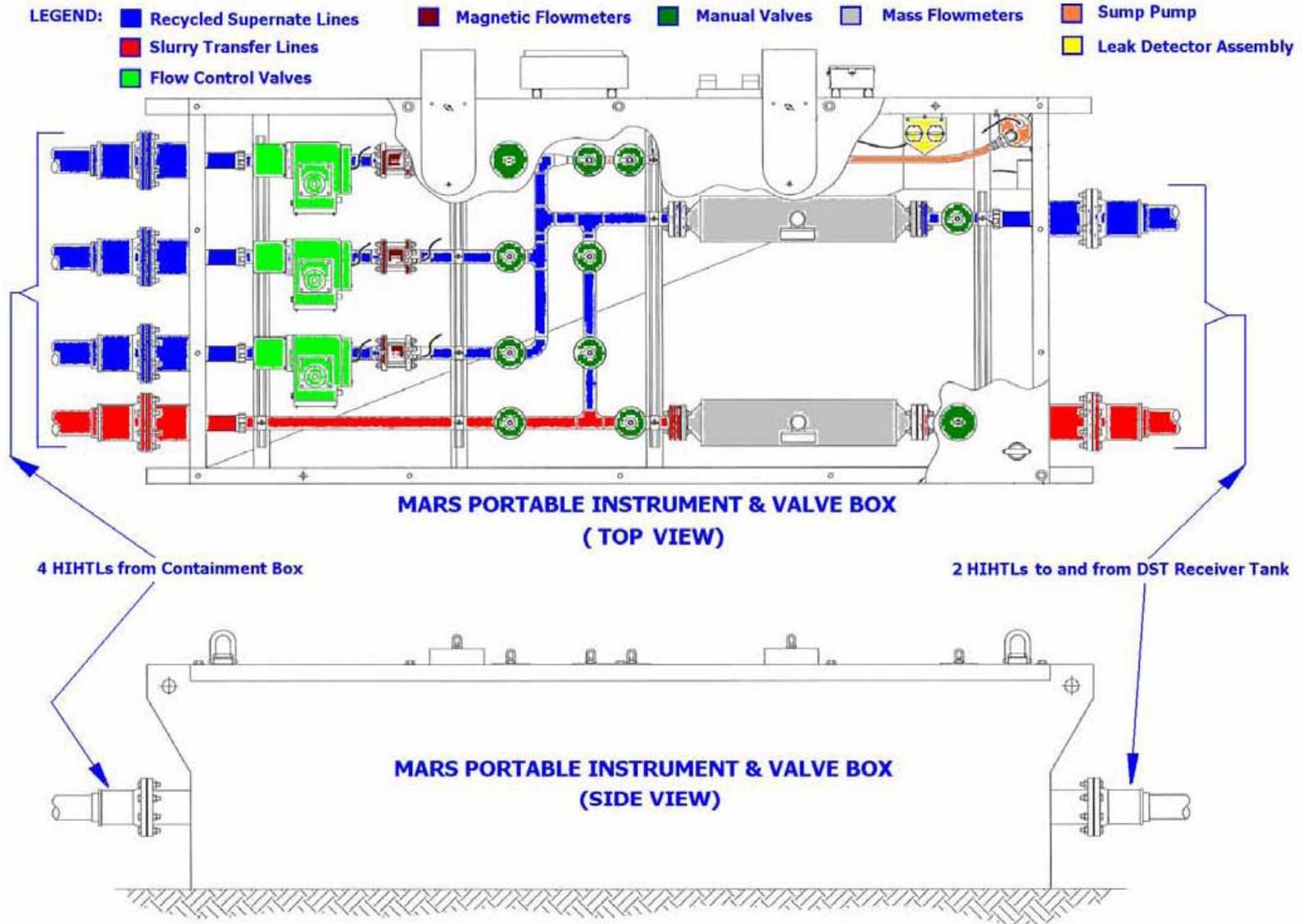
# Sound-Tank MARS- Test 2-Port Rotary Union



# Sound-Tank MARS- Test 5-Port Rotary Union



# MARS- Portable Instrument and Valve Box (PIVB)





- Fabrication of Shielding Components (Portable Instrument & Valve Box, Turntable Shielding Enclosure & Transition Shielding)

# *Fabrication of Shielding Components*



# *Fabrication of Shielding Components*



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# *Fabrication of Shielding Components*





## *Resolution of Slurry Pump Issues*

- During testing at CTF in September, 2009, the AGI pump did not handle the simulant being used in the testing.
  - Since 9/09...worked with AGI, to provide an enhanced pump with:
    - Installation of a new tungsten carbide wear ring insert in the bowl assembly,
    - Application of hard surface weld overlay (Stoody CP-2000 Chromium carbide in metal substraight) to the bottom of the impeller at the wear ring interface,
    - Installation of a hardened steel stuffer ring below the impeller, and
    - Replacement of the hydraulic motor with a bent axis radial piston motor to provide higher torque
  - Final testing of these modifications is underway, now.
- [NOTE: An alternate, larger diameter pump is being developed, in case the AGI pump is not deemed adequate for the C-107 retrieval operation.]



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# Resolution of Slurry Pump Issues



**MARS PUMP  
ASSEMBLY/  
DISASSEMBLY  
MODIFICATION  
WORK AT  
AGI FACTORY  
IN STOCKTON,  
CA.**



- Schedule
- Status
- Testing Capabilities
- Questions & Answers (Q&A)

- Schedule [NOTE: Vacuum Mode MARS proceeding because of, and with Recovery Act (RA) funding]:
  - Design Complete: April 2011
  - Phase II Testing complete: October 2011
  - Deploy on Tank C-101: ~2013

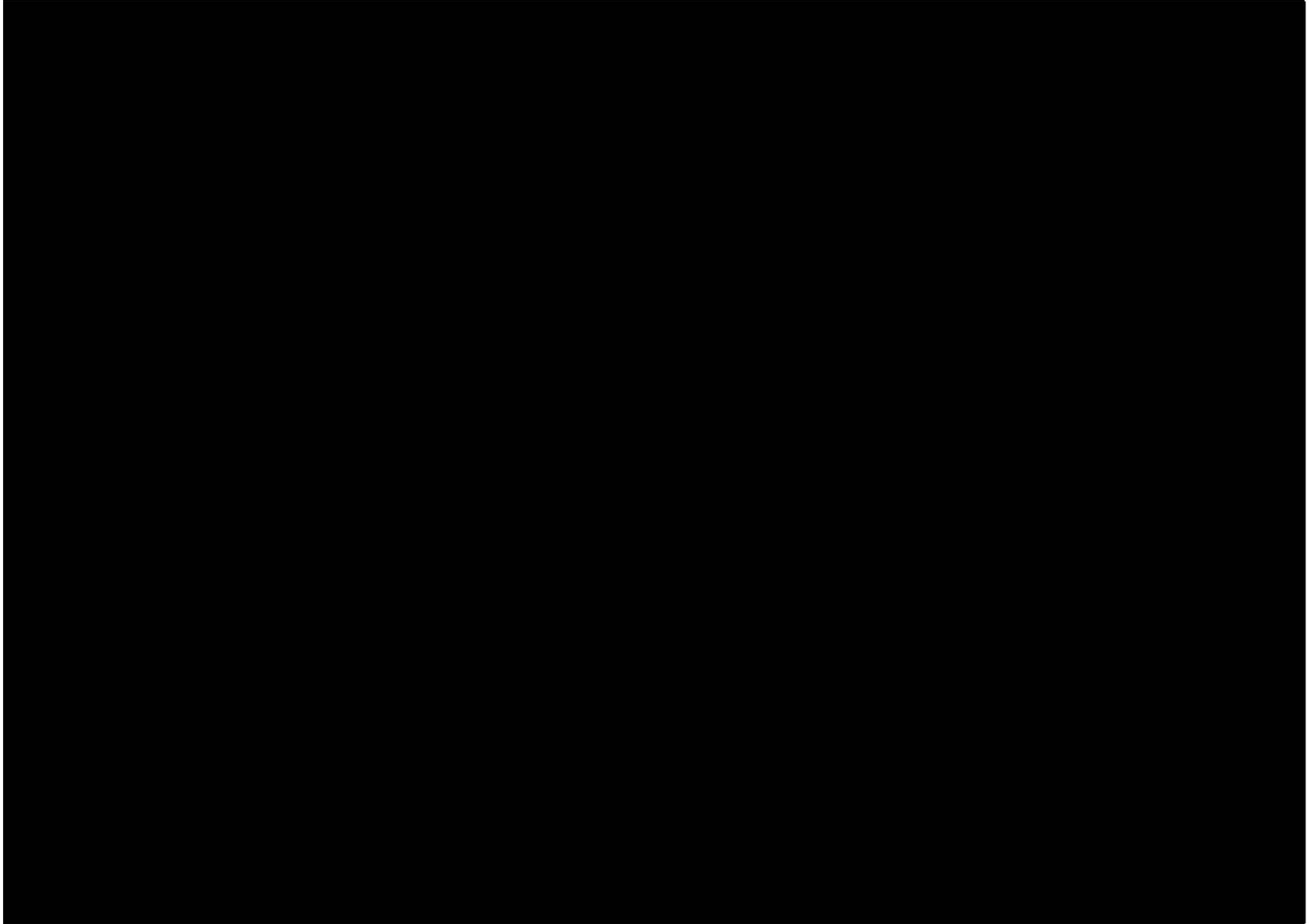
- Status

- In July 2010, due to the diligent “what-iffing” attitude of the A/E (CEES), a unique Eductor system was identified, and subsequently tested. Based on test results, the Vacuum MARS baseline for MARS was changed from the Vacuum system, to an eductor system.
- Project is being re-baselined to include the eductor
- Completion of 9/30/10 testing PBI used eductor system



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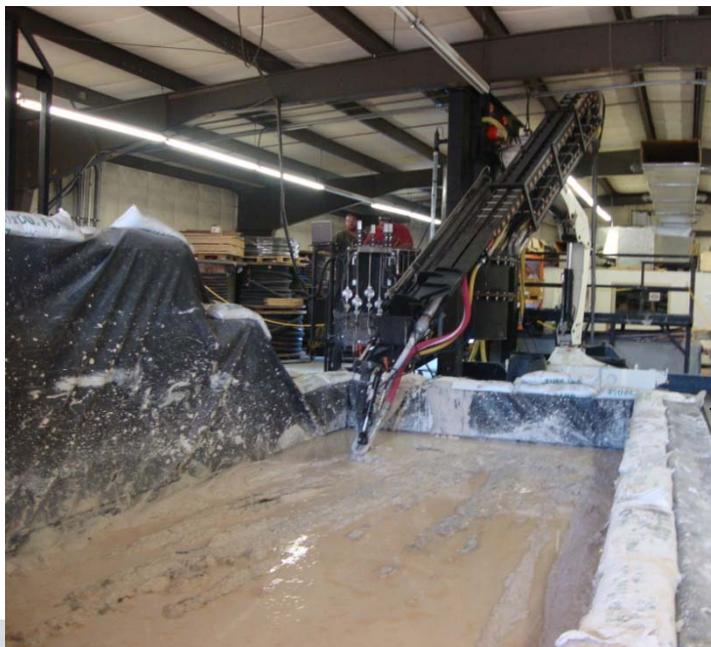
# *MARS Design Strategy- Assumed Leaking Tank System*



# MARS Testing Locations



**CEES's  
TEST  
CENTER  
(CTC)**



**HANFORD  
COLD TEST  
FACILITY  
(CTF)**



**CEES's T-107  
VACUUM TEST  
FACILITY**



- Q & A



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