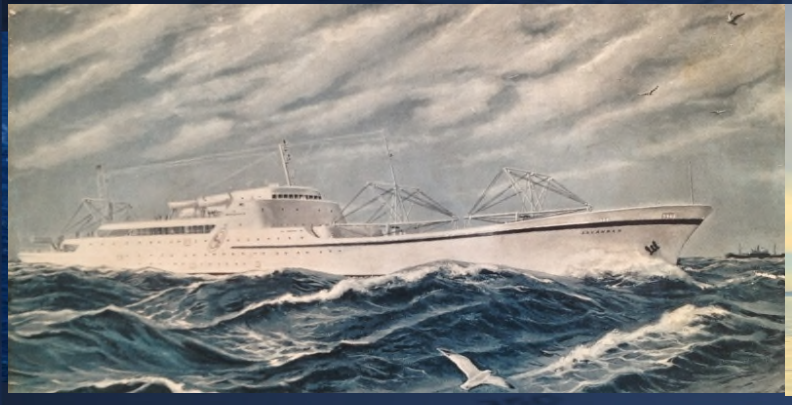

N.S. Savannah
License Termination Plan Kick-Off Meeting

October 24, 2019

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Maritime Administration

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U.S. MARITIME ADMINISTRATION

Agenda

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- Introduction
- N.S. Savannah Decommissioning Activities and Current Status
- Site Characterization
- Dose Modeling
- Final Status Survey
- Near term LAR
- Next Steps

DECON Objectives

- Terminate the NRC license without restrictions or conditions
- Allow Unrestricted Release of the ship
- MARAD Cost Estimates and Project Approach are based on “worst-case” scenarios; characterization should allow for improvement
- The actual extent of component removal and remediation efforts will be defined by the characterization data, analysis, and dose modeling

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Approach and Methodology

- **Three Phase Approach, Up To Seven Years**
  - **(I) DECON Planning and Engineering –2 years;**
  - **(II) Industrial Dismantlement Activity – 4 years; and**
  - **(III) License Termination – 1 year.**

  The phase durations are approximate, and there will be overlap at the boundaries.
- **Employ mature commercial nuclear decommissioning technologies and practices**
- **Maintain Integrity of Licensed Site and Control of Activities**

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Phase 1 Began Oct. 1, 2017

- No Radiologically Controlled Areas (RCAs) outside of the Reactor Compartment (RC) and Containment Vessel (CV).
- No insulation remaining on the Primary Coolant System and any Reactor Plant Auxiliary System.
- Dismantlement of Reactor Plant Auxiliary Systems as necessary to implement 1 and 2 above.
- Construction / Outfitting to support 1, 2 above and Phase 2 dismantlement.

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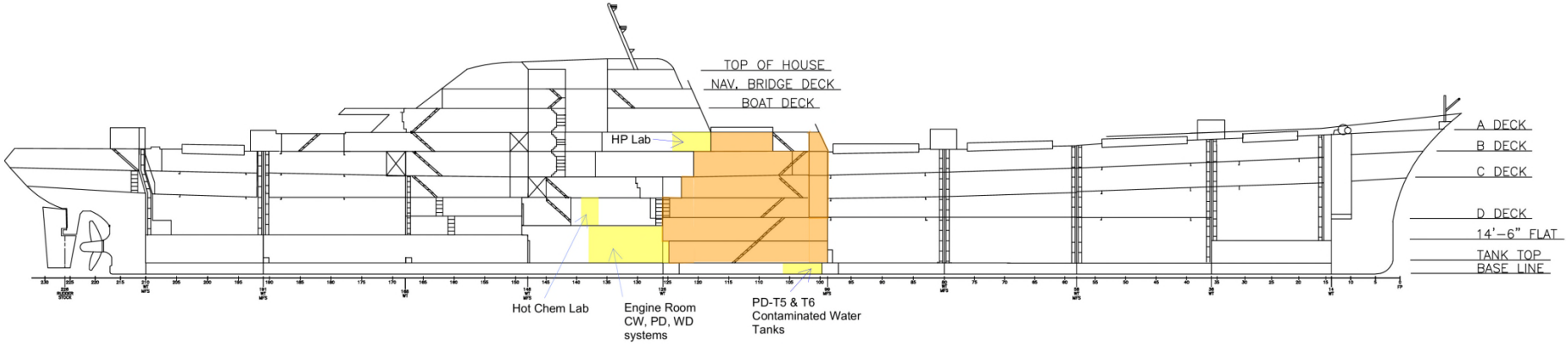
Phase 1 RCA End State

Yellow shows outlying RCAs and areas containing Reactor Plant Auxiliary Systems

Orange shows Reactor Compartment, Containment Vessel and Cold Chemistry Lab

Before



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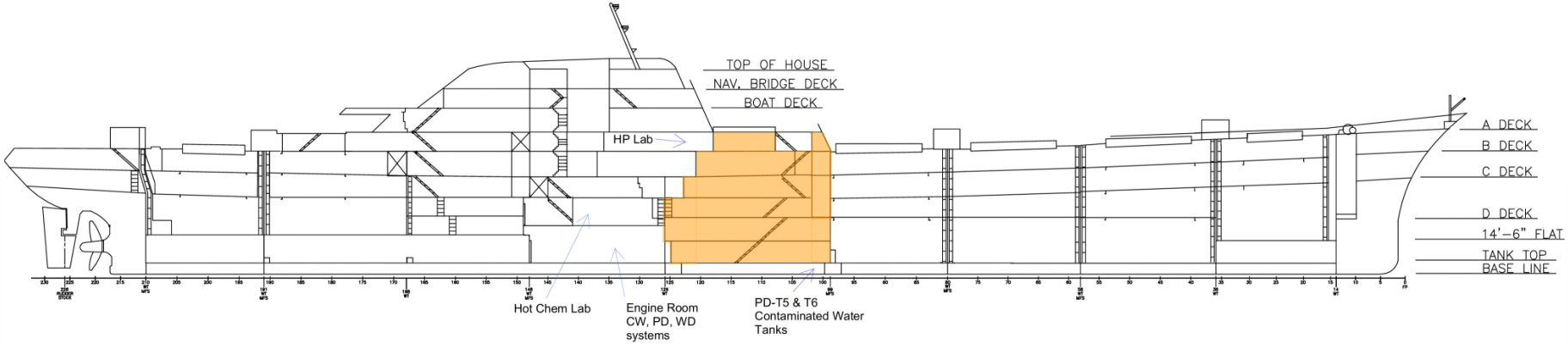
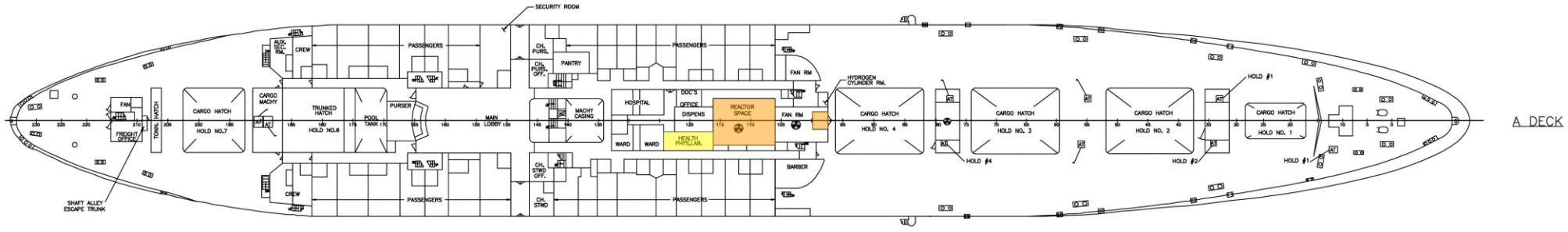


Phase 1 RCA End State - A deck

Before



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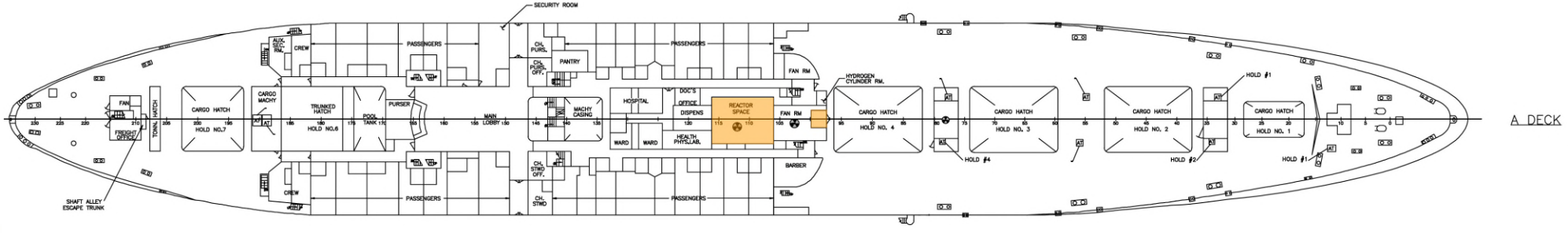
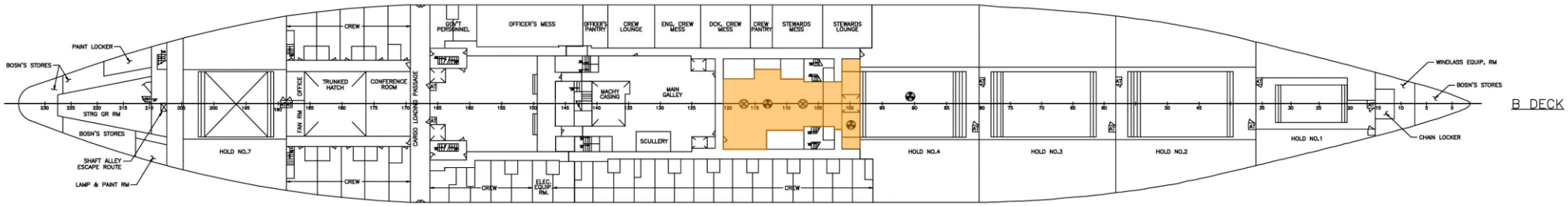


Phase 1 RCA End State - B deck

Before



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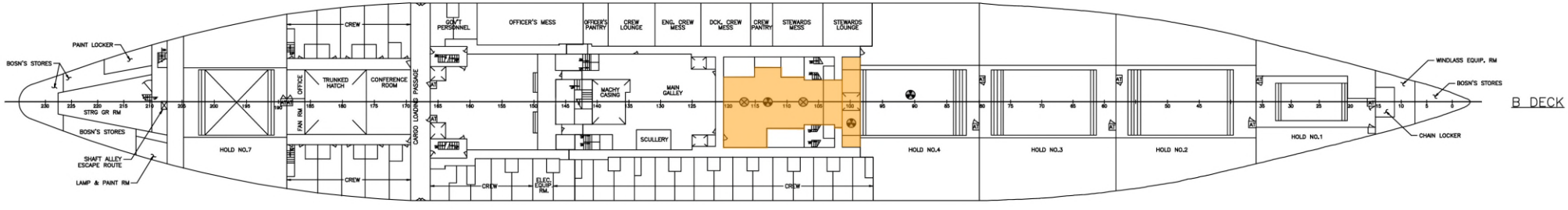

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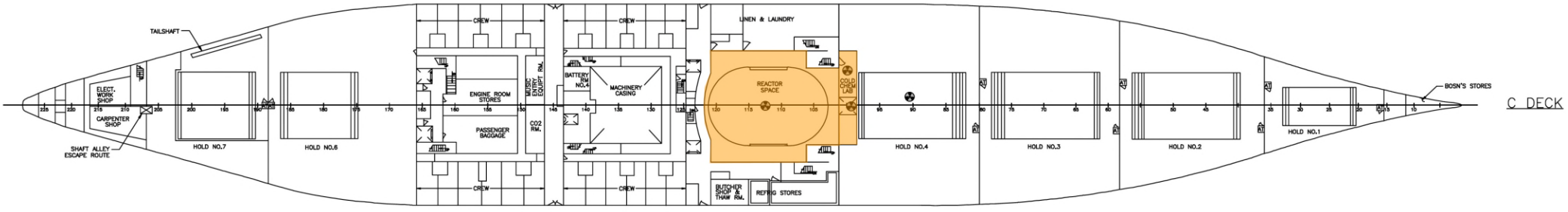
Phase 1 RCA End State - C deck

Before



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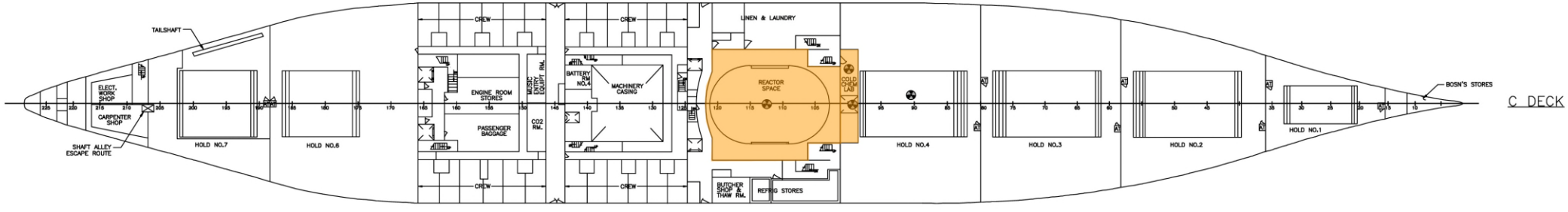
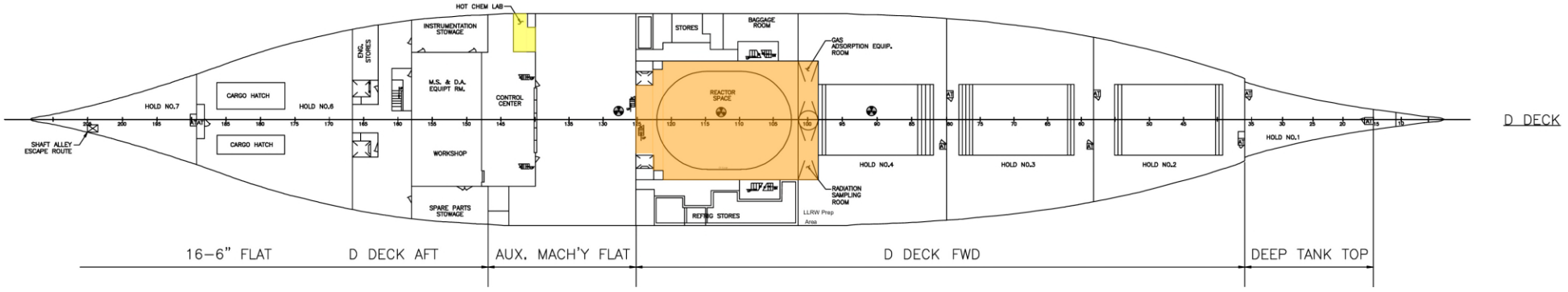


Phase 1 RCA End State - D deck

Before



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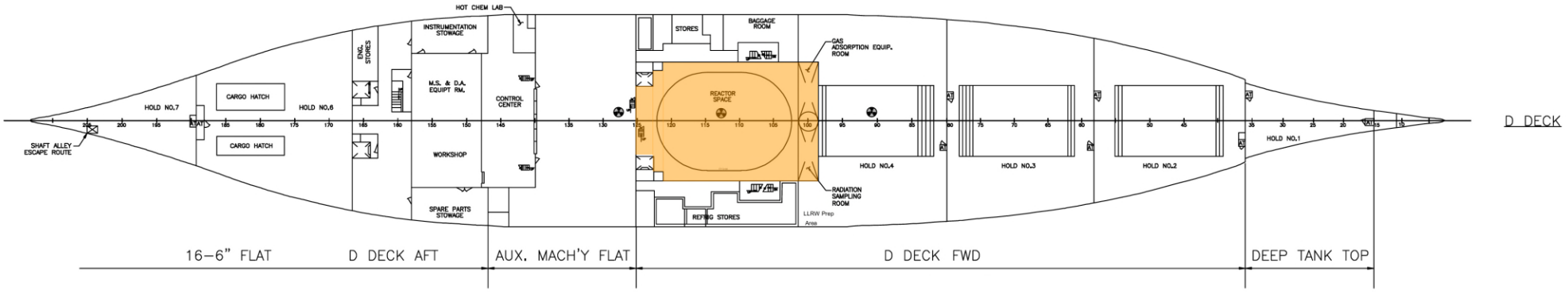
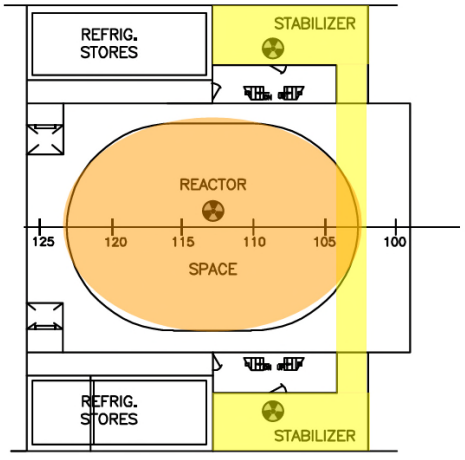


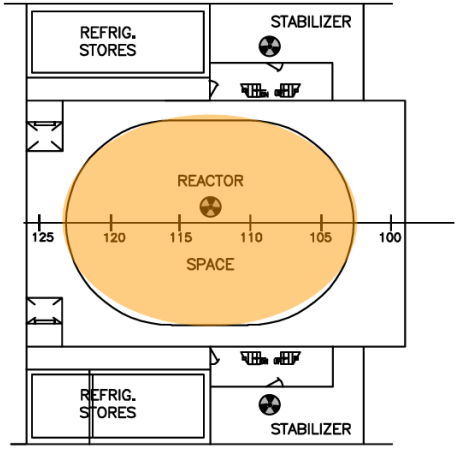
Phase 1 RCA End State - 14’ Flat

Before



14’–0” FLAT

After



14’–0” FLAT

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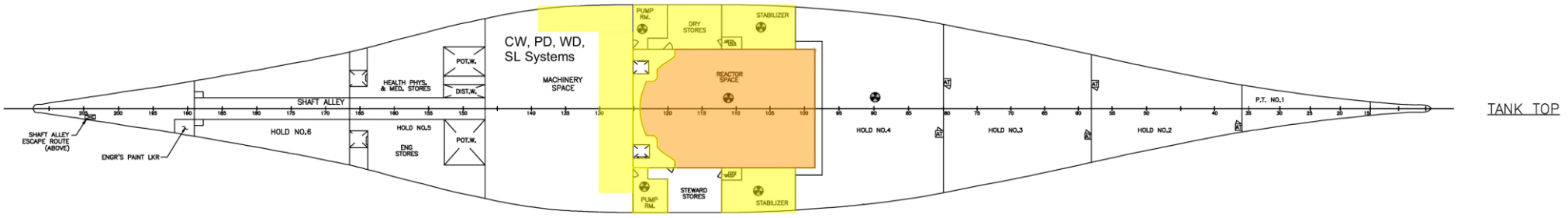
Phase 1 RCA End State - Tank top

Before



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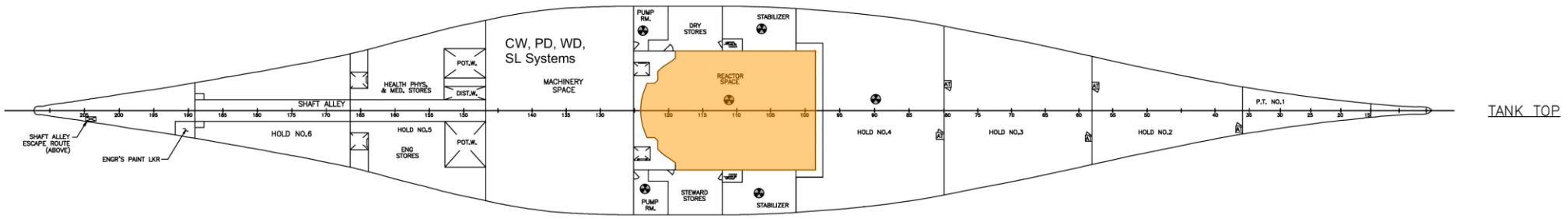

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Phase I Improvements

- Upgrade Safety Barriers, Lighting/Power Outlet Capacity, HVAC
- Improve LLW processing capabilities
- Improved Security System onboard
- Installed Fire & Smoke and Flooding Detection Systems in the RC and CV

CV Horizontal Access Portal

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Purpose:

Improve safety of worker access

License Termination Plan Approach

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- **Unrestricted Release (10CFR20, Subpart E)**
- **Meet:**
  - 25 mrem/yr (all pathways)
  - ALARA

- **Considers NS Savannah unique design**
  - No groundwater or soil, i.e., no resident farmer scenario
  - Potential pathways for ultimate disposal
  - Very compact site
  - Historic preservation (Natl. Historic Landmark)

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Scoping Surveys

- Nuclear Ship Savannah, Reactor Vessel, Internals and Neutron Shield Tank Characterization and Classification Assessment, Rev. 0, April 3, 2004
- NSS Characterization Report, Rev. 0, September 22, 2005
- CR-056, RPV Drilling, Sampling, and Radiochemical Analysis Project Report, WPI, January 31, 2006

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Characterization Surveys

- STS-198, NS Savannah Characterization Plan, 2016
- CR-104, Radiological Characterization Outside of Reactor Compartment and Containment Vessel, January 25, 2019
- CR-109, Radiological Characterization - Reactor Compartment and Containment Vessel, August 30, 2019
- Ship Hull Survey, 2019 Drydock

Characterization 2018

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- Outside RC and CV 2018 (Aug/Sept)
  - 396 Direct alpha/beta measurements
  - 412 Smears
  - 10 Tritium Measurements
  - 403 Gamma Dose Rates
  - Beta Scans
  - Gamma Scans
  - 69 ISOCS

Characterization 2019

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- **Inside RC and CV 2019 (Spring/Summer)**
  - Included interior and exterior (system) surveys
  - Areas: 332 smears, 500 LAS, 79 Fixed measurements, 173 scans, 148 dose rates
  - Systems: 39 water samples, 7 oil samples, 20 paint chips, 6 sludge, 12 smear composites, 21 tritium smears
  - Onsite Gamma analysis and offsite gamma and HTD Analysis (Incl. TRUs)
  - Cable, wire, water, and sludge - Offsite Analysis
    - Gamma, tritium, N-63, Tc-99, C-14, Metals, PCB's etc…

Characterization Findings

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- 2018 (Outside RC/CV)
  - Majority of Activity inside systems
  - Some H-3 identified
  - No significant Contamination on external surfaces
- 2019 (Inside RC/CV)
  - No Significant TRUs (Actinides)
  - Identified Radionuclides:
    - H-3
    - Co-60
    - Cs-137
    - Ni-63
  - General Dose Rates:
    - Lower Level RC/CV: less than 1 mrem/hr
    - Remainder RC/CV: < .012 mrem/hr
- Initial Classification Using Default DCGLs

Exterior Hull Survey (2019)

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- **Class 3 Survey Units**
- **9 Units**
  - Each Unit , 19 Random Fixed Point Locations
  - Starboard, Port, Rudder
  - 171 Survey Points
- **Each Fixed-Point Measurement**
  - Gamma at 1 meter
  - 1 m^2 beta scan
  - 3 minute static count time for each measurement
  - 1 smear at each location
- **Results**
  - No Activity Identified

Characterization Follow-On

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- Radionuclide Statistical Analysis
  - Establish Fixed Radionuclide Mix
  - Establish Surrogate Relationships
  - Eliminate Insignificant Radionuclides
- Additional Water and Fluids Removal
- More Detailed Analysis for some components and systems

Dose Modeling

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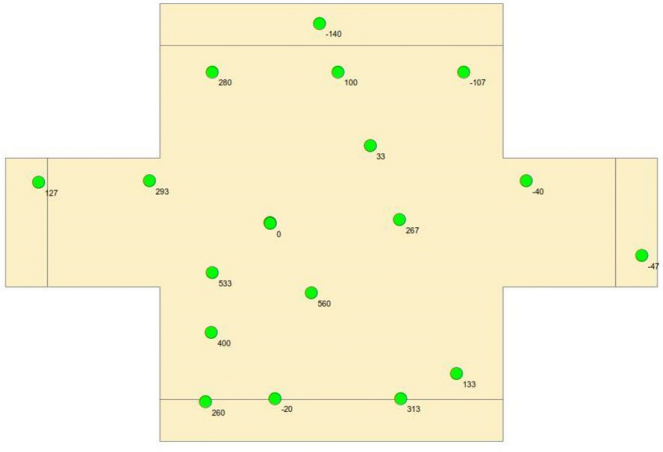
- **Anticipated Codes:**
  - RESRAD BUILD, RESRAD OFFSITE
    - Wide-spread use
    - Probabilistic and deterministic modules
    - Probabilistic Mode for Sensitivity Analysis
  - MCNP and/or Microshield
    - External Dose Modeling
- **Anticipated Scenarios:**
  - Building occupancy
  - Re-Use/Re-Cycle Models

- **Input Parameters Based Upon:**
  - Results of sensitivity analysis
  - Site-specific information, e.g.,
    - Radionuclides of interest at NSS
    - Conservative geologic and meteorological data for re-cycle scenarios
  - NUREG/CR-5512 Vol. 3
  - NUREG/CR-6697

Final Status Survey

- **Based on MARSSIM**
- **FSS development considerations include:**
  - DQOs
  - Anticipated ship conditions at time of FSS
  - Varying radionuclide mix
  - Ship contamination distribution
  - Monitoring instrumentation
- **FSS Plan included in LTP**



Near Term LAR

- LAR proposes to address duplicate TSs on security by deleting one TS requirement regarding CV security

Future Meeting Topics

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- Dose Modeling
- Final Status Survey
- Submittal Mechanics