Long Core System
UNOLS Fleet Support Capability

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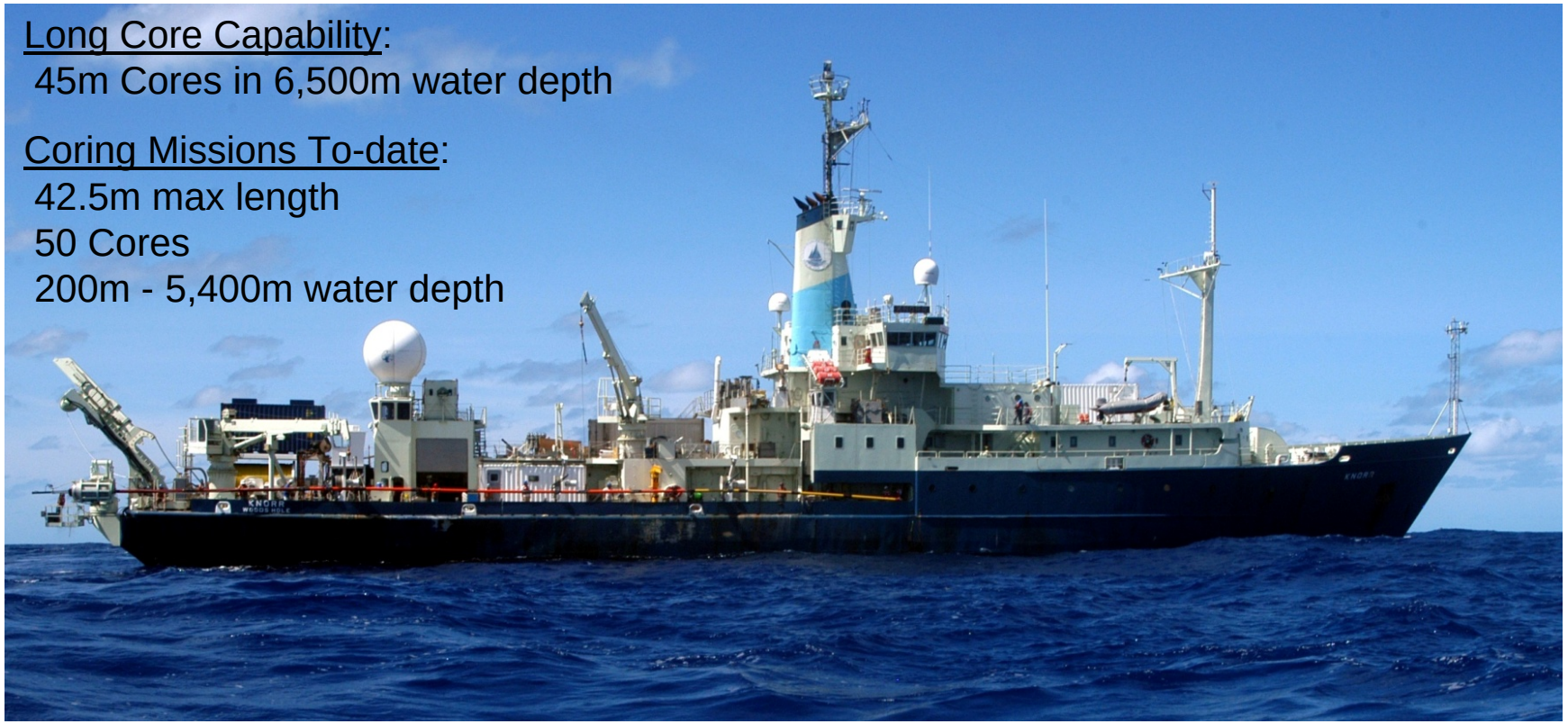
UNOLS Fleet Support for Long Core System Introduction

- Long Core System Overview
- Long Core Components
- Long Core Interface Requirements
  - Permanent Structural Modifications (*Foundations*)
  - Vessel Interfaces (*Features & Capabilities*)
  - Vessel Requirements (*Fundamental Characteristics*)
- Vessel Comparison
  - Comparison Matrix
  - Discussion of Long Core Interface Feasibility (*All Vessels*)
- Summary of Findings

UNOLS Fleet Support for Long Core System
Long Core System Overview

- Long Core System Deployed on R/V *Knorr*
  - *Knorr* Scheduled for Retirement in 2015
  - Review Long Core Deployment Feasibility in UNOLS Fleet



UNOLS Fleet Support for Long Core System
Long Core System Components

- Core Barrel Davits
- Core Handling Grapple
- Long Core A-Frame
- Lift Line Sheave
- Line Winch System

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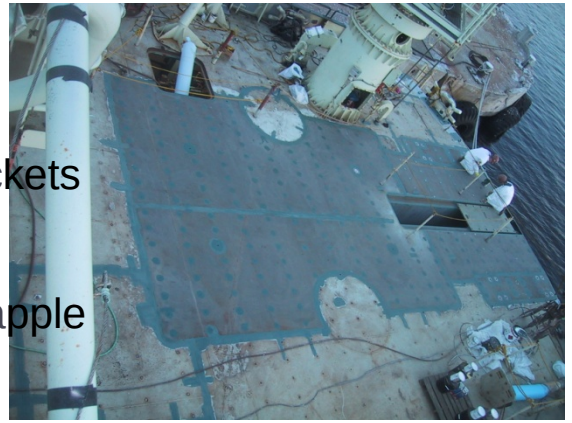
Long Core System Interface Requirements

- Permanent Structural Modifications
  Knorr's modifications, required on all candidate vessels
  - Grapple Foundation
    Transom-mounted bolting flange
  - Lift Line Sheave Foundation
    Aft deck slot for 60 inch diameter, cassette-mounted sheave
  - A-Frame Foundation
    Bolted, flush deck interface for A-Frame base
  - Lift Line Winch Foundation
    Flat, reinforced "Superdeck" area with high capacity sockets
  - Hydraulic Power Unit
    Installed below deck in aft lazarette for A-frame and Grapple



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Long Core System Interface Requirements

- Vessel Interfaces

  Capability and Features Required for Long Core Support

  - Clear Side Deck Area

    145 ft by 4ft to support core assembly, retrieval, and extrusion
  - Clear Aft Deck Area

    For Lift Line winch, reel and related gear
  - Deck Crane

    To handle corehead and auxiliary weights + general deck service
  - Lab Area

    1,200 ft^2 Main Dk Dry Lab + 500 ft^2 Aux. Lab for core processing
  - Container Stowage

    Four containers – two 20ft refrigerated, one 20 ft storage, and one custom 16ft
  - Station Keeping

    Maintain position for core location targeting and vertical lift line

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Long Core System Interface Requirements

- Vessel Requirements
  Characteristics necessary to support Long Core system
  - Pullout Load Capacity (Trim Resistivity)
    Limited by freeboard at stern at line breaking strength
  - Main Deck Load Capacity
    Support 100 long tons of Long Core Components
  - Maximum / Minimum Vessel Beam
    Limits set by Grapple reach between centerline and side

UNOLS Fleet Support for Long Core System
Long Core System Interface

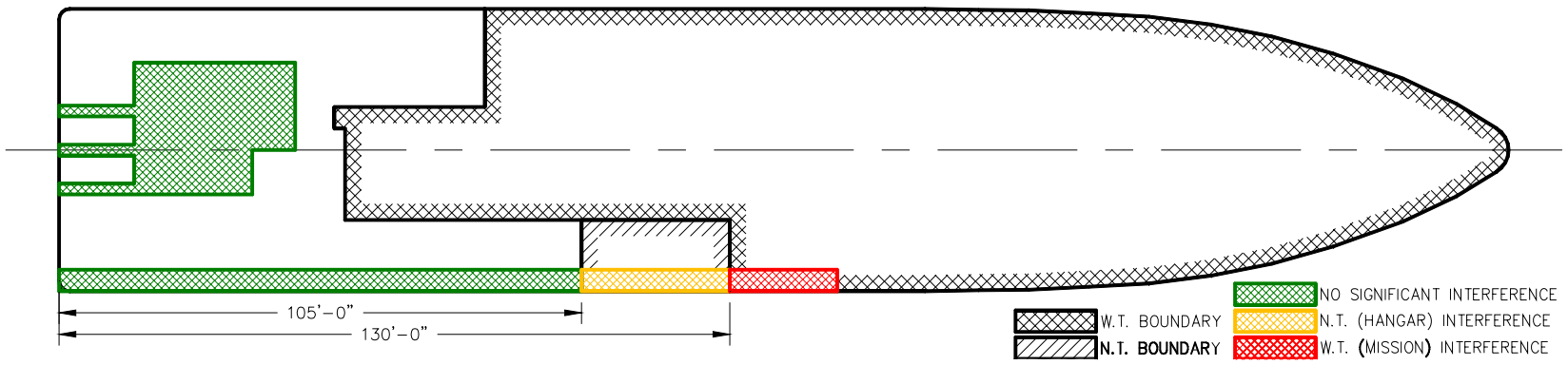
- Vessel Comparison Matrix

Long Core System Interface	*Knorr*	*Thompson Revelle*	*Atlantis*	*Langseth*	*Sikuliaq (ARRV)*	OCRV	RCRV	*Kilo Moana*
1.0 Support Required Permanent Mods	Y	Y	Y	N_C	Y	Y	N	N
2.1 Clear Extent of Side Deck (145')	Y_{M1}	N_{M2}	N_{M2}	$N_{M1,2}$	N_{M2}	N_{R1}	N	N
2.2 Aft Deck Area	Y	Y	N_{M2}	$N_{M1,2}$	Y	Y_{R2}	N	N
2.3 Crane Service at Transom Corner	Y	Y	Y	Y	Y	Y_{R2}	Y	Y
2.4 Lab Area	Y	Y	Y	Y	Y	N_{R1}	N	N
2.5 Van Stowage	Y	Y	Y	Y	Y	N_{R1}	N	N
2.6 Station Keeping Capability	Y	Y	Y	Y	Y	Y	Y	Y
3.1 Pull out Capacity	Y	Y	Y	Y	Y	Y_{R2}	N	N
3.2 Deck Payload Capacity	Y	Y	Y	Y	Y	Y	N	Y
3.3 Vessel Beam	Y	Y	Y	N_C	Y	Y	Y	N

Notes:
M1 – modification required to open hangar-type structure
M2 – modification required to interior mission critical spaces / significant impact to existing mission capability
C – Significant change/replacement of current Long Core system components required
R1 – Not currently required; unlikely to support without specific alteration
R2 – Not currently required; may meet within current design trend

UNOLS Fleet Support for Long Core System
Long Core System Interface

- R/V *Thompson*, *Revelle*, and *Atlantis*
  - Integration of existing Long Core system
    - Maximum core length without modification: 32m to 35m
    - Maximum core length with modifications: 40m
    - Modifications for 45m core – Mission Impact (Main Lab Area)
    - *Atlantis* A-Frame (*Alvin*-specific) complicates de-mobilization
  - Potential modifications to Long Core system
    - Port side, 01 Level option with Grapple modification



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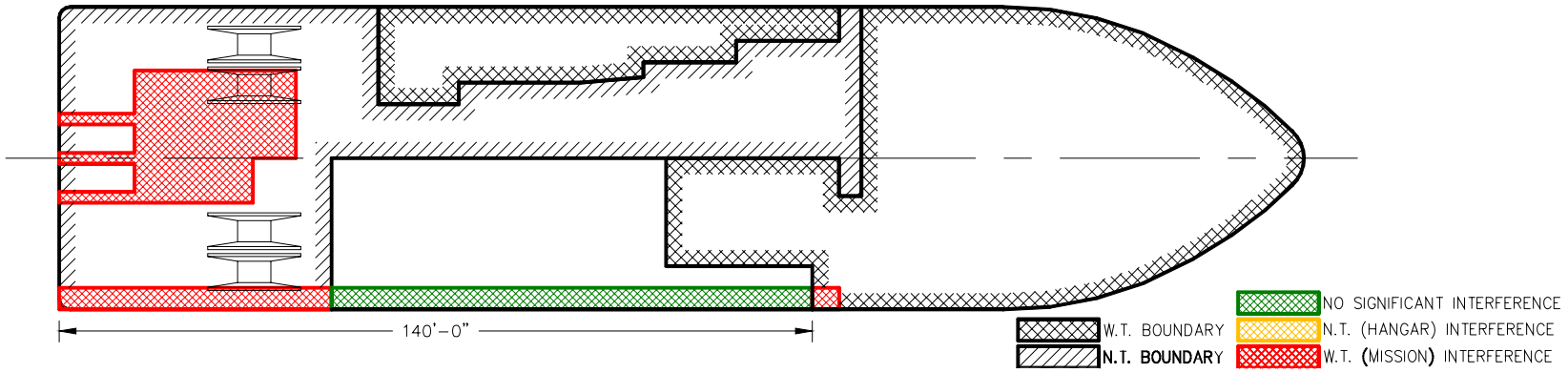
Long Core System Interface

- R/V *Langseth*
  - Integration of existing Long Core system
    - Maximum core length with modifications: 43m
    - Direct integration requires major vessel & system modifications (Seismic systems create significant interferences)
  - Potential modifications to Long Core systems
    - Focus on leveraging unique features of *Langseth*



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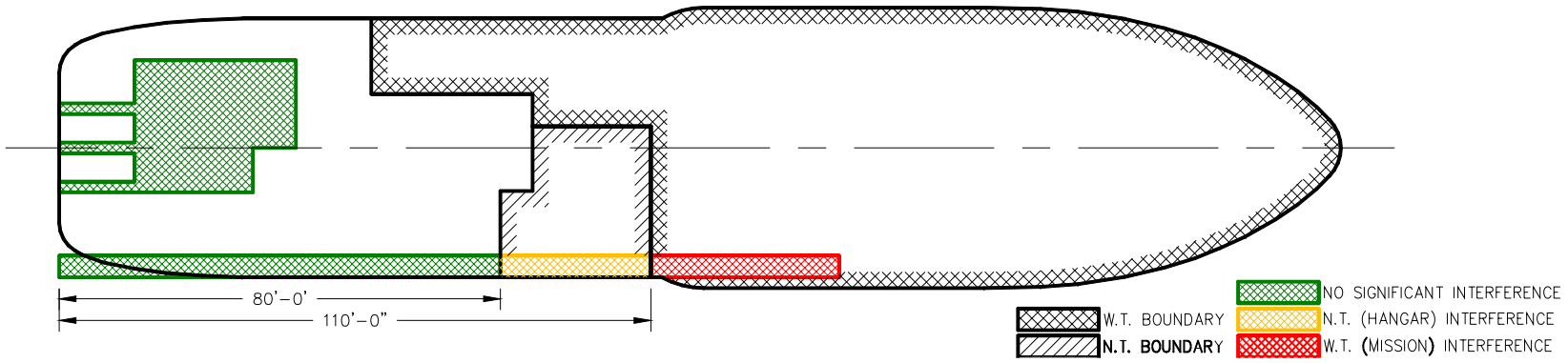
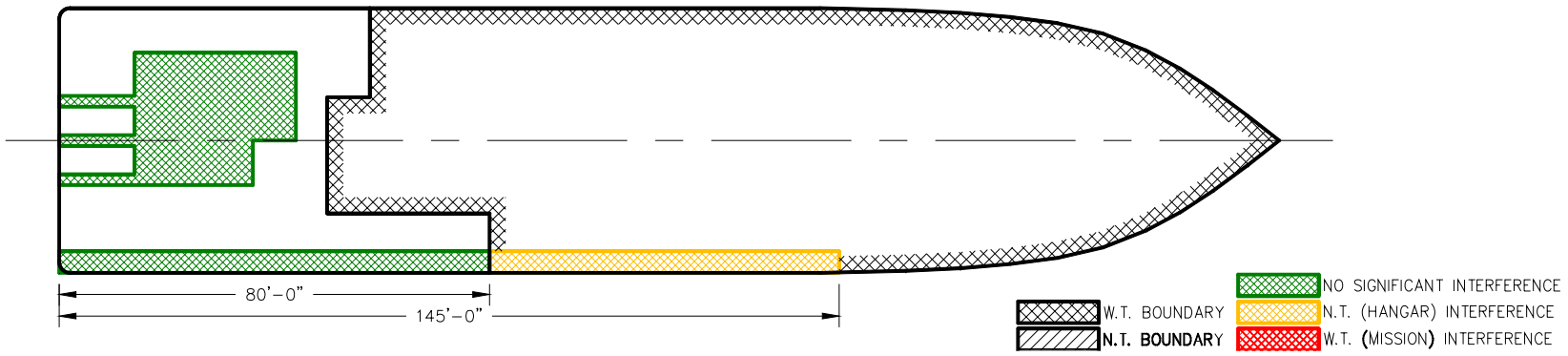
Long Core System Interface

- R/V *Sikuliaq* (ARRV)
  - Integration of existing Long Core system
    - Maximum core length without modification: 25m
    - Maximum core length with major modification: 34m (Baltic Room)
    - Modifications for 45m core – Not Feasible (Impact Ice Reamer)
  - Potential modifications to Long Core system
    - No obvious modifications for full length Long Core system



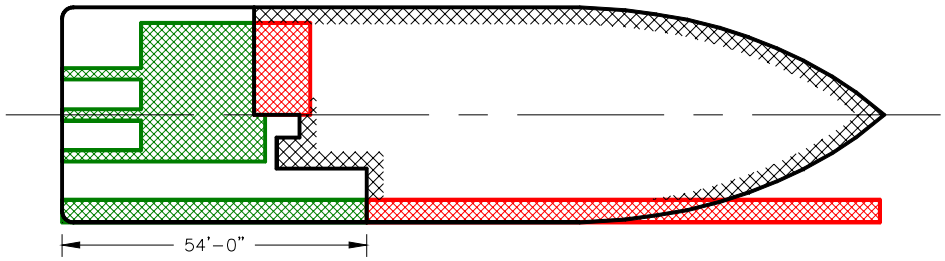
UNOLS Fleet Support for Long Core System
Long Core System Interface

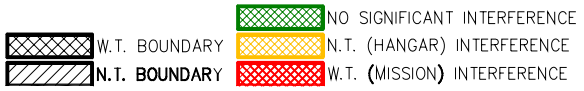
- Ocean Class Research Vessel (Design)
  - Integration of existing Long Core system
    - Current Requirements unlikely to Support Long Core System
      - Design trend: Basic vessel size could support Long Core system
    - Requirements for One-Off Long Core Support OCRV
      - Side Deck, Lab Area, and Stern Deck – prescribed dimensions
      - Additional Van Capacity
      - Hull Form – specific trim resistance



UNOLS Fleet Support for Long Core System
Long Core System Interface

- Regional Class Research Vessel (Design)
  - Integration of existing Long Core system
    - Requirements - No intention to support Long Core
    - Resulting designs – Simply too small





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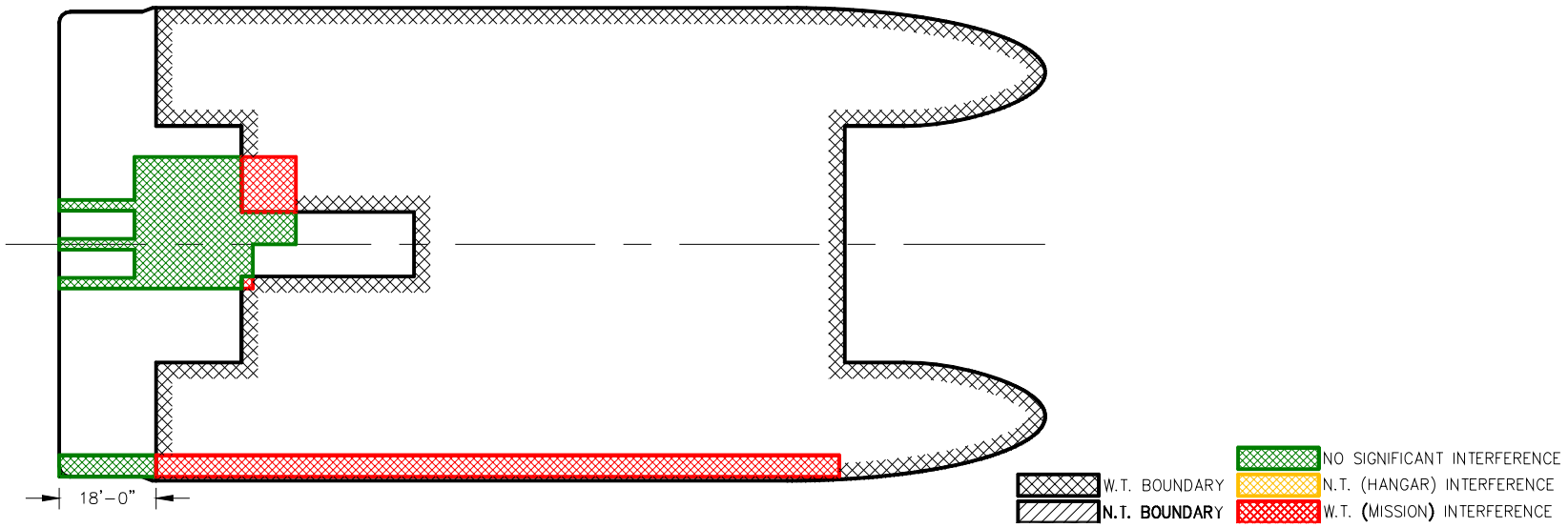
Long Core System Interface

- R/V *Kilo Moana*
  - Integration of existing Long Core system
    - SWATH not compatible with Long Core demands
      - High Pullout Loads – extreme trim
      - Limited Deck Area



UNOLS Fleet Support for Long Core System
Long Core System Interface Summary

- Summary
  - R/V *Knorr* – Long Core Integration Design and Capability Baseline
  - R/V *Thompson* and *Revelle*
    - Direct Integration - 40m core with modification (Stanchions)
  - R/V *Langseth*
    - Direct Integration complex; review Long Core system revisions
  - R/V *Sikuliaq* (ARRV)
    - Direct Integration - 34m core with major modification (Baltic Room)
  - OCRV
    - Direct Integration if OCRV Requirements changed for One-off Vessel
  - RCRV and R/V *Kilo Moana*
    - Not Viable Candidates for Long Core support