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Techniques for understory kelp salvage and recolonization of disturbed sites to mitigate temporal habitat loss

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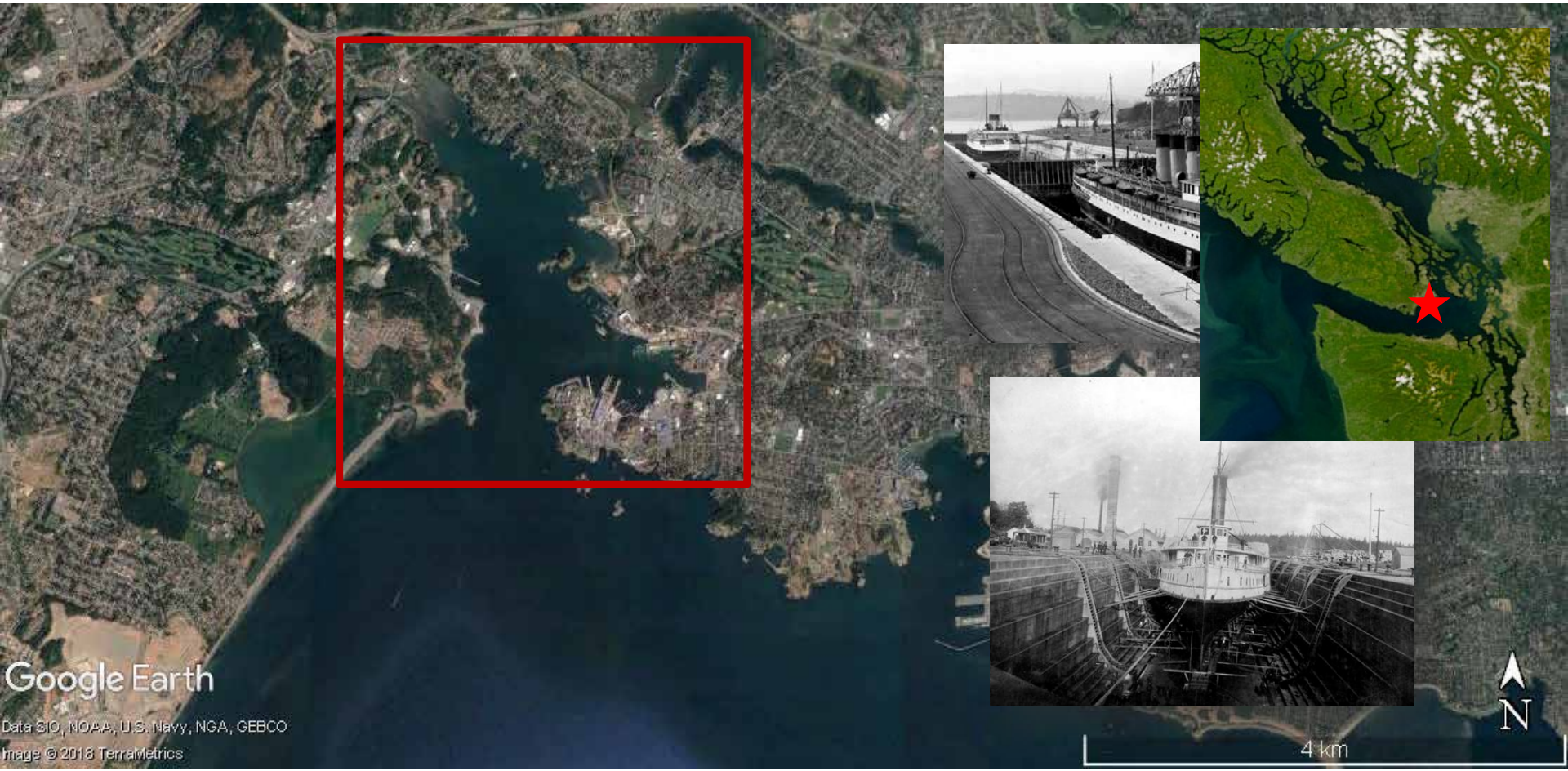
National Defence
Défense nationale

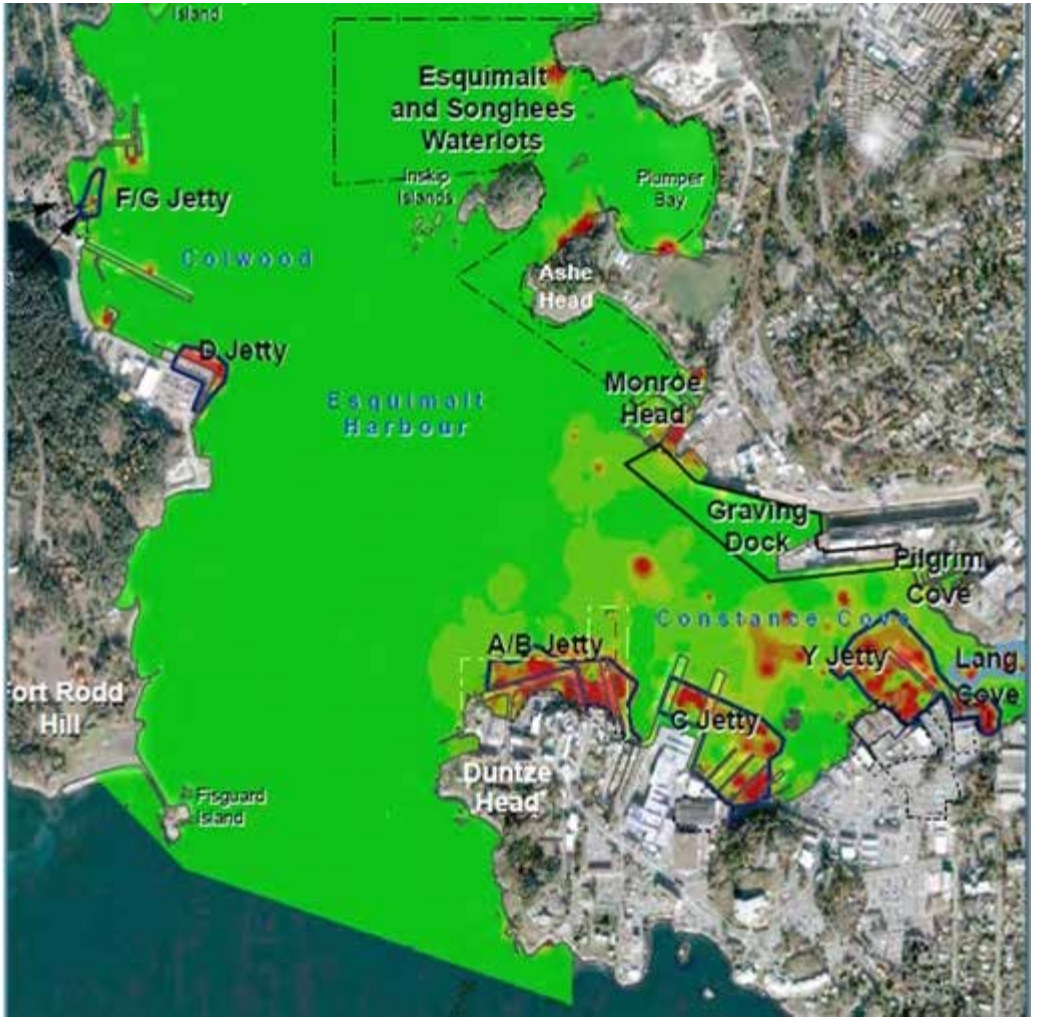
Esquimalt Harbour, BC



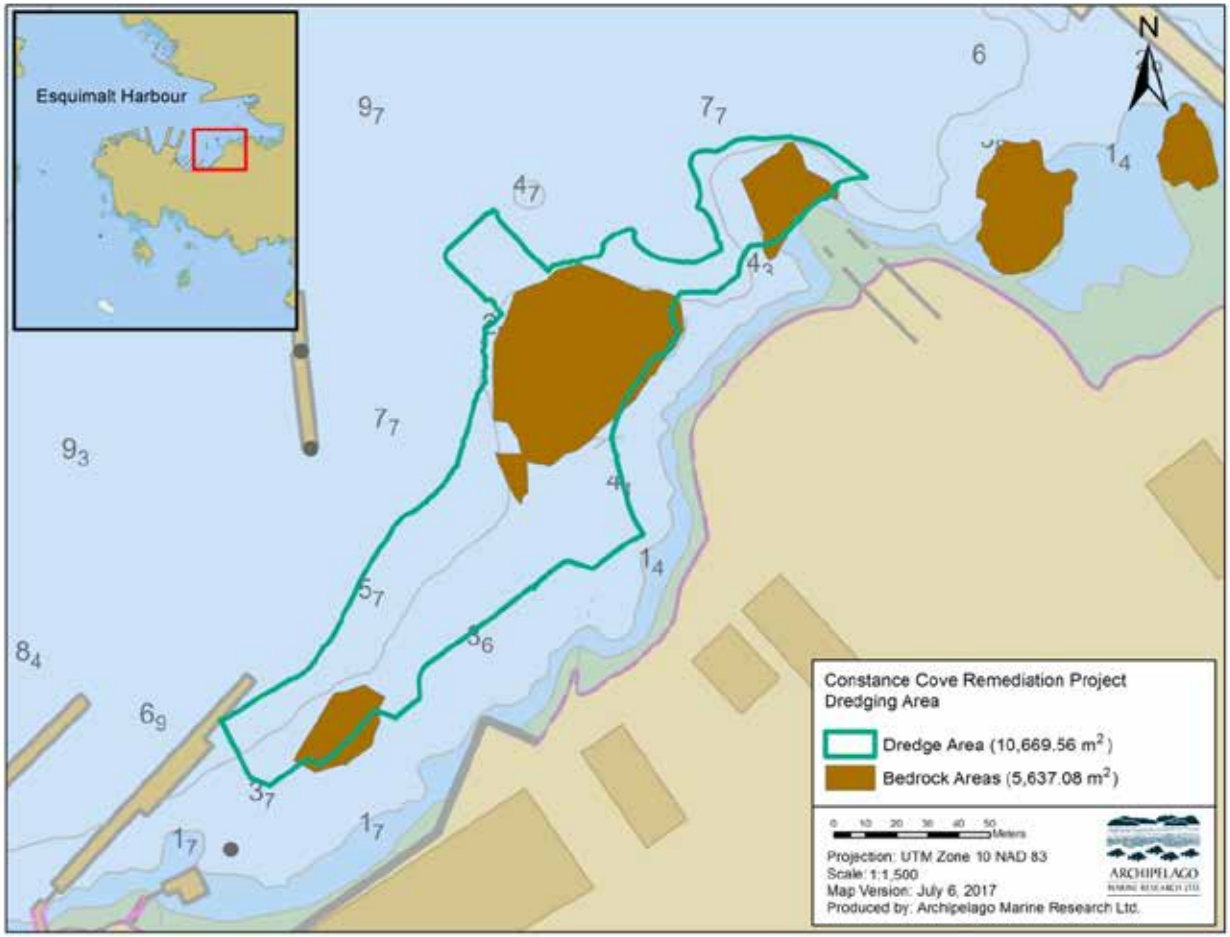
Sediment Contamination and Remedial Activities in Esquimalt Harbour

DND has been upgrading and rehabilitating its aging military infrastructure and actively remediating contaminated sediments.

Sediment investigations have identified hot spot areas of elevated sediment contamination.



Constance Cove Remediation Project Area



Project Objectives

One of the mitigation measures for the dredge project is the:

- Salvage of understory kelp prior to dredging;
- Relocation (and monitoring) of salvaged material to a temporary storage area; and
- Restocking (and monitoring) once construction is complete.

Experimental project to determine the viability of salvage vs. other mitigation techniques

These kelp salvage measures are intended to:

- Address impacts of temporal fish habitat loss due to dredging activities
- Reduce the kelp succession time for disturbed areas

The understory macro algae *Saccharina latissima* (sugar kelp) was the primary target species for salvage.

Seaweeds of Alaska

Project Timeline

Dredging activities

Blasting activities

June 2017
Reassess kelp focus areas (>25% cover) in CCRP dredge zone

December 2017
Monitoring salvaged material in Kelp Storage Area

Summer 2018
Monitoring salvaged material in Kelp Storage Area

Early and late 2019
Monitoring of restocked material in CCRP dredge zone

Summer 2017 | Fall 2017 | Winter 2017/18 | Spring 2018 | Summer 2018 | Fall 2018 | Winter 2018/19

August 2017
Six day kelp salvage in CCRP dredge zone

March 2018
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Late 2018
Six day restocking of salvaged material to CCRP dredge zone

Sporophyte growth

Sori develop on sporophyte > zoospores released > gametophytes > gametes released > zygote > juvenile sporophyte

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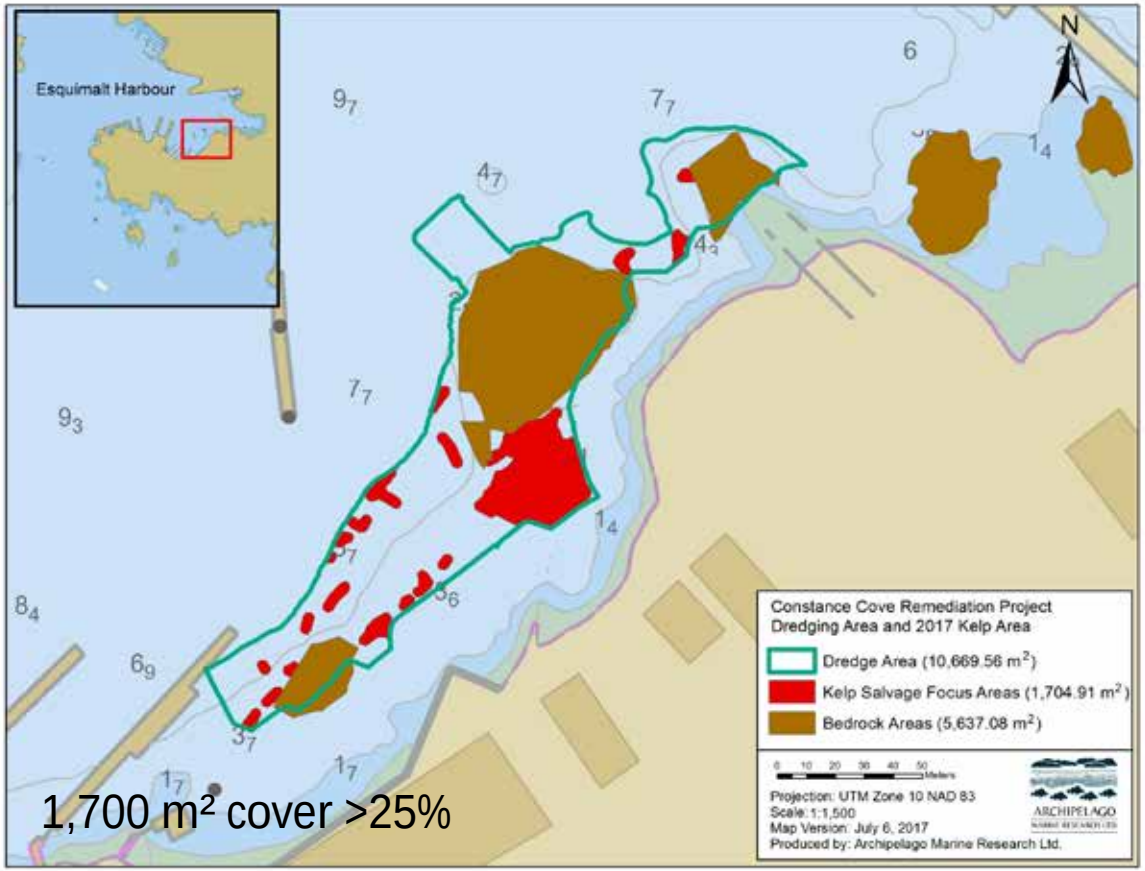
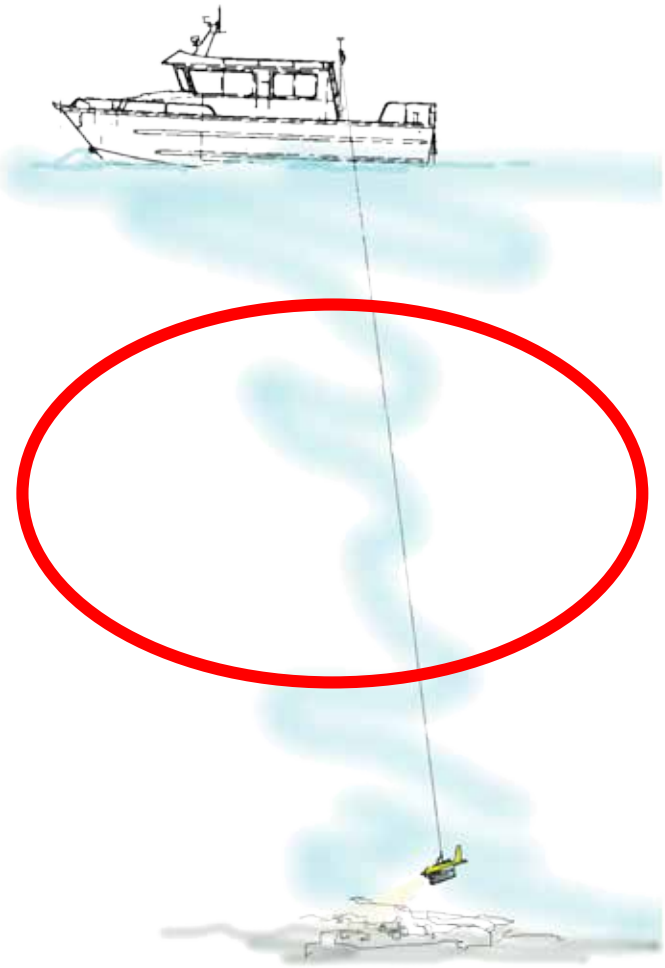
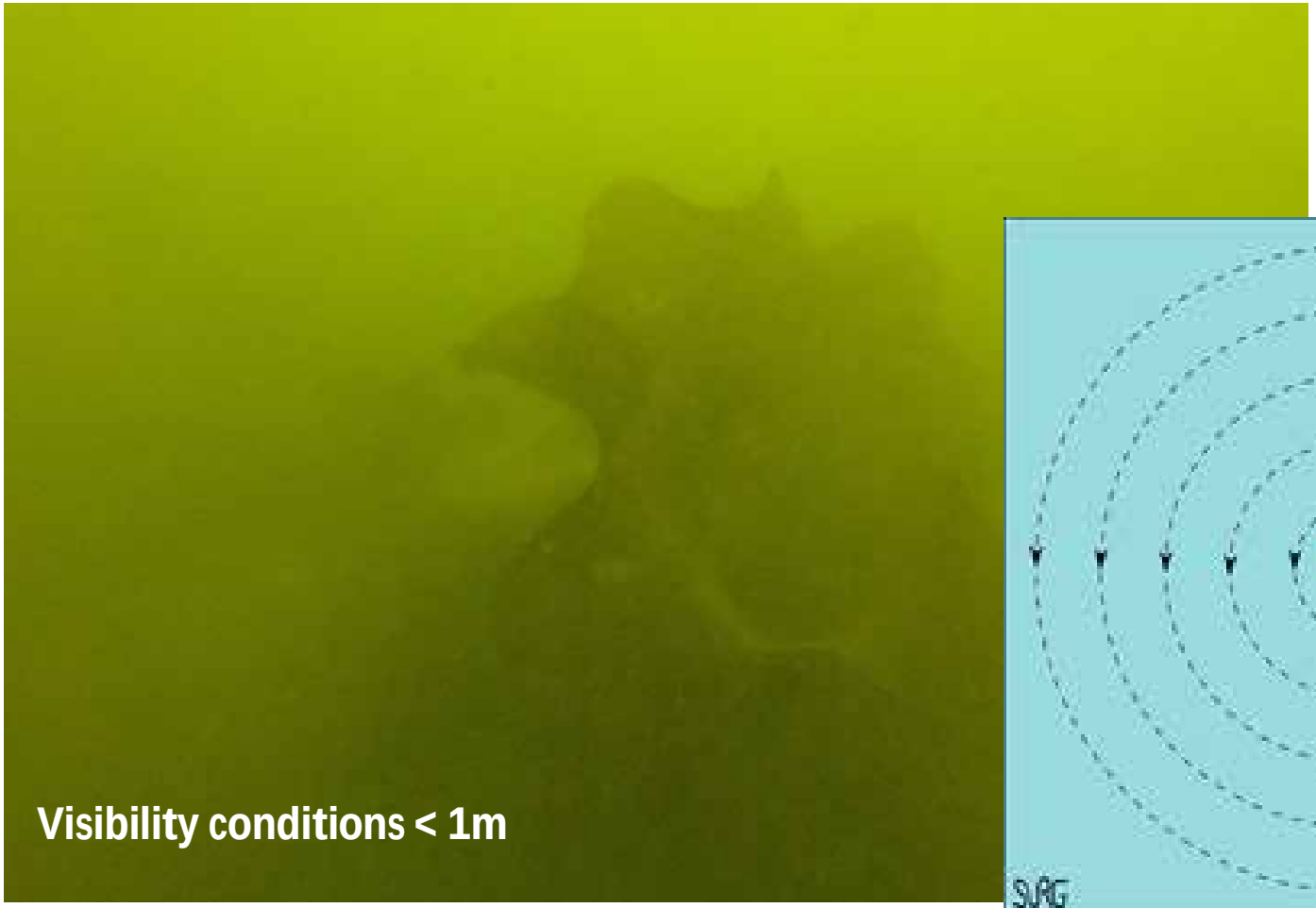
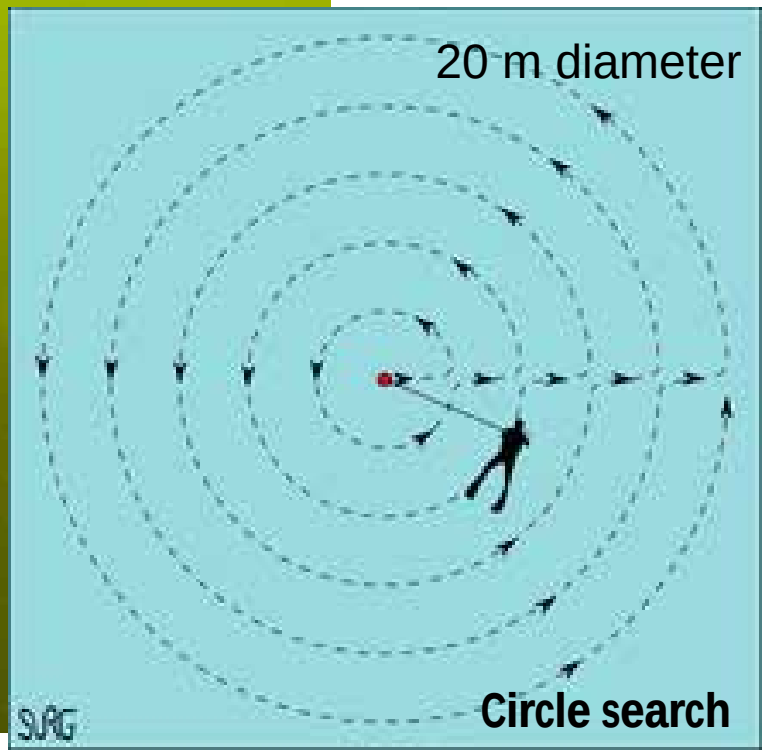
Towed video survey to identify kelp focus areas



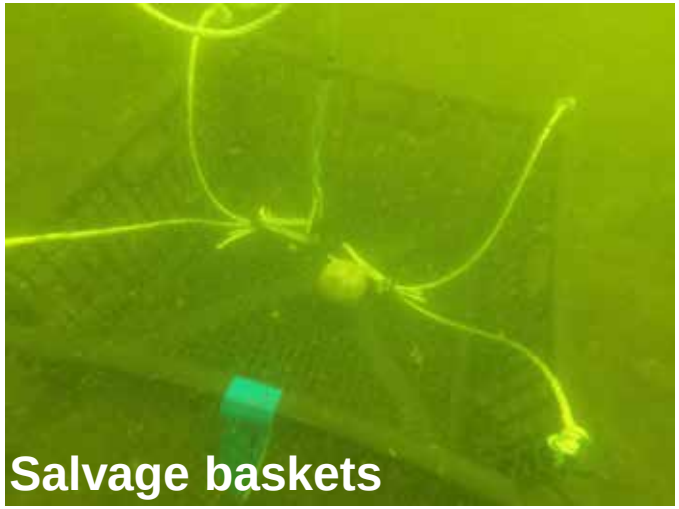


Salvage Operations

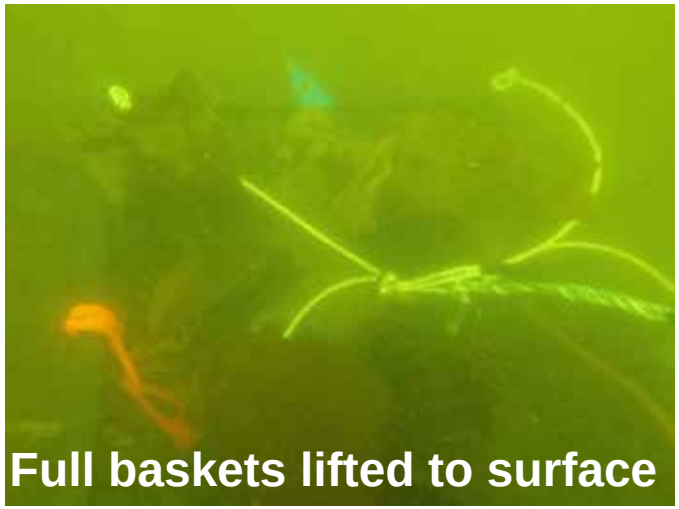




Salvage Operations

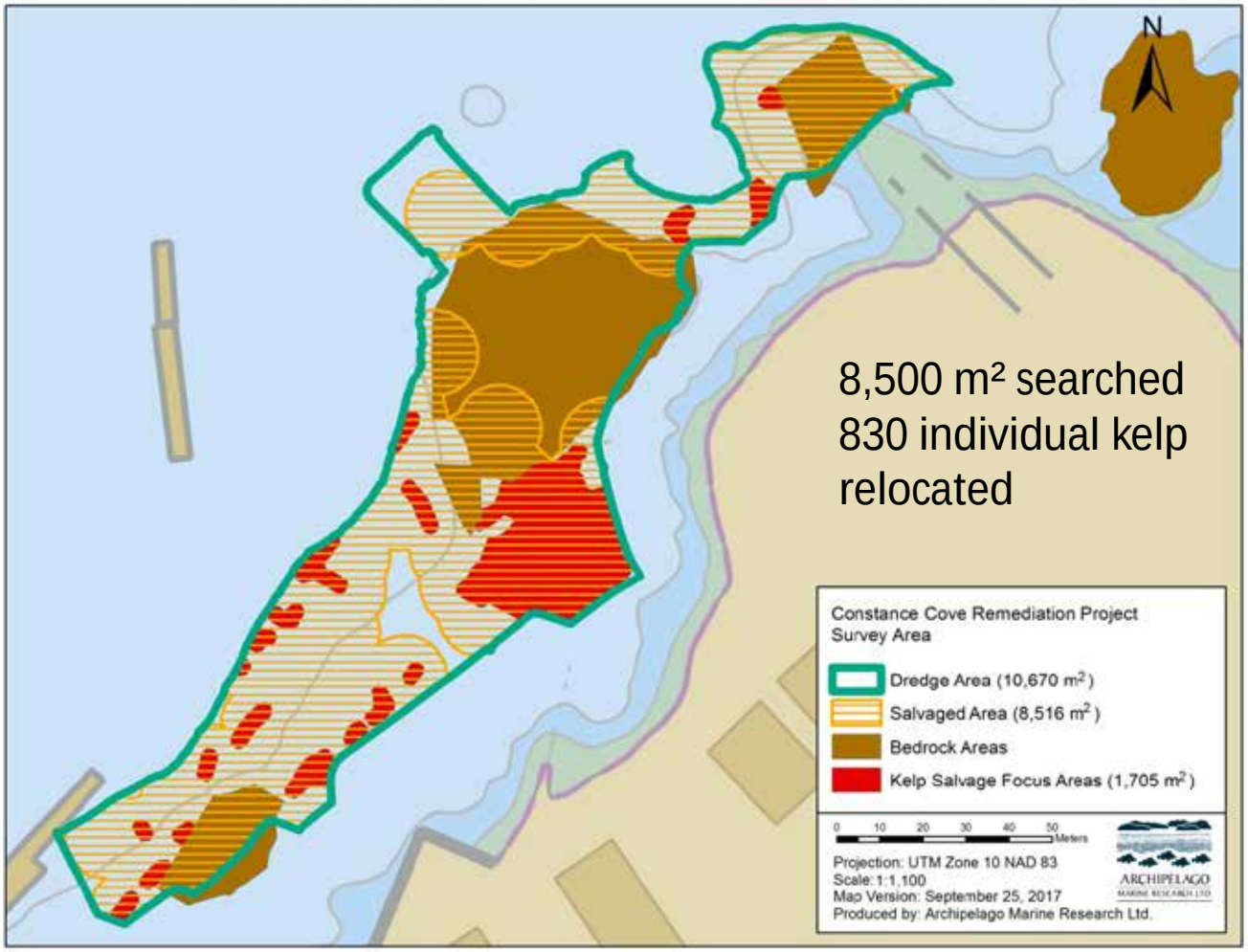

Salvage baskets


Divers fill with substrate with kelp

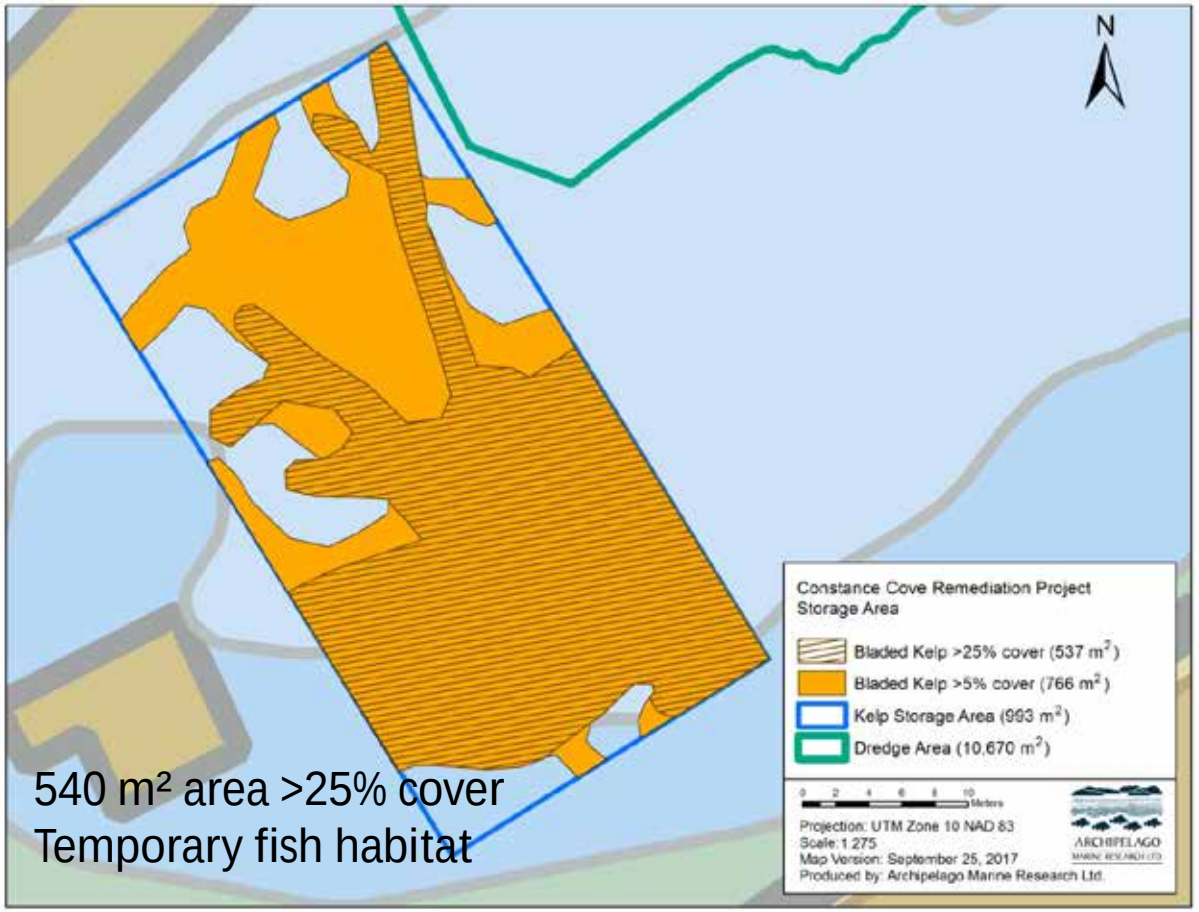

Full baskets lifted to surface


Full baskets transported

Salvage Operations



Kelp Storage Area

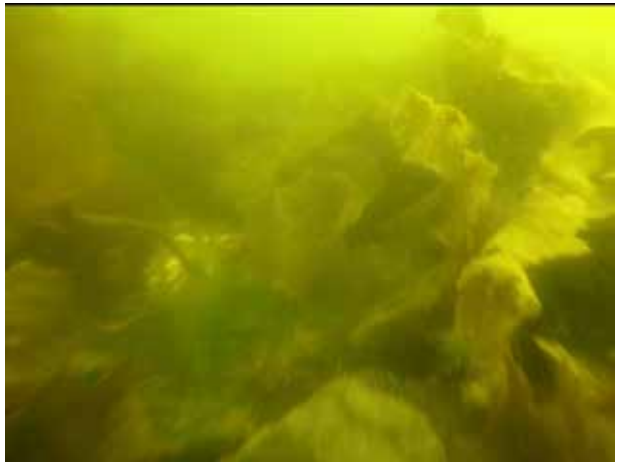


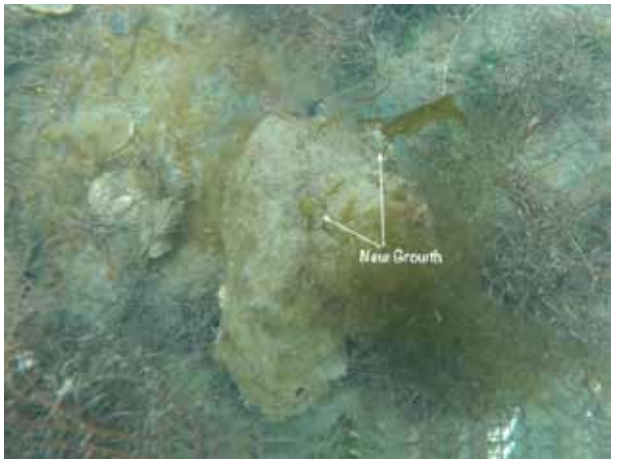
Monitoring – Salvaged Material

Monitoring objectives included:

- Assessing the condition and regrowth of the salvaged kelp; and
- Assessing the establishment of juvenile sporophytes

Monitoring – Salvaged Material



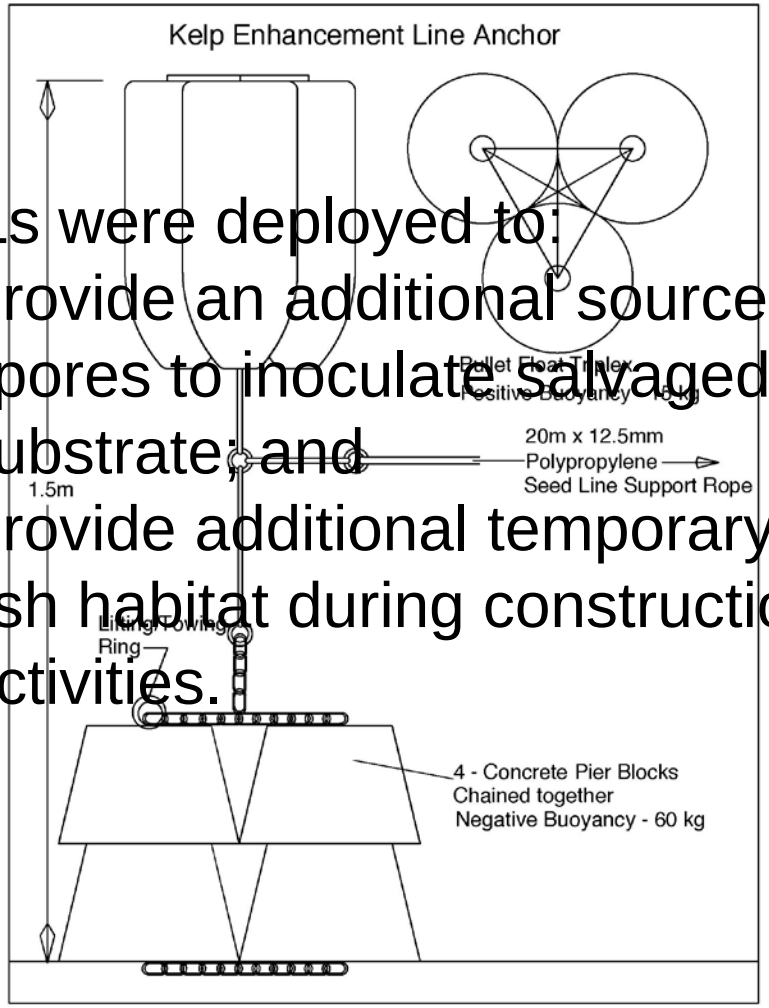


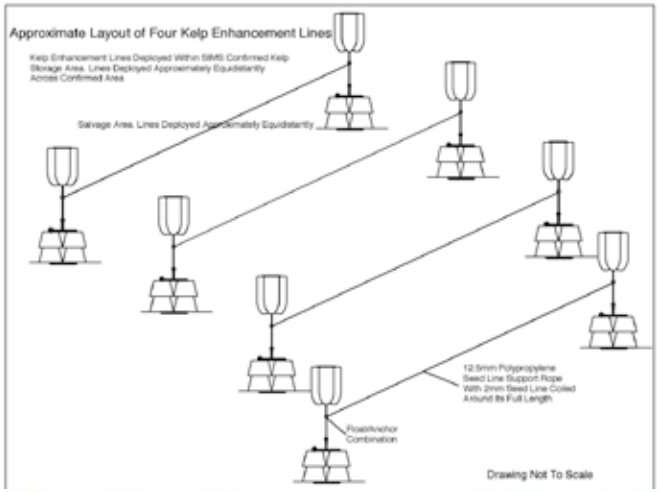
August 2017 **December 2017** **March 2018**

Kelp Enhancement Lines

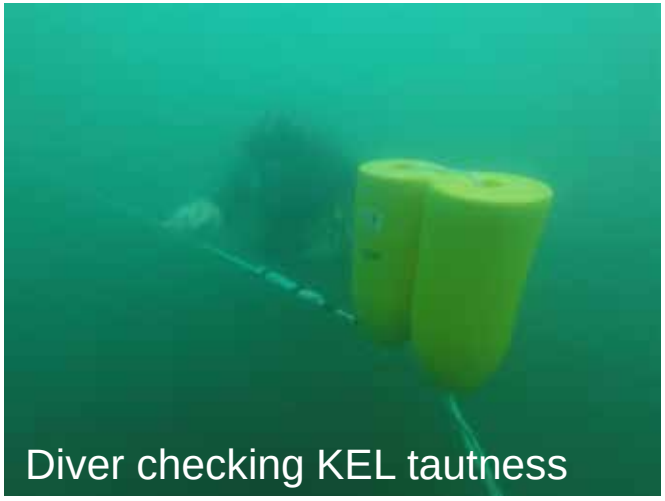
KELs were deployed to:

- Provide an additional source of spores to inoculate salvaged substrate; and
- Provide additional temporary fish habitat during construction activities.





Kelp Enhancement Lines



Monitoring – Kelp Enhancement Lines

Next Steps

Dredging activities

Blasting activities

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Monitoring salvaged material in Kelp Storage Area and KEL installation

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Monitoring salvaged material and KELs in Kelp Storage Area

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Summary

- **Large area (8,500 m^2) of kelp could successfully be salvaged by divers.**
- **Expanding circle search method is recommended for salvage.**
- **Timeline challenges. Salvage may be better suited to occur in spring as:**
  - **Underwater visibility is generally greater**
  - ***S. latissima* is at the beginning of its growing phase (smaller plants < fragile, < damage to plant material)**
  - **Less drift kelp present**
- **Some beginning indications of kelp growth on salvaged material in Kelp Storage Area – summer monitoring period will provide better indication of success**
- **Location of storage area may not be suitable for natural establishment of new generations of kelp**
  - **Natural conditions of the area (low circulation, depositional area)**
  - **Active harbour and storage area is adjacent to remedial activities so impacts from dredging are a risk**
  - **Sedimentation on substrate could act as a barrier to spores**
- **Kelp Enhancement Lines are growing as intended and being used by small invertebrates – summer monitoring period will provide better indication of fish use**