

Subject: M/T Margara - Draft Emergency Restoration Monitoring Plan
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Dear Trustees,

CSA is pleased to provide you with a draft monitoring plan for the emergency restoration activities conducted to date at the M/T Margara grounding site. Per discussions at our 3 October 2006 meeting in San Juan, and in response to the 12 January 2007 Trustee letter, this plan outlines proposed objectives and tasks for establishing a baseline and monitoring of on-site activities undertaken to date for the restoration of impacts.

We look forward to discussing the draft plan with you and finalizing a strategy to determine the relative success of these efforts.

Sincerely,

Bruce Graham

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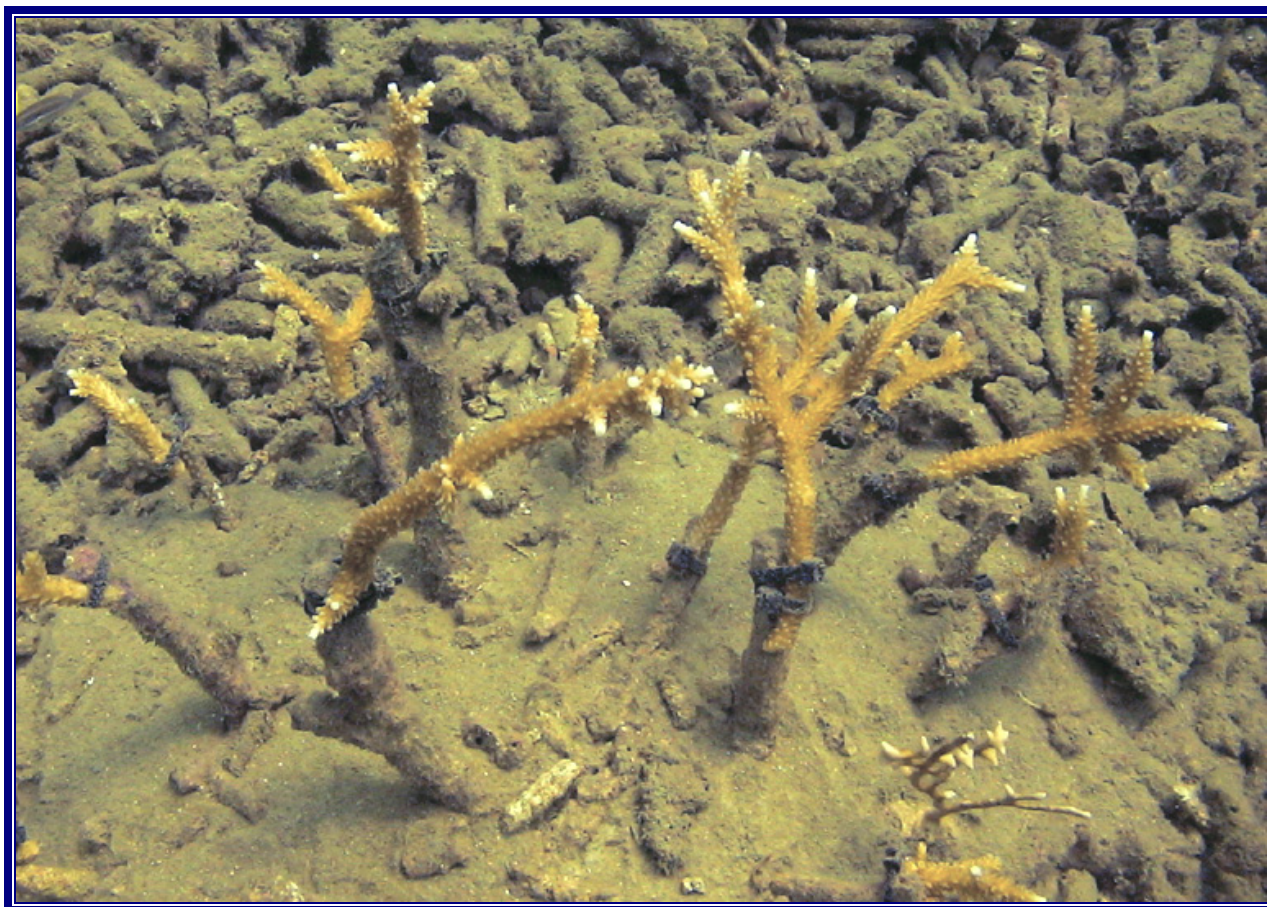
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**Proposed Monitoring Plan
For Emergency Restoration at the
M/T Margara Restoration Site**



January 2007

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PROPOSED MONITORING PLAN

1.0 INTRODUCTION AND PROJECT OBJECTIVES

Continental Shelf Associates, Inc. (CSA) is pleased to present this draft monitoring plan for emergency restoration conducted at the *M/T Margara* grounding site. The proposed monitoring plan is based on the elements discussed during the project meeting of Responsible Party (RP) and Trustee representatives in San Juan, Puerto Rico on 3 October 2006. The monitoring plan relies on the establishment of experimental and reference stations during an initial baseline survey and the completion of approved monitoring tasks during the baseline survey and subsequent surveys.

The overall goal of this draft monitoring plan is to determine the relative success of coral/substrate reattachment as a suitable means of emergency restoration at the *M/T Margara* grounding site. The proposed monitoring plan will permit the detection of, and response to, significant changes in overall habitat characteristics, hard coral/substrate reattachment status, and relative health. Monitoring study objectives are as follows:

- To evaluate the temporal stability of reattached biota and natural substrate; and
- To evaluate the relative health of reattached hard corals.

2.0 PROJECT DESIGN OVERVIEW

2.1 Monitoring Station Selection and Establishment

Monitoring stations will include both biota/substrate groupings and staghorn coral (*Acropora cervicornis*) groupings. Stations will be established within the restored impact areas and adjacent non-impact areas. Monitoring is designed to evaluate relative changes in sampling parameters within and between experimental (i.e., restored impact area) and reference (i.e., adjacent non-impact areas) groups.

Forty stations, consisting of 30 biota/substrate groupings and 10 *A. cervicornis* groupings, will be sampled during monitoring. The 30 biota/substrate stations will include 20 groupings of reattached biota/substrate displaced during the grounding event (experimental stations) and 10 groupings of biota/substrate that remained intact during the grounding event (reference stations). The 10 *A. cervicornis* stations will include 9 groupings of reattached *A. cervicornis* (experimental stations); and 1 thicket of *A. cervicornis* that remained intact during the grounding event (reference station).

Primary selection criteria for both experimental and reference groupings of biota/substrate include sound stability and health. Location of the reference biota/substrate groupings relative to the grounding site (i.e., directly adjacent to the impact area) will be considered during selection. The attachment status and relative health of the selected hard corals should be similar for both the experimental and reference groupings at the time of the baseline field survey.

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Experimental and reference biota/substrate stations will each encompass an area of 1 m². Much of the biota/substrate reattached during emergency restoration of the site was tightly clustered into large, complex groupings and often with abutting attachment points. Corners and/or boundaries of the selected 1 m² grouping will be permanently marked to facilitate their relocation during subsequent surveys.

Monitored *A. cervicornis* will include nine experimental fragment groupings and one reference group. The nine experimental groupings will be comprised of three groups of each technique utilized for reattachment of *A. cervicornis* fragments. Techniques included the reattachment of *A. cervicornis* fragments to 1) stainless-steel bolts/screws projecting outward from pooled cement, 2) natural coral rubble extending outward from pooled cement, and 3) secured frame of plastic-coated wire mesh. In all three reattachment techniques, fragments of *A. cervicornis* were secured using plastic cable ties. Clustered fragments within an individual reattachment location will constitute an experimental *A. cervicornis* monitoring station. The reference group will be a thicket of healthy *A. cervicornis* identified during impact assessment and located directly adjacent to the grounding impact area.

The selected experimental and reference groupings of biota/substrate and *A. cervicornis* will be marked with a unique numeric tag and mapped relative to reference benchmarks. Each group will be mapped by determining the distance and bearing (compass heading) relative to one or more of the thirty-five geo-referenced benchmarks established during the site restoration. Due to the spatial distribution of the groupings, multiple benchmarks will be required for mapping. The navigational coordinates will be recorded for each benchmark. Numeric tags will be positioned within the established boundaries of the grouping to ensure the tag is visible in video images collected as part of the monitoring program. Mapping and tagging of monitoring stations will be conducted during the baseline survey.

2.2 *In Situ* Data Collection

The specific objectives of this draft monitoring plan are to evaluate the stability (i.e., integrity of reattachment) and relative health of selected biota/substrate groupings and *Acropora cervicornis* groupings. Tactile censuses and direct observations will be conducted to assess the stability of the biota/substrate at experimental monitoring stations. *In-situ* tactile census will be used to determine stability of cement bond for biota/substrate groupings. Direct observations concerning the attachment status (i.e., presence/absence) and relative health of the biotic components will be made by an experienced scientist at each of the experimental and reference monitoring stations. An assessment of the relative health of hard corals will be based primarily on colony tissue color (normal, blanched, or bleached), tissue condition (i.e., the degree of accretion/regression and presence of disease) and interspecific events (e.g., clionid sponge intrusion). Qualitative digital imagery will be utilized to augment direct observations for each of the monitored parameters and to provide a reference for subsequent observations. Stability and relative health of experimental and reference groups will be compared between groups and between monitoring surveys.

3.0 FIELD SURVEY LOGISTICS AND SCHEDULE

3.1 Survey Vessel and Navigation

Monitoring activities will be conducted utilizing a contracted vessel with sufficient deck space to accommodate safe SCUBA and surface supply dive operations with essential sampling equipment. Navigation during transit to and from the project site will be achieved using an on-board differential global positioning system (DGPS).

3.2 Field Survey Team

A four-person survey team would be the optimal staffing required to conduct field operations associated with the proposed draft monitoring plan. Two-person dive teams will conduct dive operations and underwater data collection.

3.2 Field Operations and Schedule

Survey I (baseline) will be conducted during early 2007 (February or March). The first portion of Survey I will involve station identification and selection, mapping, and tagging. The remaining survey efforts will be utilized to complete data collection. A subsequent survey (Survey II) for monitoring of emergency restoration would be conducted approximately 6 months following the completion of Survey I (Baseline) and include data collection as described in **Section 2.2**.

4.0 DATA ANALYSES

4.1 Biota/Substrate Stations

The number and relative health of biotic components within each of the monitored groupings (experimental and reference) will be established during the baseline survey using the methodologies described in **Section 2.2**. During subsequent surveys, the number of attached and healthy biota per station and per survey and the relative health of hard corals will be compared to determine spatial and temporal change of each monitored parameter. Proportional difference in attachment status of reattached biota/substrate and relative health of experimental and reference biota, expressed as a percentage, will be utilized to assess the success of biota/substrate reattachment as a suitable means of long-term restoration at the *M/T Margara* site. Evidence of catastrophic events (e.g., mass bleaching, coral disease(s), and storm damage) will be noted and referenced with adjacent habitat that was not impacted during the grounding event.

4.2 *Acropora cervicornis* Stations

The reattachment status and relative health of each *A. cervicornis* fragment within experimental stations will be recorded and compared with reference stations. In addition, the proportional

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differences in stability and relative health of *A. cervicornis* fragments for each of the three reattachment techniques will be used to assess relative success of the various techniques.

5.0 REPORTS

Results from each survey will be incorporated into Draft and Final Reports. Report copies will be submitted to Independent Maritime Consulting, Ltd. and to PRDNER and NOAA General Counsel. A Final Report will be submitted within 45 days of receipt of comments concerning the Draft Report. Reports will include a detailed description of methods for sampling and analyses, station maps, including a GIS of baseline monitoring activities, and treatment of sampling results and digital images. Survey II report will present a comparative analysis of data collected between surveys and summarize temporal and spatial data comparisons and present an assessment of the relative success of the site restoration.