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Integrated Studies to Characterize the Mad Dog Spar Anchor Locations and Plan Their Installation

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Abstract

The geological setting of the Mad Dog anchoring system has been described by Berger et al (2006) and the details of the geotechnical investigation performed to design the anchors given by Liedtke et al (2006). This companion paper describes how the results of the geotechnical campaign were integrated with the high-resolution geophysical data to define the geotechnical and bathymetric constraints associated with the anchor locations and to provide input to the geotechnical design.

For Cluster 2, located on the Sigsbee Escarpment, the paper highlights the great care that was taken in positioning the anchors close to the location of the soil borings and Cone Penetrometer Tests (CPTs) and on seabed with acceptable slope angles.

Introduction

Geological setting

The shallow geological setting of the Mad Dog field has been thoroughly described by Orange et al (2003). Details pertinent to the spar anchor locations can be found in Berger et al (2006) and are briefly summarized herein.

The Mad Dog mooring system straddles the Sigsbee Escarpment (Figures 1 and 2). A total of eleven mooring anchors arranged in three clusters were planned for this mooring system. Two clusters, Cluster 1 (Anchors 1, 2, and 3) and Cluster 3 (Anchors 8, 9, 10, 11) are situated along the Lower Continental Slope and one cluster, Cluster 2 (Anchors 4, 5, 6, 7) is situated along the escarpment.

Large slump events and other significant geologic events are prevalent along this portion of the Sigsbee Escarpment.

Near Cluster 1, the geophysical profiles and geotechnical core data indicate that the subsurface stratigraphy at the three proposed anchor pile locations is spatially uniform within the depth range of interest.

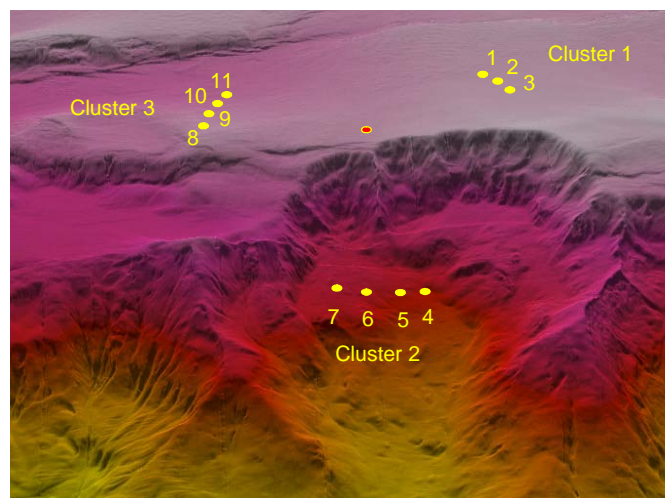


Fig. 1 Perspective view of Mad Dog spar anchors seabed locations.

The amorphous seismic character within Slump 8, where Cluster 2 sits, prevented the extrapolation of geotechnical properties within the slump debris from one anchor site to the other. The complex geologic conditions identified at Cluster 2 suggested the need for site specific data at each of the four anchor sites within Cluster 2.

A buried mass wasting event is present within Cluster 3 and is composed of a series of undulating high and low spots. Higher-amplitude reflectors, so called “bright spots”, typically occur in the low elevations of the top of the slump unit (see Berger et al, 2006 for details). Although these bright spots have been interpreted as data artifacts, the presence of silty and/or sandy sediments could not be conclusively eliminated.

Geotechnical Site Investigation

The geotechnical site investigation, as ultimately performed, has been described in detail by Liedtke et al (2006) and is briefly summarized herein.

The data collected at Cluster 1 and 3 above the escarpment consisted of one Cone Penetration Test (CPT) and one boring at Cluster 1 and two CPTs and one boring at Cluster 3. Four