APPENDIX C - PERTINENT CORRESPONDENCE

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

NOV 01 2011

Mr. Paul Souza
U. S. Fish & Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, FL 32960-3559

Dear Mr. Souza,

The U.S. Army Corps of Engineers (Corps) is conducting a beach renourishment project in Sarasota County, Florida. The project name is the Venice Beach Hurricane and Storm Damage Reduction Project. The Corps proposes to use the Statewide Programmatic Biological Opinion (SPBO) to complete the consultation requirements under the Endangered Species Act (ESA) for this project.

The project proposes to renourish approximately 3.2 miles of beach south of Venice Inlet. The placement volume is approximately 760,000 cubic yards, and the material will be obtained from one of four offshore borrow areas located approximately eleven miles southwest of the placement site. See the enclosed Project Location Map (Figure 1) and the "Project Information and Screening Checklist" for additional details. The USFWS' most recent biological opinion for this project was issued on July 15, 2003 (USFWS Log No. 4-1-03-F-2486).

The proposed action is located adjacent to an inlet. The closest piping plover critical habitat to the north is approximately 37 miles from the placement site (FL-21, Egmont Key), and the closest critical habitat to the south is approximately 28 miles from the placement site (FL-22, Cayo Costa; see Figure 2). In all other respects, the activity would comply with the scope and terms and conditions of the SPBO of August 2011 and the Statewide Programmatic Biological Assessment of February 2011. All post-construction monitoring will be conducted by the City of Venice, and it is not the responsibility of the Corps.

The project involves the placement of sand on the beach, and it may affect nesting sea turtles. All in-water activities will follow the standard manatee protection measures and the dredging and placement activity will not occur in an Important Manatee Area (see Figure 3); therefore, the proposed activity may affect, but is not likely to adversely affect manatees. The piping plover is not likely to be adversely affected because the proposed activity will not alter the on-going management of the shoreline, and migratory bird protection measures will be observed during construction. Finally, the proposed action does not occur in beach mouse habitat and will not affect beach mice.

If you determine that the proposed activity as described herein falls within the scope of the SPBO, please consider this letter as the initiation of the 30-day coordination required by the SPBO. If you determine that the proposed activity as described herein does not fall within the scope of the SPBO, please consider this letter (along with the documents referenced and the enclosures to this letter) a biological assessment initiating consultation.

As stated in the letter dated February 22, 2011 forwarding the USACE Statewide Programmatic Biological Assessment, we will continue to work with the U.S. Fish and Wildlife Service to make the SPBO a more useful tool to streamline and expedite the Section 7 consultation process while providing reasonable protection of ESA resources. We have lingering concerns over some of the exclusions and requirements which could limit our ability to utilize the SPBO. If you have any questions, please contact me at (904) 232-1665, or the technical point of contact, Aubree Hershorin, at (904) 232-2136.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

Enclosures

Figure 1. Project Location Map.

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Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Quit App

Record # 28

Prepared by: Hershorin, Aubree SAJ

Date Entered: 10/12/2011

Project Name: Sarasota County, FL B.E.C.

Project Event: Beach Renourishment

Project Number: 113092 Application #:

Sponsor/ Applicant: City of Venice

Quantity (CY): 760,000 Length (Feet): 16,700

County(ies): Sarasota Location R-Monuments: R116 to R133

Lat °: 27 Lat': 05 Lat" 20 Long° -82 Long': 27 Long": 24

Borrow or Dredge Site(s): Four borrow areas located approximately 11 miles southwest of the placement area.

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☑ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard ☐ Sarasota Co (Manasota Key)

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☑ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1: Project adjacent to an inlet.

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontial Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction)

Sponsor

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Sponsor

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early Mand and late July):

Sponsor

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat:

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.
2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.
3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Figure 2: Location of piping plover critical habitat in the project vicinity.

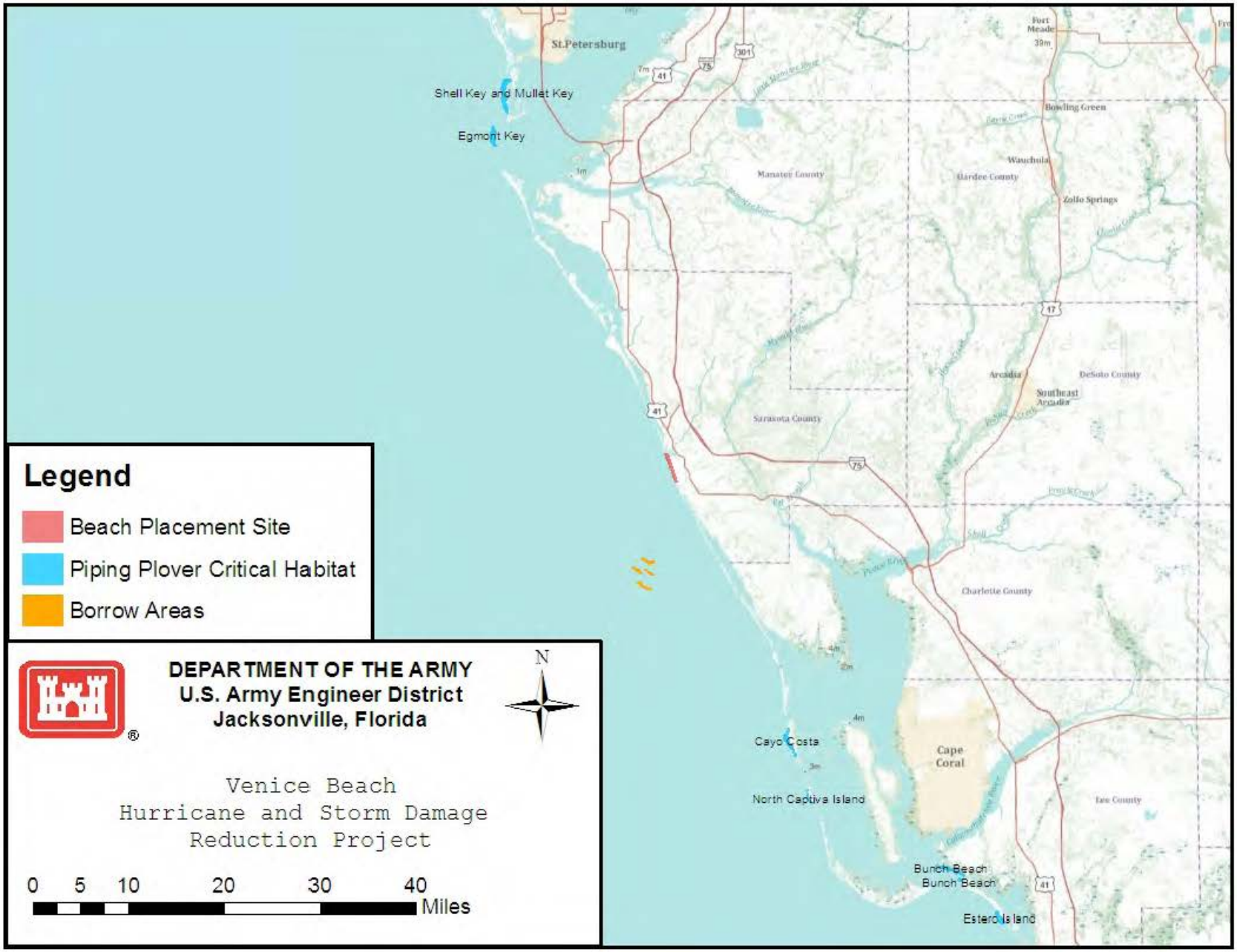
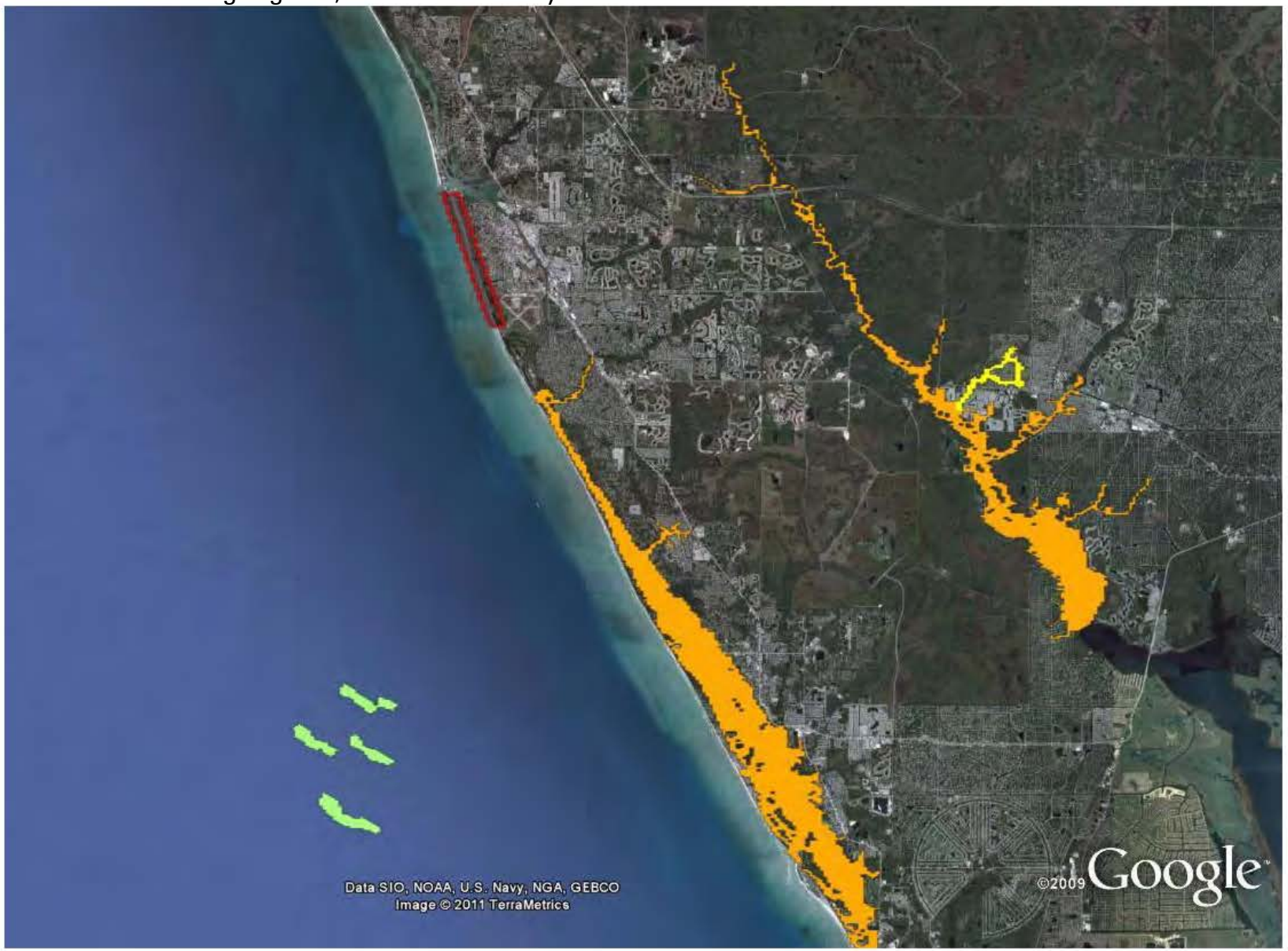


Figure 3: Important Manatee Areas (IMAs) in the project vicinity. The placement site is shown in red, the borrow areas in light green, and the IMAs in yellow.



FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Eric Summa
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

October 10, 2011

Re: DHR Project File No.: 2010-04357 (2010-05995) / Received by DHR: October 6, 2011
1A-32 Permit No.: 1011.002
Final Report: *Sarasota Beach Erosion Control Cultural Resources Survey: Remote Sensing Survey of Four Offshore Borrow Areas, Nearshore and Shoreline Survey, Sarasota County, Florida*

Dear Mr. Summa:

Our office received and reviewed the above referenced survey report in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992, and *36 C.F.R., Part 800: Protection of Historic Properties*, and Chapter 267, *Florida Statutes,* for assessment of possible adverse impact to cultural resources (any prehistoric or historic district, site, building, structure, or object) listed, or eligible for listing, in the National Register of Historic Places (NRHP).

In August and September 2010, Panamerican Consultants, Inc. (PCI) conducted an underwater remote sensing survey of four sand borrow areas and the nearshore sand placement area as well as an archaeological and historical Phase I survey of the beach area proposed for sand placement. The surveys were conducted on behalf of G.E.C., Inc. and the US Army Corps of Engineers. PCI identified no cultural resources within the terrestrial portion of the project area during the investigation. PCI identified seventy-six (76) magnetic anomalies, twenty-two (22) side-scan sonar targets, and one thousand one hundred thirty-four (1,134) subbottom impedance features within the borrow areas and nearshore area.

PCI found that six magnetic anomalies (M001, M002, M003, M008, M066, and M075), and four side-scan sonar targets (C0002, C0005, C0006, and C0023) make up six potentially significant clusters that will need to be avoided within a two hundred fifty (250) foot buffer zone. PCI also recommends that four subbottom targets that could represent significant cultural resources will need to be avoided with buffer areas of either 1500 or 1000 feet. In the event that avoidance is not possible, additional investigation of significant anomalies or features will be needed.

Based on the information provided, our office concurs with these determinations and finds the submitted report to be complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code.*

Because the project parameters have not yet been established, we can make no effects determinations at this time. We look forward to further consultation with the Corps regarding this project.

For any questions concerning our comments, please contact Rudy Westerman, Historic Preservationist, by electronic mail at rjwesterman@dos.state.fl.us, or by phone at 850.245.6333. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

Pc: Panamerican Consultants, Inc.
Kevin Porter, Interoffice Mail Station 8B

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

SEP 2 0 2011

Mr. Paul Souza
U. S. Fish & Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, FL 32960-3559

Dear Mr. Souza,

The following describes the history and the applicability of the Coastal Barrier Resources Act (CBRA) of 1982 and the Coastal Barrier Resources Improvement Act (CBRIA) of 1990 to the Venice Beach Hurricane and Storm Damage Reduction Project (HSDR). The project is located along the shoreline of Sarasota County, Florida (see Figure 1). The proposed borrow areas are located approximately 10.5 miles southwest of the placement site. The placement site is located adjacent to and within two "otherwise protected areas" (OPA) of the John H. Chafee Coastal Barrier Resources System (CBRS). The northern project limit is near CBRA Unit FL-71P, Venice Inlet, and the southern portion of the project is located in a portion of CBRA Unit P21AP, Manasota Key (see Figure 2).

The CBRA and the CBRIA limit federally subsidized development within the CBRA Units to limit the loss of human life by discouraging development in high risk areas, to reduce wasteful expenditures of Federal resources, and to protect the natural resources associated with coastal barriers. CBRIA provides development goals for undeveloped coastal property held in public ownership, including wildlife refuges, parks, and other lands set aside for conservation (OPAs). These public lands are excluded from most of the CBRA restrictions, although they are prohibited from receiving Federal Flood Insurance for new structures.

The proposed Venice Beach HSDR project does not include the construction of structures that would require Federal Flood Insurance; therefore, Federal expenditures for the proposed project should not be restricted in Unit P21AP, Manasota Key OPA.

The U.S. Army Corps of Engineers (Corps) determined that the proposed project is consistent with CBRA and CBRIA, and we request your confirmation of this determination. If you have any questions regarding this project, please contact Ms. Aubree Hershorin by phone at (904) 232-2136 or by email at Aubree.G.Hershorin@usace.army.mil.

Sincerely,

Jason J. Spinning
Chief, Coastal Section

Enclosures

Copy Furnished via Email:
Jeff Howe, USFWS, 1339 20th Street, Vero Beach, FL 32960-3559

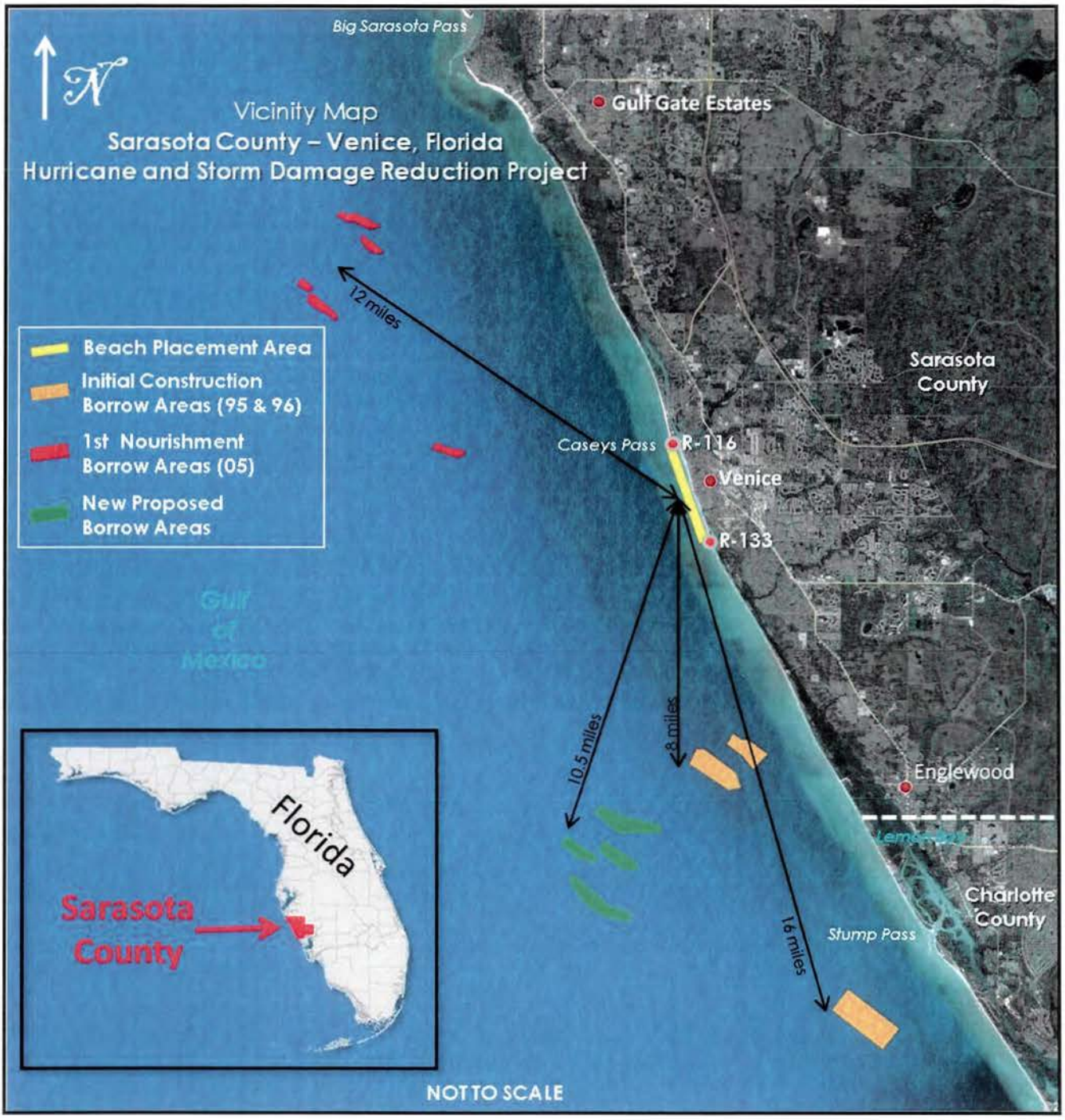


Figure 1: Location map showing the location of the proposed beach nourishment activities and the borrow areas.

Figure 2: Map showing the location of the CBRA Units in the project area.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312; FAX (727) 570-5517

JUN 2 2004

F/SER3:EGH

Mr. James C. Duck
Chief, Planning Division
Army Corps of Engineers, Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Duck:

This responds to your May 25, 2004, letter in reference to the Venice/Sarasota County Beach Erosion Control Project. The U.S. Army Corps of Engineers (COE) has determined that the borrow areas associated with this project do not meet the definition of "significant hardground" of the current Regional Biological Opinion (RBO) issued to the COE on November 19, 2003, for COE-permitted channel and sand mining site dredging in the Gulf of Mexico. You conclude that dredging of these borrow areas will not have an adverse effect on sea turtles or other resources in the areas, and intend to use a 200-foot buffer in the Venice sand mining efforts.

NOAA Fisheries' Protected Resources Division has reviewed the Final Marine Biological Survey for the Sarasota County Shore Protection Project prepared by Dial Cordy and Associates, and submitted by the COE. We agree that, given the absence of significant hardgrounds, the 400-foot buffer requirement of the RBO does not apply, and a 200-foot buffer may be used without adverse effects to sea turtles.

We appreciate the opportunity to comment on this project and work with the COE to ensure the protection of threatened and endangered species under NOAA Fisheries' purview, and to help the COE fulfill its mandate under the ESA. Please contact Mr. Eric Hawk at (727) 570-5312 if you have any questions or if we may be of assistance.

Sincerely,

for

David Bernhart
Assistant Regional Administrator
for Protected Resources

cc: F/SER4 - M. Sramek

File: 1514-22 f.1. FL

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OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 2

To Eric Gasch	From Mark Sramek, NOAA
Dept./Agency USACE, Jacksonville	Phone # (727) 570-5311
Fax # (904) 232-3442	Fax #

NSN 7540-01-317-7388 5099-101 GENERAL SERVICES ADMINISTRATION

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702
(727) 570-5317; FAX 570-5300

May 9, 2003 F/SER43:MS/DD

Colonel James G. May, District Engineer
Planning Division, Environmental Branch
Department of the Army, Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel May:

The National Marine Fisheries Service (NOAA Fisheries) has reviewed the Draft Environmental Assessment Finding of No Significant Impact, dated April 10, 2003, provided by your office for possible borrow sites for the re-nourishment of sand beach located at Venice Beach in Sarasota County, Florida. The project would utilize up to 2.77 square miles of sand substrate from as many as four borrow sites located between six to ten miles northwest of Venice Beach in water depths between 30 and 42 feet. Areas of scattered patchy low reef hard bottom identified in the borrow areas will be avoided through the establishment of a buffer around them so that no dredging will occur within 200 meters of these features. Sand from the borrow areas will be used to re-nourish approximately 120 acres of sand beach along 3.2 miles of shoreline beginning approximately 850 feet south of the jetty at Casey's Pass, Venice Beach, southward to Department of Natural Resources survey monument R-133.

We find that the description of the fishery resources and habitats in the project area and assessment of potential adverse impacts associated with the proposed activity is adequate. Further, based on our assessment of the project and mitigative measures, we anticipate that any adverse effects on living marine resources, including Essential Fish Habitat (EFH), would be minimal. Accordingly, we have no comments to provide at this time.

Be advised that issues related to consultation under the Endangered Species Act (ESA) should be directed to and will be addressed separately through NOAA Fisheries' Protected Resources Division at the above letterhead address. Any issues related to ESA should be directed to Eric Hawk at the above address or by calling (727) 570-5312.

If you have questions regarding our views on this project or our evaluation of potential EFH impacts, please contact Mark Sramek in our St. Petersburg, Florida, office at the above address or by calling (727) 570-5311.

Sincerely,

/S/
Rickey N. Ruebsamen
Acting Assistant Regional Administrator
Habitat Conservation Division

Cc:
EPA, Atlanta
FDEP, Tampa (Deborah Getzoff)
FL FWCC, Punta Gorda (Jim Beever)
FWS, Naples (Robert Koch)
F/SER3
F/SER4
F/SER43

APPENDIX D – MAILING LIST

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FEDERAL AGENCIES

Nancy Sutley
Chair
Council on Environmental Quality
722 Jackson Place NW
Washington, DC 20006

Rear Admiral Robert S. Branham
Commander, Seventh Coast Guard District
909 SE 1st Avenue
Miami, FL 33131

Bureau of Indian Affairs
Eastern Regional Office
545 Marriott Drive
Suite 700
Nashville, TN 37214

Director, Office of Environmental Policy and Compliance
U.S. Department of the Interior
Main Interior Building (MS 2462)
1849 C Street, NW
Washington, DC 20240

Mr. Richard Harvey
EPA - South Florida Office
400 N. Congress Ave
Ste 120
West Palm Beach, FL 33401

Director of Federal Activities
Environmental Protection Agency
Environmental & Compliance Dept.
1200 Pennsylvania Avenue NW
Washington, DC 20004

DOT Inspector General
FED Highway Administration
1200 New Jersey Ave. SE
Atlanta, GA 30320

Federal Emergency Management Administration
500 C Street SW, Room 714
Washington, DC 20472

Federal Highway Administration
227 N. Bronough St.
Tallahassee, FL 32301

Regional Director
FEMA Insurance & Mitigation Division
3003 Chamblee-Tucker Rd
Atlanta, GA 30341

Director, NRCS
US Dept. of Agriculture Deland Service Center
101 Heavens Gate Road
Suite F
Deland, FL 32720

Office of Constituent Services
NMFS - Recreational Fisheries Branch
1315 East West Highway
Silver Spring, MD 20910

Mr. Mark Sramek
NMFS - SERO - HCD
263 13th Ave. S.
St. Petersburg, FL 33701

Mark Thompson
NMFS-HCD
3500 Delwood Beach Dr
Panama City, FL 32408

Ken Hollingshead
NMFS-Marine Mammal Conservation Division
Sanctuary
1315 East West Highway
Silver Spring, MD 20910

Mr. David Bernhart
NOAA/National Marine Fisheries Service - PSB
263 13th Avenue South
St. Petersburg, FL 33701

U.S. Dept. of the Interior
Office of Environmental Policy and Compliance
1849 "C" St
NW-Room 2340
Washington, DC 20240

Mr. Bryant L. Vanbrakle
SEC FED Maritime COMM
800 North Capitol St. NW
Washington, DC 20573

Mr. Jeffrey Schmidt
U.S. Department of Agriculture - NRCS
420 South State Road 7, Suite 160
Royal Palm Beach, FL 33414

U.S. DOI
Office of Environmental Policy and Compliance
1849 "C" St., NW - Room 2340
Washington , DC 20240

Mr. Paul Gagliano
U.S. EPA Region 4
Environmental Policy Section
61 Forsyth Street SW
Atlanta, GA 30303

Mr. Larry Williams
US Fish & Wildlife Service
State Supervisor
1339 20th St.
Vero Beach, FL 32960-3559

Mr. Craig Aubrey
US Fish & Wildlife Service
South Florida Field Office
1339 20th St.
Vero Beach, FL 32960-3559

Southern Region Forester
US Forest Service
1720 Peachtree Road NW
Atlanta, GA 30309

Executive Director
Advisory Council on Historic Preservation
The Old Post Office Bldg Suite 809
1100 Pennsylvania Ave NW
Washington, DC 20004

Mr. Scott Gudes
US Department of Commerce
HCHB SP Room 6117
14th & Constitution Ave. NW
Washington, DC 20230

Ms. Ann Marie Lauritsen
US Fish & Wildlife Service
600 4th St. S.
St. Petersburg, FL 33701

State Conservationist
USDA/Natural Resources Conservation Service
PO. Box 141510
Gainesville, FL 32605

Mr. William Waskes
BOEMRE Offshore Alternative Energy Programs
Mail Stop 4090
Herndon, VA 20170

STATE/LOCAL GOVERNMENT

Edward F. Lavallee
City Manager
City of Venice
401 West Venice Ave.
Venice, FL 34285

Kathleen Weeden
City Engineer
City of Venice
401 West Venice Ave.
Venice, FL 34285

Mr. Robert Bendus
Director
Div of Historical Resources - SHPO
500 South Bronough St
Tallahassee, FL 32399

Mr. Mark Ferrulo
FL Public Interest Research Group
1010 Central Ave #209
St. Petersburg, FL 33705

Mrs. Sally B. Mann
FLDEP - Office of Intergovernmental Programs
3900 Commonwealth Blvd.
Mail Station 47
Tallahassee, FL 32399

Ms. Lauren Milligan
FLDEP - State Clearinghouse
3900 Commonwealth Blvd.
Mail Station 47
Tallahassee, FL 32399

General Manager, Sarasota County
Environmental Services Business Center
Natural Resources
1301 Cattlemen Road
Sarasota, FL 34232

John Stevely
Florida Cooperative Extension
1303 17th St. West
Palmetto, FL 34221

Secretary Herschel Vinyard
Florida Department of Environmental Protection
3900 Commonwealth Blvd.
Mail Station 10
Tallahassee, FL 32399

Ms Catherine M. Florko
FDEP Beach Control Erosion Program
3900 Commonwealth Blvd.
Mail Station 300
Tallahassee, FL 32399

Director Bureau Chief
FDEP, Beaches & Coastal Systems
3900 Commonwealth Blvd
Mailing Station 300
Tallahassee, FL 32399

Director
FDEP - Div. of State Lands
3900 Commonwealth Blvd
Mail Station 100
Tallahassee, FL 32399

FDOT
10041 Daniels Pkwy
Ft. Myers, FL 33913

Director
FFWCC - Imperiled Species Management
620 South Meridian Street
Mail Station 6A
Tallahassee, FL 32399

Robbin N. Trindell
FFWCC - Office of Environmental Services
620 South Meridian Street
Tallahassee, FL 32399

Nancy Douglass
FFWCC, SW Division
3900 Drane Field Road
Lakeland, FL 33811

FL Dept of Agriculture & Consumer Services
3125 Conner Blvd. RM 269
Tallahassee, FL 32399

Ms. Lisa Gregg
FWC, Divi. of Marine Fisheries Management
2590 Executive Center Circle East
Ste 203
Tallahassee, FL 32301

House Environmental Protection Committee
Institute of Florida Studies
402 S. Monroe St.
Tallahassee, FL 32399

Andy Squires
Coastal Manager
Pinellas County Environment and Infrastructure
22211 US Hwy. 19 N
Building 10
Clearwater, FL 33765

Manager, Sarasota County
Resources Protection Services
1301 Cattlemen Road
Bldg. A
Sarasota, FL 34232

Sarasota County Chamber of Commerce
1945 Fruitville Rd.
Sarasota, FL 34236

General Manager
Sarasota County Environmental Services
Business Center
1301 Cattlemen Road
Sarasota, FL 34232

Manager
Sarasota County Parks & Rec.
6700 Clark Road
Sarasota, FL 34241

Southwest Florida Regional Planning Council
PO Box 3455
North Ft. Myers, FL 33918

Executive Director
Southwest Florida Water Management Dist.
2379 Broad Street
Brooksville, FL 34604

Office of Governor Rick Scott
State of Florida The Capitol
400 S. Monroe St.
Tallahassee, FL 32399

Town Manager
Town of Longboat Key
501 Bay Isles Road
Longboat Key, FL 33548

ELECTED OFFICIALS

Honorable Marco Rubio
US Senate
B40A Dirksen Senate Office bldg.
Washington, DC 20510

Honorable Bill Nelson
US Senate
716 HART SENATE OFFICE BUILDING
Washington, DC 20510

Honorable Vern Buchanan
U.S. House of Representatives, Dist. 13
1051 Manatee Ave. West
Suite 305
Bradenton, FL 34205

Hon. Darryl Ervin Rouson
Florida House of Representatives, Dist. 55
405 House Office Building
402 South Monroe Street
Tallahassee, FL 32399

Honorable Greg Steube
Florida House of Representatives, Dist. 67
1102 The Capitol
402 South Monroe Street
Tallahassee, FL 32399

Honorable Jim Boyd
Florida House of Representatives, Dist. 68
1102 The Capitol
402 South Monroe Street
Tallahassee, FL 32399

Honorable Ray Pilon
Florida House of Representatives, Dist. 69
1101 The Capitol
402 South Monroe Street
Tallahassee, FL 32399

Honorable Doug Holder
Florida House of Representatives, Dist. 70
204 House Office Building
402 South Monroe Street
Tallahassee, FL 32399

Hon. Nancy C. Detert
Florida Senate, District 28
417 Commercial Court
Suite D
Venice, FL 34292

STAKEHOLDERS/SPECIAL INTEREST GROUPS

Ms. Victoria Tschinkel
1000 Friends of Florida
926 East Park Ave.
PO Box 5948
Tallahassee, FL 32314

Ann Paul
Audubon of Florida
Florida Coastal Islands Sanctuaries
410 Ware Blvd.
Suite 702
Tampa, FL 33619

Florida Program Director
Defenders of Wildlife
233 Third Street North
Suite 201
St. Petersburg, FL 33701

Dr. Brent Weisman
Department of Anthropology
4202 East Fowler Ave.
SOC 104
Tampa, FL 33620

Pat Saunders
Ducks Unlimited
4343 Tideview Drive
Jacksonville Beach, FL 32250

Director of the Southeast Office
Environmental Defense Fund
4000 Westchase Blvd.
Suite 510
Raleigh, NC 27607

Florida Defenders of the Environment
4424 NW 13 St.
Suite C-8
Gainesville, FL 32609

Executive Director
Florida Shore & Beach Preservation Assoc
PO Box 13146
Tallahassee, FL 32317

Florida Wildlife Federation
PO Box 6870
Tallahassee, FL 32314

Chairperson
Gulf of Mexico Fishery Management Council
2203 N. Lois Avenue
Suite 1100
Tampa, FL 33607

Mr. Bernie Roman
Miccosukee Tribe of Indians
Post Office Box 440021
Tamiami Station
Miami, FL 33144

Mr. Steve Terry
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Mr. Fred Dayhoff
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Chairman Colley Billie
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Betty Osceola
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Mr. Curtis Osceola
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Mr. Rory Feeney
Miccosukee Tribe of Indians
P.O. Box 440021
Tamiami Station
Miami, FL 33144

Mote Marine Laboratory
1600 Ken Thompson Parkway
Sarasota, FL 34236

Mrs. Joyce Bear
Muscogee (Creek) Nation of Oklahoma
Cultural & Historical Tribal Complex
P.O. Box 580
Okmulgee, OK 74447

Mr. Ted Isham
Muscogee (Creek) Nation of Oklahoma
Cultural & Historical Tribal Complex
P.O. Box 580
Okmulgee, OK 74447

Michael Harty
National Resources Defense Council
40 West 20th Street
11th Floor
New York, NY 10011

Andrew Schock
National Wildlife Federation
1330 W Peachtree Street
Suite 475
Atlanta, GA 30309

John Hammond
National Wildlife Federation
730 Peachtree St. NE
Suite 1000
Atlanta, GA 30308

Alberto Tamayo
OSAT International Cooperation
6550 NW 77th Ct.
Miami, Fl 33166

Tribal Historic Preservation Officer
Poarch Creek Indians - Environmental Dept.
5811 Jack Springs Rd.
Atmore, AL 36502

Reefkeeper International
PO. Box 1316
Middletown, MD 21769

Sarasota Audubon Society
P.O. Box 52132
Sarasota, FL 34232

Sarasota Bay National Estuary Program
111 S. Orange Avenue
Suite 200 W.
Sarasota, FL 34232

Mr. Patrick Rose
Save the Manatee Club
500 N. Maitland Ave
Maitland, FL 32751

Sea Turtle Conservancy
4424 NW 13th St.
Suite B-11
Gainesville, FL 32609

Ms. Jennifer Johnson
Seminole Nation of Oklahoma
P.O. Box 1489
Wewoka, OK 74884

Executive Director, Human Resources Dept.
Seminole Tribe of Florida
Tribal Historic Preservation Office
Ah Tha Ki Museum
Box 21-A
Clewiston, FL 33440

Mr. Mitchell Cypress
Seminole Tribe of Florida
6300 Stirling Road
Hollywood, FL 33024

Dr. Paul Backhouse, THPO
Seminole Tribe of Florida
30290 Josie Billie Hwy
PMP 1004
Clewiston, FL 33440

Sierra Club - Manatee-Sarasota Group
P.O. Box 3485
Sarasota, FL 34236

Surfrider Foundation- Suncoast Chapter
P.O. Box 22974
St. Petersburg, FL 33742

Mr. Robert Dendick
The Nature Conservancy - Florida Chapter
222 S. Westmonte Dr.
Suite 300
Altamonte Springs, FL 32714

Mr. David White
The Ocean Conservancy
South Atlantic Regional Office
449 Central Ave.
Suite 200
St. Petersburg, FL 33701

Mr. Charles W. Listowski
West Coast Inland Navigation District
PO Box 1845
Venice, FL 34284

Mr. William Steele
Ah Tha Thi Ki Museum
HC-61 P.O. Box 21-A
Clewiston, FL 33440

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Venice, FL 34293

Venice Area Public Library
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Venice, FL 34285

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1355 South River Road
Englewood, FL 34223

WSEB FM91.3
135 West Dearborn St.
Englewood, FL 34223

ABC 7
1477 10th Street
Sarasota, FL 34236-4048

WEDU/PBS
1888 Brother Greenen Way
Sarasota, FL 34236-7118

Fox 4 News Desk
621 Southwest Pine Island Road
Cape Coral, FL 33991-1950

APPENDIX E – HARDBOTTOM ANALYSIS OF FOUR PROPOSED BORROW AREAS NEAR VENICE BEACH, SARASOTA COUNTY, FLORIDA

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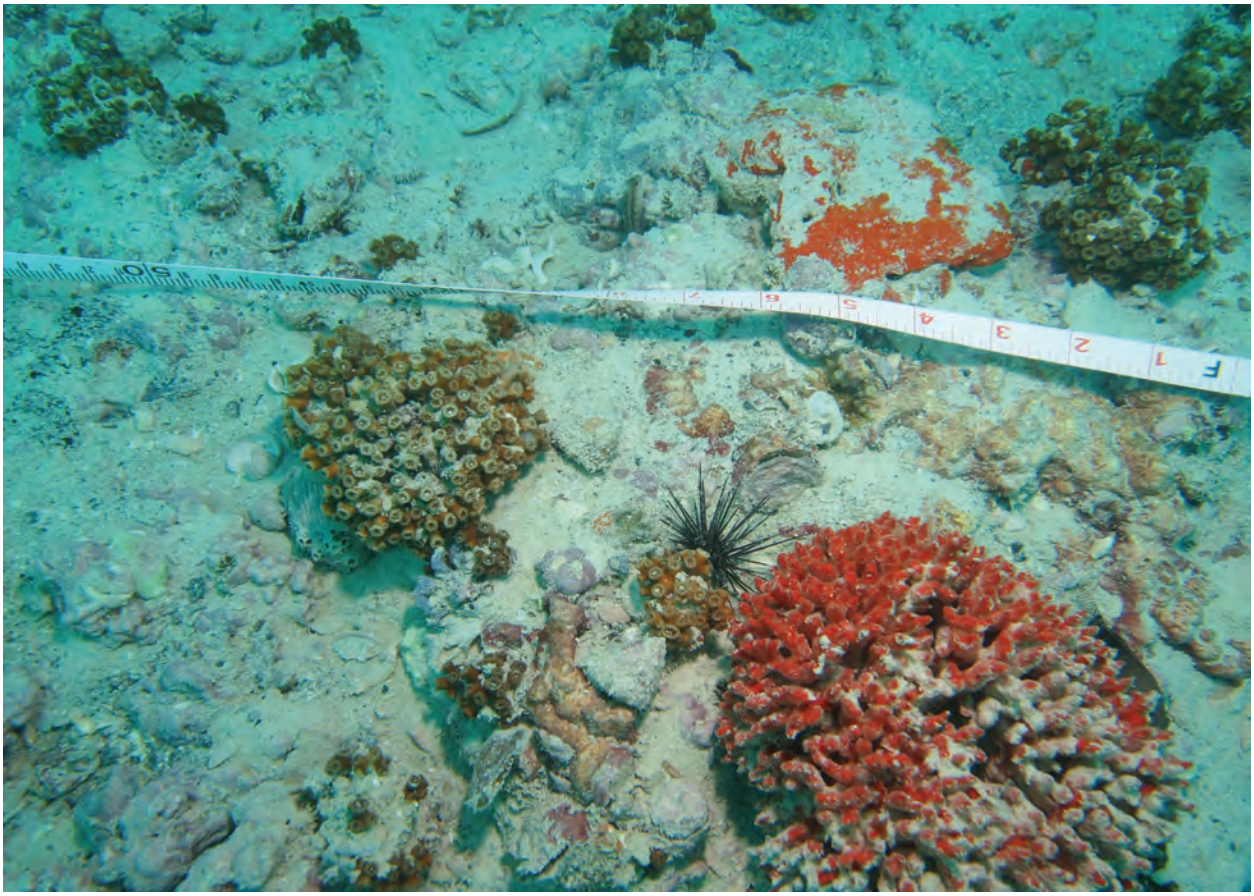
Hardbottom Analysis of Four Proposed Borrow Areas Near Venice Beach, Sarasota County, Florida



Final Report

June 2011

US Army Corps of Engineers
Jacksonville District

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Habitat Analysis of Four Proposed Borrow Areas Near Venice Beach, Sarasota County, Florida

FINAL R E P O R T

June 2011

Prepared for:
G.E.C., Inc.
9357 Interline Avenue
Baton Rouge, LA 70809

and

U.S. Army Corps of Engineers
Jacksonville District
701 San Marco Blvd.
Jacksonville, FL 32207

Prepared by:
Dial Cordy and Associates Inc.
3620 Tuscany Drive
Hollywood, FL 33021

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers is investigating four sand shoals for their suitability as borrow areas for the Sarasota County/Venice Beach erosion control project in Sarasota County, Florida. The borrow areas are located approximately 55 miles southeast of Tampa between 5.5 and 8.5 miles offshore of Manasota Key in the Gulf of Mexico.

Dial Cordy and Associates Inc. (DC&A) was contracted to analyze previously collected side-scan sonar data, prepare a mosaic of substrate features, conduct towed video transects to verify hardbottom, and collect *in-situ* data from representative hardbottom habitats within and/or adjacent to (1,000-foot buffer areas) each proposed borrow area, in order to inform and to assist in planning HEA and UMAM calculations.

Side-scan sonar mosaics were developed for each borrow area and the adjacent 1,000-foot buffer. Mosaics were developed using 1-foot by 1-foot resolution side-scan imagery. Hardbottom habitat lies within Borrow Areas 8P and 8S (0.08 and 2.89 acres, respectively), and is located within the 1,000-foot buffer for all borrow areas surveyed. After verification of hardbottom areas with towed video, representative hardbottom areas were characterized using *in-situ* methods.

Together, side-scan sonar, towed video, and *in-si*tu surveys documented low relief (< 40 cm) hardbottom habitat within 1,000 feet of each of the four proposed borrow areas. Five hardbottom sites adjacent to the four proposed borrow areas were documented using *in-situ* benthic surveys. The five sites surveyed were similar to each other in relief and scleractinian, octocoral, and sponge richness and abundance. *In-situ* surveys recorded the presence of five species of scleractinian, three genera of octocoral, and several morphotypes of sponges. All scleractinian species were represented at each site, while octocorals were present at four out of five sites with only one site inclusive of all three octocoral genera.

These habitats were dominated by isolated scleractinians which colonized bare hardbottom substrate. Noticeably, little macroalgae was present at any site. Only *Sargassum* sp. and turf algae were documented. Scleractinian density ranged from four to 13 individuals/m^2 across hardbottom sites. Octocorals were less abundant, with density ranging from 0.1 to 0.2 individuals/m^2. Sponges were more common than octocorals, ranging from two to five individuals/m^2.

The Gulf of Mexico NMFS Biological Opinion states that a significant hardground in a project area is one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet (45.72 cm) or greater, and has algae growing on it. By this definition, the results of side-scan sonar, towed video and in-situ surveys suggest that no significant hardbottom exists within the project area.

Other studies of the effects of placed sand on nearshore hardbottom and hardbottom surrounding offshore borrow areas have been conducted within hardbottom habitat along the west coast of Florida (CSA 2003, Craft 2009). Benthic communities documented in the current study were different than those documented in studies conducted closer to shore.

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1.0 INTRODUCTION

Dial Cordy and Associates Inc. (DC&A) was contracted by the Jacksonville District U.S. Corps of Engineers through G.E.C., Inc. (Contract No. W912EP-09-D-0005, Task Order 0022) to map and assess hardbottom habitat within and adjacent to (1,000-foot buffer) of each of four proposed sand borrow areas. The U.S. Army Corps of Engineers is investigating four sand shoals for their suitability as borrow areas for the Sarasota County/Venice Beach Erosion Control project in Sarasota County, Florida. The borrow areas are located on the west coast of Florida approximately 55 miles southeast of Tampa.

The study of hardbottom associated with the proposed borrow areas is necessary to address the Gulf of Mexico NMFS Biological Opinion, which states that a significant hardground in a project area is one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet (45.72 cm) or greater, and has algae growing on it.

A side-scan sonar survey was conducted by Panamerican Consultants, Inc. (Memphis, TN) of Borrow Areas 8O, 8P, 8R, and 8S (including a 1,000-foot buffer area for each) from 6-August through 22-August 2010 using a 600 kHz Marine Sonic sonar system with a range of 30 meters and sufficient overlap to provide thorough coverage. Analysis of these data sets and further field verification of the hardbottom habitats associated with these borrow areas were completed by DC&A in February 2011.

The side-scan sonar survey was conducted with at least 50 percent overlapping coverage between survey lines to ensure complete, 100 percent, data for the survey area. Line spacing was required to be less than 25 meters during data collection. A dual frequency instrument was used to capture data at lower frequencies, should light penetration of the water column create “noise” in the higher frequencies.

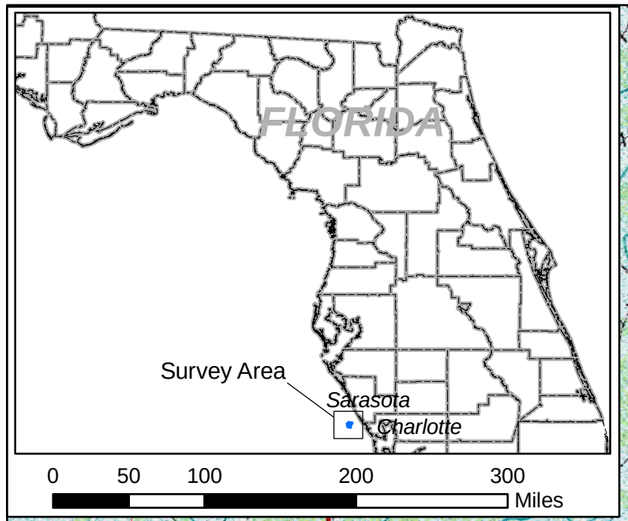
Side-scan sonar, video transects, and *in-situ* benthic surveys were conducted to confirm and document hardbottom habitat adjacent to or within the four proposed borrow areas.

1.1 Study Area Location

The proposed borrow areas are located on the west coast of Florida approximately 55 miles southeast of Tampa. They are located between 5.5 and 8.5 miles offshore of Manasota Key in the Gulf of Mexico (Figure 1). The project area for the purposes of this report includes the borrow areas 8O, 8P, 8R, and 8S and the 1000’ foot buffers surrounding each borrow area.

2.0 METHODS

The side-scan sonar data collected by Panamerican Consultants, Inc. in August 2010 were analyzed by DC&A to produce accurate mosaics of borrow areas and associated hardbottom habitat. Towed video transects were filmed to visually verify hardbottom habitat interpreted from the side-scan sonar mosaics. *In-situ* surveys were conducted to provide detailed biological information on the benthic communities within the adjacent hardbottom habitat. A description of the technical approach employed to prepare a side-scan mosaic, ground-truth side-scan mapped signatures using towed video, and collect *in-situ* hardbottom community data is provided below.



8O
8R
8P
8S
Manasota Key
Englewood
Buchan Airport
New Point Comfort
Punta Gorda Beach
CHARLOTTE BEACH STATE RECREATION AREA
GULF OF MEXICO
74
75
T 40 S
T 41 S
R 19 E
R 20 E

Legend

- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer

0 0.5 1 2 3 4 Miles

Location Map of Borrow Areas	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 1 mile	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 1

2.1 Side-Scan Interpretation

A side-scan sonar survey was conducted for Borrow Areas 8O, 8P, 8R, and 8S (including a 1,000-foot buffer area for each) from 6-August through 22-August 2010 using a 600 kHz Marine Sonic sonar system with a range of 30 meters and sufficient overlap to provide thorough coverage. Raw side-scan data was processed and imported into SonarWiz 5 by DC&A to create a mosaic with a 1-foot by 1-foot resolution, instead of the standard 1-meter resolution (Appendix A).

One-foot resolution was chosen due to the low relief of the area. One-meter resolution mosaics would have appeared flat, as if the entire area were without relief. Due to file size and to improve data manageability, three mosaics were created: one for 8O, one for 8S, and one that included both 8P and 8R. Borrow area designations correspond to designations assigned by Panamerican for side-scan data files.

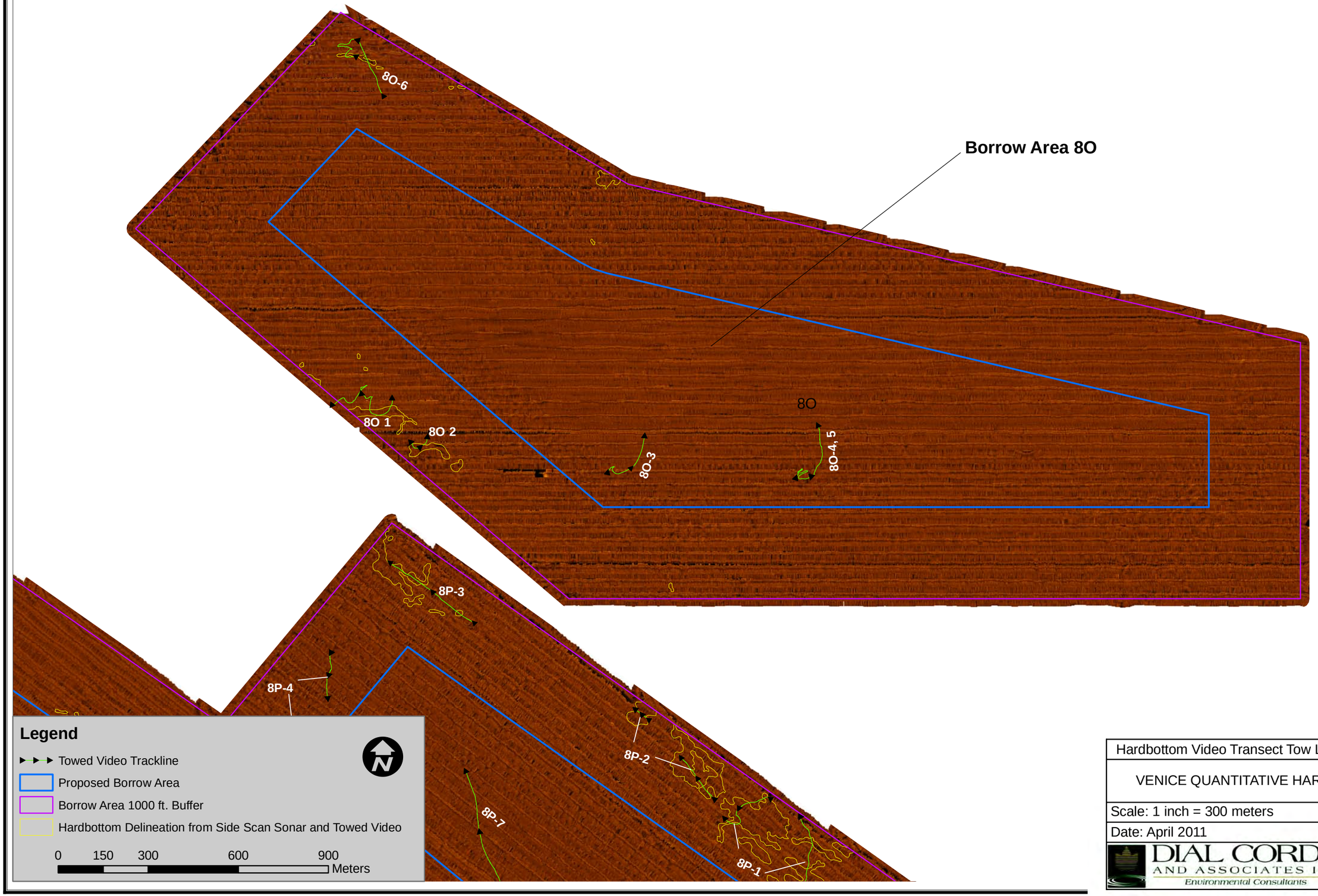
The borrow area mosaics were examined using image texture and shadow analysis to determine potential location and delineation of hardbottom areas. Areas of hardbottom targets were all of low relief (< 40 cm).

2.2 Towed Video Survey

The towed video survey was performed to visually verify the hardbottom habitat identified from side-scan sonar analysis and to provide a visual representation of sediment types within the borrow area (Figures 2, 3, 4). Sixteen polygons were delineated based on hardbottom aggregations from side-scan sonar mosaic results. Towed video was recorded in order to verify hardbottom signatures interpreted by side-scan sonar image analysis. Marine scientists in the field chose areas for towed video based on side scan results, sea state and wave direction and the need to capture hardbottom/sand transitions for visual verification. The video survey was performed utilizing an integrated towed calibrated video system which records high definition digital video, and is linked to geo-referenced navigational software and a precision positioning system (DGPS) with an accuracy of +/- one-meter. A digital video camera was mounted on the tow fish with a bird's eye view to record hardbottom and sand features. Recorded images were indexed according to the specified tow line number identified from Figures 2, 3, 4 and were transferred to DVDs (Appendix B).

2.3 *In-Situ* Surveys

Five hardbottom sites out of sixteen possible sites were chosen for detailed *in-situ* surveys (Figures 5, 6, 7). These hardbottom sites were chosen because they were the areas with the greatest aggregation of hardbottom features identified by side-scan sonar image analysis. Within each hardbottom site, transect-start locations were randomly established using ArcView GIS. From these random start locations, 10-m transects were placed using random bearings that did not allow any portion of a transect to be closer than 2 meters from any other transect, and did not allow a transect to cross another transect. The total number of transects varied among hardbottom sites based on the total area of hardbottom encountered and scleractinian species richness. A total of 40 transects were established within the five hardbottom sites as follows, 10 transects within Area 1, four transects within Area 2, 15 transects within Area 7, five transects within Area 9, and six transects within Area 13 (Appendix C).



Hardbottom Video Transect Tow Lines for Borrow Area 8O	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 2

Borrow Area 8P

8R-1

8R

8R-2

8R-3

8R 4

8P-3

8P-4

8P-2

8P-7

8P

8P-1

8P-5

8P-6

8O

8O-3

8O-4

8S-18

8S

8S-17

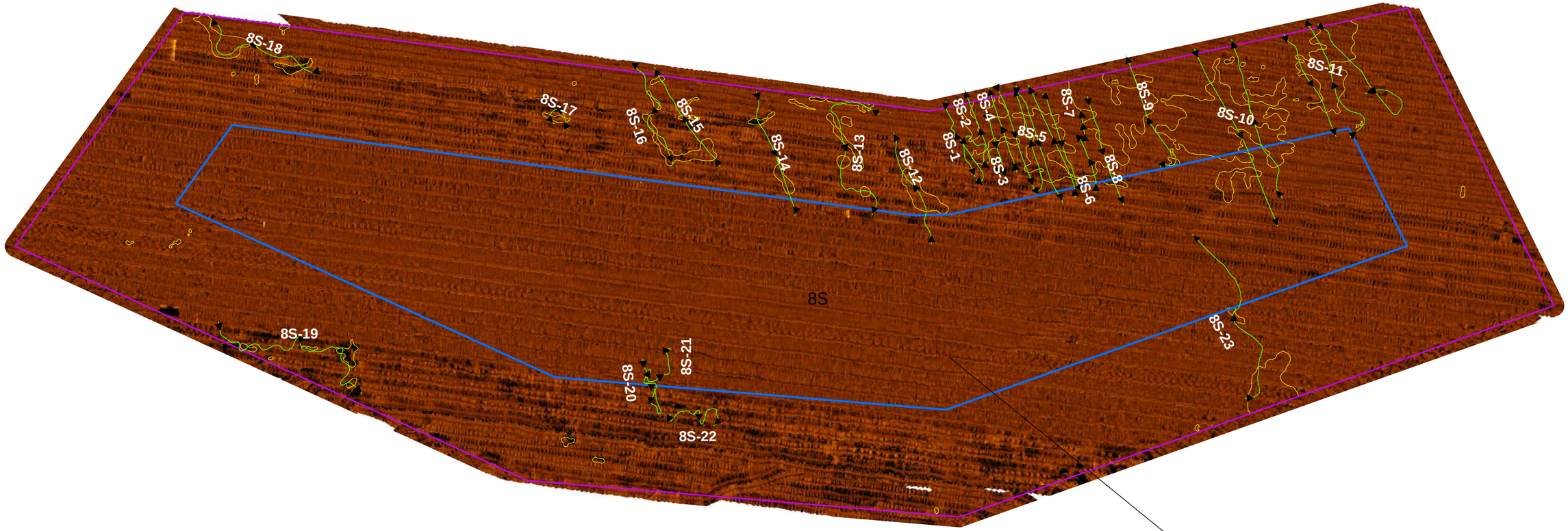
Borrow Area 8P

Legend

- Towed Video Trackline
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Hardbottom Video Transect Tow Lines for Areas 8P and 8R	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 3

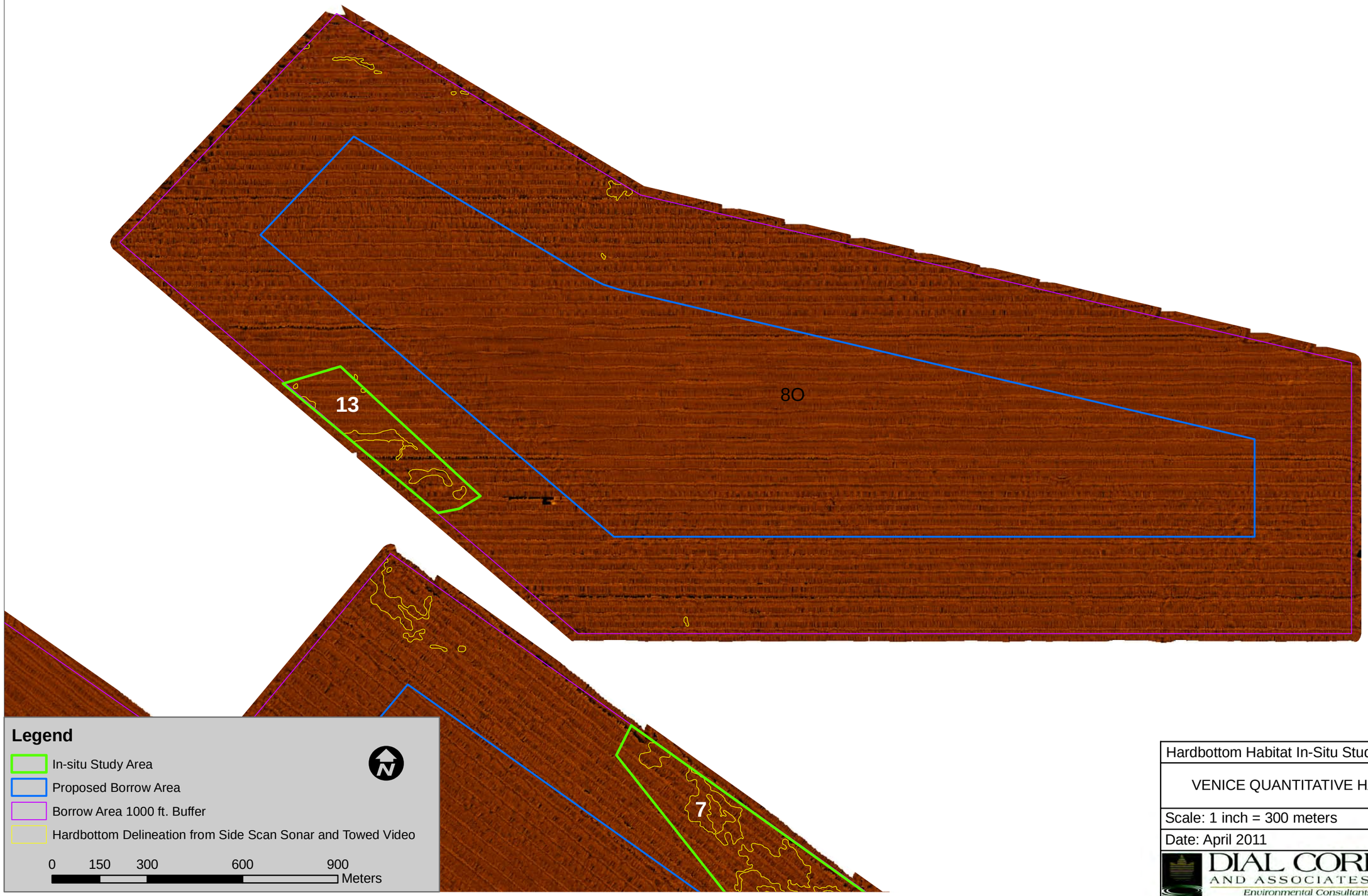


Legend

- Towed Video Trackline
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Hardbottom Video Transect Tow Lines for Borrow Area 8S	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 4

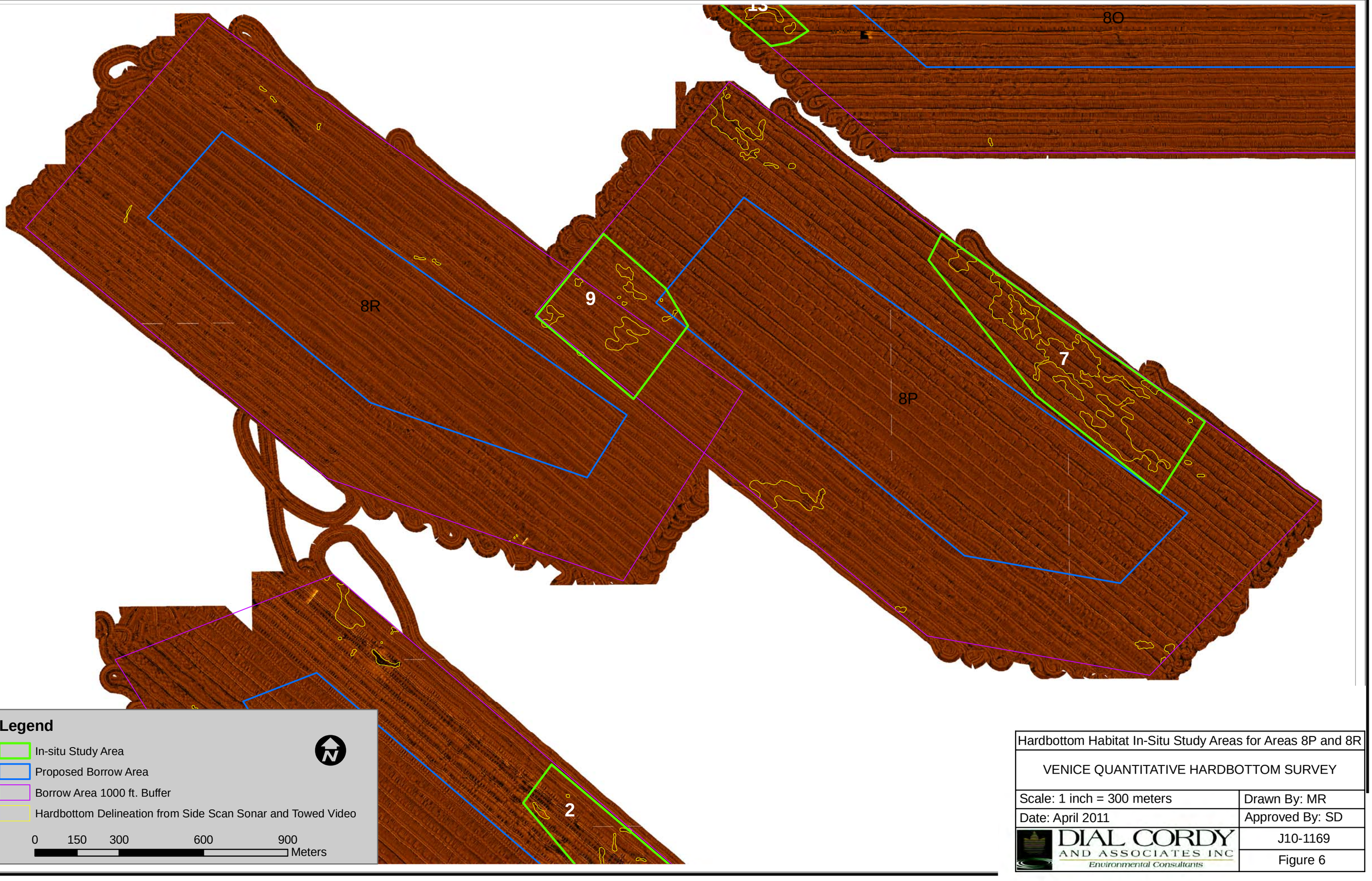


Legend

- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Hardbottom Habitat In-Situ Study Areas for Borrow Area 8O	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 5

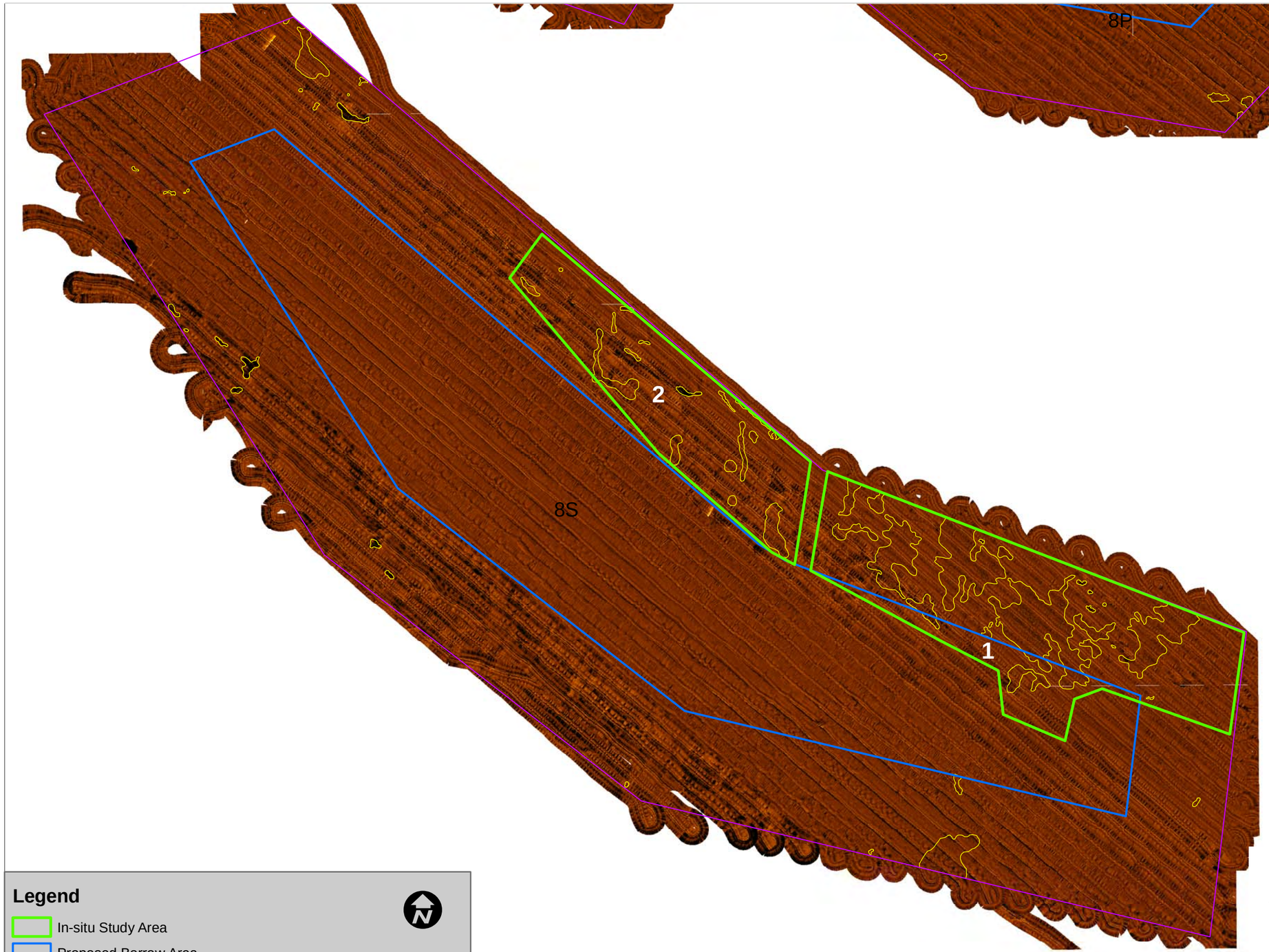


Legend

- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Hardbottom Habitat In-Situ Study Areas for Areas 8P and 8R	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 6



Legend

- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Hardbottom Habitat In-situ Study Areas for Borrow Area 8S	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 300 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Figure 7

In-situ data collected along transects included the abundance of benthic octocorals and scleractinians. Specifically, the following information was documented along each 10 x 1m transect: (1) species-specific scleractinian colony counts; (2) genus-specific octocoral colony counts; (3) sponge colony morphotype counts; and (4) the average relief of the hardbottom features along each transect, measured every 2 meters along the transect. Forty transects, or 400 m^2, were sampled in total. Video transect data were collected for all transects down each side of the transect (10 x 0.8-meter per transect) for archival purposes. Data were used to calculate density (organisms/m^2), diversity (H'), and evenness (J') (H'/ln(s)), where s = species richness at each site. The Shannon-Wiener diversity index (H') was used to express the biological diversity of scleractinian species in this study. H' was not calculated for octocorals and sponges because these groups were less abundant at study sites. H' is expressed by the following equation

$$H' = -\sum_{i=1}^{S} p_i \ln p_i$$

The calculation considers the relative abundance of species and species evenness distribution (how evenly the species present are represented) to create an index which may be used for comparison purposes. Higher values are indicative of higher biological diversity, diversity values range depending upon the habitat from 0 to 5 or more, depending upon sample size and species richness. These data may be used to conduct Habitat Equivalency Analysis (HEA), UMAM and determine significance of resources based on National Marine Fisheries Service (NMFS) standards in the Gulf Biological Opinion.

3.0 RESULTS

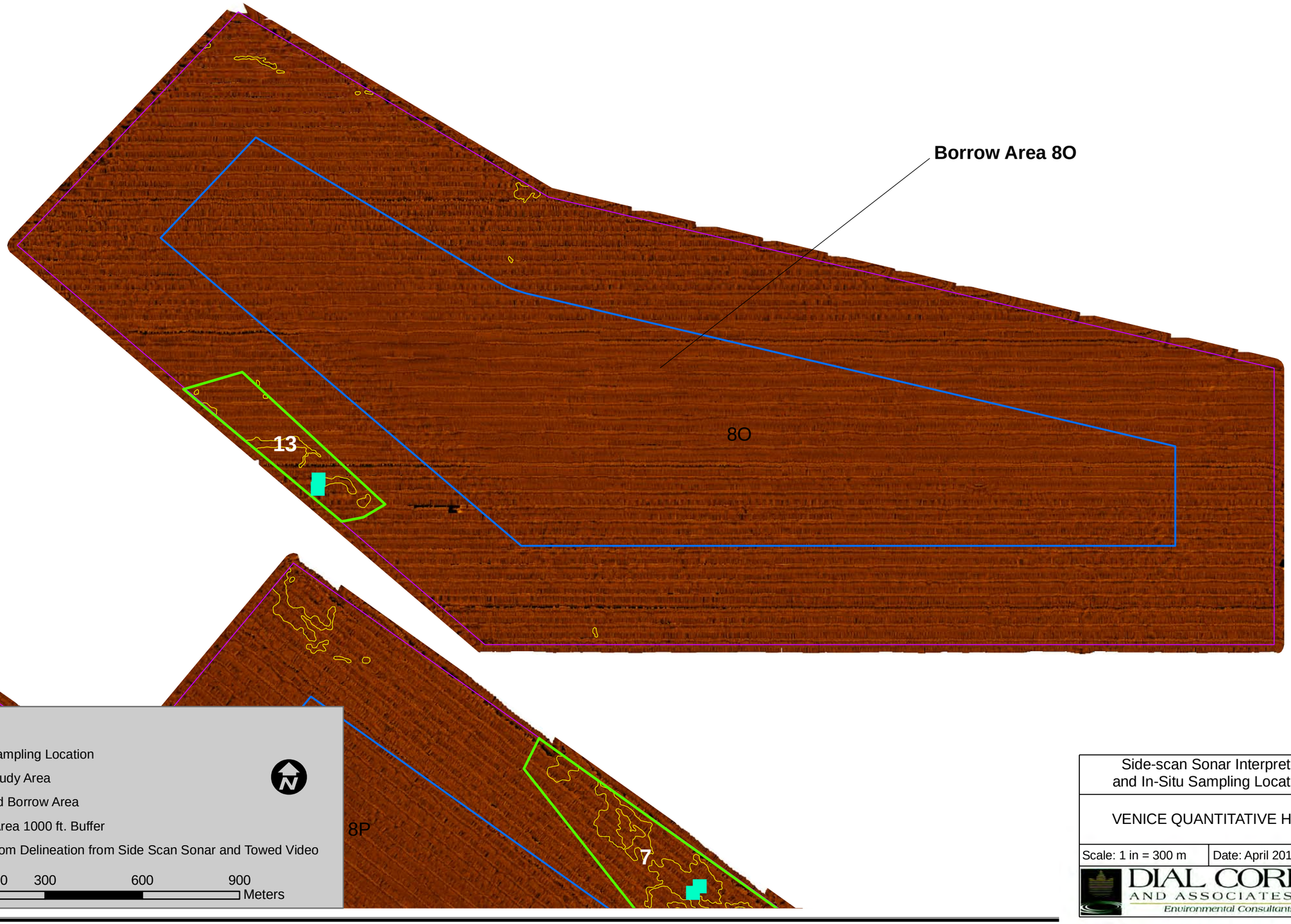
3.1 Side-Scan Mosaics of Hardbottom Habitat

Side-scan mosaics were developed for each borrow area, including the 1,000-foot buffer areas (Figures 8, 9, 10). Hardbottom habitat lies within Borrow Areas 8P and 8S, and is located within the 1,000-foot buffer for all borrow areas surveyed. Hardbottom contacts identified from the side-scan image, interpretation, and shadow analysis are listed in Appendix D.

No hardbottom habitat was located within the 8O borrow area. The closest hardbottom habitat to Borrow Area 8O is 71 meters from the borrow area on the north side. An estimated 3.8 acres of hardbottom habitat is located within the 1,000-foot buffer, adjacent to the 8O borrow area (Figure 8). The adjacent southwestern hardbottom habitat was surveyed using *in-situ* methods (Area 13, Section 3.3.).

The 8P borrow area included 0.08-acre of hardbottom habitat within the proposed borrow area. The closest hardbottom habitat adjacent to Borrow Area 8P is 23 meters from the borrow area on the northwestern side: this area was surveyed using *in-situ* methods (Area 7, Section 3.3). An estimated 26.7 acres of hardbottom habitat is located within the 1,000-foot buffer, adjacent to the 8P borrow area (Figure 9).

No hardbottom habitat was located within the 8R borrow area. The closest hardbottom habitat adjacent to Borrow Area 8R is 23 meters from the borrow area on the northwestern side, this area was surveyed using *in-situ* methods (Area 9, Section 3.3). An estimated 3.9 acres of hardbottom habitat is located within the 1,000-foot buffer, adjacent to the 8R borrow area. A portion of this hardbottom habitat is also within the 1,000-foot buffer of Borrow Area 8P, however, the acreage is only included in the 8R hardbottom habitat estimate value (Figure 9).



Legend

- In-situ Sampling Location
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Side-scan Sonar Interpreted Hardbottom Habitat and In-Situ Sampling Locations for Borrow Area 8O

VENICE QUANTITATIVE HARDBOTTOM SURVEY

Scale: 1 in = 300 m	Date: April 2011	Approved By: SD
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		Figure 8

13

8O

8R

9

8P

7

Borrow Area 8R

Borrow Area 8P

2

Legend

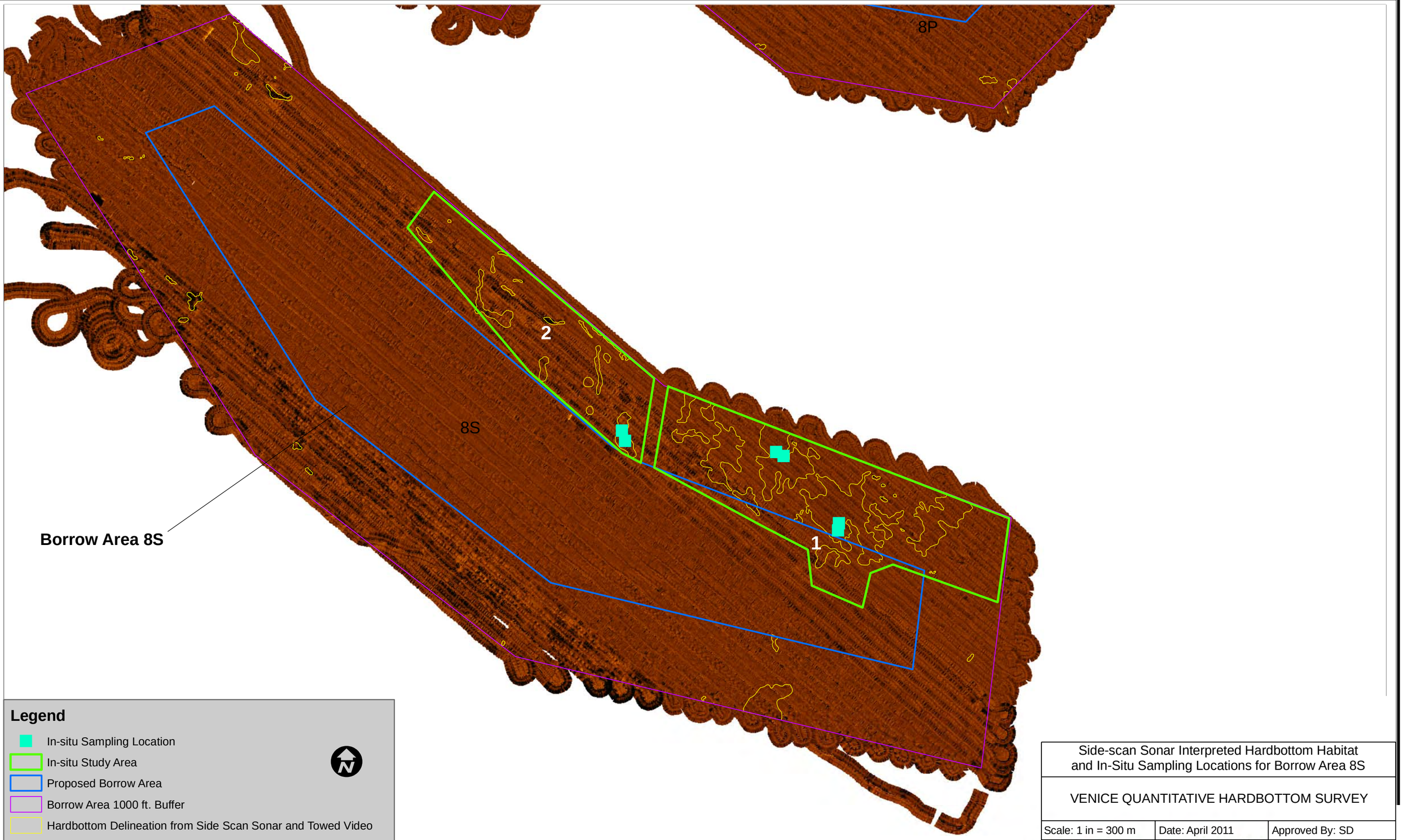
- In-situ Sampling Location
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Side-scan Sonar Interpreted Hardbottom Habitat and In-Situ Sampling Locations for Borrow Areas 8P and 8R

VENICE QUANTITATIVE HARDBOTTOM SURVEY

Scale: 1 in = 300 m	Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants		J10-1169
		Figure 9



Legend

- In-situ Sampling Location
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 150 300 600 900 Meters

Side-scan Sonar Interpreted Hardbottom Habitat and In-Situ Sampling Locations for Borrow Area 8S

VENICE QUANTITATIVE HARDBOTTOM SURVEY

Scale: 1 in = 300 m	Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants		J10-1169
		Figure 10

The 8S borrow area included 2.9 acres of hardbottom habitat within the proposed borrow area. The closest hardbottom habitat adjacent to Borrow Area 8R is 2 meters from the borrow area on the northeastern side, these areas were surveyed using *in-situ* methods (Area 1 and 2, Section 3.3). An estimated 48.8 acres of hardbottom habitat is located within the 1,000-foot buffer, adjacent to the 8S borrow area (Figure 10).

On average hardbottom identified in the side-scan sonar analysis was 40 cm in relief. Based on side-scan analysis there is a high level of confidence that no hardbottom within the 1,000-foot buffer is higher than 1.5 feet (45.72 cm).

3.2 Towed Video

The towed video survey provided a visual verification of the hardbottom features interpreted from side-scan sonar records and a visual representation of the sediment types within each borrow area. Towed video footage for each transect (Figures 2, 3, 4) is included as a five-DVD set in Appendix B.

3.3 *In-Situ* Surveys

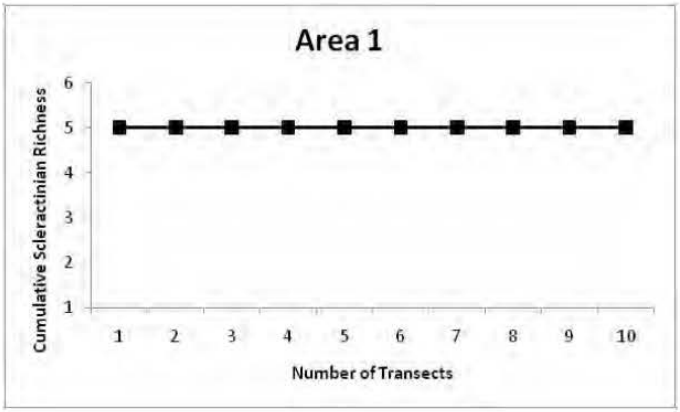
Hardbottom areas adjacent to the four proposed borrow areas with the greatest aggregation of hardbottom features were selected for *in-situ* surveys to provide data on the associated benthic communities (Figures 5, 6, 7). Hardbottom *in-situ* field data are provided in Appendix E. Photographs of hardbottom habitat and their biological constituents are provided in Appendix F. Hand-held video was recorded for all transects for archival purposes and is viewable on DVD (Appendix G).

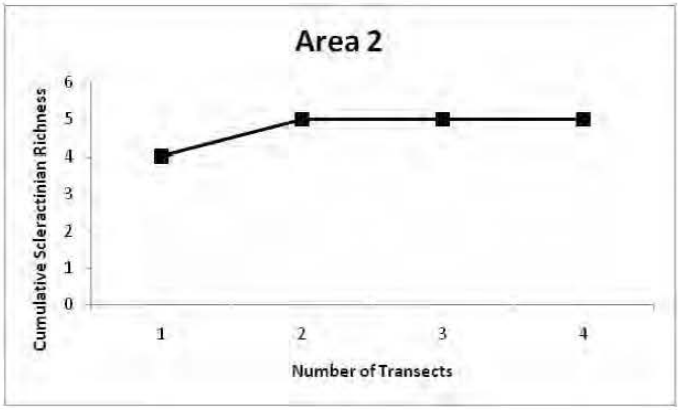
Hardbottom sites 1, 2, 7, 9, and 13 included areas of hardbottom, shell hash, and sand (Table 1) (Figures 5, 6, 7). Water depth ranged from 12 m to 15 m and the maximum relief at any area measured along transects was 28.3 cm. Area 1 had rocks (larger than 25 cm maximum diameter) and rubble (5 cm to 25 cm maximum diameter) and was the only area where sedimentation was documented during surveys. Area 7 also included rubble. Algae were a minor contributor to benthic cover at these sites. Only *Sargassum* sp. and turf algae were documented at Areas 1, 7, and 9.

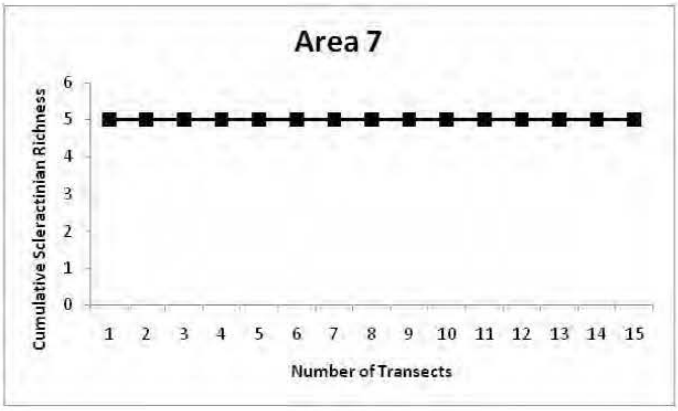
Table 1. Abiotic data for all sites.

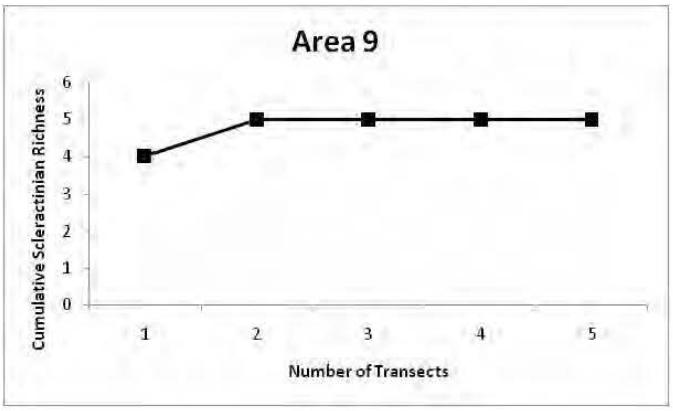
	Area				
Characteristics	**1**	**2**	**7**	**9**	**13**
Hardbottom	•	•	•	•	•
Rocks	•				
Rubble	•		•		
Shell Hash	•	•	•	•	•
Sand	•	•	•	•	•
Sedimentation	•				
Maximum Relief (cm)	17.5	16.7	28.3	5.8	15
Depth Range (m)	14-15	15	12-14	14	14-15

Asymptotic species richness curves show that an adequate sample size (number of transects) was surveyed to document scleractinian species richness at all hardbottom sites (Figure 11).









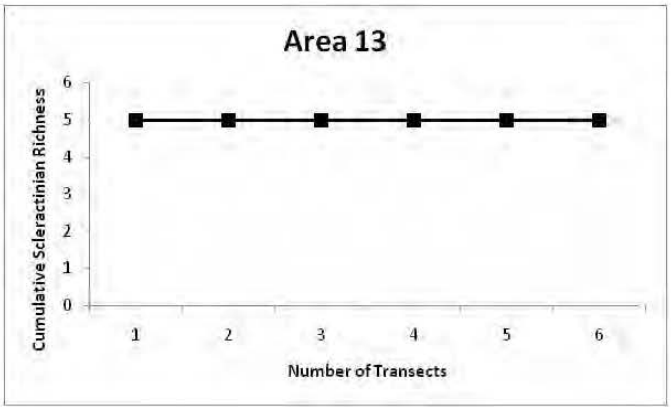


Figure 11 Scleractinian species rarefaction curves for all hardbottom sites.

Scleractinian Species Richness

Five scleractinian coral species were documented at all hardbottom sites (Table 2). Each site included all five species. Colony density varied by site and ranged from 4.3 to 13.5 individuals/m^2 (Table 3). *Oculina robusta* and *Phyllangia americana* were the least abundant species across sites, while *Cladocora arbuscula* was the most abundant (Figure 12). Photographs of typical hardbottom communities found across sites are shown in Figures 13 and 14.

Table 2. Scleractinian species present at each hardbottom sites.

Scleractinian Species	Area 1	Area 2	Area 7	Area 9	Area 13
Cladocora arbuscula	•	•	•	•	•
Oculina robusta	•	•	•	•	•
Phyllangia americana	•	•	•	•	•
Siderastrea siderea	•	•	•	•	•
Solenastrea hyades	•	•	•	•	•

Table 3. Number of scleractinian colonies, species richness, and density of scleractinian colonies at hardbottom sites. SD = standard deviation, N = number of belt transects.

Hardbottom Area	Colonies	Species	Mean Density (colonies/m^2)	*SD*	*N*
1	703	5	7.0	5.1	10
2	539	5	13.5	2.9	4
7	1,921	5	12.8	2.6	15
9	214	5	4.3	2.2	5
13	733	5	12.2	4.8	6

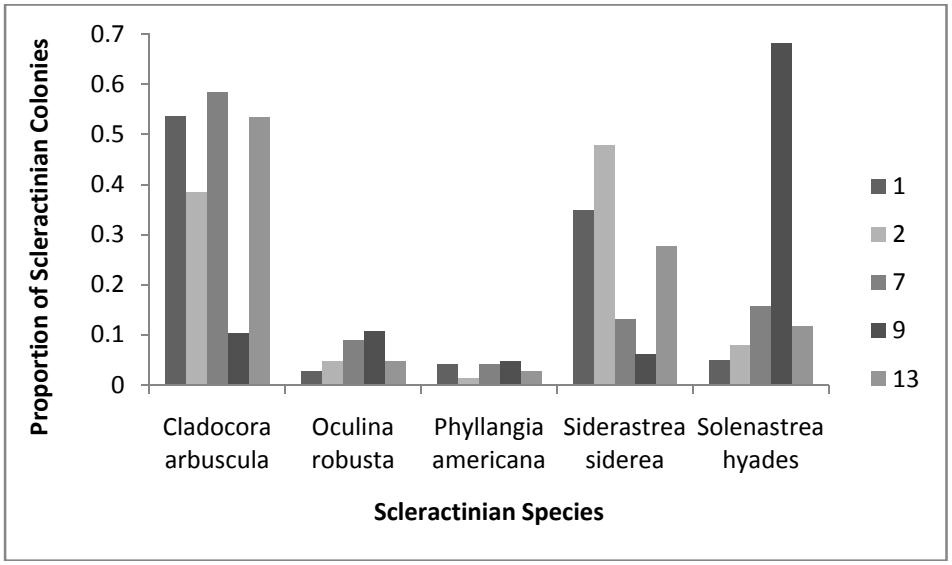


Figure 12. Proportional Abundance of the Scleractinian Corals at Each Hardbottom Site

Figure 13. Shell and Sponge Assemblage with *Cladocora arbuscul*a Colonies

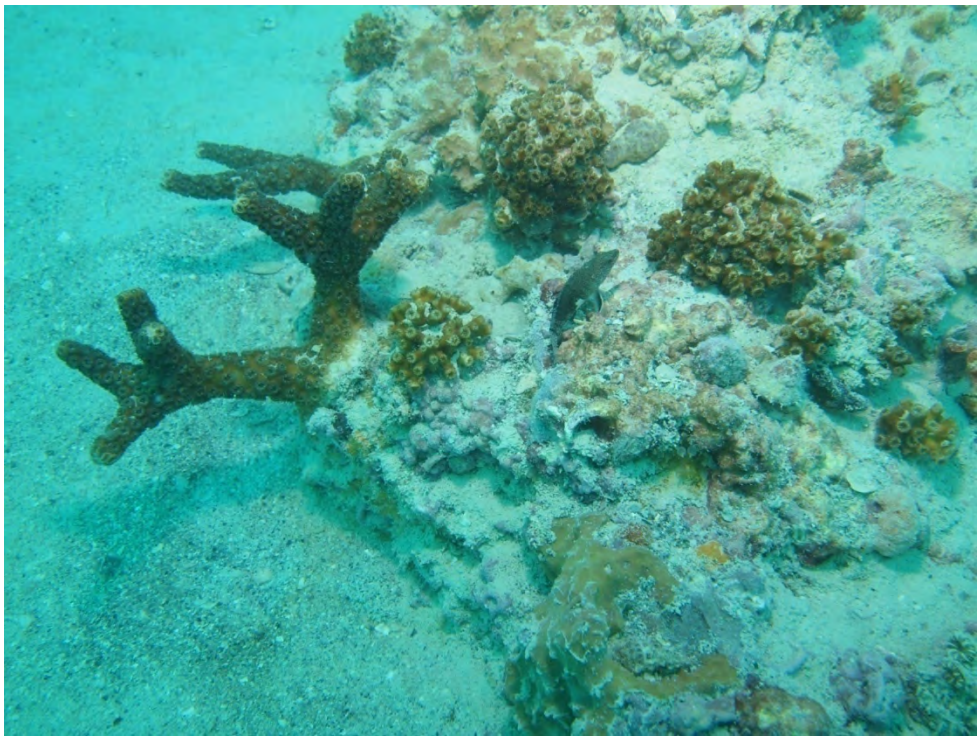


Figure 14. Hardbottom and Sand Edge with *Oculina robusta* and *Cladocora arbuscula* colonies

Scleractinian Species Diversity

The Shannon–Wiener diversity Index (H') was used to calculate species diversity. Diversity indexes are used to evaluate the biological diversity of a community. H' value calculations consider species richness (number of species) and species evenness distribution (the relative evenness of species sampled). Higher values are indicative of higher biological diversity. Diversity (H') values ranged from 1.1 to 1.3 across the five sites, indicating low diversity across sites (Table 4). Evenness (J') ranged from 0.7 to -0.8 across sites, indicating a fairly even distribution of scleractinians at each site. Evenness values range from 0 to 1, with values closer to 1 indicating a more even distribution of scleractinian species at a site. (Table 4).

Table 4. Shannon–Wiener Diversity Index (H') and Evenness (J') calculated for scleractinian species at hardbottom sites.

Index	1	2	7	9	13
Diversity (H')	1.1	1.1	1.3	1.2	1.2
Evenness (J')	0.7	0.7	0.8	0.7	0.7

Scleractinian Density

Scleractinian density ranged from 4.3 to 13.5 individuals/m^2 across all transects within hardbottom sites. Mean scleractinian density was lowest at Area 9 and highest at Area 2 (Figure 15).

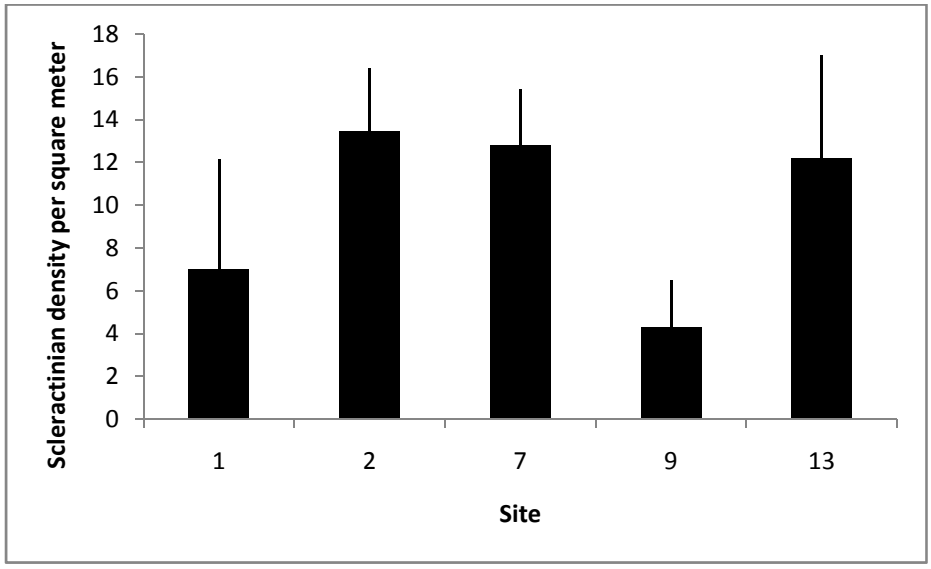


Figure 15. Scleractinian Density Per Square Meter at All Hardbottom Sites (+/- SD)

Octocoral Generic Richness

Hardbottom sites included three octocoral genera (Table 5). Area 1 did not include any octocorals surveyed along transects or documented in field notes. Area 7 had the highest number of genera, whereas Area 2 had the fewest (Table 5).

Table 5. List of octocoral genera present at each hardbottom site.

Octocoral Genera	Area 2	Area 7	Area 9	Area 13
Eunicea	•	•	•	
Leptogorgia		•	•	•
Pseudopterogorgia		•		•

Octocorals were less abundant than scleractinians at hardbottom sites (Table 6). Density values were low across all sites and ranged from less than 0.1 colonies/m^2 to 0.2 colonies/m^2.

Table 6. Number of octocoral colonies, species richness, and density of octocoral colonies by hardbottom site as encountered in visual belt transects off Venice Beach, FL. SD = standard deviation, N = number of belt transects.

Hardbottom Area	Colonies	Genera	Mean Density (colonies/m^2)	*SD*	*N*
2	1	1	>0.1	0	4
7	13	2	0.1	0.1	15
9	11	2	0.2	0.1	5
13	5	2	0.1	0.2	6

Morphological Richness of Sponges

Sponge abundance data were collected at all transects. Sponge data were collected based upon morphotype characterization, since taxonomic identification often requires microscopy. The following categories were used to categorize sponges; ball, encrusting, finger, lumpy, tube, and vase (Table 7).

The greatest variety of sponge types occurred at Area 7, with five out of six types present along transects. Most sites only included half of all sponge types, with the exception of Area 1, which included four out of six.

Table 7. List of sponge morphotypes present at each hardbottom site.

Sponge Types	Area 1	Area 2	Area 7	Area 9	Area 13
ball	•	•	•	•	•
encrusting	•	•	•	•	•
finger	•	•	•	•	•
lumpy			•		
tube			•		
vase	•				

Sponge density ranged from 2.1 colonies/m^2 to 4.7 colonies/m^2 and were most abundant at Area 7, while Area 2 had the highest density (Table 8). Sponge morphotype data reveal that ball, encrusting, and finger were the dominant morphotypes at all sites surveyed. The lumpy, tube, and vase morphotypes were minorly represented at any single site (Figure 16).

Table 8. Number of sponge colonies, morphotype richness, and density of sponge colonies encountered within the hardbottom sites. SD = standard deviation, N = number of belt transects.

Hardbottom Area	Colonies	Morphotype	Mean Density (colonies/m^2)	*SD*	*N*
1	213	4	2.1	1.6	10
2	187	3	4.7	1.7	4
7	510	5	3.4	0.9	15
9	159	3	3.2	1.0	5
13	168	3	2.8	1.4	6

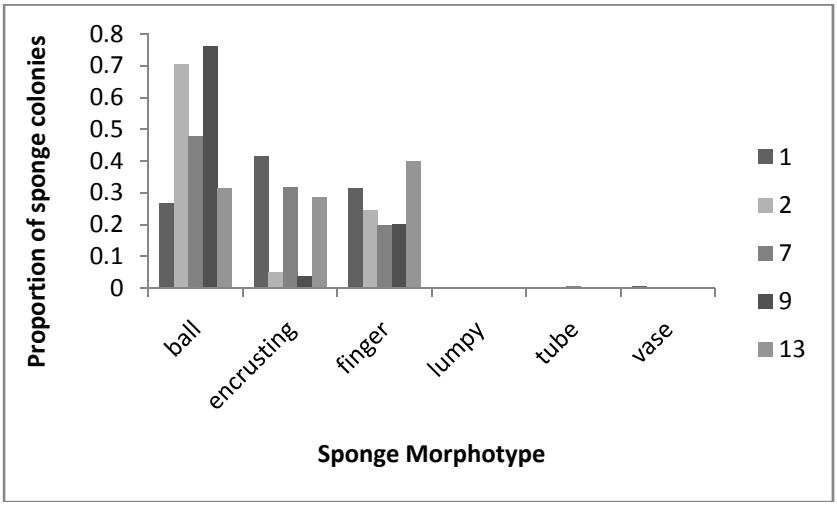


Figure 16. Proportional Sponge Abundance by Morphotype and Site

Sponge Density

Mean sponge density ranged from 2 to 5 colonies/m^2 across the hardbottom sites (Figure 17).

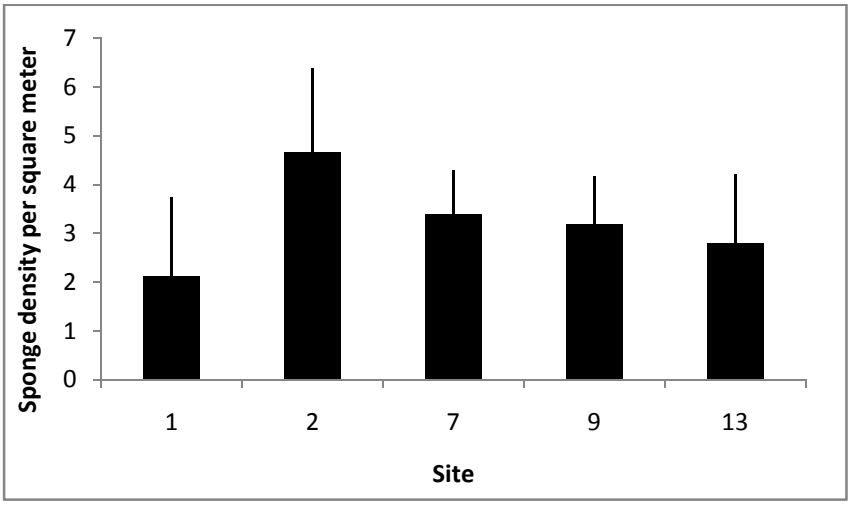


Figure 17. Mean Sponge Colony Density Per Square Meter at the Hardbottom Sites. Error Bars Represent One SD

The characterization of the hardbottom Areas 1, 2, 7, 9, and 13 adjacent to the proposed borrow areas reveal hardbottom with relatively low relief (< 40 cm), as well as low diversity of scleractinians, octocorals, and sponges common to offshore hardbottom habitat of the west coast of Florida (Craft 2009). The five sites surveyed were similar to each other in terms of scleractinian, octocoral, and sponge richness, while scleractinian density ranged between three to 14 individuals/m^2 across sites, and was highest at Area 2 and lowest at Area 9. Sponges and octocorals were less abundant across sites.

4.0 DISCUSSION

Side-scan sonar, towed video, and *in-situ* surveys documented low relief (< 40 cm) hardbottom habitat adjacent to (within 1,000-foot buffer) and within proposed Borrow Areas 8O, 8P, 8R, and 8S. Hardbottom habitat was identified within Borrow Areas 8P and 8S (0.08 and 2.89 acres, respectively), the relief of these areas was also low relief (< 40 cm). Interpreted side-scan sonar data and video transects confirmed that adjacent hardbottom areas fringe the larger sand-filled borrow areas and are isolated from each other. Towed video was used to verify side-scan interpreted and mapped hard bottom features. Five hardbottom habitat sites were documented using *in-situ* benthic surveys. These sites were chosen because they were the areas with the greatest amount of aggregated hardbottom features, identified by the side-scan sonar survey. The five sites surveyed were similar to each other in relief (< 30 cm), and scleractinian, octocoral and sponge richness. *In-situ* surveys recorded the presence of five species of scleractinian, three genera of octocoral, and several morphotypes of sponges. All scleractinian species were represented at each site, while octocorals were present at four out of five sites with only one site inclusive of all three octocoral genera.

These habitats were low in diversity and dominated by isolated scleractinians, which colonized otherwise bare hardbottom substrate (see Appendix F, Photographs). Scleractinian density ranged from four to 13 individuals/m^2 across hardbottom sites. Octocorals were less abundant, with density ranging from 0.1 to 0.2 individuals/m^2. Sponges were more common, ranging from two to five individuals/m^2.

The Gulf of Mexico NMFS Biological Opinion states that a significant hardground in a project area is one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet (45.72 cm) or greater, and has algae growing on it. By this definition, the results of side-scan sonar, towed video and in-situ surveys suggest that no significant hardbottom exists within the project area, including within the 1000' buffer.

Other studies of the effects of placed sand on nearshore hardbottom and hardbottom surrounding offshore borrow areas have been conducted within hardbottom habitat along the west coast of Florida (CSA 2003, Craft 2009). Scleractinians and octocorals documented in the current study were different than those documented in studies conducted closer to shore and further north in Pinellas County (CSA 2003 and Craft 2009). In comparison, this study documented fewer octocorals with fewer genera represented, higher density scleractinian corals, and a less diverse and less abundant assemblage of macroalgae than at sites in Pinellas County (CSA 2003 and Craft 2009). These differences may be attributed to the further distance from shore. These habitats are likely similar to other hardbottom habitats nearby (further south and further offshore than those reviewed here).

5.0 CONCLUSION

In order to support the borrow area search for the Sarasota County/Venice Beach Erosion Control project in Sarasota County located approximately 55 miles southwest of Tampa, DC&A was contracted to analyze previously collected side-scan sonar data, prepare a mosaic of substrate features, conduct towed video transects to visually verify mapped hardbottom areas adjacent to or within the borrow areas, and collect *in-situ* data from representative hardbottom habitats within the project area (the proposed borrow areas with a 1,000-foot buffer). The study was conducted to provide data needed to make a determination of hardbottom significance based on the NMFS GRBO, and to conduct HEA and UMAM assessments as necessary. The presence of low relief (< 40 cm) hardbottom habitat was documented and quantified (Table 9). Hardbottom documented adjacent to and within the proposed borrow areas were not significant per the NMFS GRBO criteria.

Table 9. Estimated hardbottom habitat from side-scan sonar analysis, within and adjacent to (1,000-foot buffer) each borrow area.

Borrow Area	Hardbottom Habitat Within (acre)	Adjacent Hardbottom Habitat (acre)
8O	0.08	3.8
8P	0	26.7
8R	0	3.9
8S	2.9	48.8

6.0 LITERATURE CITED

CSA. 2003. Hardbottom Assessment for the City of Venice (Florida) Beach Nourishment Project. Prepared for CoastalTech. Pp.85.

Craft, J., and Ward, G. 2009. Sand Key Beach Renourishment Project: Borrow Area Hardbottom Resource Investigation Report. Boca Raton, Florida. Coastal Planning & Engineering, Inc. 23 pp.

APPENDIX A

Side-Scan Mosaics and GIS Data (DVD)

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APPENDIX B

Towed Video - Hardbottom Transects (DVDs)

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APPENDIX C

In-Situ Survey Areas

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1

8S

Legend

- Transect Sampling Area
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 25 50 100 150 Meters

Hardbottom Habitat Sampling Area 1 for Borrow Area 8S

VENICE QUANTITATIVE HARDBOTTOM SURVEY

Scale: 1 inch = 50 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Appendix C-1

2

1

8S

Legend

- Transect Sampling Area
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 25 50 100 150 Meters

Hardbottom Habitat Sampling Area 2 for Borrow Area 8S	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 50 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Appendix C-2

7

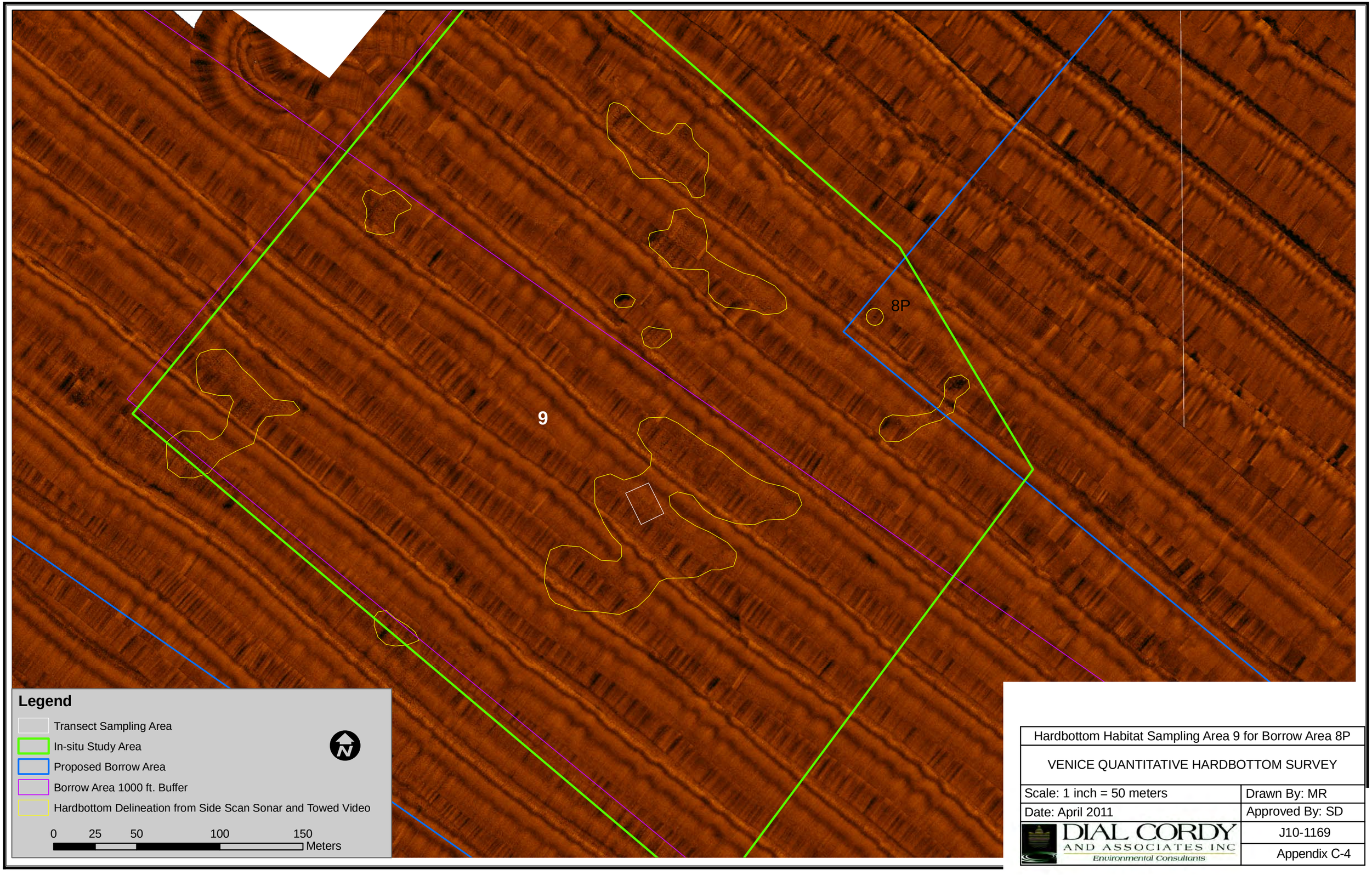
8P

Legend

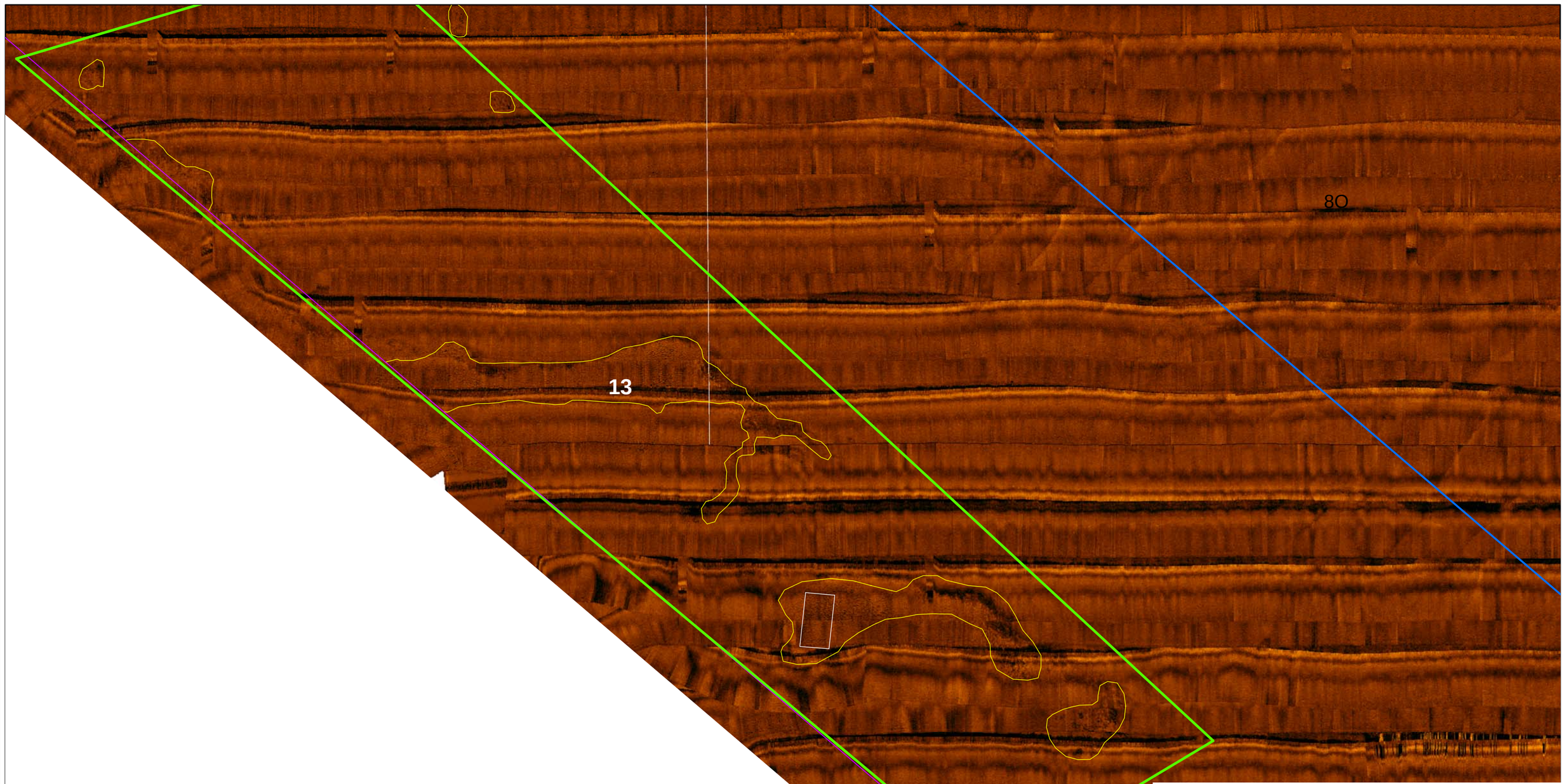
- Transect Sampling Area
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 25 50 100 150 Meters

Hardbottom Habitat Sampling Area 7 for Borrow Area 8P	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 50 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Appendix C-3



Hardbottom Habitat Sampling Area 9 for Borrow Area 8P	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 50 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Appendix C-4



Legend

- Transect Sampling Area
- In-situ Study Area
- Proposed Borrow Area
- Borrow Area 1000 ft. Buffer
- Hardbottom Delineation from Side Scan Sonar and Towed Video

0 25 50 100 150 Meters

Hardbottom Habitat Sampling Area 13 for Borrow Area 8O	
VENICE QUANTITATIVE HARDBOTTOM SURVEY	
Scale: 1 inch = 50 meters	Drawn By: MR
Date: April 2011	Approved By: SD
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J10-1169
	Appendix C-5

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APPENDIX D

Interpreted Hardbottom Habitat Contact List for All Borrow Areas

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Interpreted Hardbottom Habitat Contact List for All Borrow Areas

BORROW_AREA	UNIQUE_ID	POLY_ID	CONTACT CENTER EASTING (X)	CONTACT CENTER NORTHING (Y)	AREA_FT	AREA_ACRES	COMMENTS
Area 8O	8O-01	1	491989	953184	1731.997	0.040	HB present / SSS confirmed
Area 8O	8O-02	2	492495	953032	14401.618	0.331	HB absent / SSS not confirm
Area 8O	8O-03	3	492720	952923	1758.176	0.040	HB present / SSS confirmed
Area 8O	8O-04	4	493617	952711	1899.209	0.044	HB present / SSS confirmed
Area 8O	8O-05	5	493504	952706	1428.731	0.033	HB present / SSS confirmed
Area 8O	8O-06	6	495204	951703	27416.465	0.629	HB present / SSS confirmed
Area 8O	8O-07	7	490826	951174	4799.901	0.110	HB absent / SSS not confirm
Area 8O	8O-08	8	490793	951025	4306.860	0.099	HB absent / SSS not confirm
Area 8O	8O-09	9	495051	951021	1609.630	0.037	HB present / SSS confirmed
Area 8O	8O-10	10	496735	949846	862.450	0.020	HB absent / SSS not confirm
Area 8O	8O-11	11	492495	949773	1472.730	0.034	HB present / SSS confirmed
Area 8O	8O-12	12	491872	949679	1637.452	0.038	HB present / SSS confirmed
Area 8O	8O-13	13	492569	949634	1258.741	0.029	HB present / SSS confirmed
Area 8O	8O-14	14	492018	949516	5770.307	0.132	HB present / SSS confirmed
Area 8O	8O-15	15	502101	949281	10684.217	0.245	HB absent / SSS not confirm
Area 8O	8O-16	16	492744	949144	55347.526	1.271	HB present / SSS confirmed
Area 8O	8O-17	17	497517	948879	2852.966	0.065	HB absent / SSS not confirm
Area 8O	8O-18	18	493250	948754	38201.147	0.877	HB absent / SSS not confirm
Area 8O	8O-19	19	497331	948637	862.734	0.020	HB absent / SSS not confirm
Area 8O	8O-20	20	493569	948574	10769.827	0.247	HB present / SSS confirmed
Area 8O	8O-21	21	502321	948483	824.651	0.019	HB absent / SSS not confirm
Area 8O	8O-22	22	497800	948463	1189.551	0.027	HB absent / SSS not confirm
Area 8O	8O-23	23	497413	948423	9492.711	0.218	HB absent / SSS not confirm
Area 8O	8O-24	24	501412	948404	5384.789	0.124	HB absent / SSS not confirm
Area 8O	8O-25	25	497519	948271	2255.370	0.052	HB absent / SSS not confirm
Area 8O	8O-26	33	495909	947250	2928.552	0.067	HB present / SSS confirmed
Area 8P	8P-01	27	492840	947783	1915.521	0.044	HB present / SSS confirmed
Area 8P	8P-02	30	492897	947457	118512.811	2.721	HB present / SSS confirmed
Area 8P	8P-03	34	493152	947118	6260.990	0.144	HB absent / SSS not confirm
Area 8P	8P-04	35	493350	946979	4985.243	0.114	HB present / SSS confirmed
Area 8P	8P-05	36	493591	946967	4107.251	0.094	HB present / SSS confirmed
Area 8P	8P-06	38	492198	946218	15942.764	0.366	HB absent / SSS not confirm
Area 8P	8P-07	39	492081	946114	3044.210	0.070	HB absent / SSS not confirm
Area 8P	8P-08	41	495575	945863	48948.709	1.124	HB present / SSS confirmed
Area 8P	8P-09	43	491640	945730	19867.120	0.456	HB present / SSS confirmed
Area 8P	8P-10	45	491749	945501	20506.353	0.471	HB present / SSS confirmed
Area 8P	8P-11	46	491572	945433	824.269	0.019	HB present / SSS confirmed
Area 8P	8P-12	47	492066	945402	876.577	0.020	HB present / SSS confirmed
Area 8P	8P-13	48	491633	945362	1879.161	0.043	HB present / SSS confirmed
Area 8P	8P-14	49	496177	945301	176870.167	4.060	HB absent / SSS not confirm
Area 8P	8P-15	50	492163	945212	6947.081	0.159	HB absent / SSS not confirm
Area 8P	8P-16	54	496845	944711	225461.441	5.176	HB present / SSS confirmed
Area 8P	8P-17	56	497506	944402	31197.165	0.716	HB present / SSS confirmed
Area 8P	8P-18	57	497783	944386	15961.867	0.366	HB present / SSS confirmed
Area 8P	8P-19	58	496840	944383	35139.441	0.807	HB present / SSS confirmed
Area 8P	8P-20	62	498239	943995	2191.743	0.050	HB present / SSS confirmed
Area 8P	8P-21	65	497419	943852	249383.278	5.725	HB present / SSS confirmed
Area 8P	8P-22	70	498215	943503	3069.200	0.070	HB present / SSS confirmed
Area 8P	8P-23	71	498365	943352	2326.862	0.053	HB present / SSS confirmed
Area 8P	8P-24	72	493517	943132	151175.121	3.471	HB present / SSS confirmed
Area 8P	8P-25	77	494861	941788	6461.995	0.148	HB present / SSS confirmed
Area 8P	8P-26	82	497704	941371	13753.866	0.316	HB present / SSS confirmed

Interpreted Hardbottom Habitat Contact List for All Borrow Areas

BORROW_AREA	UNIQUE_ID	POLY_ID	CONTACT CENTER EASTING (X)	CONTACT CENTER NORTHING (Y)	AREA_FT	AREA_ACRES	COMMENTS
Area 8P	8P-27	83	498003	941331	9430.182	0.216	HB present / SSS confirmed
Area 8P	8P-28	85	497924	941198	2410.744	0.055	HB present / SSS confirmed
Area 8P-8R	8P-R-01	44	491096	945611	5755.635	0.132	HB present / SSS confirmed
Area 8P-8R	8P-R-02	51	490781	945206	26013.096	0.597	HB absent / SSS not confirm
Area 8P-8R	8P-R-03	52	491647	944996	88680.594	2.036	HB present / SSS confirmed
Area 8P-8R	8P-R-04	59	492551	944282	4013.653	0.092	HB absent / SSS not confirm
Area 8P-8R	8P-R-05	63	492750	943967	18832.591	0.432	HB absent / SSS not confirm
Area 8R	8R-01	26	487407	947869	2377.942	0.055	HB present / SSS confirmed
Area 8R	8R-02	28	487532	947750	2351.521	0.054	HB present / SSS confirmed
Area 8R	8R-03	29	487097	947656	27568.998	0.633	HB absent / SSS not confirm
Area 8R	8R-04	31	487744	947441	23443.734	0.538	HB absent / SSS not confirm
Area 8R	8R-05	32	488063	947433	2220.644	0.051	HB present / SSS confirmed
Area 8R	8R-06	37	485830	946402	3899.518	0.090	HB present / SSS confirmed
Area 8R	8R-07	40	489240	945892	3347.310	0.077	HB present / SSS confirmed
Area 8R	8R-08	42	489435	945845	3010.444	0.069	HB present / SSS confirmed
Area 8R	8R-09	53	491116	944783	3934.379	0.090	HB present / SSS confirmed
Area 8R	8R-10	55	487129	944548	21845.573	0.502	HB absent / SSS not confirm
Area 8R	8R-11	60	487909	944109	3806.986	0.087	HB absent / SSS not confirm
Area 8R	8R-12	61	487443	944077	5424.546	0.125	HB absent / SSS not confirm
Area 8R	8R-13	64	488906	943955	4610.328	0.106	HB absent / SSS not confirm
Area 8R	8R-14	66	489105	943839	12530.818	0.288	HB absent / SSS not confirm
Area 8R	8R-15	67	488200	943604	1260.081	0.029	HB absent / SSS not confirm
Area 8R	8R-16	68	488138	943522	1360.087	0.031	HB absent / SSS not confirm
Area 8R	8R-17	69	488246	943512	860.846	0.020	HB absent / SSS not confirm
Area 8R	8R-18	73	490380	942649	324.996	0.007	HB present / SSS confirmed
Area 8R	8R-19	74	490351	942627	266.692	0.006	HB present / SSS confirmed
Area 8R	8R-20	75	490295	942586	149.087	0.003	HB present / SSS confirmed
Area 8S	8S-01	76	488164	942151	1938.139	0.044	HB present / SSS confirmed
Area 8S	8S-02	78	488399	941765	79421.134	1.823	HB present / SSS confirmed
Area 8S	8S-03	79	488944	941544	3303.688	0.076	HB present / SSS confirmed
Area 8S	8S-04	80	488311	941448	1104.266	0.025	HB present / SSS confirmed
Area 8S	8S-05	81	488799	941401	411.775	0.009	HB present / SSS confirmed
Area 8S	8S-06	84	488468	941284	2697.448	0.062	HB present / SSS confirmed
Area 8S	8S-07	86	488822	941190	20018.566	0.460	HB present / SSS confirmed
Area 8S	8S-08	87	486612	940640	1707.102	0.039	HB present / SSS confirmed
Area 8S	8S-09	88	487157	940421	600.221	0.014	HB present / SSS confirmed
Area 8S	8S-10	89	487122	940397	237.276	0.005	HB present / SSS confirmed
Area 8S	8S-11	90	486977	940397	2840.558	0.065	HB present / SSS confirmed
Area 8S	8S-12	91	490974	939609	1239.057	0.028	HB present / SSS confirmed
Area 8S	8S-13	92	490672	939403	7378.801	0.169	HB present / SSS confirmed
Area 8S	8S-14	93	491654	939207	5266.408	0.121	HB present / SSS confirmed
Area 8S	8S-15	94	487010	939191	6503.757	0.149	HB present / SSS confirmed
Area 8S	8S-16	95	491517	939050	6346.518	0.146	HB present / SSS confirmed
Area 8S	8S-17	96	487139	938989	1048.809	0.024	HB present / SSS confirmed
Area 8S	8S-18	97	487493	938869	4922.403	0.113	HB present / SSS confirmed
Area 8S	8S-19	98	491827	938865	2518.352	0.058	HB present / SSS confirmed
Area 8S	8S-20	99	491357	938815	16788.174	0.385	HB present / SSS confirmed
Area 8S	8S-21	100	491710	938743	6216.435	0.143	HB present / SSS confirmed
Area 8S	8S-22	101	487783	938619	22070.650	0.507	HB present / SSS confirmed

Interpreted Hardbottom Habitat Contact List for All Borrow Areas

BORROW_AREA	UNIQUE_ID	POLY_ID	CONTACT CENTER EASTING (X)	CONTACT CENTER NORTHING (Y)	AREA_FT	AREA_ACRES	COMMENTS
Area 8S	8S-23	102	487654	938374	5549.541	0.127	HB present / SSS confirmed
Area 8S	8S-24	103	492268	938355	10599.549	0.243	HB present / SSS confirmed
Area 8S	8S-25	104	492659	938280	5914.747	0.136	HB present / SSS confirmed
Area 8S	8S-26	105	492826	938230	4431.072	0.102	HB present / SSS confirmed
Area 8S	8S-27	106	493076	938014	17205.353	0.395	HB present / SSS confirmed
Area 8S	8S-28	107	492946	937902	7013.543	0.161	HB present / SSS confirmed
Area 8S	8S-29	108	492155	937758	6310.902	0.145	HB present / SSS confirmed
Area 8S	8S-30	109	492836	937745	27088.158	0.622	HB present / SSS confirmed
Area 8S	8S-31	110	492710	937596	11679.791	0.268	HB present / SSS confirmed
Area 8S	8S-32	111	493934	937272	32788.038	0.753	HB present / SSS confirmed
Area 8S	8S-33	112	492729	937244	7155.799	0.164	HB present / SSS confirmed
Area 8S	8S-34	113	494211	937215	23169.848	0.532	HB present / SSS confirmed
Area 8S	8S-35	114	494004	936964	4858.269	0.112	HB present / SSS confirmed
Area 8S	8S-36	115	493166	936964	87490.508	2.009	HB present / SSS confirmed
Area 8S	8S-37	116	493831	936921	8195.511	0.188	HB present / SSS confirmed
Area 8S	8S-38	117	494148	936901	7369.615	0.169	HB present / SSS confirmed
Area 8S	8S-39	118	490189	936835	12793.152	0.294	HB absent / SSS not confirm
Area 8S	8S-40	119	495285	936828	1636.206	0.038	HB present / SSS confirmed
Area 8S	8S-41	120	489069	936798	6809.557	0.156	HB present / SSS confirmed
Area 8S	8S-42	121	494413	936710	185640.832	4.262	HB present / SSS confirmed
Area 8S	8S-43	122	495514	936706	11601.530	0.266	HB present / SSS confirmed
Area 8S	8S-44	123	490003	936700	7015.815	0.161	HB absent / SSS not confirm
Area 8S	8S-45	124	495108	936608	343426.841	7.884	HB present / SSS confirmed
Area 8S	8S-46	125	489219	936485	4267.844	0.098	HB present / SSS confirmed
Area 8S	8S-47	126	496303	936405	3587.991	0.082	HB present / SSS confirmed
Area 8S	8S-48	127	496392	936308	1417.787	0.033	HB present / SSS confirmed
Area 8S	8S-49	128	490310	936254	38325.986	0.880	HB absent / SSS not confirm
Area 8S	8S-50	129	496539	936181	1066.385	0.024	HB present / SSS confirmed
Area 8S	8S-51	130	496398	936134	3469.404	0.080	HB present / SSS confirmed
Area 8S	8S-52	131	494714	936112	51469.174	1.182	HB present / SSS confirmed
Area 8S	8S-53	132	495373	935975	1302.413	0.030	HB present / SSS confirmed
Area 8S	8S-54	133	496431	935928	40536.724	0.931	HB present / SSS confirmed
Area 8S	8S-55	134	495900	935918	499749.668	11.473	HB present / SSS confirmed
Area 8S	8S-56	135	497107	935893	244234.909	5.607	HB present / SSS confirmed
Area 8S	8S-57	136	495338	935889	6065.029	0.139	HB present / SSS confirmed
Area 8S	8S-58	137	496632	935750	811.867	0.019	HB present / SSS confirmed
Area 8S	8S-59	138	496414	935735	16792.332	0.385	HB present / SSS confirmed
Area 8S	8S-60	139	496718	935701	1239.108	0.028	HB absent / SSS not confirm
Area 8S	8S-61	140	497075	935505	970.750	0.022	HB absent / SSS not confirm
Area 8S	8S-62	141	495718	935422	53911.394	1.238	HB absent / SSS not confirm
Area 8S	8S-63	142	497323	935374	12621.757	0.290	HB absent / SSS not confirm
Area 8S	8S-64	143	496984	935225	375.795	0.009	HB present / SSS confirmed
Area 8S	8S-65	144	497027	935221	739.010	0.017	HB present / SSS confirmed
Area 8S	8S-66	145	495850	935076	47024.929	1.080	HB absent / SSS not confirm
Area 8S	8S-67	146	492580	934940	10059.190	0.231	HB absent / SSS not confirm
Area 8S	8S-68	147	495037	934341	9998.645	0.230	HB present / SSS confirmed
Area 8S	8S-69	148	491649	934338	1744.586	0.040	HB present / SSS confirmed
Area 8S	8S-70	149	497480	934155	3653.118	0.084	HB present / SSS confirmed
Area 8S	8S-71	150	494148	933651	1609.048	0.037	HB present / SSS confirmed
Area 8S	8S-72	151	494954	933614	158610.930	3.641	HB present / SSS confirmed

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APPENDIX E

In-Situ Survey Data

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In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
1	1	Scleractinian	Siderastrea siderea	7		Y	Y					Y	Y			22.5	0.7
1	1	Scleractinian	Cladocora arbuscula	37		Y	Y					Y	Y			22.5	3.7
1	1	Scleractinian	Solenastrea hyades	3		Y	Y					Y	Y			22.5	0.3
1	1	Scleractinian	Oculina robusta	2		Y	Y					Y	Y			22.5	0.2
1	1	Sponge	Brown encrusting	9		Y	Y					Y	Y			22.5	0.9
1	1	Sponge	finger	4		Y	Y					Y	Y			22.5	0.4
1	1	Sponge	ball	4		Y	Y					Y	Y			22.5	0.4
1	2	Scleractinian	Cladocora arbuscula	71		Y	Y					Y	Y			22.5	7.1
1	2	Scleractinian	Siderastrea siderea	14		Y	Y					Y	Y			22.5	1.4
1	2	Scleractinian	Solenastrea hyades	2		Y	Y					Y	Y			22.5	0.2
1	2	Sponge	encrusting	12		Y	Y					Y	Y			22.5	1.2
1	2	Sponge	finger	3		Y	Y					Y	Y			22.5	0.3
1	2	Sponge	ball	3		Y	Y					Y	Y			22.5	0.3
1	3	Scleractinian	Cladocora arbuscula	51		Y	Y					Y	Y			22.5	5.1
1	3	Scleractinian	Oculina robusta	2		Y	Y					Y	Y			22.5	0.2
1	3	Scleractinian	Siderastrea siderea	10		Y	Y					Y	Y			22.5	1
1	3	Scleractinian	Solenastrea hyades	1		Y	Y					Y	Y			22.5	0.1
1	3	Sponge	finger	9		Y	Y					Y	Y			22.5	0.9
1	4	Scleractinian	Cladocora arbuscula	62		Y	Y					Y	Y			29.2	6.2
1	4	Scleractinian	Oculina robusta	2		Y	Y					Y	Y			29.2	0.2
1	4	Scleractinian	Siderastrea siderea	14		Y	Y					Y	Y			29.2	1.4
1	4	Scleractinian	Solenastrea hyades	1		Y	Y					Y	Y			29.2	0.1
1	4	Scleractinian	Phyllangia americana	2		Y	Y					Y	Y			29.2	0.2
1	4	Sponge	encrusting	12		Y	Y					Y	Y			29.2	1.2
1	4	Sponge	finger	7		Y	Y					Y	Y			29.2	0.7
1	4	Sponge	ball	5		Y	Y					Y	Y			29.2	0.5
1	5	Scleractinian	Cladocora arbuscula	96		Y	Y					Y	Y			24.2	9.6
1	5	Scleractinian	Oculina robusta	3		Y	Y					Y	Y			24.2	0.3
1	5	Scleractinian	Siderastrea siderea	11		Y	Y					Y	Y			24.2	1.1
1	5	Scleractinian	Solenastrea hyades	4		Y	Y					Y	Y			24.2	0.4
1	5	Scleractinian	Phyllangia americana	2		Y	Y					Y	Y			24.2	0.2
1	5	Sponge	encrusting	12		Y	Y					Y	Y			24.2	1.2
1	5	Sponge	finger	13		Y	Y					Y	Y			24.2	1.3
1	5	Sponge	ball	4		Y	Y					Y	Y			24.2	0.4
1	6	Scleractinian	Siderastrea siderea	40	49	Y	Y						Y			8.3	4
1	6	Scleractinian	Cladocora arbuscula	69	49	Y	Y						Y			8.3	6.9
1	6	Scleractinian	Solenastrea hyades	11	49	Y	Y						Y			8.3	1.1
1	6	Scleractinian	Phyllangia americana	6	49	Y	Y						Y			8.3	0.6
1	6	Scleractinian	Oculina robusta	4	49	Y	Y						Y			8.3	0.4
1	6	Sponges	ball	13	49	Y	Y						Y			8.3	1.3
1	6	Sponges	vase	1	49	Y	Y						Y			8.3	0.1
1	6	Sponges	finger	10	49	Y	Y						Y			8.3	1
1	6	Sponges	encrusting	3	49	Y	Y						Y			8.3	0.3
1	7	Scleractinian	Siderastrea siderea	46	48	Y	Y									7.5	4.6
1	7	Scleractinian	Cladocora arbuscula	48	48	Y	Y									7.5	4.8
1	7	Scleractinian	Solenastrea hyades	8	48	Y	Y									7.5	0.8
1	7	Scleractinian	Oculina robusta	2	48	Y	Y									7.5	0.2
1	7	Scleractinian	Phyllangia americana	7	48	Y	Y									7.5	0.7
1	7	Sponges	ball	11	48	Y	Y									7.5	1.1
1	7	Sponges	finger	4	48	Y	Y									7.5	0.4
1	7	Sponges	encrusting	6	48	Y	Y									7.5	0.6
1	7	Algae	Sargassum		48	Y	Y									7.5	0
1	7	Algae	turf		48	Y	Y									7.5	0
1	8	Scleractinian	Siderastrea siderea	23	49	Y	Y									10.0	2.3
1	8	Scleractinian	Cladocora arbuscula	55	49	Y	Y									10.0	5.5

In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
1	8	Scleractinian	Oculina robusta	2	49	Y	Y									10.0	0.2
1	8	Scleractinian	Solenastrea hyades	1	49	Y	Y									10.0	0.1
1	8	Sponges	ball	3	49	Y	Y									10.0	0.3
1	8	Sponges	finger	8	49	Y	Y									10.0	0.8
1	8	Algae	Sargassum		49	Y	Y									10.0	0
1	8	Algae	turf		49	Y	Y									10.0	0
1	9	Scleractinian	Siderastrea siderea	29	49	Y	Y									12.5	2.9
1	9	Scleractinian	Cladocora arbuscula	63	49	Y	Y									12.5	6.3
1	9	Scleractinian	Oculina robusta	3	49	Y	Y									12.5	0.3
1	9	Scleractinian	Phyllangia americana	6	49	Y	Y									12.5	0.6
1	9	Sponges	ball	5	49	Y	Y									12.5	0.5
1	9	Sponges	encrusting	35	49	Y	Y									12.5	3.5
1	9	Algae	Sargassum		49	Y	Y									12.5	0
1	9	Algae	turf		49	Y	Y									12.5	0
1	10	Scleractinian	Siderastrea siderea	52	45	Y	Y									17.5	5.2
1	10	Scleractinian	Cladocora arbuscula	90	45	Y	Y									17.5	9
1	10	Scleractinian	Oculina robusta	2	45	Y	Y									17.5	0.2
1	10	Scleractinian	Solenastrea hyades	3	45	Y	Y									17.5	0.3
1	10	Scleractinian	Phyllangia americana	2	45	Y	Y									17.5	0.2
1	10	Sponges	ball	9	45	Y	Y									17.5	0.9
1	10	Sponges	finger	12	45	Y	Y									17.5	1.2
1	10	Sponges	encrusting	27	45	Y	Y									17.5	2.7
1	11	Scleractinian	Siderastrea siderea	23		Y	Y									5.0	2.3
1	11	Scleractinian	Cladocora arbuscula	10		Y	Y									5.0	1
1	11	Scleractinian	Oculina robusta	2		Y	Y									5.0	0.2
1	11	Scleractinian	Solenastrea hyades	7		Y	Y									5.0	0.7
1	11	Sponges	ball	7		Y	Y									5.0	0.7
1	11	Sponges	finger	12		Y	Y									5.0	1.2
1	11	Sponges	encrusting	6		Y	Y									5.0	0.6
1	11	Algae	Sargassum			Y	Y									5.0	0
1	12	Scleractinian	Siderastrea siderea	23	49	Y	Y									8.3	2.3
1	12	Scleractinian	Cladocora arbuscula	38	49	Y	Y									8.3	3.8
1	12	Scleractinian	Oculina robusta	2	49	Y	Y									8.3	0.2
1	12	Scleractinian	Solenastrea hyades	4	49	Y	Y									8.3	0.4
1	12	Scleractinian	Phyllangia americana	8	49	Y	Y									8.3	0.8
1	12	Sponges	ball	7	49	Y	Y									8.3	0.7
1	12	Sponges	finger	16	49	Y	Y									8.3	1.6
1	12	Sponges	encrusting	11	49	Y	Y									8.3	1.1
1	12	Algae	Sargassum		49	Y	Y									8.3	0
1	12	Algae	turf		49	Y	Y									8.3	0
1	13	Scleractinian	Siderastrea siderea	2		Y							Y		Y	1.7	0.2
1	13	Sponges	ball	2		Y							Y		Y	1.7	0.2
1	13	Sponges	finger	3		Y							Y		Y	1.7	0.3
1	14									Y		Y	Y			0.0	0
1	15	Scleractinian	Siderastrea siderea	6		Y	Y		Y			Y	Y			4.2	0.6
1	15	Scleractinian	Cladocora arbuscula	4		Y	Y		Y			Y	Y			4.2	0.4
1	15	Scleractinian	Oculina robusta	2		Y	Y		Y			Y	Y			4.2	0.2
1	15	Sponges	finger	2		Y	Y		Y			Y	Y			4.2	0.2
2	42	Scleractinian	Siderastrea siderea	75												16.7	7.5
2	42	Octocoral	Eunicea	1												16.7	0.1
2	42	Scleractinian	Cladocora arbuscula	69												16.7	6.9
2	42	Scleractinian	Oculina robusta	11												16.7	1.1
2	42	Scleractinian	Solenastrea hyades	13												16.7	1.3
2	42	Sponges	ball	33												16.7	3.3
2	42	Sponges	finger	22												16.7	2.2

In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
2	42	Sponges	encrusting	1												16.7	0.1
2	43	Scleractinian	Siderastrea siderea	53	49		Y					Y	Y			14.2	5.3
2	43	Scleractinian	Cladocora arbuscula	43	49		Y					Y	Y			14.2	4.3
2	43	Scleractinian	Oculina robusta	4	49		Y					Y	Y			14.2	0.4
2	43	Scleractinian	Solenastrea hyades	10	49		Y					Y	Y			14.2	1
2	43	Scleractinian	Phyllangia americana	1	49		Y					Y	Y			14.2	0.1
2	43	Sponges	ball	52	49		Y					Y	Y			14.2	5.2
2	43	Sponges	finger	10	49		Y					Y	Y			14.2	1
2	43	Sponges	encrusting	4	49		Y					Y	Y			14.2	0.4
2	44	Scleractinian	Siderastrea siderea	47			Y					Y	Y			13.3	4.7
2	44	Scleractinian	Cladocora arbuscula	51			Y					Y	Y			13.3	5.1
2	44	Scleractinian	Oculina robusta	3			Y					Y	Y			13.3	0.3
2	44	Scleractinian	Solenastrea hyades	6			Y					Y	Y			13.3	0.6
2	44	Scleractinian	Phyllangia americana	3			Y					Y	Y			13.3	0.3
2	44	Sponges	ball	24			Y					Y	Y			13.3	2.4
2	44	Sponges	finger	4			Y					Y	Y			13.3	0.4
2	44	Sponges	encrusting	4			Y					Y	Y			13.3	0.4
2	45	Scleractinian	Siderastrea siderea	82			Y					Y	Y			10.8	8.2
2	45	Scleractinian	Cladocora arbuscula	44			Y					Y	Y			10.8	4.4
2	45	Scleractinian	Oculina robusta	7			Y					Y	Y			10.8	0.7
2	45	Scleractinian	Solenastrea hyades	14			Y					Y	Y			10.8	1.4
2	45	Scleractinian	Phyllangia americana	3			Y					Y	Y			10.8	0.3
2	45	Sponges	ball	23			Y					Y	Y			10.8	2.3
2	45	Sponges	finger	10			Y					Y	Y			10.8	1
7	16	Scleractinian	Siderastrea siderea	27	47		Y			Y			Y			15.0	2.7
7	16	Scleractinian	Solenastrea hyades	32	47		Y			Y			Y			15.0	3.2
7	16	Scleractinian	Cladocora arbuscula	67	47		Y			Y			Y			15.0	6.7
7	16	Scleractinian	Oculina robusta	19	47		Y			Y			Y			15.0	1.9
7	16	Scleractinian	Phyllangia americana	9	47		Y			Y			Y			15.0	0.9
7	16	Octocoral	Leptogorgia	4	47		Y			Y			Y			15.0	0.4
7	16	Sponges	ball	26	47		Y			Y			Y			15.0	2.6
7	16	Sponges	finger	24	47		Y			Y			Y			15.0	2.4
7	16	Sponges	encrusting	10	47		Y			Y			Y			15.0	1
7	17	Scleractinian	Siderastrea siderea	15	48		Y			Y		Y	Y			14.2	1.5
7	17	Scleractinian	Cladocora arbuscula	60	48		Y			Y		Y	Y			14.2	6
7	17	Scleractinian	Oculina robusta	15	48		Y			Y		Y	Y			14.2	1.5
7	17	Scleractinian	Solenastrea hyades	31	48		Y			Y		Y	Y			14.2	3.1
7	17	Octocoral	Leptogorgia	1	48		Y			Y		Y	Y			14.2	0.1
7	17	Sponges	ball	15	48		Y			Y		Y	Y			14.2	1.5
7	17	Sponges	finger	7	48		Y			Y		Y	Y			14.2	0.7
7	17	Sponges	encrusting	8	48		Y			Y		Y	Y			14.2	0.8
7	17	Algae	Sargassum		48		Y			Y		Y	Y			14.2	0
7	18	Scleractinian	Siderastrea siderea	25			Y			Y			Y			8.3	2.5
7	18	Scleractinian	Cladocora arbuscula	93			Y			Y			Y			8.3	9.3
7	18	Scleractinian	Oculina robusta	11			Y			Y			Y			8.3	1.1
7	18	Scleractinian	Solenastrea hyades	21			Y			Y			Y			8.3	2.1
7	18	Scleractinian	Phyllangia americana	5			Y			Y			Y			8.3	0.5
7	18	Octocoral	Leptogorgia	1			Y			Y			Y			8.3	0.1
7	18	Sponges	ball	14			Y			Y			Y			8.3	1.4
7	18	Sponges	finger	4			Y			Y			Y			8.3	0.4
7	18	Sponges	encrusting	8			Y			Y			Y			8.3	0.8
7	19	Scleractinian	Siderastrea siderea	36	47		Y					Y	Y			6.4	3.6
7	19	Scleractinian	Cladocora arbuscula	55	47		Y					Y	Y			6.4	5.5
7	19	Scleractinian	Oculina robusta	5	47		Y					Y	Y			6.4	0.5
7	19	Scleractinian	Solenastrea hyades	16	47		Y					Y	Y			6.4	1.6

In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
7	19	Scleractinian	Phyllangia americana	7	47		Y					Y	Y			6.4	0.7
7	19	Sponges	ball	11	47		Y					Y	Y			6.4	1.1
7	19	Sponges	finger	2	47		Y					Y	Y			6.4	0.2
7	19	Sponges	encrusting	6	47		Y					Y	Y			6.4	0.6
7	19	Sponges	lumpy	1	47		Y					Y	Y			6.4	0.1
7	20	Scleractinian	Siderastrea siderea	51	47		Y					Y	Y			10.8	5.1
7	20	Scleractinian	Cladocora arbuscula	29	47		Y					Y	Y			10.8	2.9
7	20	Scleractinian	Oculina robusta	9	47		Y					Y	Y			10.8	0.9
7	20	Scleractinian	Solenastrea hyades	19	47		Y					Y	Y			10.8	1.9
7	20	Scleractinian	Phyllangia americana	4	47		Y					Y	Y			10.8	0.4
7	20	Sponges	ball	12	47		Y					Y	Y			10.8	1.2
7	20	Sponges	finger	5	47		Y					Y	Y			10.8	0.5
7	20	Sponges	encrusting	8	47		Y					Y	Y			10.8	0.8
7	21	Scleractinian	Siderastrea siderea	16	47		Y					Y	Y			7.5	1.6
7	21	Scleractinian	Cladocora arbuscula	48	47		Y					Y	Y			7.5	4.8
7	21	Scleractinian	Oculina robusta	11	47		Y					Y	Y			7.5	1.1
7	21	Scleractinian	Solenastrea hyades	36	47		Y					Y	Y			7.5	3.6
7	21	Sponges	ball	26	47		Y					Y	Y			7.5	2.6
7	21	Sponges	finger	2	47		Y					Y	Y			7.5	0.2
7	22	Scleractinian	Siderastrea siderea	7			Y					Y	Y			12.5	0.7
7	22	Scleractinian	Cladocora arbuscula	77			Y					Y	Y			12.5	7.7
7	22	Scleractinian	Oculina robusta	16			Y					Y	Y			12.5	1.6
7	22	Scleractinian	Solenastrea hyades	32			Y					Y	Y			12.5	3.2
7	22	Scleractinian	Phyllangia americana	5			Y					Y	Y			12.5	0.5
7	22	Scleractinian	Pseudopterogorgia	1			Y					Y	Y			12.5	0.1
7	22	Octocoral	Eunicea	1			Y					Y	Y			12.5	0.1
7	22	Sponges	ball	14			Y					Y	Y			12.5	1.4
7	22	Sponges	finger	13			Y					Y	Y			12.5	1.3
7	22	Sponges	encrusting	5			Y					Y	Y			12.5	0.5
7	23	Scleractinian	Siderastrea siderea	7			Y					Y	Y			6.7	0.7
7	23	Scleractinian	Cladocora arbuscula	50			Y					Y	Y			6.7	5
7	23	Scleractinian	Oculina robusta	25			Y					Y	Y			6.7	2.5
7	23	Scleractinian	Solenastrea hyades	40			Y					Y	Y			6.7	4
7	23	Scleractinian	Phyllangia americana	1			Y					Y	Y			6.7	0.1
7	23	Octocoral	Leptogorgia	3			Y					Y	Y			6.7	0.3
7	23	Sponges	ball	17			Y					Y	Y			6.7	1.7
7	23	Sponges	finger	12			Y					Y	Y			6.7	1.2
7	23	Sponges	encrusting	3			Y					Y	Y			6.7	0.3
7	24	Scleractinian	Siderastrea siderea	9			Y					Y	Y			12.5	0.9
7	24	Scleractinian	Cladocora arbuscula	129			Y					Y	Y			12.5	12.9
7	24	Scleractinian	Oculina robusta	10			Y					Y	Y			12.5	1
7	24	Scleractinian	Solenastrea hyades	20			Y					Y	Y			12.5	2
7	24	Scleractinian	Phyllangia americana	4			Y					Y	Y			12.5	0.4
7	24	Octocoral	Eunicea	1			Y					Y	Y			12.5	0.1
7	24	Sponges	ball	25			Y					Y	Y			12.5	2.5
7	24	Sponges	finger	11			Y					Y	Y			12.5	1.1
7	24	Sponges	encrusting	2			Y					Y	Y			12.5	0.2
7	25	Scleractinian	Siderastrea siderea	19	47		Y					Y	Y			17.5	1.9
7	25	Scleractinian	Cladocora arbuscula	72	47		Y					Y	Y			17.5	7.2
7	25	Scleractinian	Oculina robusta	13	47		Y					Y	Y			17.5	1.3
7	25	Scleractinian	Solenastrea hyades	26	47		Y					Y	Y			17.5	2.6
7	25	Scleractinian	Phyllangia americana	8	47		Y					Y	Y			17.5	0.8
7	25	Octocoral	Eunicea	1	47		Y					Y	Y			17.5	0.1
7	25	Sponges	ball	23	47		Y					Y	Y			17.5	2.3
7	25	Sponges	tube	2	47		Y					Y	Y			17.5	0.2

In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
7	25	Sponges	finger	7	47		Y					Y	Y			17.5	0.7
7	25	Sponges	encrusting	8	47		Y					Y	Y			17.5	0.8
7	26	Scleractinian	Siderastrea siderea	4			Y					Y	Y			23.3	0.4
7	26	Scleractinian	Cladocora arbuscula	90			Y					Y	Y			23.3	9
7	26	Scleractinian	Oculina robusta	3			Y					Y	Y			23.3	0.3
7	26	Scleractinian	Solenastrea hyades	4			Y					Y	Y			23.3	0.4
7	26	Scleractinian	Phyllangia americana	3			Y					Y	Y			23.3	0.3
7	26	Sponges	ball	4			Y					Y	Y			23.3	0.4
7	26	Sponges	finger	5			Y					Y	Y			23.3	0.5
7	26	Sponges	encrusting	29			Y					Y	Y			23.3	2.9
7	27	Scleractinian	Siderastrea siderea	8	41		Y					Y	Y			28.3	0.8
7	27	Scleractinian	Cladocora arbuscula	119	41		Y					Y	Y			28.3	11.9
7	27	Scleractinian	Oculina robusta	10	41		Y					Y	Y			28.3	1
7	27	Scleractinian	Solenastrea hyades	5	41		Y					Y	Y			28.3	0.5
7	27	Scleractinian	Phyllangia americana	3	41		Y					Y	Y			28.3	0.3
7	27	Sponges	ball	9	41		Y					Y	Y			28.3	0.9
7	27	Sponges	finger	2	41		Y					Y	Y			28.3	0.2
7	27	Sponges	encrusting	18	41		Y					Y	Y			28.3	1.8
7	28	Scleractinian	Siderastrea siderea	12	47		Y					Y	Y			20.8	1.2
7	28	Scleractinian	Cladocora arbuscula	107	47		Y					Y	Y			20.8	10.7
7	28	Scleractinian	Oculina robusta	14	47		Y					Y	Y			20.8	1.4
7	28	Scleractinian	Solenastrea hyades	10	47		Y					Y	Y			20.8	1
7	28	Scleractinian	Phyllangia americana	12	47		Y					Y	Y			20.8	1.2
7	28	Sponges	ball	20	47		Y					Y	Y			20.8	2
7	28	Sponges	finger	3	47		Y					Y	Y			20.8	0.3
7	28	Sponges	encrusting	16	47		Y					Y	Y			20.8	1.6
7	29	Scleractinian	Siderastrea siderea	7			Y					Y	Y			24.2	0.7
7	29	Scleractinian	Cladocora arbuscula	54			Y					Y	Y			24.2	5.4
7	29	Scleractinian	Oculina robusta	5			Y					Y	Y			24.2	0.5
7	29	Scleractinian	Solenastrea hyades	4			Y					Y	Y			24.2	0.4
7	29	Scleractinian	Phyllangia americana	7			Y					Y	Y			24.2	0.7
7	29	Octocoral	Leptogorgia	1			Y					Y	Y			24.2	0.1
7	29	Sponges	ball	9			Y					Y	Y			24.2	0.9
7	29	Sponges	finger	1			Y					Y	Y			24.2	0.1
7	29	Sponges	encrusting	21			Y					Y	Y			24.2	2.1
7	30	Scleractinian	Siderastrea siderea	9	47		Y					Y	Y			20.0	0.9
7	30	Scleractinian	Cladocora arbuscula	72	47		Y					Y	Y			20.0	7.2
7	30	Scleractinian	Oculina robusta	4	47		Y					Y	Y			20.0	0.4
7	30	Scleractinian	Solenastrea hyades	4	47		Y					Y	Y			20.0	0.4
7	30	Scleractinian	Phyllangia americana	9	47		Y					Y	Y			20.0	0.9
7	30	Sponges	ball	19	47		Y					Y	Y			20.0	1.9
7	30	Sponges	finger	3	47		Y					Y	Y			20.0	0.3
7	30	Sponges	encrusting	20	47		Y					Y	Y			20.0	2
9	31	Scleractinian	Siderastrea siderea	6			Y					Y	Y			3.3	0.6
9	31	Scleractinian	Cladocora arbuscula	4			Y					Y	Y			3.3	0.4
9	31	Scleractinian	Oculina robusta	2			Y					Y	Y			3.3	0.2
9	31	Scleractinian	Solenastrea hyades	41			Y					Y	Y			3.3	4.1
9	31	Octocoral	Leptogorgia	2			Y					Y	Y			3.3	0.2
9	31	Sponges	ball	28			Y					Y	Y			3.3	2.8
9	31	Sponges	finger	3			Y					Y	Y			3.3	0.3
9	31	Sponges	encrusting	2			Y					Y	Y			3.3	0.2
9	32	Scleractinian	Oculina robusta	3			Y					Y	Y			4.2	0.3
9	32	Scleractinian	Oculina robusta	6			Y					Y	Y			4.2	0.6
9	32	Scleractinian	Solenastrea hyades	23			Y					Y	Y			4.2	2.3
9	32	Octocoral	Leptogorgia	2			Y					Y	Y			4.2	0.2

In-Situ Survey Data																	
Area	Transect	Category	Subcategory	Total Count/ Subcategory	Depth (ft)	Bare Substrate	Hard Bottom	Boulders	Rocks	Rubble	Gravel	Shell Hash	Sand	Artif Substrate	Sediment ation	Relief (cm)	Density
9	32	Sponges	ball	12			Y					Y	Y			4.2	1.2
9	32	Sponges	finger	4			Y					Y	Y			4.2	0.4
9	32	Algae	Sargassum				Y					Y	Y			4.2	0
9	33	Scleractinian	Siderastrea siderea	7	47		Y									5.8	0.7
9	33	Scleractinian	Cladocora arbuscula	5	47		Y									5.8	0.5
9	33	Scleractinian	Oculina robusta	6	47		Y									5.8	0.6
9	33	Scleractinian	Solenastrea hyades	52	47		Y									5.8	5.2
9	33	Scleractinian	Phyllangia americana	6	47		Y									5.8	0.6
9	33	Octocoral	Leptogorgia	2	47		Y									5.8	0.2
9	33	Octocoral	Eunicea	1	47		Y									5.8	0.1
9	33	Sponges	ball	28	47		Y									5.8	2.8
9	33	Sponges	finger	12	47		Y									5.8	1.2
9	33	Sponges	encrusting	1	47		Y									5.8	0.1
9	33	Algae	Sargassum		47		Y									5.8	0
9	34	Scleractinian	Cladocora arbuscula	3	47		Y									1.7	0.3
9	34	Scleractinian	Oculina robusta	4	47		Y									1.7	0.4
9	34	Scleractinian	Solenastrea hyades	15	47		Y									1.7	1.5
9	34	Scleractinian	Phyllangia americana	4	47		Y									1.7	0.4
9	34	Octocoral	Leptogorgia	3	47		Y									1.7	0.3
9	34	Sponges	ball	21	47		Y									1.7	2.1
9	34	Sponges	finger	7	47		Y									1.7	0.7
9	34	Sponges	encrusting	1	47		Y									1.7	0.1
9	35	Scleractinian	Cladocora arbuscula	10	47		Y									5.8	1
9	35	Scleractinian	Oculina robusta	2	47		Y									5.8	0.2
9	35	Scleractinian	Solenastrea hyades	15	47		Y									5.8	1.5
9	35	Octocoral	Leptogorgia	1	47		Y									5.8	0.1
9	35	Sponges	ball	32	47		Y									5.8	3.2
9	35	Sponges	finger	6	47		Y									5.8	0.6
9	35	Sponges	encrusting	2	47		Y									5.8	0.2
13	36	Scleractinian	Siderastrea siderea	26	46		Y					Y	Y			10.0	2.6
13	36	Scleractinian	Cladocora arbuscula	107	46		Y					Y	Y			10.0	10.7
13	36	Scleractinian	Oculina robusta	2	46		Y					Y	Y			10.0	0.2
13	36	Scleractinian	Solenastrea hyades	12	46		Y					Y	Y			10.0	1.2
13	36	Scleractinian	Phyllangia americana	8	46		Y					Y	Y			10.0	0.8
13	36	Sponges	ball	12	46		Y					Y	Y			10.0	1.2
13	36	Sponges	finger	10	46		Y					Y	Y			10.0	1
13	36	Sponges	encrusting	13	46		Y					Y	Y			10.0	1.3
13	37	Scleractinian	Siderastrea siderea	13	47		Y					Y	Y			12.5	1.3
13	37	Scleractinian	Cladocora arbuscula	60	47		Y					Y	Y			12.5	6
13	37	Scleractinian	Oculina robusta	7	47		Y					Y	Y			12.5	0.7
13	37	Scleractinian	Solenastrea hyades	14	47		Y					Y	Y			12.5	1.4
13	37	Sponges	finger	16	47		Y					Y	Y			12.5	1.6
13	37	Sponges	encrusting	11	47		Y					Y	Y			12.5	1.1
13	38	Scleractinian	Siderastrea siderea	13	47		Y					Y	Y			4.2	1.3
13	38	Scleractinian	Cladocora arbuscula	10	47		Y					Y	Y			4.2	1
13	38	Scleractinian	Solenastrea hyades	14	47		Y					Y	Y			4.2	1.4
13	38	Scleractinian	Phyllangia americana	2	47		Y					Y	Y			4.2	0.2
13	38	Sponges	finger	2	47		Y					Y	Y			4.2	0.2
13	38	Sponges	encrusting	2	47		Y					Y	Y			4.2	0.2
13	39	Scleractinian	Siderastrea siderea	40	47		Y					Y	Y			15.0	4
13	39	Scleractinian	Cladocora arbuscula	85	47		Y					Y	Y			15.0	8.5
13	39	Scleractinian	Oculina robusta	8	47		Y					Y	Y			15.0	0.8
13	39	Scleractinian	Solenastrea hyades	15	47		Y					Y	Y			15.0	1.5
13	39	Scleractinian	Phyllangia americana	2	47		Y					Y	Y			15.0	0.2
13	39	Octocoral	Pseudopterogorgia	1	47		Y					Y	Y			15.0	0.1

In-Situ Survey Data																	
Area	**Transect**	**Category**	**Subcategory**	**Total Count/ Subcategory**	**Depth (ft)**	**Bare Substrate**	**Hard Bottom**	**Boulders**	**Rocks**	**Rubble**	**Gravel**	**Shell Hash**	**Sand**	**Artif Substrate**	**Sediment ation**	**Relief (cm)**	**Density**
13	39	Sponges	ball	8	47		Y					Y	Y			15.0	0.8
13	39	Sponges	finger	9	47		Y					Y	Y			15.0	0.9
13	39	Sponges	encrusting	9	47		Y					Y	Y			15.0	0.9
13	40	Scleractinian	Siderastrea siderea	52			Y					Y	Y			9.2	5.2
13	40	Scleractinian	Cladocora arbuscula	47			Y					Y	Y			9.2	4.7
13	40	Scleractinian	Oculina robusta	11			Y					Y	Y			9.2	1.1
13	40	Scleractinian	Solenastrea hyades	17			Y					Y	Y			9.2	1.7
13	40	Scleractinian	Phyllangia americana	5			Y					Y	Y			9.2	0.5
13	40	Octocoral	Leptogorgia	4			Y					Y	Y			9.2	0.4
13	40	Sponges	ball	15			Y					Y	Y			9.2	1.5
13	40	Sponges	finger	11			Y					Y	Y			9.2	1.1
13	40	Sponges	encrusting	4			Y					Y	Y			9.2	0.4
13	41	Scleractinian	Siderastrea siderea	58	50		Y					Y	Y			14.2	5.8
13	41	Scleractinian	Cladocora arbuscula	83	50		Y					Y	Y			14.2	8.3
13	41	Scleractinian	Oculina robusta	6	50		Y					Y	Y			14.2	0.6
13	41	Scleractinian	Solenastrea hyades	14	50		Y					Y	Y			14.2	1.4
13	41	Scleractinian	Phyllangia americana	2	50		Y					Y	Y			14.2	0.2
13	41	Sponges	ball	18	50		Y					Y	Y			14.2	1.8
13	41	Sponges	finger	19	50		Y					Y	Y			14.2	1.9
13	41	Sponges	encrusting	9	50		Y					Y	Y			14.2	0.9

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APPENDIX F

In-Situ Transect Photographs (CD)

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