FBPE
FLORIDA BOARD OF PROFESSIONAL ENGINEERS

RICK SCOTT, GOVERNOR

MATILDE MILLER, INTERIM SECRETARY
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

2639 North Monroe Street
Suite B-112
Tallahassee, Florida 32303
Phone: (850) 521-0500
Fax: (850) 521-0521
www.fbpe.org

June 16, 2017

John Magnavita, P.E.
3824 San Simeon Circle
Weston, Florida 33326

RE: Complaint #2017026703

Dear Mr. Magnavita:

Pursuant to Sections 455.225 and 471.038, Florida Statutes, the Board of Professional Engineers is required to investigate legally sufficient complaints that allege violations of the Engineering Practice Act. Section 455.225(1), Florida Statutes, further states that when an investigation is undertaken, the Board shall promptly furnish to the person or his/her attorney a copy of the complaint or document which resulted in the initiation of the investigation.

Attached for your review is a copy of the complaint or document received by the Board. You have the option of submitting a written response to the complaint for consideration by the Board's legal staff and by the Probable Cause Panel for the Board. Please submit this response to the Board office within twenty (20) days.

Please be advised that pursuant to Section 455.225(10), F.S., upon completion of the investigation and pursuant to a written request, you will be provided an opportunity to review the investigative file or a copy will be sent to you at your expense. You may then file a written response to the information contained in the investigative file so long as the response is filed within 20 days from the date of receipt of the investigative file. If you wish to exercise this right then you must make a written request to FEMC at the above address within 20 days of receipt of this letter.

Thank you for your cooperation in this matter.

Sincerely,

Wendy Anderson
Investigator

/wsa
Enclosure

Florida Board of Professional Engineers

UNIFORM COMPLAINT FORM

Please return to: Florida Board of Professional Engineers
2639 North Monroe Street, Suite B-112
Tallahassee, Florida 32303

Type or Print

Your Name: Timothy L Nargi

Address: 5632 Skimmer Dr

Apollo Beach, FL 33572

City , State , Zip

Telephone(703)622-5654 (_____)_____
Business

Your Occupation: Harbor Bay CDD Board Supervisor

Contact (other than yourself)

Name: _____

Address: _____

_____

City , State , Zip

Telephone (_____)_____
Residence

SUBJECT OF COMPLAINT

Name: John Magnavita Langan Engineering
Engineer and/or Engineering Firm

Address: 15150 N.W. 79th Court, Suite 200

City: Miami Lakes, FL

Zip:____ 33016

Telephone: (_____)_____

State_____

License # (if known): PE # 54826 CA# 00006601

Have you contacted subject concerning complaint? Yes ☒ No ☐ Date: _____

Private Attorney
(if applicable) _____
Name

_____
Address

_____

_____, _____, _____
City State Zip

(_____)_____
Telephone

Because of the Statute of Limitations, please do not delay in consulting with an attorney or initiating any actions to preserve your civil remedies in this matter. *The Board cannot be your legal representative. Matters, which involve monetary recovery or questions of restitution for damages, are civil in nature and should be addressed to the court with appropriate jurisdiction.*

Witnesses (Please give full name and address)

This I all public record on the Harbor Bay CDD website
http://harborbaycdd.org/projects/seawall-project/

Please see other side

Note: A copy of this form will be sent to the Engineer named in your complaint pursuant to **455.225(1) Florida Statutes.**

Please give full details of your complaint. Include facts, details, and dates. Please attach copies of documents, records, correspondence, plans and contracts.

Florida Statutes 837.06, False Official Statements: Whoever knowingly makes a false statement in writing with the intent to mislead a public servant in the performance of his official duty shall be guilty of a misdemeanor of the second degree.

Signature (required to file complaint)

1 JUN 17
Date

To the Florida Board of Professional Engineers

I am one of five elected supervisors representing the Harbor Bay Community Development District and we are currently tasked with making extremely important and multi-million dollar decisions on a major infrastructure rebuilt in our community. It is imparitive that I and the other voting supervisors consider our decisions very carefully with a complete and accurate information package from our hired consultants.

I am having some serious doubts regarding the validity and completeness of the information that is being presented to me by our engineering consultant, Mr. John Magnavita from Langan Engineering, and I am extremely concerned. Given that our board decisions are being based almost entirely on Mr. Magnavita and Langan's professional recommendations, any technical errors or failures in sound engineering judgement may have disasterous and potentially dangerous results in my opinion. He has in the past made contradictory statements regarding the longterm viability of his design and I have been met with defensive posturing when attempting to challenge him on key aspects. It has gotten so bad that I have taken the step of issuing a no confidence statement related to his engineering work on our project.

By way of background, our community is a canal community off of Tampa Bay and contains approximately 7 miles of bulkhead which is currently in a state of failure. Upland damages to residents homes have been occuring and continue to occur at an ever worsening rate. Two stabilization options are being recommended by Mr. Magnavita and his employer Langan Engineering. The two options include:

- Installation of a new, thicker and deeper wall in front of the existing wall, and
- Placement of rip rap in front of the existing wall to stop further movement.

Mr. Magnavita has indicated on numerous occasions that either the new wall option or the rip rap option is viable for long term stabilization of the wall. The one and only constraint being that the new wall option is the only available option when wall movement/deformation has reached a certain threshold. He seems to glance over or outright ignore all of the other myriad of potential failure mechanisms and long term maintenance issues associated with the rip rap stabilization method. From a common sense standpoint the rip rap option appears to be pushing the limit on a number of stability fronts. Many of which Mr. Magnavita seems to be either ignoring or not properly communicating.

This complaint is specifically associated with design and engineering of the rip rap alternative. My concerns are summarized below:

- Mr. Magnavita signed and sealed the rip rap stabilization design based on faulty assumptions and/or ignored evidence of deficiencies of the existing wall. Concerns have been raised for years by our District engineer that the existing wall was not installed to the proper depth, and that soil migration has occurred under the wall. Despite having made no measurements, Mr. Magnavita has repeatedly dismissed those concerns by saying that soil migration has not occurred. During a recent formal board Q & A exchange (attached) with Mr. Magnavita, I again asked about the possibility of soil migration under the wall. His formal response was terse. He stated "*once and for all, we dismiss the notion of soil migration under the wall.*"

  As it turns out, he was incorrect. A recent wall failure in April 2017 has been attributed to shortened sheet piles and soil migration under the wall. It was determined that the wall embedment depth at the failure location was only about 12". Langan Engineering and Mr. Magnavita are now framing the occurrence as likely an isolated incident, but again have provided no measurements to support their downplaying of the issue. As such, he and his employer continue to stand by their signed and sealed design, and I continue to be skeptical. Their minimizing of the concern is provided

- Mr. Magnavita signed and sealed a drainage design which is inferior for the rip rap stabilization alternative. The signed and sealed drawings (attached) indicate the drainage improvements are shallow and are intended to intercept water infiltrating through a landside swale located immediately adjacent to the wall. The drainage improvements are focused on controlling hydrostatic pressure next to the wall. They do little to control groundwater mounding that occurs during the wet season or after extended heavy rain events. Mr. Magnavita and Langan Engineering have erroneously assumed no shortened sheet pile sections exist and no soil erosion occurs under the wall. Since it has now been determined that both conditions exist, there can be little or no tolerance for groundwater build up in those deficient areas that could cause seepage forces to develop. I do not believe the current signed and sealed drainage design is sufficient to eliminate that concern.

- Mr. Magnavita signed and sealed plans specifying a triangular wedge of rip rap extending 8 feet into the canal and 4 feet up the wall with a 2:1 slope. However, the base of the rip rap will be placed on sloped bottom in the vast majority of cases. The sloping base will be such that typical slopes on the rock will range from about 1:3 to 1:5. I alerted Mr. Magnavita to this problem and his written response indicated that if the rocks are hand placed and angular in nature the steeper slope angle "should be fine". Considering that the rocks will be holding the wall up indefinitely, and are not simply an erosion control measure, I do not

think this statement alone is sufficient. He has provided no documentation with regard to anticipated long term ramifications.

- Mr. Magnavita and Langan Engineering have stated that loose soils are prevalent and there will be slope instability related to the added weight of rip rap failing into the canal if dredging has or will be done under homeowner boat lifts. They are recommending a 20 feet restriction on dredging due to this instability potential.

  I am concerned that unstable conditions may currently exist with regard to dredged bottom soils. Mr. Magnavita has utilized bathometric surveys for the purpose of evaluating berm instability resulting from the weight of rip rap. Review of the bathymetric study indicates that no elevation data has been collected under existing boat lifts. It is highly likely that dredged conditions exist in these areas as a result of either incidental boat propeller dredging or other type of clandestine dredging by individual boat owners. If the engineering stability calculations have not accounted for these conditions there remains a potential for unsafe slope failures immediately following rip rap placement and independent of any imposed dredging restrictions. The soil borings and the bathymetric survey are attached. A navigation study conducted by our board confirms the dredging sensitivity and provide other useful information. The navigation study is also attached.

- The existing wall is badly deformed in many areas, yet Mr. Magnavita is recommending and willing to approve rip rap as the long term repair in those areas. There is a threshold of deformation he has presented, above which rip rap is no longer a viable option and a new wall is needed. The issue I have is that the methodology used to arrive at the threshold appears to be very rudimentary, consisting of tilt angle measurements of the bulkhead cap and comparing it to actual wall rupture (yes some of our walls have bent to the point of rupture). The basis for the recommendation appears not to be founded on any engineering principles or material studies. It is simply based on a single measurement. Essentially they say the point of rupture of the existing wall corresponds to a tilt angle of 2¾", but anything less (say 2 3/8") the existing wall is viable long term. If rip rap is placed, additional movement would be required before the placed rip rap is able to counter the movement. Mr. Magnavita has not quantified or even identified the additional movement, or whether the residual movement will be such that marginal locations will be in danger of failing.

- The soil drilling shows there are very loose wet soils below right below where the rip rap will be placed. Mr. Magnavita has indicated the weight of the rocks will sink down into the soft soils and make them denser. I consulted with an

outside professional engineer experienced in seawall construction regarding this situation. The engineer told me that with the soft soil conditions and sloped bottom, the soils below the rip rap may bulge sideways rather than pushing downward. I believe it's referred to as bearing failure. If that were to happen our dock pilings and boat lifts would surely be pushed as well, causing unsafe conditions and costly damage. Soil borings, Langan plans and the bathymetric survey illustrate the conditions. All are attached.

As a general comment, our district has paid Langan Engineering in excess of a million dollars to conduct the engineering design on this project. For a project of this scope one would expect to see hundreds of pages of technical report documentation describing analysis methodologies, assumptions, identification of site constraints, contingency plans, maintenance plans, etc. However all I have seen in terms of work product has been power point presentations, a set of construction plans with insufficient detail, and various Q & A back and forth wherein the onus falls to the individual supervisors to drag information out of Mr. Magnavita and Langan Engineering in order to make informed decisions. I am aware that our board is partially to blame for communication problems of this nature or for not effectively directing the efforts of this hired consultant. However in this case I feel that the recommendations we are receiving from Langan Engineering, and upon which we are relying on, are significantly flawed and exhibit poor engineering judgement.

Sincerely,

Tim Nargi

Harbor Bay CDD Supervisor

ATTACHMENTS

SIGNED AND SEALED PERMIT DOCUMENTS

June 8, 2015

Cardno
Shaping the Future

Richard M. Alt, P.E.
Regulation Division
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604

Cardno

3905 Crescent Park Drive
Riverview, FL 33578
USA

Phone: +1 813 664 4500
Fax: +1 813 664 0440

www.cardno.com

Subject: Response to Request for Additional Information
MiraBay Seawall Repair
Application ID: 708627

Dear Mr. Alt:

Cardno provides the following in response to your Request for Additional Information (RAI) issued on March 4, 2015. Our responses follow the RAI questions (**bold type**) in normal type.

EXEMPTION CERTIFICATION & DOCUMENTATION:

1. **Please provide a contact name for Harbor Bay CDD. [Rule 62-330.060, F.A.C.]**

   Response: The contact information is as follows:

   Mr. Matthew Huber
   District Manager, Harbor Bay Community Development District
   3434 Colwell Ave., Suite 200
   Tampa, FL 33614

2. **Please provide construction plans for the proposed project. [Rule 62-330.060, F.A.C.]**

   Response: Please see the attached Seawall Rehabilitation Conceptual Profiles prepared by Langan Engineering.

If you have any questions or require further information to complete your review of this application, please contact me at 813-367-0967. As always, we appreciate your assistance in this matter.

Sincerely,

Drew E. Sanders

Drew E. Sanders
Senior Project Scientist
Cardno, Inc.
Natural Resources and Health Sciences Division
Division
Email: drew.sanders@cardno.com

Timothy L. Neldner

Timothy L. Neldner, PWS
Senior Consultant
Cardno, Inc.
Natural Resources and Health Sciences

Email: timothy.neldner@cardno.com

DES/cab

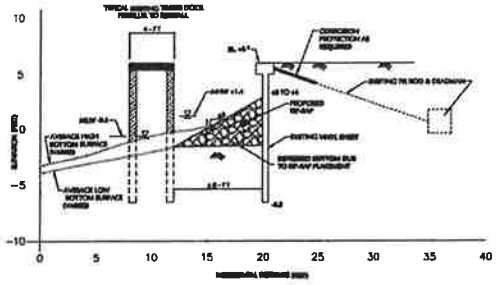
Enc: Seawall Rehabilitation Conceptual Profiles

Cardno®
Shaping the Future

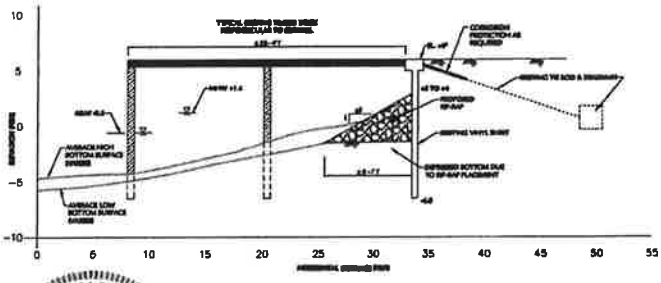
cc: Jamie Scarola\Scarola Associates, Inc.
Susan Stephens\Hopping Green & Sams
Jere Earlywine\\Hopping Green & Sams
Matthew E. Huber\Rizzetta &Company

File: SWFWMD RAI Response_Correspondence

OPTION 1
NEW RIP-RAP BERM
CONCEPTUAL TYPICAL PROFILE



OPTION 1
NEW RIP-RAP BERM
CONCEPTUAL TYPICAL PROFILE



NOTES:

1. DIMENSIONS AND SLOPE OF RIP-RAP ARE APPROXIMATE (NOT FOR CONSTRUCTION).
2. CHANNEL BOTTOM SURFACE ELEVATION BASED UPON "HYDROGRAPHIC SURVEY" PREPARED BY GEORGE F. YOUNG, INC., DATED 11 JULY 2013.
3. NO MODIFICATIONS ARE INTENDED TO BE MADE TO EXISTING DOCKAGE.
4. ELEVATIONS ARE REFERENCED TO NGVD 1929.

LEGEND:

MLW MEAN LOW WATER
MHW MEAN HIGH WATER
FRP FIBER REINFORCED FABRIC
AVERAGE HIGH & LOW CHANNEL BOTTOM SURFACE ELEVATIONS

JOHN MAGNAVITA
LICENSE
No 54826
STATE OF
FLORIDA

SIGNATURE DATE SIGNED
PROFESSIONAL ENGINEER, FLORIDA LIC. No. 54826

LANGAN

16150 N.W. 79th Court, Suite 200
Miami Lakes, FL 33016
T: 786.364.7200 F: 786.364.7201 www.langan.com

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan

FL CERTIFICATE OF AUTHORIZATION No. 30000661

Project
MIRABAY COMMUNITY DEVELOPMENT
APOLLO BEACH FLORIDA

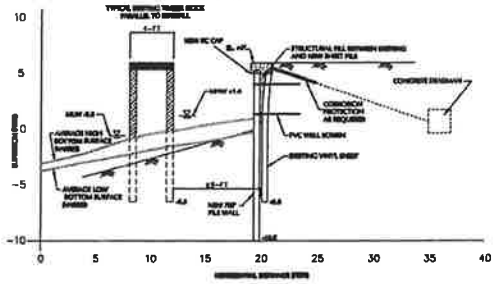
Drawing Title
SEAWALL REHABILITATION CONCEPTUAL PROFILES
OPTION 1

Project No.	300117702
Date	JUNE 2015
Scale	1" = 8'
Drawn By	
Checked By	

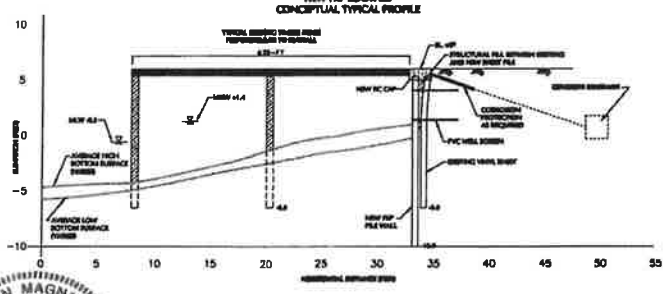
Drawing No.
FIG. 1

Filename: langan.com\data\M7\data7\300117702\Cadd Data - 300117702\sheet\set\F1302-300117702-SW001-0101.dwg Date: 6/9/2015 Time: 10:03 User: cmeson Style Table: Langan.stb Layout: FIG1

OPTION 2
NEW RIP SEAWALL
CONCEPTUAL TYPICAL PROFILE



OPTION 2
NEW RIP SEAWALL
CONCEPTUAL TYPICAL PROFILE



NOTES:

1. DIMENSIONS AND SLOPE OF RIP-RAP ARE APPROXIMATE (NOT FOR CONSTRUCTION)
2. CHANNEL BOTTOM SURFACE ELEVATION BASED UPON "HYDROGRAPHIC SURVEY" PREPARED BY GEORGE F. YOUNG, INC., DATED 17 JULY 2012.
3. NO MODIFICATIONS ARE INTENDED TO BE MADE TO EXISTING DOCKAGE.
4. ELEVATIONS ARE REFERENCED TO NGVD 1929.

LEGEND:

MLW MEAN LOW WATER
MHW MEAN HIGH WATER
RIP RIPRAP REINFORCED FABRIC
AVERAGE HIGH & LOW CHANNEL BOTTOM SURFACE ELEVATION

JOHN MAGNAVITA LICENSE No 54826 STATE OF FLORIDA

SIGNATURE JOHN MAGNAVITA, PROFESSIONAL ENGINEER DATE SIGNED

PROFESSIONAL ENGINEER IN STATE LIC. No. 54826

LANGAN

13150 N.W. 79th Court, Suite 200
Miami Lakes, FL 33016
T: 786 364 7200 F: 786 364 7201 www.langan.com

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan

FL CERTIFICATE OF AUTHORIZATION No. 00008901

Project
MIRABAY COMMUNITY DEVELOPMENT
APOLLO BEACH FLORIDA

Drawing Title
SEAWALL REHABILITATION CONCEPTUAL PROFILES
OPTION 3

Project No.	300117702
Date	JUNE 2015
Scale	1" = 8'
Drawn By	
Checked By	

Drawing No.
FIG. 2

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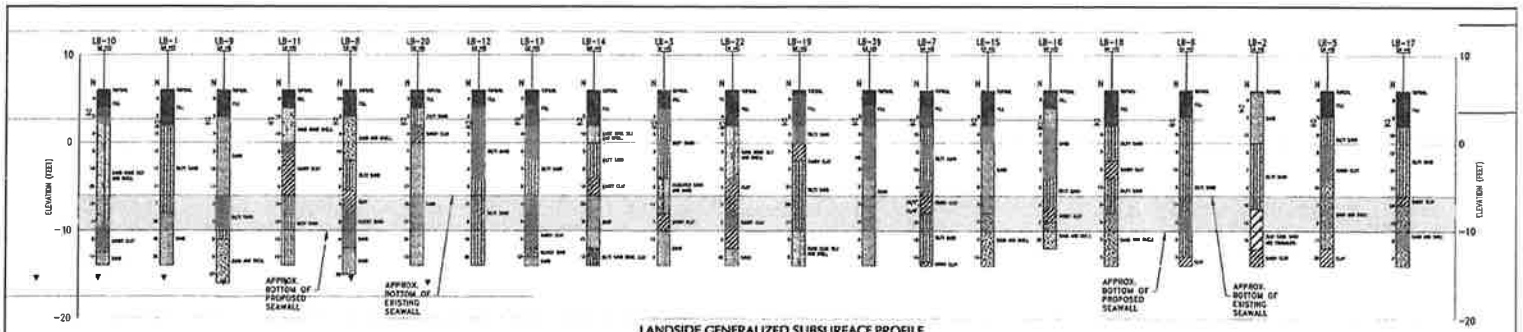
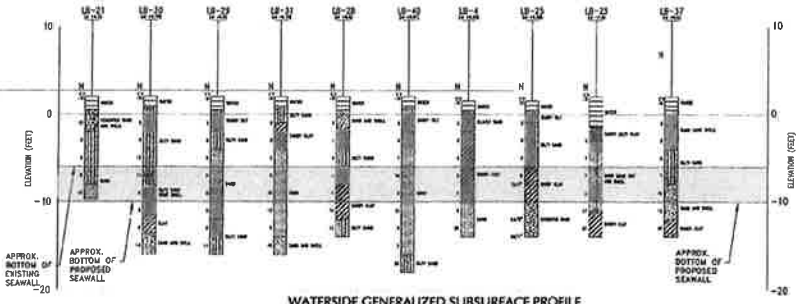
GEOTECHNICAL BORING RESULTS



LANDSIDE GENERALIZED SUBSURFACE PROFILE

VERTICAL SCALE 1"=10'
HORIZONTAL SCALE N.T.S



WATERSIDE GENERALIZED SUBSURFACE PROFILE

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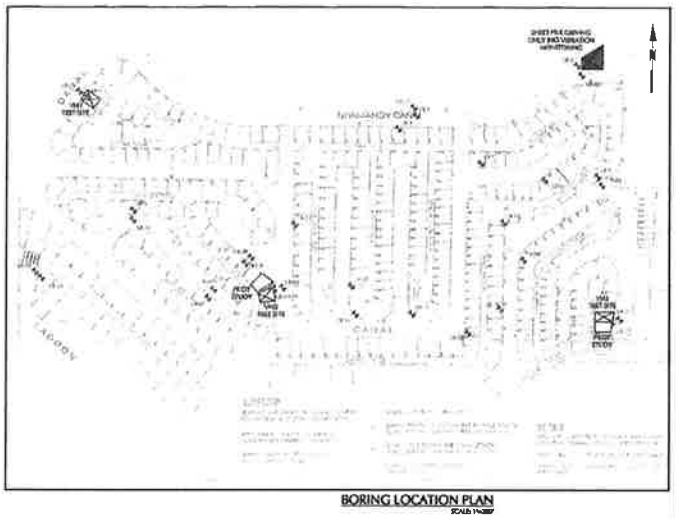
HORIZONTAL SCALE N.T.S



BORING LOCATION PLAN

SCALE 1"=200'

NOTES:

1. SHEET PREPARED USING HBA ENGINEERS & SCIENTISTS DRAWING ENTITLED "BORING AND SEAWALL GEOMETRY MEASUREMENT LOCATION MAP - FIGURE 2" DATED 6 MAY 2015.
2. BORING LOCATIONS SHOWN ARE APPROXIMATE.
3. ELEVATIONS FIELD MEASURED REFERENCING THE TOP OF CAP ELEVATION OF 6± NGVD
4. THE PROFILES SHOW ONLY GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. SEE BORING LOGS FOR DETAILED DESCRIPTIONS OF CONDITIONS ENCOUNTERED AT EACH LOCATION.
5. THE SPT N-VALUES SHOWN ARE BASED ON UN-CORRECTED AUTOMATIC HAMMER BLOW COUNTS. SEE REPORT TEXT FOR DISCUSSION REGARDING THE CORRECTION ASSOCIATED WITH THE USE OF AN AUTOMATIC SPT HAMMER.

LEGEND:

N	STANDARD PENETRATION RESISTANCE N-VALUE (BLOWS/FT)
▽	GROUNDWATER LEVEL ENCOUNTERED AT TIME OF DRILLING
▼	WATER LEVEL IN CHANNEL AT TIME OF DRILLING
LB-#	APPROXIMATE LANGAN BORING LOCATION
SB-#	APPROXIMATE WATER BORING LOCATION
WT	WEIGHT OF BOD
VIBE1	SELECTED VIBRATION MONITORING TEST SITES
	ENGINEUM MIRABAY PILOT PROJECT TEST SITE (2014)
TDS	SHEETPILE TEST DRIVE SITE

LANGAN

Project: MIRA BAY SEAWALL STABILIZATION
APOLLO BEACH FLORIDA

Drawing Title: BORING LOCATION PLAN AND GENERALIZED SUBSURFACE PROFILES

Project No. 100117702
Date MAY 2015
Scale AS SHOWN
Drawn By ROVDSH
Checked By AHA

Drawing No. FIG. 2

HYDROGRAPHIC CANAL BOTTOM SURVEY

MIRABAY CHANNELS

Section 29, Township 31 South, Range 19 East, Hillsborough County, Florida

IMAGE NOT TO SCALE

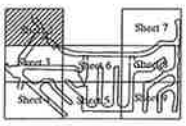
Surveyor's Notes:

MIRABAY
HYDROGRAPHIC SURVEY

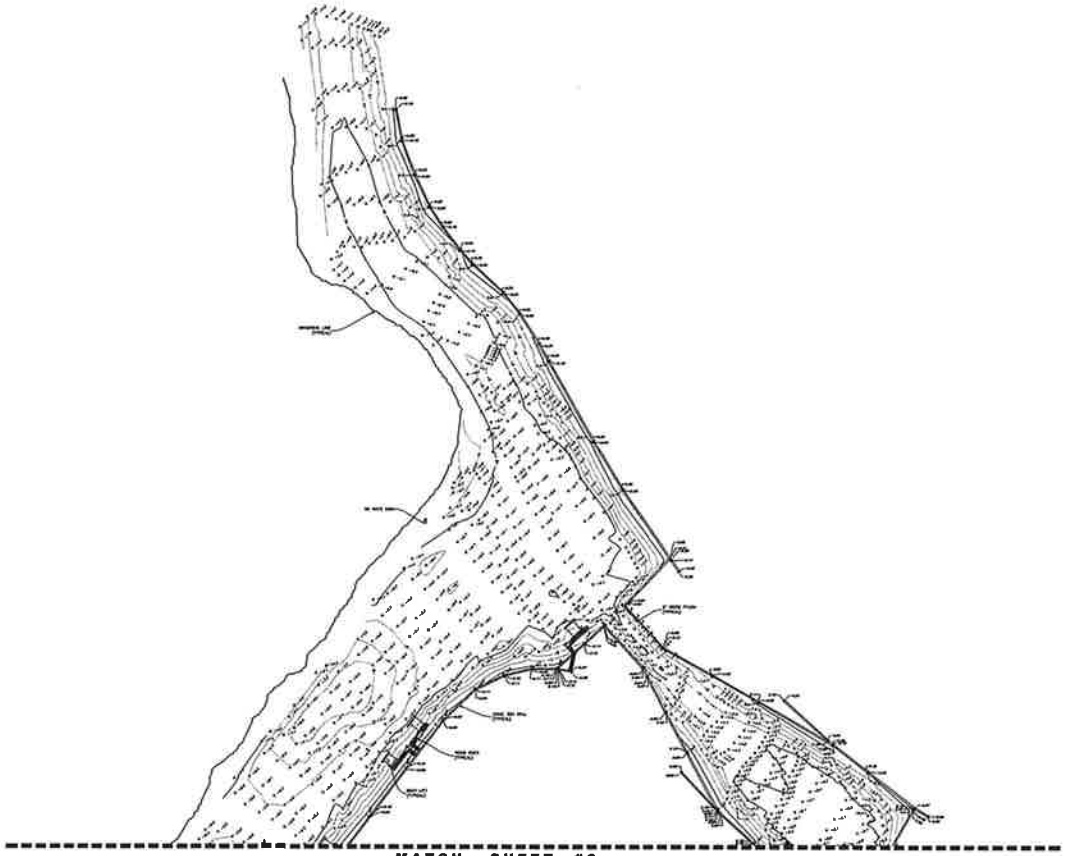
NGVD 1929

Sheet No. 1 of 11 Sheets

GeoPoint Surveying, Inc.



SCALE: 1" = 40'



MATCH SHEET #3

MIRABAY
HYDROGRAPHIC SURVEY

REVISIONS			
No.	Date	Description	By

Prepared For: Hillsborough County Development District
Last Date of Field Survey: 08/11/2015

SEE SHEET 1 FOR SURVEYORS CERTIFICATE

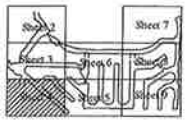
Sheet No. 2 of 14 Sheets

NGVD 1929

GeoPoint Surveying, Inc.

MATCH SHEET #3

MATCH SHEET #5



SCALE: 1" = 40'

NGVD 1929

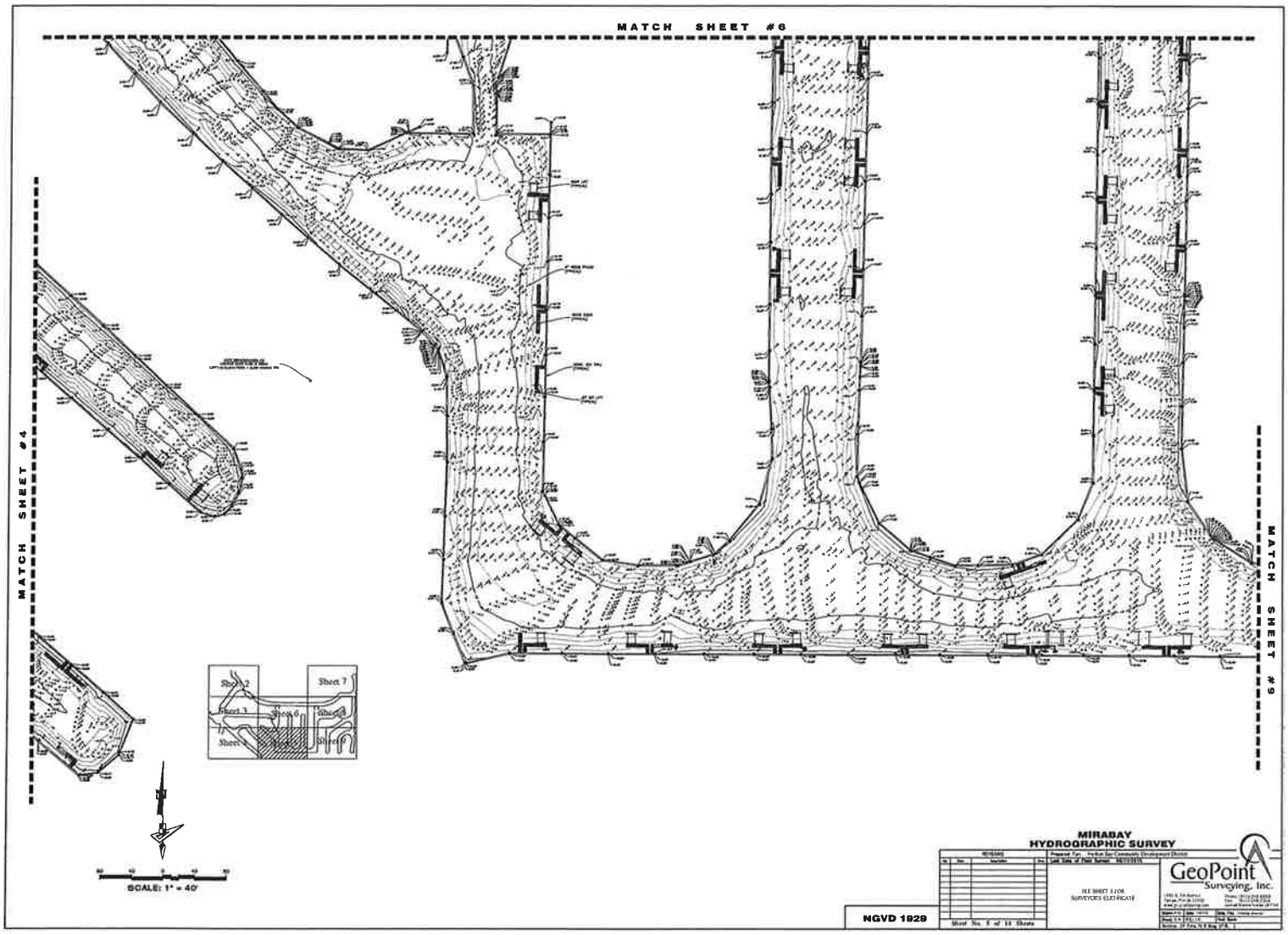
MIRABAY
HYDROGRAPHIC SURVEY

REVISIONS				Prepared For: Harbor Bay Community Development District
No.	Date	Remarks	Init.	Date of Field Survey: 09/11/2019

SEE SHEET 1 FOR SURVEYOR'S CERTIFICATE

Sheet No. 4 of 11 Sheets

GeoPoint Surveying, Inc.


MATCH SHEET #6
MATCH SHEET #4
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Sheet 2
Sheet 7
Sheet 3
Sheet 8
Sheet 4
Sheet 9
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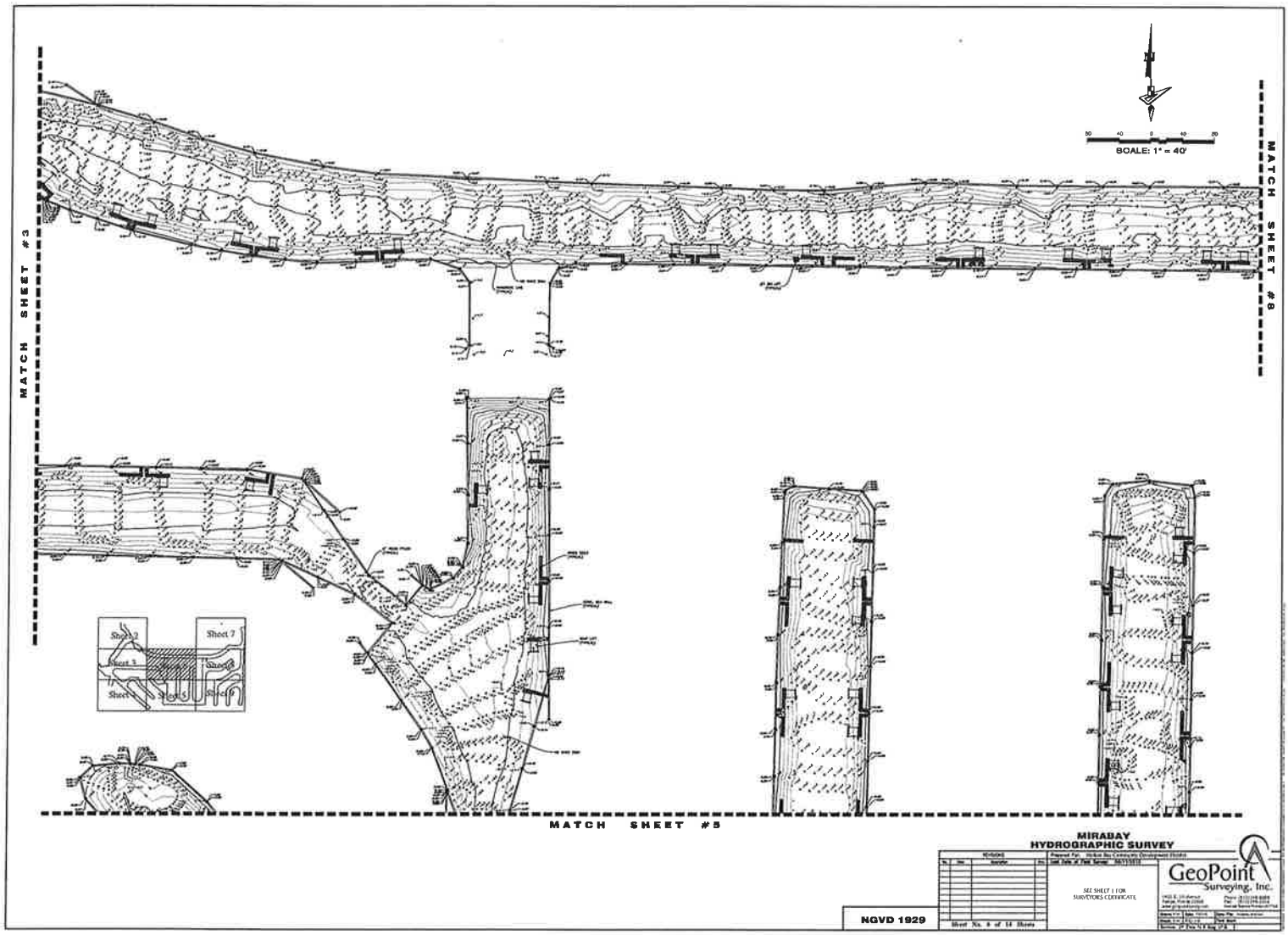
MIRABAY
HYDROGRAPHIC SURVEY
GeoPoint
Surveying, Inc.
NGVD 1929



MIRABAY
HYDROGRAPHIC SURVEY

NGVD 1929

SEE SHEET 1 FOR SURVEYORS CERTIFICATE

Sheet No. 6 of 14 Sheets

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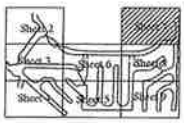
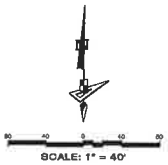
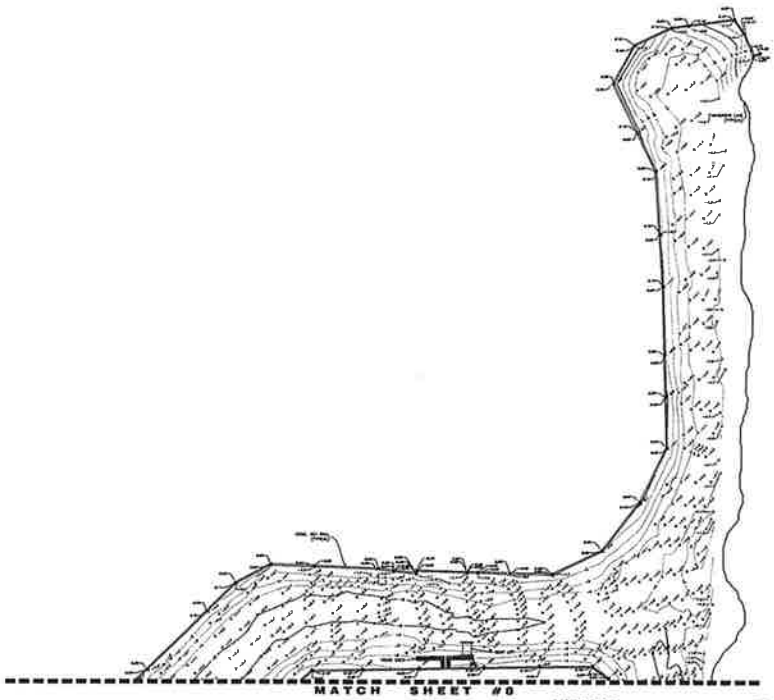




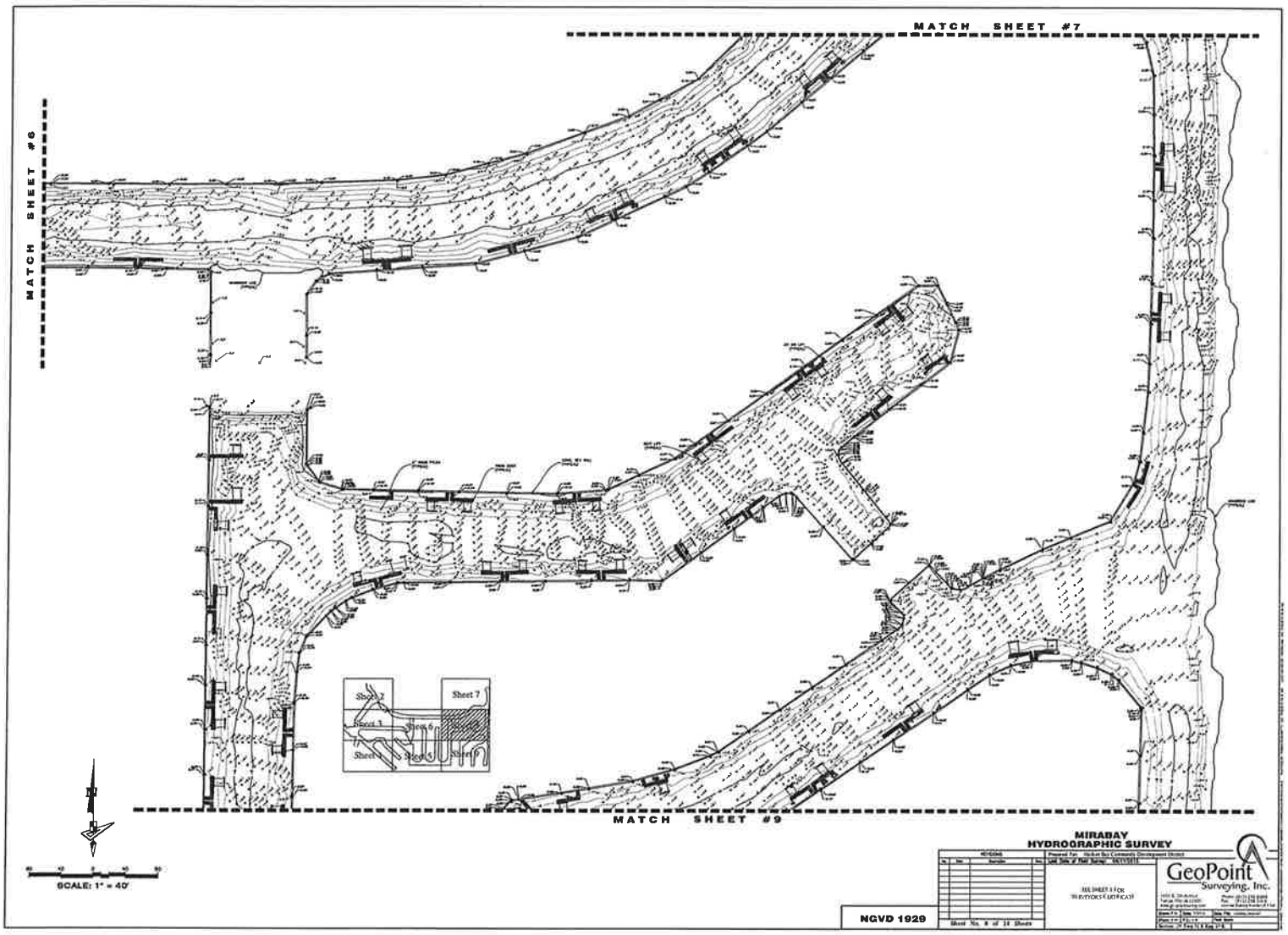


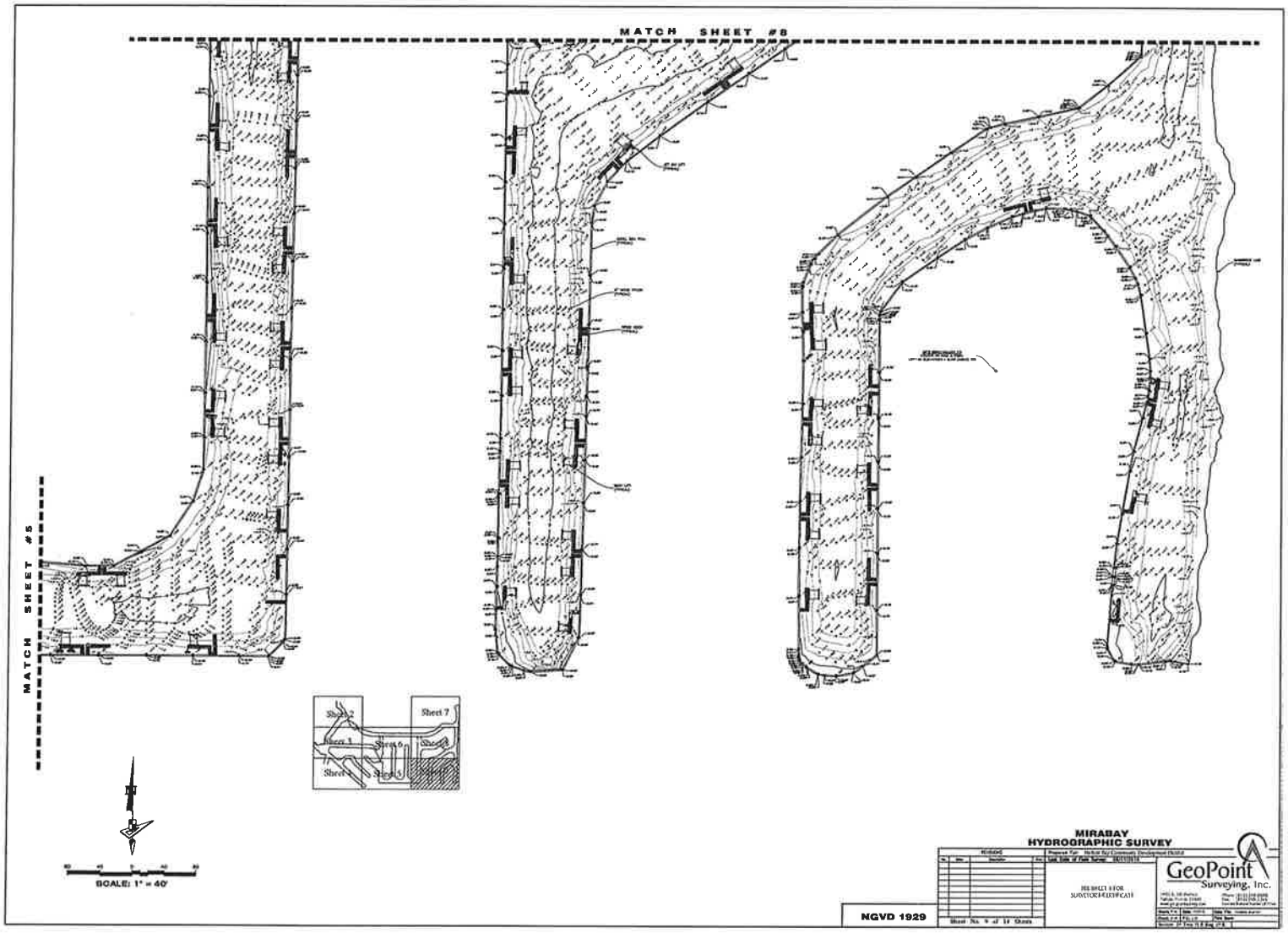
MIRABAY
HYDROGRAPHIC SURVEY

NGVD 1929

SEE SHEET 1 FOR SURVEYORS CERTIFICATE

GeoPoint Surveying, Inc.


MATCH SHEET #7
MATCH SHEET #6
MATCH SHEET #9
Sheet 2
Sheet 7
Sheet 3
Sheet 6
Sheet 4
Sheet 5
Sheet 1
N
SCALE: 1" = 40'
MIRABAY
HYDROGRAPHIC SURVEY
NGVD 1929
GeoPoint
Surveying, Inc.



MIRABAY
HYDROGRAPHIC SURVEY

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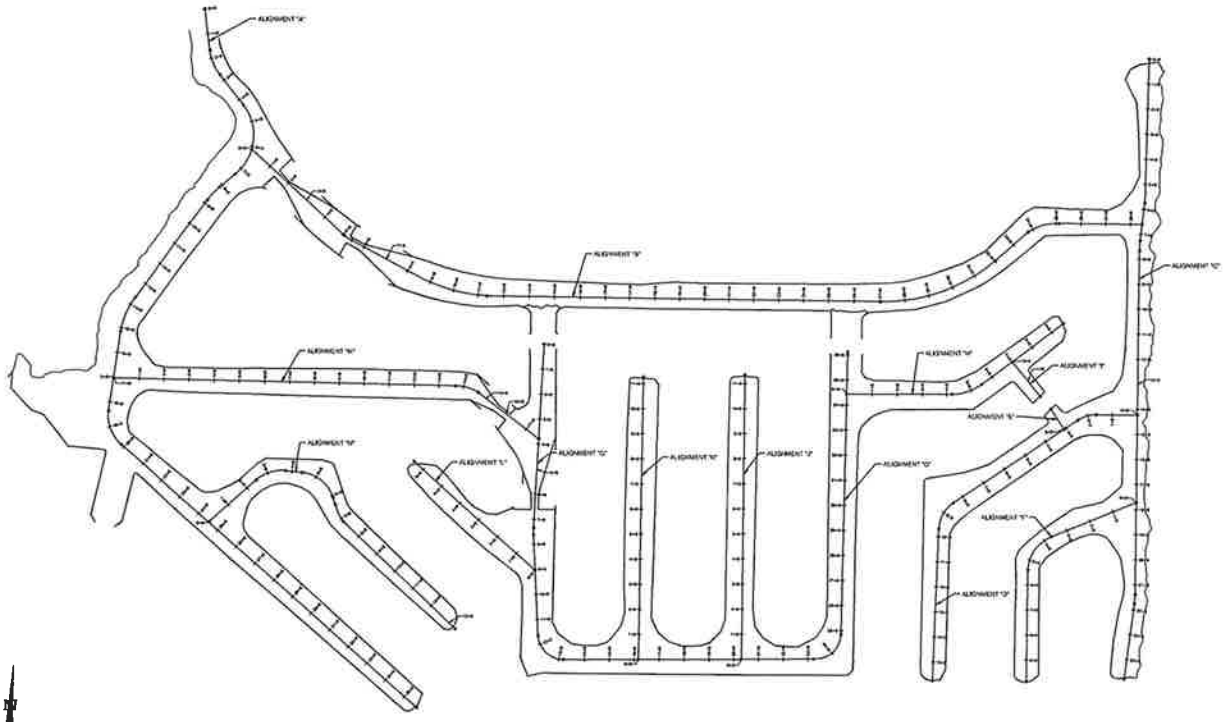

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MIRABAY
HYDROGRAPHIC SURVEY

REVISIONS			
No.	Date	Description	By

Prepared For: Harbor Bay Community Development District
Last Date of Field Survey: 10/11/2021

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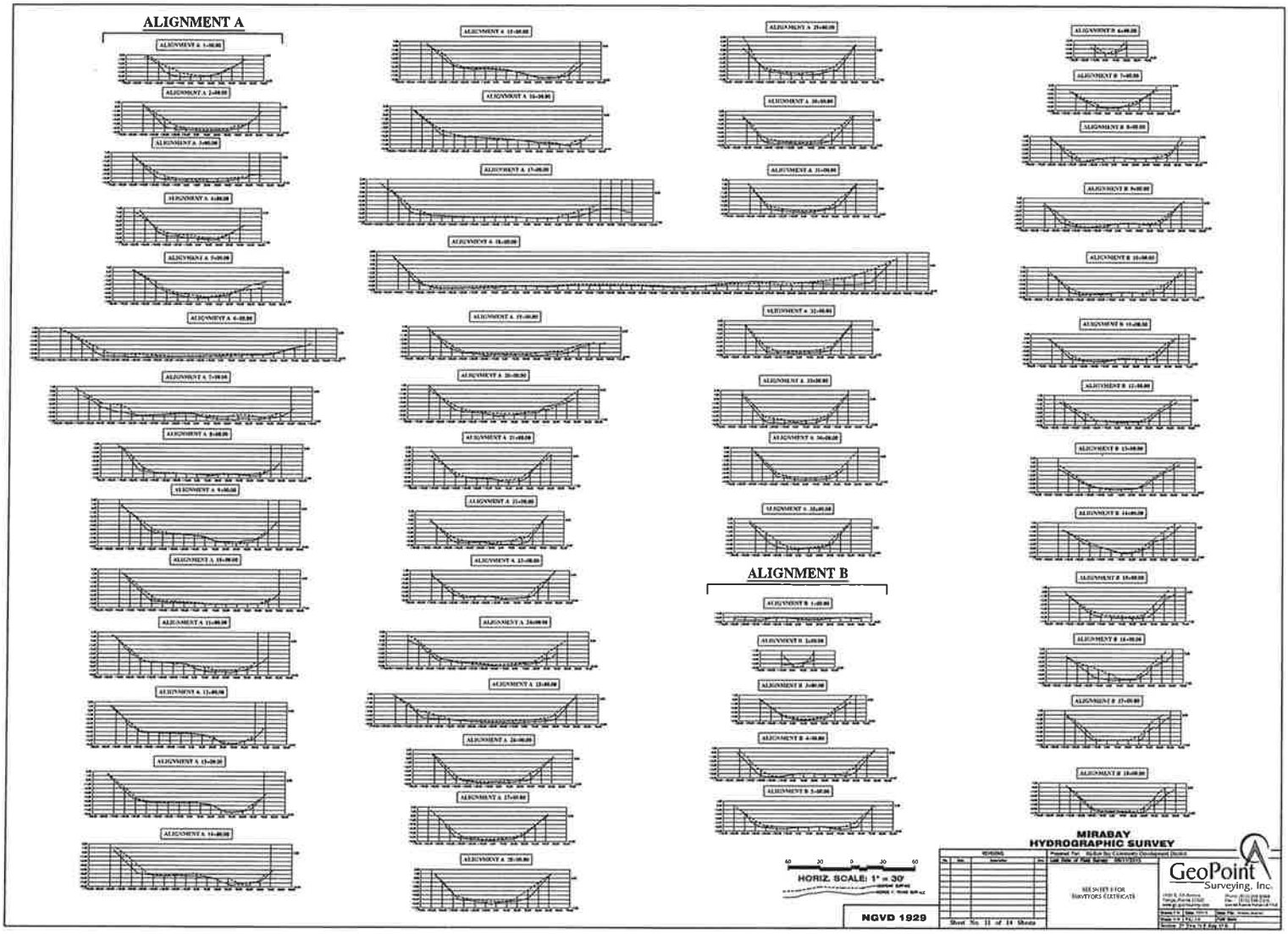
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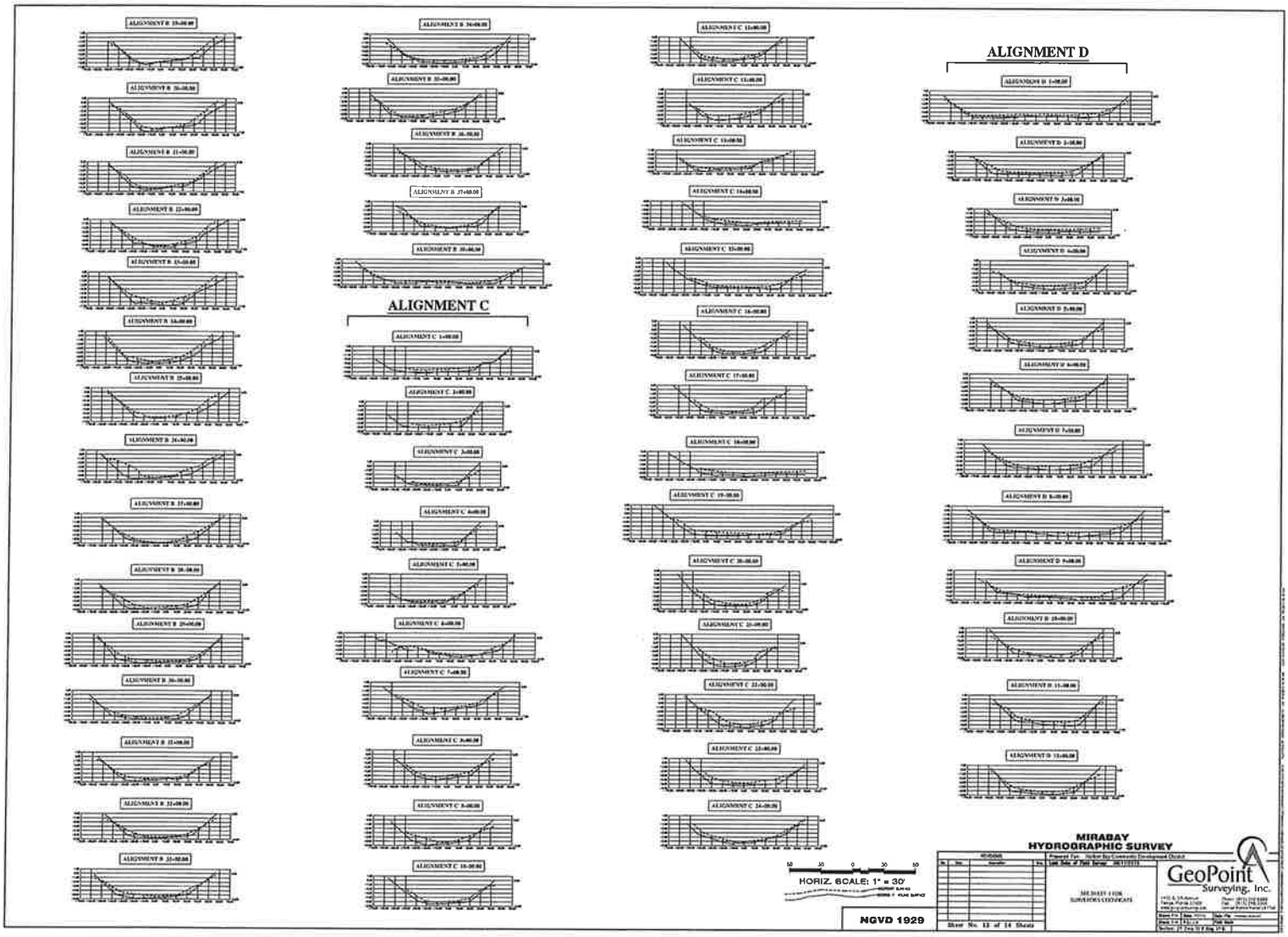

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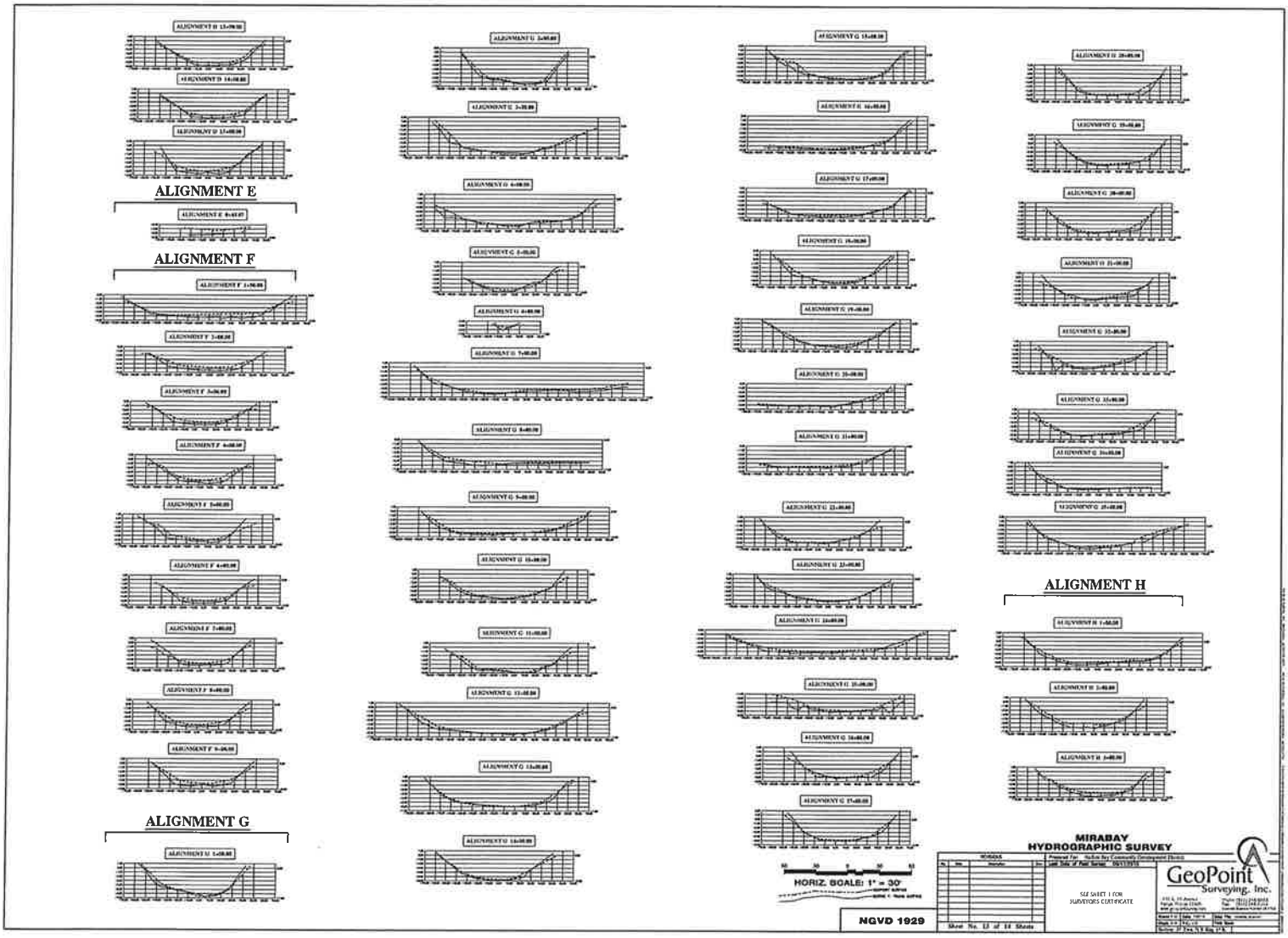
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MIRABAY
HYDROGRAPHIC SURVEY
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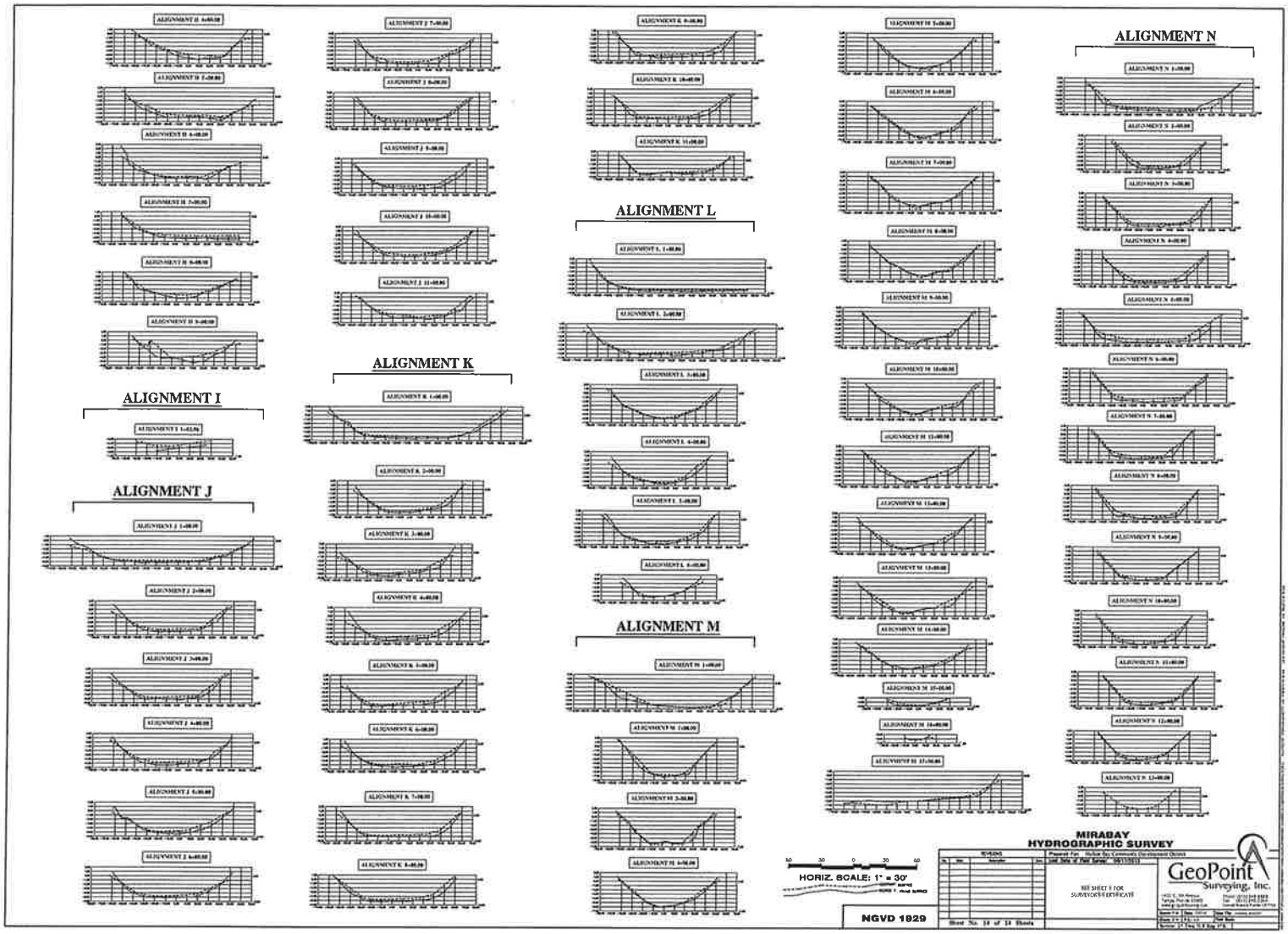
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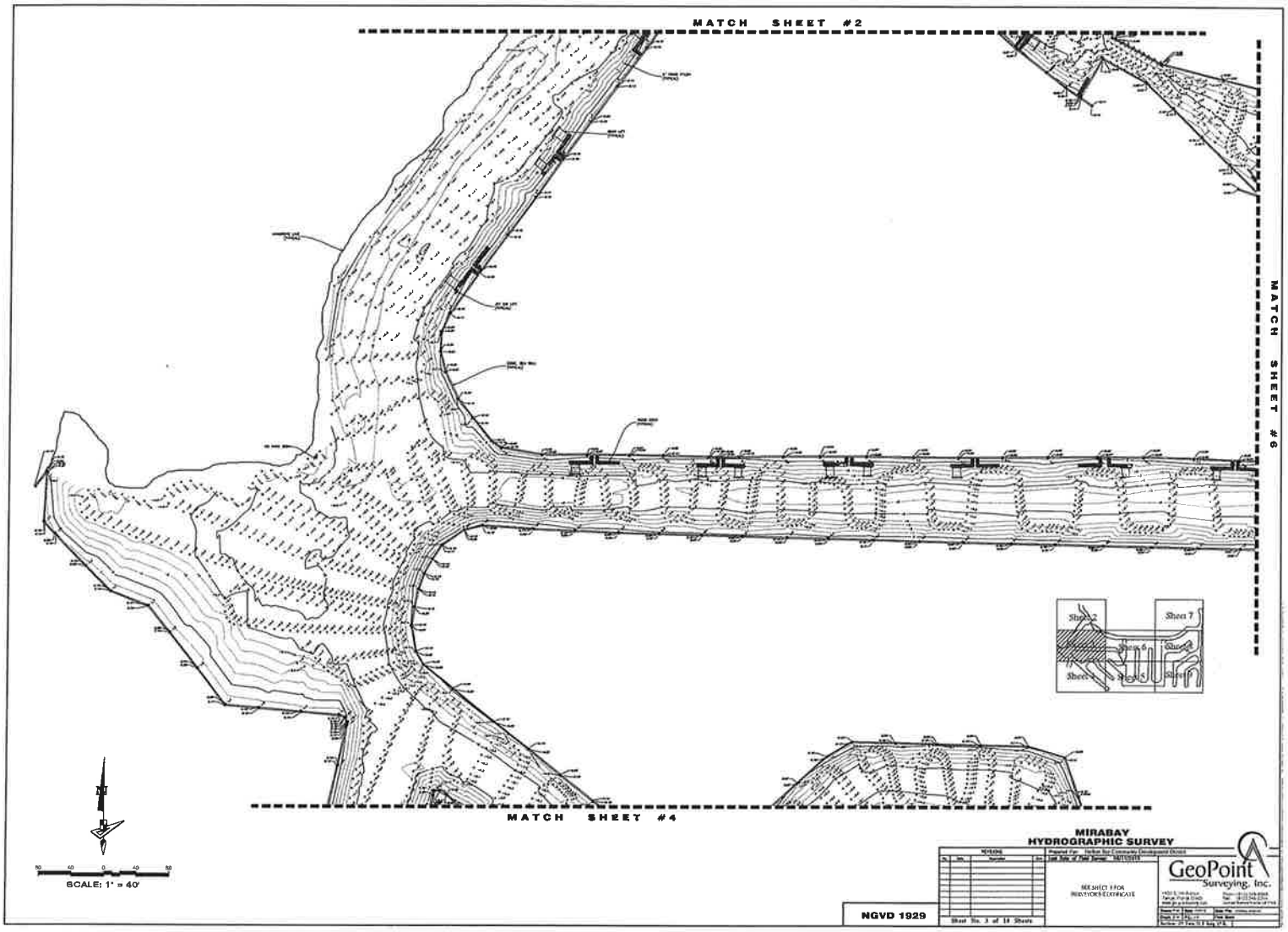
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HYDROGRAPHIC SURVEY
REVISIONS
No. Date Number Init.
Last Date of Field Survey: 10/17/2019
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Sheet No. 3 of 10 Sheets
NGVD 1929
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NAVIGATION STUDY

NAVIGATION STUDY REPORT

for

MiraBay
Apollo Beach, Florida

December 12, 2015

BUCHART HORN
ENGINEERS · ARCHITECTS · PLANNERS

1 Introduction

Mirabay as a community was designed with a bulkhead revetment management system as part of its master stormwater system. The existing bulkhead also serves as a retaining wall between the properties and canal system. The MiraBay community development is at the east side of Tampa Bay and immediately west of Tamiami Trail (U.S. Highway 41) in Apollo Beach, Florida. The site is nearly fully developed with most homes built along interior canals. There are approximately seven to eight miles of bulkhead along the back of the properties. The back of the properties adjacent to the bulkheads consist of uplands with amenity structures (i.e. pool and pool decks, screen houses and landscape walls). The canal system serves as a navigable waterway with access to Tampa Bay. It also serves as a stormwater conveyance system for the MiraBay community.

The aims of the present study are:

- Evaluate the dimensions of the MiraBay waterways including canal fairways and personal mooring berths.
- Compare the methodologies proposed by others for certain bulkhead modifications specifically as it relates to navigation in the waterways and berths.
- Develop suitable guidelines and procedures to be applied to navigate the MiraBay waterways smoothly and safely.

2 Reference Vessels

Vessel draft and height are the main parameters determining whether the network of canals is accessible for certain recreational craft. According to the MiraBay by-laws, a canal dock is allowed a vessel with a maximum length of one-half the size of the lot, as designated by the Harbor Bay Community Development District (CDD) plus 5 feet up to a maximum of 45 feet.

The following table shows a few vessel dimensions up to 45 feet in length and typical water depths for the allowable vessel classes per recognized published design data:

Location	Length (feet, maximum)	Beam (feet)*	Draft (feet)*	Typical Water Depth (feet, MLLW)*, **	Pleasure Boat Classification***
Canal Dock	17	7.5	2.5	5.5	II
Canal Dock	35	14	4.5	8	III
Canal Dock	45	16	5	8	III

Table 1: Standard Inventory Vessel Lengths, Beam and Draft Measurements
*ref: Marinas and Small Craft Harbors, 2nd ed., Tobiasson
**Water depths shown are about 3 feet greater than the draft of a representative deep draft vessel
***ref: Classification of Pleasure Boats as proposed by Permanent International Association of Navigation Congresses (PIANC) 1965. Class II-overall length 16ft < L < 26ft (5m < L < 8m), Class III overall length 26ft < L < 49ft (8m < L < 15m)

3 Hydraulic Parameters

Table 2 below lists the various water levels at MiraBay, Apollo Beach, Florida as provided by the National Oceanic and Atmospheric Administration (NOAA):

MIRA BAY, APOLLO BEACH, FLORIDA	
Latitude: 27°46'31.33"N	
Longitude: 82°25'38.45"W	
Water Level	**Elevation (Ft, NAVD88)**
Mean Higher High Water (MHHW)	0.8139
Mean High Water (MHW)	0.5319
Local Mean Sea Level (LMSL)	-0.3141
Mean Low Water (MLW)	-1.2119
Mean Lower Low Water (MLLW)	-1.6348

NGVD29	-0.8992
Datum Shift	
NAVD88 = NGVD29 – 0.899 ft.	
NGVD29 = NAVD88 + 0.899 ft.	

Table 2: Water Levels at MiraBay (ref: NOAA vDatum 3.2)

This navigation study considers MLLW to assess the full functionality of the waterways available to vessel navigation.

4 Wind Parameters

Wind problems must be prevented as far as possible on routes for recreational navigation. Problems are caused mainly by fluctuations in wind strength as a result of sudden lulls in the wind, abrupt transitions and wind effects around high buildings. It is unclear whether the canals that join the main waterways were designed with a view to possible wind problems.

5 Waterway Elements

The network of waterways at MiraBay includes an entrance channel, interior channels, fairways and personal berths, as well as a lagoon accessed by a boat lift structure. Table 3 lists various dimensions and water depths for the waterways at MiraBay with reference to MLLW.

Waterway Location	Width (avg., feet)	Depth at Center of Fairway	Depth at Waterward Edge of Dock	Depth at 12.5 ft. Waterward of Dock
Islebay Drive, North	90	4.90	3.66	4.49
Islebay Drive, South (E & W)	110	4.40	2.68	3.89
Islebay Drive, East	92	4.32	3.47	4.20
Islebay Drive, West	160	5.26	3.95	4.39
Sea Trout Place, East	115	4.16	3.43	4.19
Sea Trout Place, West	115	5.11	2.71	3.91
Sea Turtle Place, East	104	4.26	3.13	3.98
Sea Turtle Place, West	112	4.16	2.96	3.83
Skimmer Drive, East	92	4.08	3.14	3.82
Skimmer Drive, West	104	4.16	3.05	4.08
Seagrass Place, East	92	4.16	3.12	4.10
Mirabay Boulevard, North	92	4.39	3.04	4.46
Mirabay Boulevard, South	100	4.65	3.66	4.55

Table 3: Dimensions and Water Depths of Existing Waterways.
Note: Fairways that vary by more than several feet in width indicate critical widths. Waterway locations refer directionally to various roadways listed. Water depths are referenced to MLLW.

An entrance channel connects Tampa Bay with two interior channels along Islebay Drive, one located to the north and the other west. Channel width is defined as the clear width at the design depth, and specifically does not include the channel side slopes. According to UFC 4-152-07, minimum channel widths for 2-way traffic should be the greater of:

- 100 feet
- 5B, where B = Beam of the largest vessel expected to use the channel;

As can be seen in Table 3, the channel to the north of Islebay Drive at 90 feet wide is approximately 10 percent narrower than that preferred based on the above criteria; however, given the restricted wave climate it may be considered acceptable by some for 2-way traffic depending on user skill of each vessel.

A hydrographic survey for the MiraBay waterways has been prepared by GeoPoint Surveying, Inc. 7/7/2015 depicting the state of the waterway bottom at the MiraBay community (see Attachment 2). The vertical datum reference is MLLW as discussed in Section 3.

Fairways provide vessel access from interior channels to individual berths. The waterway canals having the marginal side-tie berths at MiraBay are considered fairways and not interior channels. Table 3 lists dimensions and water depths of existing fairways at this community. The fairways should have been designed to provide as much room as necessary to allow safe boat maneuvering under existing environmental parameters. In practice the actual sizing of a fairway is based on a certain rule of thumb according to which the fairway width is equal to the design boat length multiplied by a certain coefficient.

Per UFC 4-152-07, the minimum clear width of fairways should be based on the following where L_b is the length overall (LOA) of the design vessel:

- 1.5 L_b (finger slips) for power boats and 1.75 L_b for sailboats, where L_b is the length of the longest berth perpendicular to the fairway where vessel are not allowed to overhang the berth.

- 1.5 L_b (with side/end-ties) for power boats and 1.75 Lb for sailboats, where L_b is the length of the longest berth parallel to the fairway where the fairway width does not include the side-tie berth width. A side/end tie is a berth at the end of the main walkway adjacent to the interior channel (See Figure 2).

While the general rule of thumb most frequently used assumes a clear distance between boat extremities located on both sides of the fairway is equal to 1.5 times the longest boat length, in the past the coefficient used frequently was equal to 1.25. It is noted that certain fairways at the MiraBay community appear to have been designed closer to this 1.25 coefficient (see Table 3). With that said however, most fairways appear to meet the 1.5 coefficient as can be seen by comparing Tables 3 and 4.

The table below lists the minimum recommended fairways based on the above criteria for the vessels at MiraBay:

Location	Length (feet, maximum)	1.25 L_b	1.25 L_b + 2 Berths*	1.50 L_b	1.50 L_b + 2 Berths*
Canal Dock	17	21.25	46.25	25.5	50.5
Canal Dock	35	43.75	68.75	52.5	77.5
Canal Dock	45	56.25	81.25	67.5	92.5

Table 4: Minimum Clear Width of Fairways and Berths
* Berths assumed at 12.5ft each x 2 berths = 25ft.

Fairway depths are determined using the same considerations as interior channels.

Berth widths should be based on the particulars of the vessels to be berthed or recognized sources such as UFC 4-152-07 Design: Small Craft Berthing Facilities, or Marinas and Small Craft Harbors, 2 ed., Tobiasson may be referenced for typical vessel dimensions. The minimum width of a berth according to UFC 4-152-07 shall be:

- Double berth: 2 x Beam of the wider vessels served + clearance for environmental conditions, boater experience, and fendering system
- Single Berth: Beam of the widest vessel served + clearance for environmental conditions, user experience, and fendering system

Berth depths should be the same as the fairway depth. Depending on vessel characteristics, site and environmental conditions, and user skill, the bottom clearance for safe navigation will vary. Site conditions include rip rap, mangroves or other shoreline protection elements. It is recognized based on generally accepted navigation standards that the minimum water depth extending to a hard bottom should be no less than 3 feet below the keel of the deepest draft boat at the design low water level taken as the Mean Lower Low Water (MLLW) tidal datum. This distance is also recommended by Tsinker (Marine Structures Engineering, 1995, Tsinker).

6 Construction

6.1 Existing Sheet Pile Bulkhead

The existing bulkheads were designed and constructed between approximately 2000 and 2003. The existing anchored bulkheads were designed using vinyl sheet piles with a reinforced concrete cap. Hot dipped galvanized anchor rods extend from the back of the bulkhead cap to below-grade deadmen approximately 15 feet inland. Based on previous understanding of the original design and our discussions with Ingenium and HBCDD, the deadmen were constructed under pool structures at many locations. The top of the bulkhead cap was designed and constructed at elevation +6 MSL.

The permitted design showed the waterside berm at elevation +1 adjacent to the bulkhead. The design width of the waterside berm was about 5 feet. The most recent bathymetric survey performed by GeoPoint Survey, Inc. in July 2015 indicates that the waterside berm significantly eroded away on the eastside of the development with sounding elevations ranging between approximate elevation 0 and elevation -1.5. Where mangrove trees were planted and thriving, predominately at the west side of the development, the waterside berm has remained intact between approximate elevation +1 and elevation +2 MSL. Where the waterside berm has eroded, the bulkhead has excessive vinyl sheet deflection and cap rotation. In extreme instances at the eastside of the development, sheet pile deflection had become significant and caused localized rupture of the existing vinyl sheet piles. Hence, the existing bulkheads in those areas are undergoing emergency repairs that are described below as an Option 3 bulkhead rehabilitation alternative. The rehabilitation alternatives came about through on site pilot testing of the design alternatives performed by Ingenium, Inc. in 2014. The pilot study alternatives have since been peer reviewed and redesigned by Langan Engineering and Environmental Services, Inc., the project bulkhead engineers. The bulkhead rehabilitation alternative design Options 1, 2 and 3 are briefly described below.

6.2 Bulkhead Rehabilitation Alternatives

6.2.1 Option 1: Rip Rap Alternative

The Option 1 Rip-Rap Alternative consists stabilizing the existing vinyl sheet pile wall with rip-rap placed immediately waterside of the bulkhead. The rip-rap would extend a horizontal distance of approximately 8 feet from the bulkhead to the back edge of timber dock piers. The top of the rip rap would be at elevation +4 and is sloped at 2 horizontal to 1 vertical (2H:1V) downward into the canal.

6.2.2 Option 2: Rip Rap with Secondary Vinyl Sheetpile Wall Alternative

Option 2 was part of the pilot test study in 2014 and was constructed similar to Option 1, except the toe of the rip rap slope was shortened to about 4.5 feet by installing a secondary vinyl sheet pile wall 4.5 feet in front of the existing bulkhead. The pilot study Option 1 and Option 2 alternatives also had a waler with helical anchors as tie back support. This Option 2 alternative was peer reviewed by Langan who deemed it undesirable. The Option 2 alternative was therefore discarded.

6.2.3 Option 3: New Bulkhead using Fiberglass Reinforced Polymer Sheet Pile

The Option 3 bulkhead rehabilitation alternative consists of constructing a new bulkhead using significantly stiffer fiberglass reinforced polymer (FRP) sheet piles installed deeper than the previous vinyl sheet piles were driven and immediately in front of the existing PVC sheet pile wall. A new larger reinforced concrete cap envelopes the old bulkhead cap to act in conjunction with the new bulkhead. The new sheet pile wall is currently being installed as emergency repairs at several areas throughout the eastern half of the development. The FRP sheet piles are being installed with tip elevations at approximately elevation -10 feet in lieu of placing back the waterside berm to elevation +2 feet at the emergency repair areas. Additional tie-rod anchors are also being installed about every 13 ft on centers. These tie-rods are being incorporated into the new heavily reinforced concrete bulkhead cap.

A number of cross section profiles have been prepared as follows that depict representative design vessels of varying size and draft. The vessel geometry shown in these profiles is used only for assessment purposes and is not intended to match that of any particular craft. As can be seen in these profiles, clearance distances exist beneath the vessels to the soft mudline less than the recommended 3 feet. However, the recommended minimum 3 foot clearance to the hard rip rap is satisfied since it would be placed no further than the back edge of the docks which measure roughly 4 feet wide.

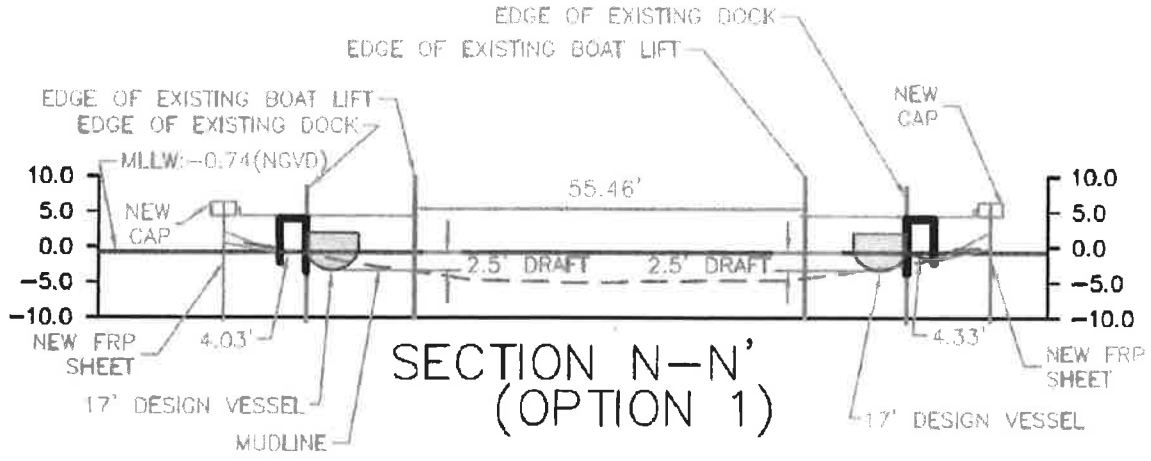


Figure 1: Waterway Profile (ref: vDatum MLLW)

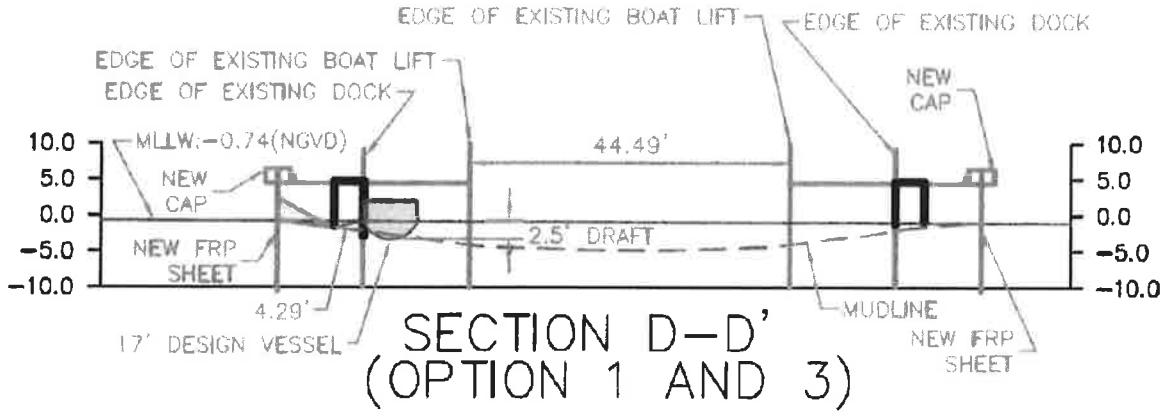


Figure 2: Waterway Profile (ref: vDatum MLLW)

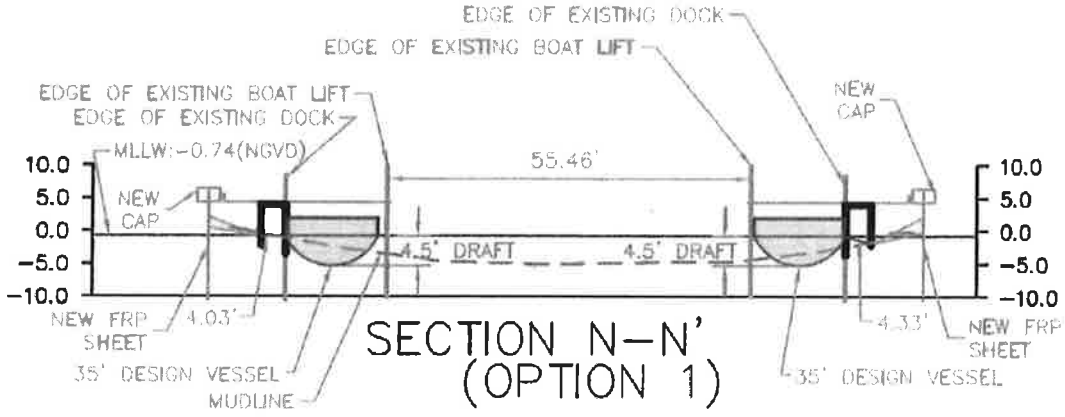


Figure 3: Waterway Profile (ref: vDatum MLLW)

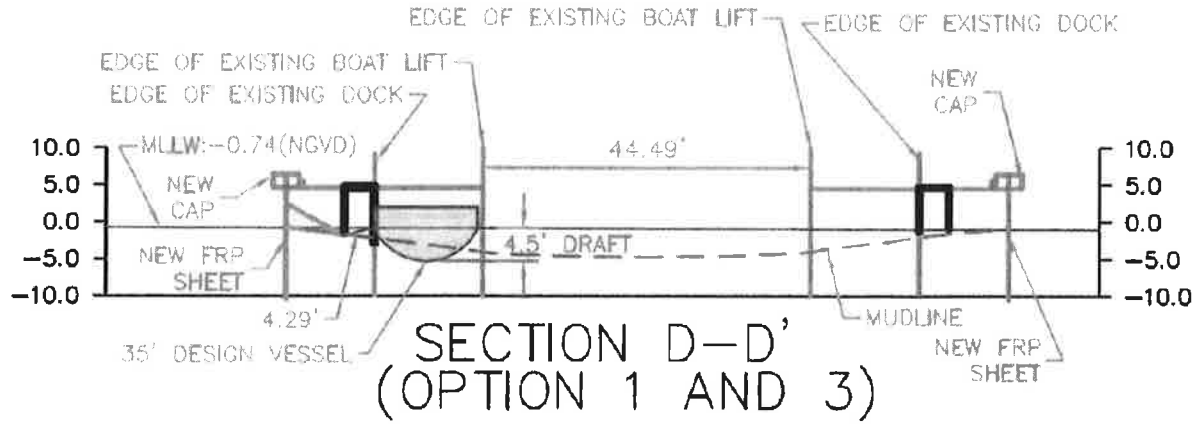


Figure 4: Waterway Profile (ref: vDatum MLLW)

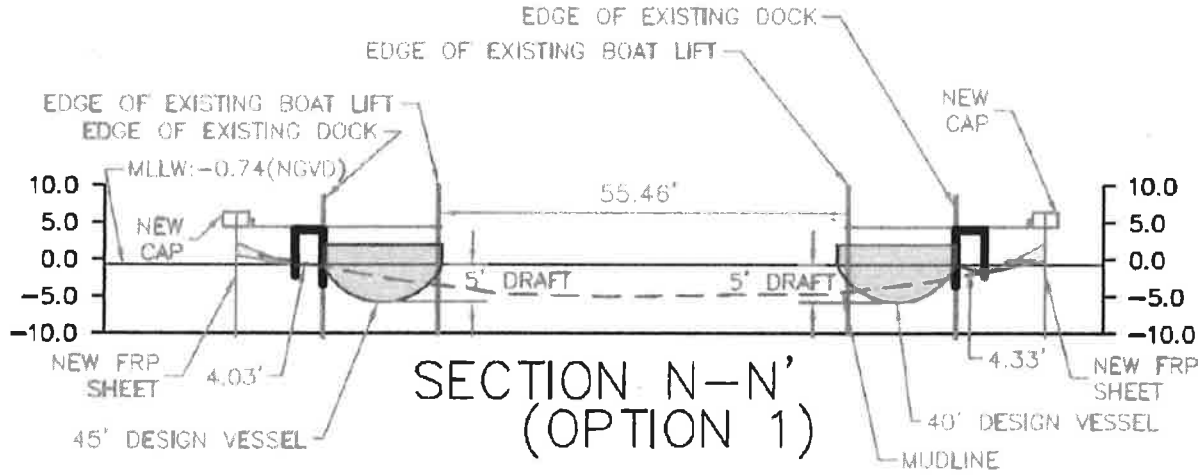


Figure 5: Waterway Profile (ref: vDatum MLLW)

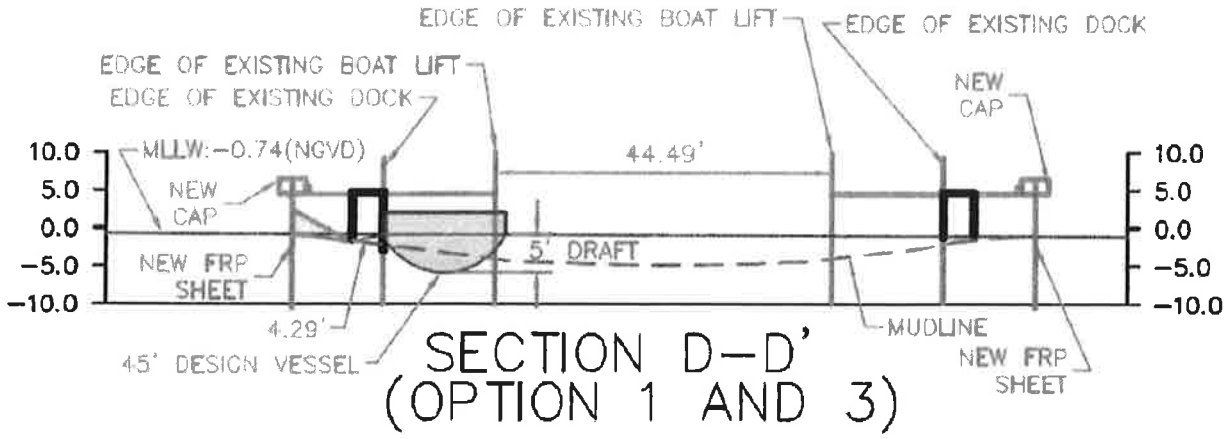


Figure 6: Waterway Profile (ref: vDatum MLLW)

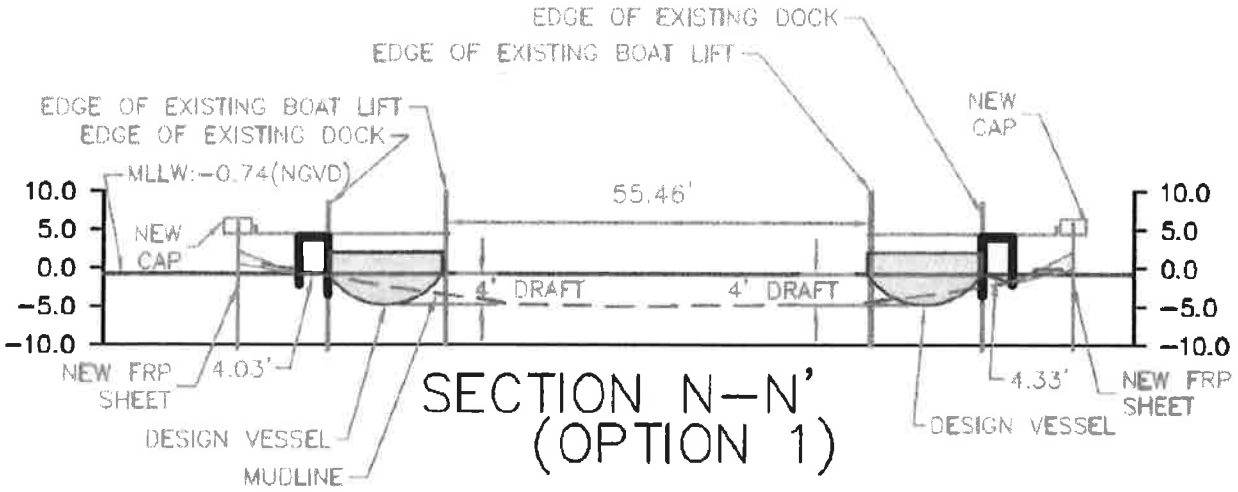


Figure 7: Waterway Profile (ref: vDatum MLLW)

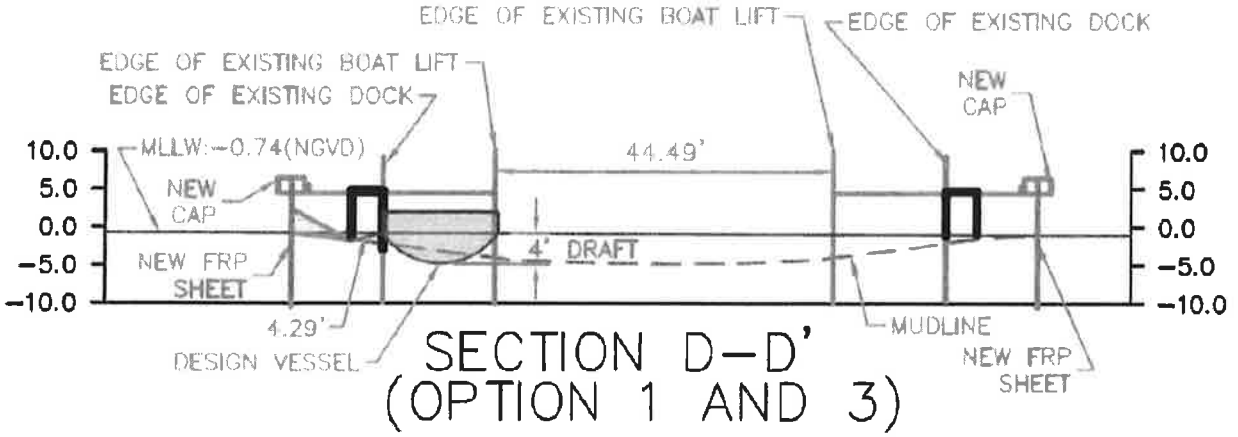


Figure 8: Waterway Profile (ref: vDatum MLLW)

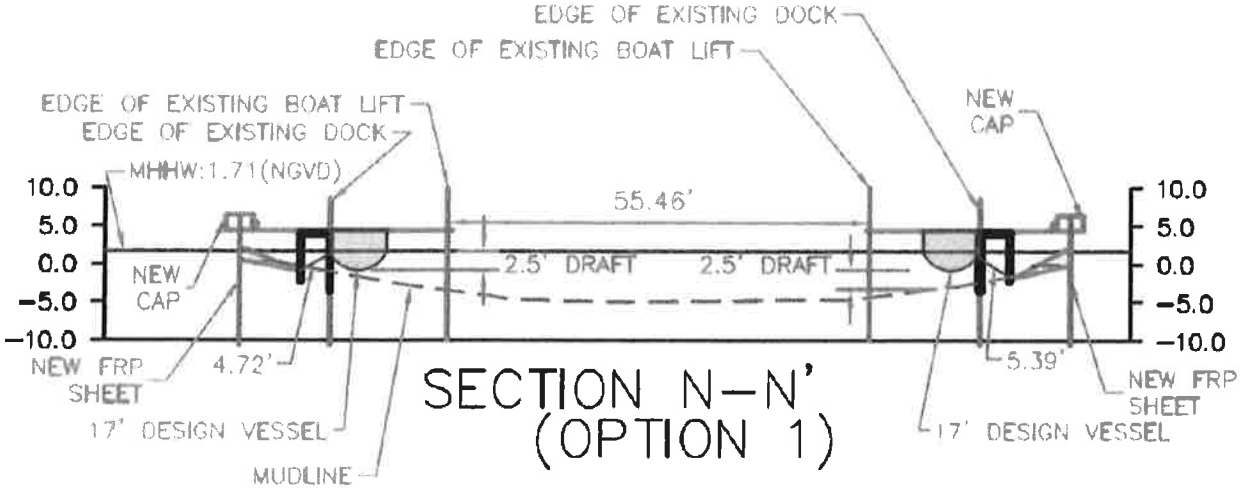


Figure 9: Waterway Profile (ref: vDatum MHHW)

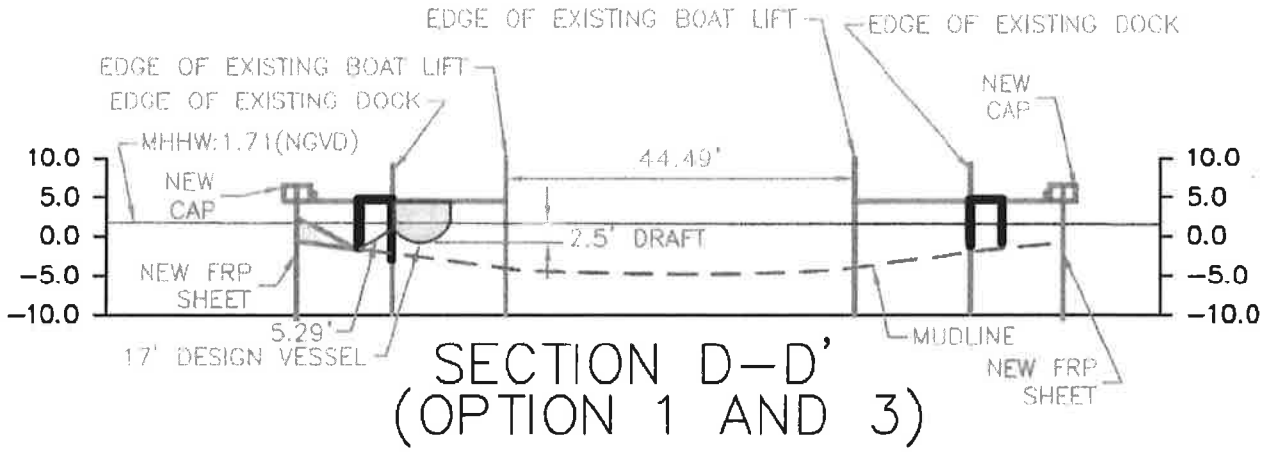


Figure 10: Waterway Profile (ref: vDatum MHHW)

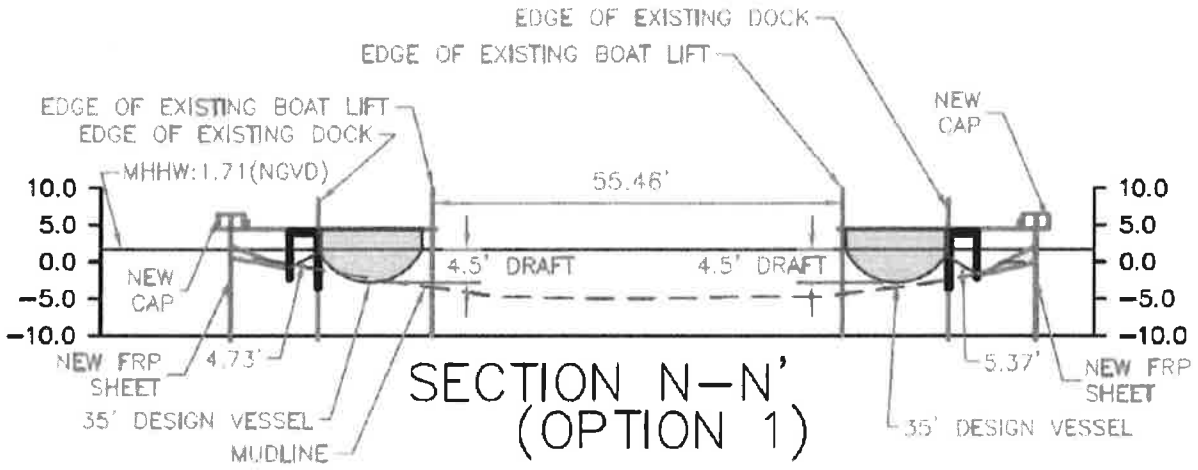


Figure 11: Waterway Profile (ref: vDatum MHHW)

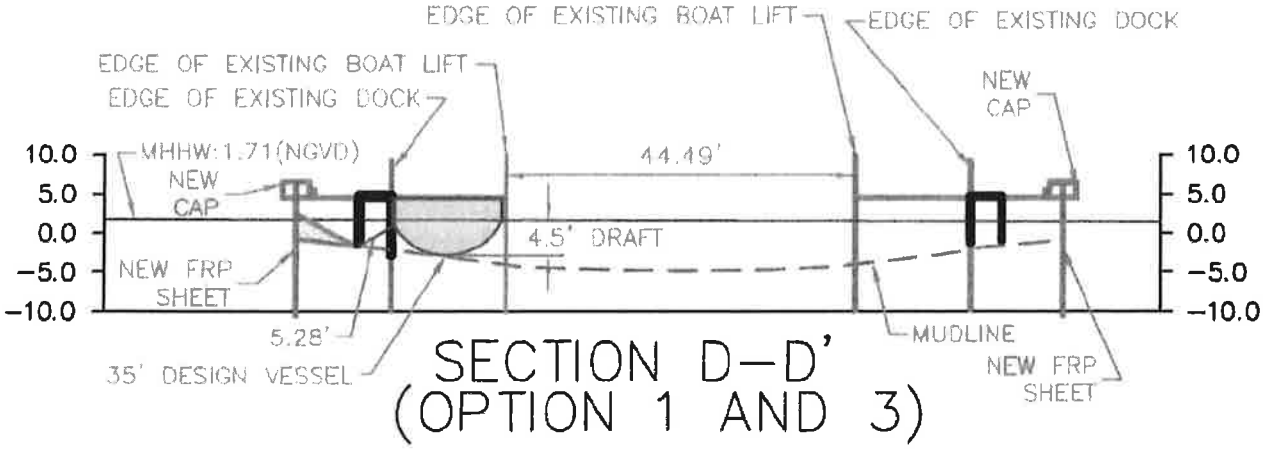


Figure 12: Waterway Profile (ref: vDatum MHHW)

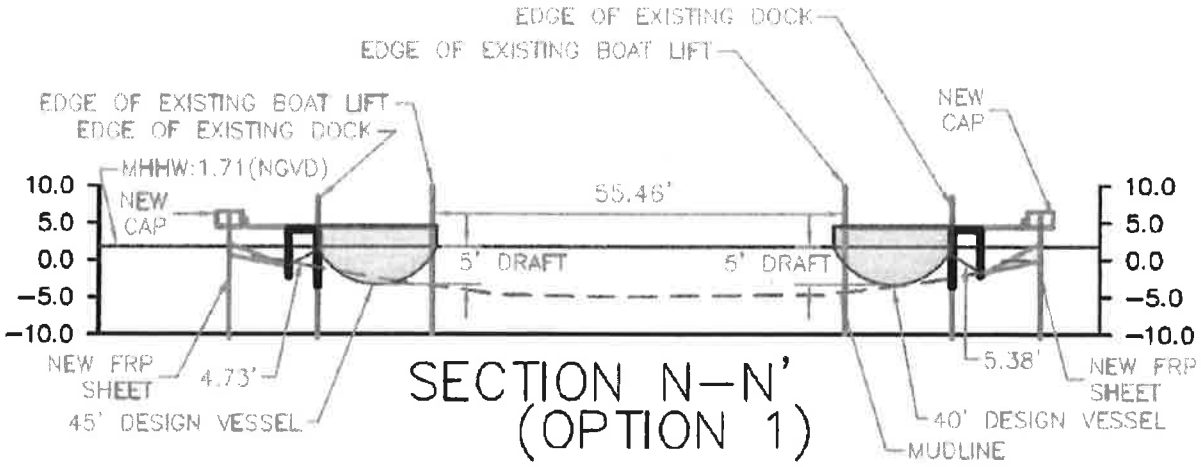


Figure 13: Waterway Profile (ref: vDatum MHHW)

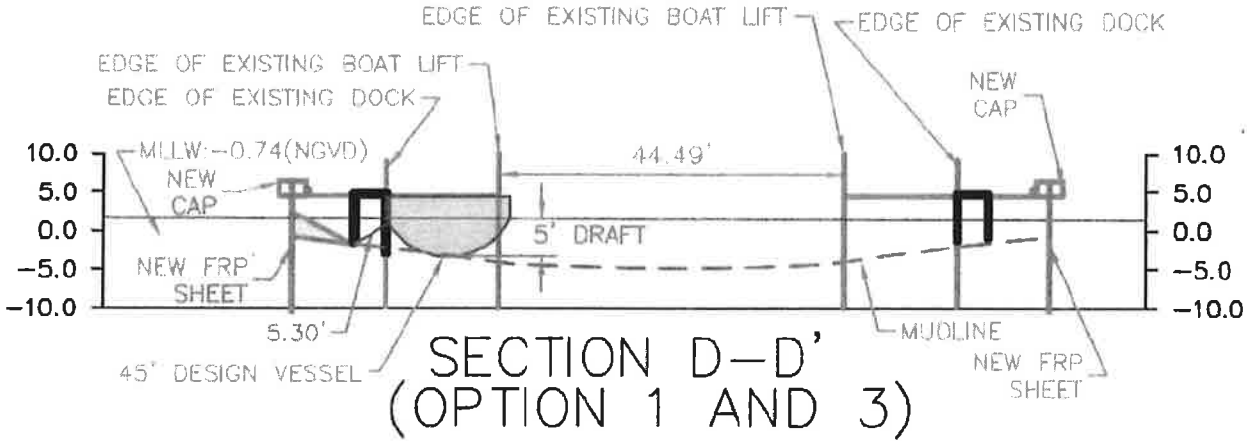


Figure 14: Waterway Profile (ref: vDatum MHHW)

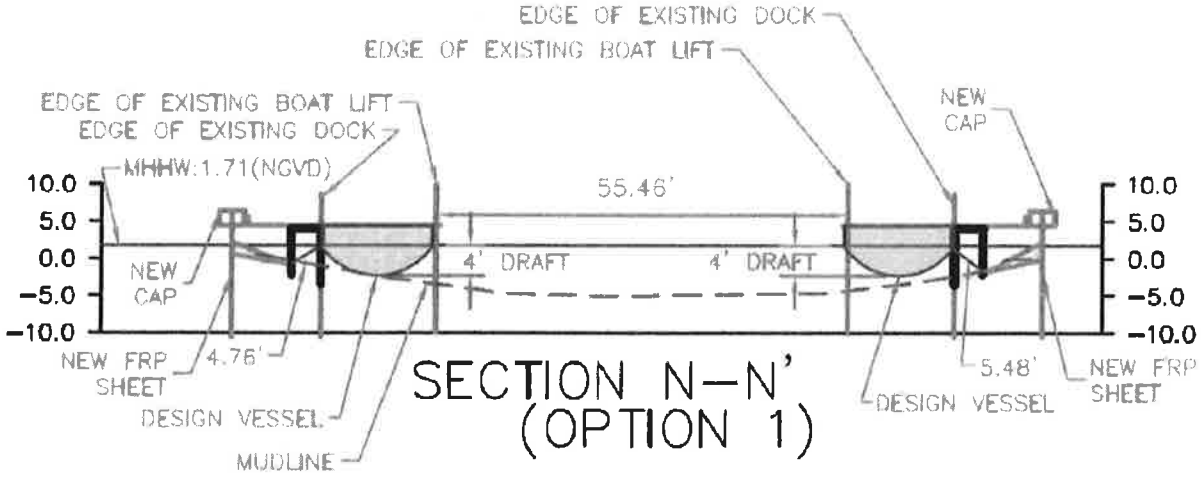


Figure 15: Waterway Profile (ref: vDatum MHHW)

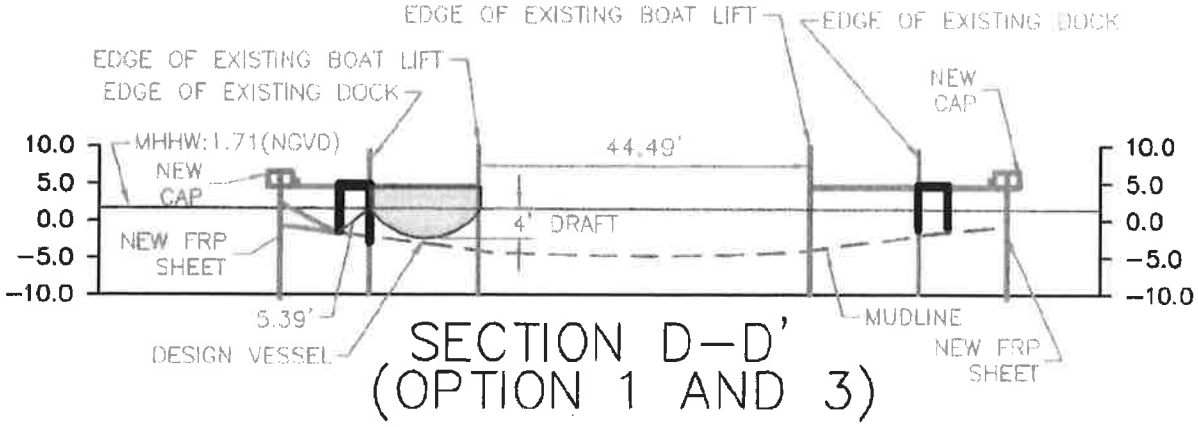


Figure 16: Waterway Profile (ref: vDatum MHHW)

6.2.4 Modified Option 1: Rip Rap, Mangroves and New Cap

Mangroves can help prevent erosion by stabilizing shorelines along the network of bulkheads with their specialized root systems. This has been evidenced by site surveys made throughout MiraBay indicating mudlines along the bulkheads at or close to their original elevations where mangroves are growing. Mangrove roots act not only as physical traps for sediments but provide attachment surfaces for various marine organisms. Mangroves also filter water and maintain water quality and clarity.

Naturally recruiting mangroves would protect sediments in front of the bulkhead from erosion as part of a long-term maintenance solution to the bulkhead system and provide improved water quality and attractive healthy ecosystems.

7 Conclusions

Table 3 lists dimensions and water depths of existing fairways at this community. The fairways should have been designed to provide as much room as necessary to allow safe boat maneuvering under existing environmental parameters. While the general rule of thumb most frequently used assumes a clear distance between boat extremities located on both sides of the fairway is equal to 1.5 times the longest boat length, in the past the coefficient used frequently was equal to 1.25. It is noted that certain fairways at the MiraBay community appear to have been designed closer to this 1.25 coefficient (see Table 3), however most fairways appear to meet the 1.5 coefficient as can be seen by comparing Tables 3 and 4.

The right of a vessel to have the navigable waters free of obstructions is paramount. It is recognized based on generally accepted navigation standards that the minimum water depth and clearance below the keel or prop of the deepest draft boat extending to a hard bottom should be no less than 3 feet and for a soft bottom no less than 2 feet below the Mean Lower Low Water (MLLW) tidal datum subject to environmental regulatory criteria. These clearance distances are recommended for safe navigation and berthing for the varying size vessels allowed at the MiraBay community, the existing and proposed site conditions, environmental conditions, and expected user skill. The cross sections through the canals contained in Section 6.2.3 show a sloped mudline profile that may result in restricted water depths at the berths at lower tide levels such as MLLW. In fact, it has been reported that various boats bottom out in the mud during lower tide levels

As discussed above, Option 1 includes placement of rip rap alongside the bulkhead extending out approximately to the back, landside edge of the parallel canal docks. Clearance distances would be greater than 3 feet from vessels to the toe of the proposed rip rap since the rip rap would not extend beneath the docks which measure

approximately 4 feet in width. Nonetheless, taking a vessel towards the bulkhead area landward of the berths where rip rap placement is proposed under Option 1 may result in undesirable effects.

When transiting an area where there is a submerged obstruction to navigation such as the proposed rip rap in Option 1, a mariner is entitled to rely on the accuracy of soundings indicated on a navigation chart and signage on the shore unless he/she has notice they may be inaccurate. As such, if Option 1 is constructed, a post construction bathymetric survey should be performed and made available to the MiraBay community. Additionally, any underwater obstacles should be marked with beacons or another notification device. More specifically, safety navigation signage is strongly recommended to be affixed at regular intervals along the bulkhead warning boaters of the underwater obstructions. Fender piles may also be driven in alignment with the waterside edge of the docks at regular intervals providing both a visual marker and periodic fendering for vessels nearing the underwater obstructions. If mangroves were successfully planted or naturally recruited as part of the remediation program, these would act as natural markers indicating the location of the rip rap.

When navigating a vessel throughout the MiraBay environment, precise navigation is required for safety, efficiency, repeatability, accountability and to be systematic. However, the class of recreational craft at MiraBay is most likely depending mostly on visual information and perhaps depth finders. This precise navigation becomes more important during higher water levels such as MHHW which may suggest to an inexperienced boater that adequate water depths exist for navigating landward of the outside edge of the docks, thereby placing the vessel in proximity of the proposed rip rap considered in Option 1 and possibly striking it causing damage to the vessel.

Regardless of the type of navigation being used, there may be no practical action that can be taken to overcome inexperienced user skill so even safety signage and precise navigation instrumentation is not a guarantee that vessel damage does not occur for certain users if the Option 1 bulkhead rehabilitation alternative that involves placement of rip rap along the bulkhead wall is constructed. It is likened to driving a car in proximity to a guardrail; if you keep driving towards the guardrail the car will eventually strike the rail causing damage to the car. Boater skill is paramount to safe navigation in all water bodies and should be taken seriously, albeit it may not be possible to mandate this in the MiraBay community.

Consideration of future dredging operations is warranted in this study. The bulkhead design is sensitive to increase in the height of the exposed face. Election of Option 1 must be carefully considered in connection with any possible future dredging requirements that may jeopardize the structural integrity of the bulkhead in the form of further lateral deformation or failure of global or toe stability.

All bulkheads must have sufficient strength to resist the lateral soil pressure exerted on the structure by the soil on the upland side. A bulkhead is pushed towards a waterway by lateral soil pressure. The bulkhead structure has to transfer that force back into the surrounding earth to prevent lateral displacement and failure. At the bottom of the bulkhead, this resistance against "toe kickout" is provided by the soil in which the bottom of the bulkhead is embedded. Dredging near the existing bulkhead may remove sediment that is working to prevent this toe kickout for the structure. If sediment is removed from the waterway side of the bulkhead (or front side), then the resistance capacity at the bottom of the wall would be weakened. Dredging may also increase the vertical distance between the top of the bulkhead and the mudline, which is the same effect as making the bulkhead taller. This could lead to increased lateral deformation. These conditions could lead to failure of global or toe stability.

The MiraBay docks are also susceptible to any over dredging that may occur. Dredging near the existing docks may remove sediment that is working to prevent lateral and vertical stability of the docks. If sediment is removed adjacent to the piles, then their overall structural capacity would be weakened. This may cause increased lateral bending movement during berthing maneuvers and high wind events, or perhaps even a permanent deformation of the dock structures.

It may seem an obvious conclusion at this point, but election to construct a new bulkhead as described for Option 3 would eliminate the potential navigation hazards for inexperienced boaters associated with the rip rap proposed under Option 1. More specifically, Option 3 does not involve any rip rap as part of its rehabilitation solution.

Q & A FROM JANUARY 17 AND APRIL 27, 2017

Based on your Statement of work which I have read and I do not believe any of these below apply, but the CDD Board should have this on the record;

Does your statement of work include the following concerns and costs associated with: We are assuming you are referring to Master Project drawings?

- Residents upland issues? No. the master rehabilitation plan is to repair the seawall. However, stabilizing the seawall would be beneficial to the upland performance.
- repair options that interferes or creates the loss of personal property? Not clear on the question.
- repair options that interferes with navigation? This was addressed by a specialty sub consultant. Please review the navigation report for details.
- possible litigation cost to the community from seawall owners? No.
- Follow on maintenance?
    - If Yes to any of these; please provide the cost analysis of each. Once all final repair work is done, we do not believe maintenance will be significant for either alternative. There does not include pre-existing upland wall issues that need to be addressed.

Based upon the evidence presented about the seawall in the litigation process that resulted in the $8.3 million settlement to the Harbor Bay CDD.

Do you agree that the original seawall:

- is of inferior material? No
    - If No, why? The existing vinyl sheet pile itself is structurally capable of supporting original design intent of with a waterside berm at el +2. However, the original design of the system in terms of stability (sheet pile embedment) was marginal. Lowering of the waterside berm below el +2 increase landside stresses on the sheet pile above the original design intent causing it to bend. This is apparent throughout the waterfront community. Where the waterside berm is significantly lower that el +2, there is significant deflection of the vinyl sheet. Where the berm has been stable and near el +2 the wall is performing significantly better. Keep in mind, the proposed rip rap will provide significant increased resistive pressure (passive pressure) making the wall stable.
- Is installed incorrectly to include areas that were dug out and then backfilled vs. vibrated in.
    - If No, why? Refer to prior litigation record. In any event, the actual wall performance (deflection) is being monitored.
    - If Yes; then can you pinpoint all the areas that occurred?
- is short sheeted in many areas?
    - If No, why? No, refer to prior litigation record.
    - If Yes; then can you pinpoint all the areas that occurred?

We know that there was an attempt to shore up worst bowings of seawall with the waler in 2006–2007, and now those walers have fractured in many areas.

We have been told that the reason is because of Hydrostatic pressure has bowed the walls outward in the vertical plane and you (Langan) said in a phone conversation with the district attorney, engineer and the CDD Board that you believe the wall is being deformed and made thinner by stretching of the vinyl. That is incorrect. Refer to the previous litigation record. Berm sloughing erosion was determined to be the root cause of sheet pile deflection.

- Therefore, does this not mean that the wall in those areas bowed is close to reaching its yield point?
    - If No, please explain how a thinner wall is still viable and is not more susceptible to fracture and/or rupture? There are varied degrees of wall deflection that we have identified on the monitoring plan. The green zones refer to less than 7/8 inch cap deflection, yellow zones refer to defection between 7/8 inch and 1 ¾ inch and light red zones refer to deflections between 1 ¾ inch and 2 ¾ inch. The dark red zones are the lowest state of wall defection where observed

rupture has occurred and; hence, new wall would be required. For zones that are in the green, yellow and light red, rip rap is a viable alternative.

- If Yes, does this make the wall more susceptible to fracture and/or rupture? The vinyl sheet piles are capable of large deflections before rupturing. For areas that are below the lowest direction criteria for rupture rip rap is a viable alternative.

From prior talks and presentations you have given the CDD Board and based upon these variables the following conditions have been identified:

- Fracturing, rupturing, or seam separation of the vinyl;
- Waler fracturing; failures
- Soil conditions that are different throughout.
- Cap fracturing;
- Berm is too low; and
- Vinyl short sheeted; or insufficiently driven into substrate

Have you estimated the stresses on the wall at rupture based on cap rotation and compared them to the inherent yield stresses of the vinyl material?

- If yes, how did they compare? We have theoretically estimated flexural stresses in the vinyl sheet based on varied waterside berm elevations. Stresses increase as the berm elevation decreases. Even for berm elevations at the lowest levels observed, the theoretical flexural stresses are ok.
- Did rupture occur above or below the material yield stress? See answer above. Theoretical flexural stress values should have been within the maximum allowable bending moment.
- If no, should that exercise by done for the purpose of determining viability of relying on the old wall with rip rap stabilization? Rip rap placed waterside against the existing sheet piles would decrease flexural stress levels well below the original design loads.

Do you confirm:

- the color in one area is not indicative of what the condition of a seawall section is in another area with the same color code? No.
  - If No, why? The color codes are indicative of similar ranges in cap rotation/sheet pile deflection.
- That seawalls with same color-coding might not exhibit equivalent conditions?
  - If No, why? Seawalls with the same color-coding are in the same range of deflections and generally the overall conditions are the similar as well.
- The color-coding only shows primarily the current level of rotation of the cap? Yes
  - If No, why?

In our talks, you have told the CDD board that the original cap has shown extensive fracturing—with internal fracturing as well.

Do you agree that:

- Normal weathering processes will cause the cap to eventually fall apart? Typically no, within the design life period. The cap material would be in safe stress states and reinforcing steel is suitably covered with concrete.
- Any attempt to seal the cap without complete encasement and sealant would have to be redone every 3 -5 years. The timeframe is unknown for sealant application.
  - If No, why?
- With sealing, you are also sealing in the moisture in the cracks that have already developed thus Internal weathering would continue and cause the cap to fail eventually anyway?
  - If No, why? Proper sealing techniques would be required, if and where used. Specialty contactors should be engaged.

Concerning Soil migration from all the uplands, it has been reported that soil has flowed through the wall itself and flowed under the wall. Once and for all, we dismiss the notion of soil migration under the wall. Any soil migration through the wall would not be through the vinyl material as it is impermeable, but through any localized breached in the sheet pile wall.

Based upon those factors

- Does placing rip-rap in front of the seawall fully stop the soil migration? No, rip rap is not the mechanism. As mentioned above, for localized soil migration from the upland through breaches in the sheet pile (i.e. weep holes without filter fabric, seam separations, etc.) are required to be addressed as part of the rip rap placement. The vinyl material itself is impermeable. As the Master Project plans indicate, the existing weep holes will be replaced with weep hole tubes, and any observed seam separations will be sealed.
    - If yes, how?
        - And if answered how, please explain how this will be monitored as the rip rap would not be below the wall to stop soil migration that goes under the wall? Once and for all, soil migration below the wall should be dismissed.
- With all the soil migration, how do you know there are no void pockets behind the wall? For either the new wall or rip rap designs, we are replacing the upper existing soils landside of the wall with an enhanced drainage system with clean sand that is being placed in a manner (hydro compaction) such that if fills voids created by the lateral deflection of the existing sheet piles with soil.
- do we know how many exist and where? See answer above.
- Are you concerned about cracking and soil loss at connection seams in areas where the wall is deflected (stressed)? Would re-sealing of the stressed seams be required from time to time? No. Any separation observed would be sealed at the time of rehabilitation.

You have stated that the wall has been stretched—made thinner—wherever it is bowing or the cap is rotated.

- Does this not mean means a product proven to be inferior in the prior litigations been made even more susceptible by having its millage (thickness) reduced? We do not concur with this statement.
- Would it still be true that the welds between the sheet pile sections that are highly probable that they start failing where the wall is under a permanently stressed condition? No.
- have you accounted for deficient wall thickness in your material stability calculations? Not a concern, refer to the prior litigation record.
- Your statement in the Q&A that "*Both the new wall and rip rap options are viable permanent repairs alternatives for the remaining lots where deflections have not exacerbated into the "emergency" fix condition*" needs clarification. People are running around the neighborhood saying Langan stated it's ok to use rip rap everywhere. Is rip rap indeed viable in areas where the wall is deflected to just short of rupturing?
    - Please explain: Yes, refer to the prior Board of Supervisor presentation December 2016.

Based upon your 14 December 2015 presentation to the CDD Board, (see attachment)
You wrote in your report

1. Weather event in Late July 2015 has triggered the failure and rupture of sheetpile at Skimmer Drive
2. Langan, having inspected the community wall, recommended emergency repair work at approximately 5,000 LF of seawall for the immediate repair of ruptured seawall sheets those endanger of rupturing 3. Implementation of option
3. (new seawall option) with additional anchors in lieu of waterside berm buildup was chosen as best emergency repair alternative based on historical and current cap rotation and vinyl sheetpile deflection 4. The Board authorized emergency work for approximately 2,500 LF of retaining wall and for Langan to closely monitor the remaining emergency repair phases

- Please explain why at that time Option 3 was the recommended fix for areas with less than 2-3/4" cap rotation, but is no longer the recommended long term fix for similarly deflected areas. The Board requested Langan to forecast areas that were projected to exceed emergency deflection criteria in this near future. Langan provided that information and the Board elected to proceed with "interim repair" of

those areas with the new wall even though they were not at the specified emergency deflection level at that time.

- Please explain how this is not relevant for the other 2500 feet 13 months later? Please refer to the response above.
- nor relevant for any other site under the same condition? Please refer to the response above.

If wall doesn't rupture until 2 3/4" of deflections takes place, there is no reason to presume that wall has sufficient integrity to resist rupturing with rip-rap placement. Clearly the wall is diminishing in resistance to rupturing right up to the point of rupturing.

- Does the Lack of wall rupture and deflection <2 3/4 in. the same thing To claim one is superior to the other for determining where rip-rap should go? Not clear on the question. Ruptured vinyl walls with deflections in the observed rupture range have been deemed to require a new wall because of the loss of or near term potential loss of structural integrity of the vinyl. Placing rip rap against the wall before the vinyl reaches this deflection criteria would minimize or preclude material failures from occurring.
- Is the presumption is that the wall is perfectly fine until it ruptures and placing rip-rap against a wall that hasn't ruptured will keep it from rupturing? Rip rap placed against the wall prior to reaching rupture criteria will prevent the vinyl from rupturing.

For the interim repair of the 22 lots of putting rip rap in front of those walls

You have stated to the CDD Board that you can just push the rip-rap back should those walls need the replacement wall fix.

- Does that not require moving the rip-rap 2 more times after initially installing it? For the new wall installation, a portion of the rip rap immediately adjacent the wall could be moved back to allow the new sheet pile to be installed, and then be placed back up against the newly installed FRP sheet pile to el +2. So if the new wall is ultimately desired in zones with stabilizing rip rap, there would be some secondary handling. For the master project rip rap alternative, more rip rap would be brought in and simply stacked atop of the el +3 interim rip rap to el +4. For this case of rip rap there would be no secondary handling.

Moving rip-rap is a labor-intensive effort. Moving rip-rap stacked up to +4 high

- would the cost not be at least 1.5 times the original cost installing it the first time?
    - If no, please give us that cost. No. Based on the contractor's most recent cost estimates, the additional cost to place rip rap from el +3 to el +4 is $75 per linear ft, which is not 1.5 times more than the original base price of $265 to place rip rap to el +3 with bedding stone.

Consider the truly impermeable barrier created when the replacement wall is put into the ground at least 4 feet deeper, a grout-like substance is poured between the failed wall and the new thicker millage vinyl sheet.

- Does this not solve many of the problems that will still be associated with a rip rap repair? There are no "problems" associated with the rip rap repair alternative that would not be addressed as previously discussed. The new sheet pile and intermediate concrete filled zone are certainly benefits associated with the New Wall option.
- Does rip rap repair create an impermeable barrier? Yes, the rip rap repair option does.
    - If Yes, How? See previous discussion on soil migration.
- Can you guarantee that rip rap will create an impermeable barrier? See the previous discussion on the rip rap alternative. Please note that engineering design services do not provide guarantees, rather the services are performed in accordance with the standards of practice in the engineering industry.
- Can you guarantee that the rip rap will stop all future upland damage? We have been advised repeatedly by the CDD's counsel not to comment on upland.

Seawall Questions – April 25, 2017

Please answer the following questions as you have time. In some cases, a "yes" or "no" response is sufficient, e.g., Q 3 and Q4. Higher priorities include analyzing the viability of the helical pier solution and conducting the Rip Rap test project. These questions should be answered prior to awarding the Phase I RFP.

Rip Rap solution

1. Throughout our canals, what, if any, evidence do we have of variations in bed depth within 8 feet of the seawall.
    a. If no evidence is available, how will variations in bed depth be addressed during the Rip Rap installation process?
2. When the canal bottom is not at a 90 degree angle, how will you maintain a 2 to 1 slope with the Rip Rap?
    a. If you increase the slope, how will you prevent sloughing of the Rip Rap?
    b. If you maintain the 2 to 1 slope, how do you avoid impeding the docking of boats?
3. Have we completed all appropriate environmental impact studies to support the use of the Rip Rap solution throughout most of the community?
    a. If not, is there any risk of not receiving the appropriate permits in a timely manner?
4. Do we have all appropriate permits, if we plan on using the Rip Rap solution throughout most of the community?
    a. If not, is there any risk of not receiving the appropriate permits in a timely manner?
5. Based on modeling, what level of short sheeting (-2, -3 or -4) might result in the Rip Rap solution being inadequate, if Rip Rap were installed unknowingly in front of a severely short-sheeted wall?
    a. At what point does the short-sheeting of the original seawall impact the factor of safety for the Rip Rap repair solution?

Langan Answer: See our response to questions below indicating short sheeting is not considered to be a global issue. However, to answer your hypothetical question, we offer the following. Currently, we have only observed the significant slough and apparent short sheet manifest itself over a 4 ft length throughout the entire site. Considering the Rip Rap solution has a sheet pile embedment factor of safety of about 1.8 with a sheet pile tip at -6, some similar localized areas of short sheeting would not be a significant concern. Isolated or localized tips

at el -4 would still have suitable factor of safety for embedment. Localized tips at el -2 would still have a factor of safety of slightly greater than 1.

6. What would be the consequence if Rip Rap was unknowingly installed in front of a severely short-sheeted wall? Langan Answer: See answer above and below.
    a. How would such a failure be repaired? Langan Answer: if a problem hasn't developed to date with the eroded berm profile, we wouldn't expect it to occur post Rip Rap placement. However, should any localized sloughing occur it could be addressed from the landside.
    b. What would be the cost of the repair?
7. Based on measurements taken during the installation of 6000 feet of new seawall, in what percent of the cases did you encounter cemented soil Langan Answer: Based on the FRP driving records, we estimate the following relative to harder zones potentially encountered during original driving:
    a. Between el -3 and el -4 feet? Langan Answer: 0 percent.
    b. Between el - 4 and el -5 feet? Langan Answer: < ½ percent.
    c. Between el -5 and el -6 feet? Langan Answer: < 1 ½ percent.
8. What is the procedure and cost (per test) for periodic testing for short sheeting? Langan Answer: There is no simple test such as a geophysical test to determine length. This would have to be a physical hand probing to better evaluate this. For the entire site, we anticipate this would take about 1 to 2 weeks, probing on 50 ft centers at a cost of about $12,000 to $15,000.
    a. Are there any external markers indicating an increased likelihood of short sheeting, e.g., multiple voids needing to be filed? Langan Answer: In the non-waler zones with eroded profile, significant short sheeting zones would have caused bulkhead collapse by now. Otherwise, the significant sloughing as observed at 5617 Seagrass would have manifested itself at numerous other locations. As far as we're aware, the 5617 Seagrass 4 ft zone is the only zone with significant sloughing. The other minor sloughing zones have been attributed to sheet pile deflection (previous and continued).
    b. Would it be appropriate to test in front of every lot where multiple voids have been filled? Langan Answer: Yes, this could be done by probing as discussed above. However, we reiterate that the minor sloughing has been attributed to sheet pile deflection (previous and continued).
    c. What testing methodology would you recommend, e.g., every 100 feet, or every lot with multiple voids and every 100 feet thereafter?

Langan Answer: As stated above, this would be physical probing with a thin steel bar\probe on approximately 50 ft centers.

New Seawall solution

9. Have accelerated life tests been conducted on the FRP panels used in the construction of the new seawall Langan Answer: See project specifications and manufacturers' submittals to answer the details associated with this question. The Fiber Reinforced Polymer sheets have a warrantied life of 25 years.
    a. Do the FRP panels have an anti-water absorption coating applied?
        i. If so how long does it remain effective?
    b. How are the FRP panels protected from the UV rays of the sun and the effects of marine growth which attach to the panels? Langan Answer: See material specification and submittal.

Alternative solutions

10. What are your topline comments on the viability (constructability, longevity and economics) of installing a steel seawall directly behind the current seawall? Langan Answer: This would be significantly more costly than the solutions posed. Also, the existing tie-backs would be severed and the performance of the unanchored PVC sheet pile and cap is unknown.
11. Any quick comments on implementing a repair solution that raises the water level via locks or a second lift. Langan Answer: Don't understand the question specifically. But, the existing seawall with the eroded berm is in a critical and detrimental state where there is eroded berm profile and artificially raising the water a foot or two would not get rid of that condition.
    a. Do you believe it would be a cost-effective solution
    b. Do you believe it would be viable from a regulatory and environmental perspective

Miscellaneous

12. How has the drainage system been designed to facilitate routine maintenance, e.g., can a water jet be used from the canal to clean the entire system? Langan Answer: Which drains are you referring to? 1. The original wall drains cannot be water jetted as they are simply holes in the sheet pile. 2. The new sheet pile drains have perforated tubes which extend into the backfill and should not need any maintenance other than the clearing of vegetation that may grow

around it. If soil is in the tube there is a breach somewhere that needs to be addressed. 3. The new bulkhead caps drains should be periodically cleaned to clear vegetation and water jetting or simple garden hose washing of the interior of these cap drains could be performed, if necessary.

a. What measurements should be obtained to determine whether the drainage system is working properly Langan Answer: Quite simply, if water is observed to be draining freely through the drain holes, it is working.

    i. For each metric, what levels indicate a working system and what levels indicate a problem

13. What are the potential causes of landside voids? Langan Answer: Langan has attributed the typically observed landside void or sloughing along the back of cap to the previous and continued sheet pile deflection causing void creation and migration of landside soil into the created void. The 4 ft long section at 5617 Seagrass which was a significant big and deep void was attributed to a short sheet condition. However, this type of situation has not been observed elsewhere.

    a. Discuss how each of the proposed seawall repair solutions will reduce or eliminate each potential cause of landside voids. Langan Answer: The solutions will prevent further wall deflection. The placement of the enhanced drainage system will fill any voids that may exist. So future void creation is considered to be minimal.

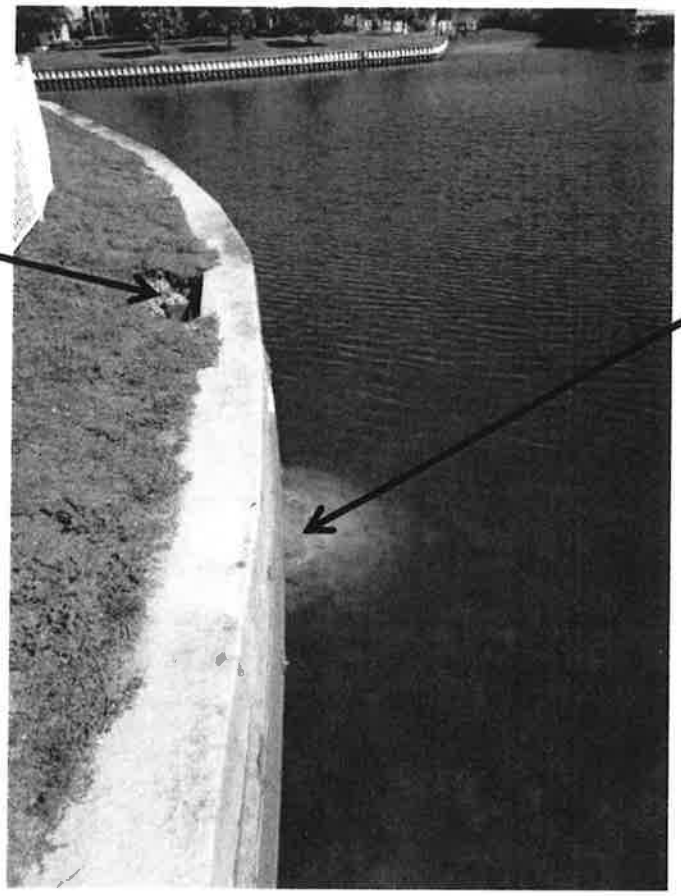
INCIDENT OF SHORTENED SHEET PILE AND SOIL MIGRATION FAILURE

SPECIAL CONDITION REGARDING EXISTING VINYL SHEET PILES

1. DESCRIBE ISOLATED STRETCH OF EXISTING BULKHEAD WITH SHALLOW SHEET PILE TIP EMBEDMENT - 5617 SEAGRASS PLACE)
2. DISCUSS ORIGINAL VINYL SHEET PILES INSTALLATION
3. DISCUSS POSSIBLE INSTALLATION ISSUES THAT WOULD PREVENT ACHIEVING DESIGN EMBEDMENT DEPTH
4. DISCUSS NEARBY FRP DRIVING RECORDS AND SUBSURFACE CONDITIONS INDICATE PENETRABLE UPPER ZONE
5. RECOMMENDED URGENT REPAIR REQUIRED AT LOCATION
6. DESCRIBE LONG-TERM REPAIR OPTIONS
7. DISCUSS RISKS ASSOCIATED WITH RIP RAP AND NEW WALL OPTION
8. DISCUSS ESTIMATED COSTS AND SCHEDULE

SHALLOW SHEET PILE CONDITION – 5617 SEAGRASS PLACE

Landside Soil Depression as deep as Approx. EL -1 Immediately Landside of Sheet Pile



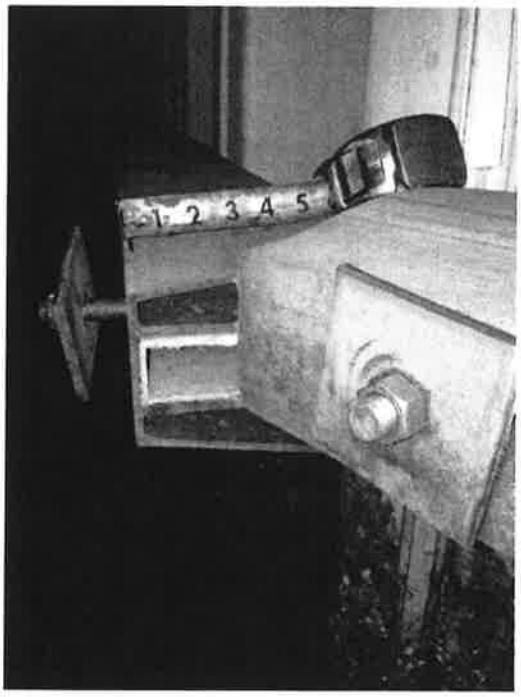
Soil accumulation as deep at Approx. EL -1.5 to EL +1 Immediately Waterside of Sheet Pile

SHALLOW SHEET PILE CONDITION – PHOTOGRAPHS

Bulkhead Length is Approx. 200 Linear Feet, Shallow Sheet Zone is Approx. 4 ft long

SHALLOW SHEET PILE CONDITION – PHOTOGRAPHS

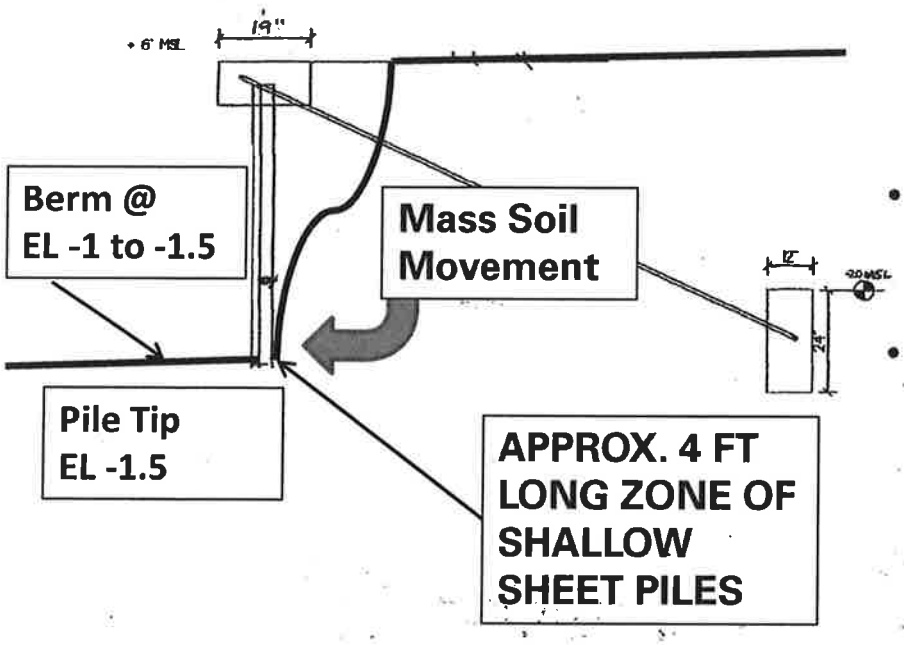
Overstressed/Damaged Waler



Over Stressed Anchor Connection

EXISTING CONDITIONS AT 5617 SEAGRASS PLACE

No Upland in Vicinity of Depression

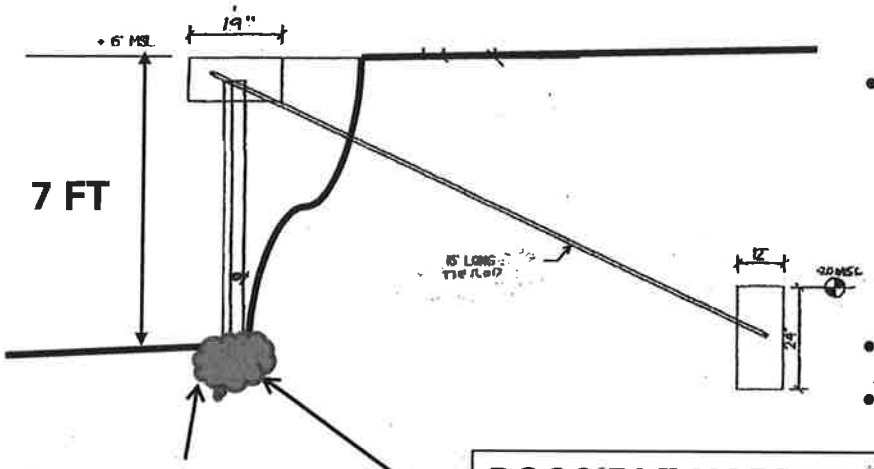


- WATERSIDE BERM LOWERED FROM CONSTRUCTED 5 FT WIDE BENCH AT EL +1 TO RELATIVELY FLAT SLOPE AT EL -1 TO -1.5
- SHEET PILE TIP IN SUBJECT ZONE IS AT EXISTING BERM LEVEL
- SOIL MOVEMENT BELOW BOTTOM OF SHEET PILES (4 FT LONG ZONE)

ORIGINAL SHEET PILE DRIVING AT 5617 SEAGRASS PLACE

- IN GENERAL, RELATIVELY LOOSE MATERIAL SHOULD HAVE BEEN ENCOUNTERED WHEN DRIVING SHEET TO A DEPTH OF 6 FT
- CEMENTED SANDY MODULES MAY HAVE BEEN ENCOUNTERED AT EL -1.5 BASED ON FIELD OBSERVATION
- NO SHEET PILE BELOW
- EL -1.5 AT THIS LOCATION

No Upland in Vicinity of Depression



Cemented Sandy Nodules Encountered when Inspected

POSSIBLE HARDER MATERIAL OBSTRUCTED SHEET PILE DRIVING AT EL -1.5

NEARBY FRP (NEW WALL) SHEET PILE DRIVING RECORDS

- FRP DRIVING RECORDS FOR APPROX. 7,000 LINEAR FT OF SHEET PILES DRIVEN FROM SEAGRASS PLACE THROUGH SEA TROUT PLACE
- ALL FRP SHEETS REACHED THE DESIGN DEPTH OF EL -10 WITH NO INSTALLATION ISSUES