APPENDIX R

Biological Resources and Transportation: *Barge Discharge Memo—Operational Confirmation of Avoidance of Marine Floor and Eelgrass* (Zostera marina)

Central Oceans

Barge Discharge Memo – Operational confirmation of avoidance of marine floor and eelgrass (*Zostera marina*). Memo to be used for discussion purposes only.

Reference Attached

1. Likely Barge Sketch Drawings.
2. *"Fields Landing Sounding*" page 2 for Fields Landing.
    a. Sounding performed on August 23rd 2018 at "MLLW ("Mean Low Lower Water"), which is defined per NOAA as "*The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch.* In laymen terms, the depths provided on the attached sounding represent the average day lowest tide level observed at the location over a specific 19-year period (1960-1978) adopted by the National Ocean Service as the official time segment over which tide observations are taken.
    b. The Tidal Bench Marks for this survey was taken from Designation "941 8739 C Tidal" located at 40° 44.2' N, 124° 12.7' W in King Salmon. A Tidal Bench Mark is local fixed physical object used as a reference to which a tide staff can locally calculate tidal accurate datums (level of sea defined by phase of tide).
3. Eelgrass Distribution map (http://humboldtbay.org/eelgrass-distribution-map), as mapped by the 2009 Humboldt Bay and Eel River Estuary Benthic Habitat Project (Schlosser and Eicher, 2012) and updated during Fall 2016 surveys. Website accessed on January 24, 2019.

The barges utilized to transport wind turbine componentry for the Humboldt Wind Energy Project (project) would be restricted by the max barge crossing limits of the jetty entrance to Humboldt Bay from the open ocean. The largest barge sizes which can enter the jetty and unload at Fields Landing without impacts to the seafloor or eelgrass include the 285' x 76' x 18' and the 340' x 86' x 20' deck barges, or smaller. For purposes of this memo, a 300' x 84' x 20' deck barge would be considered the largest barge that could be used to transport wind turbine componentry and is the base case for this analysis.

To avoid impacts to the seafloor, barges must have enough draft or be positioned in deep enough water during the unloading process. Draft is the depth of the bottom of the barge below the surface of the water. A 300' x 84' x 20' deck barge would draft approximately 2'6" at empty weight (light draft). The max weight this size barge can handle is approximately 7,000 gross tonnage or 14M lbs. At that weight, the barge would draft approximately 15'. Project cargo will "cube" out well before it "weights" out, which

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means that the barge would run out of space far before weights came close to the max weight.

For a review of draft at worst case, a barge loaded to max deck capacity of the heaviest piece of cargo, a tower base section at 71,500 KG (157,630 lbs.) was considered. Based on a single stack, no more than 20 base tower sections would fit on the barge at 2 rows of 10 towers. This configuration is also subject to stow plan design, engineering, room for handling, lashing, and other items for full review. If base towers had stacking fixtures available, double stacked in ocean fixtures, the max load quantity would be 40 bases with a weight of 6.3M lbs. Forty bases loaded on a single barge are very unlikely basis logistics supply limitations and this scenario also does not account for the space needed for lifting and lashing. At 6.3M lbs + light draft, the barge would draft 7'1" below surface which is sufficient for discharge at mean low tide. As the barge unloads, it becomes lighter and the draft becomes shallower.

The abandoned pier field (last of the edge of former dock pilings) is 50' from the stable terminal wall. At mean low tide, the water depth here is 2.5' (8-10' at high tide); however 10' beyond (or 60' from the terminal wall), the water depth at mean low tide drops to over 10 feet, which is ample depth at low tide for barge discharge without affecting the seafloor.

The safest and most efficient discharge for barge at 60' from the terminal wall at worse case mean low tide is a shore crane discharge with spud barge / spud leg moorings. The barge would be placed at a proper location based on specific load weight draft and daily tidal forecast to ensure that it does not contact the seafloor during mean low tide. Using steel ropes extending to the shore, the barge will tie up to heavy concrete blocks to keep from drifting away from shore. In the barge channel, a Series S-50 or S-70 model spud barges with cleats, potable spud wells, and spud/morning legs will be used to provide a mooring to prevent the barge from drifting towards the shore. Spud-leg is a method of anchorage better known for securing floating work platforms to their watery bed to prevent general movement and drifting from their work area. Four (4) spud legs would be utilized with an approx. impact of about a square foot per leg for mooring. Each spud barge leg is two-feet in diameter. Spud barges would be temporarily deployed in the deep-water channel to avoid impacting eel grass.

There are many crane types, but for reference, a 600 Ton RT (Rubber Tire Crane) could be deployed at Fields Landing by road without physical concern. This type of crane could be placed at shore, reach and lift 160,000 lbs (slightly heavier than largest piece) 65' high at 115' reach. Reach is measured from the center of crane to end of hook. This reach would allow a the crane to access componentry from the front of the barge to the center of the barge. After offloading the first half of the barge, if would be flipped (rotated) for access to the remainder of the cargo.

In a likely operations scenario, loaded barge would begin discharge at high tide, closer to the shore. As the barge becomes lighter from discharge, the draft becomes less, allowing for the barge to remain in place as the tide falls. Specific high and low tide forecasts along with barge load plan would be calculated for placement of barge for that specific daily discharge. If needed, the barge could untie and move out further if tide becoming too low for draft of specific loaded barge.

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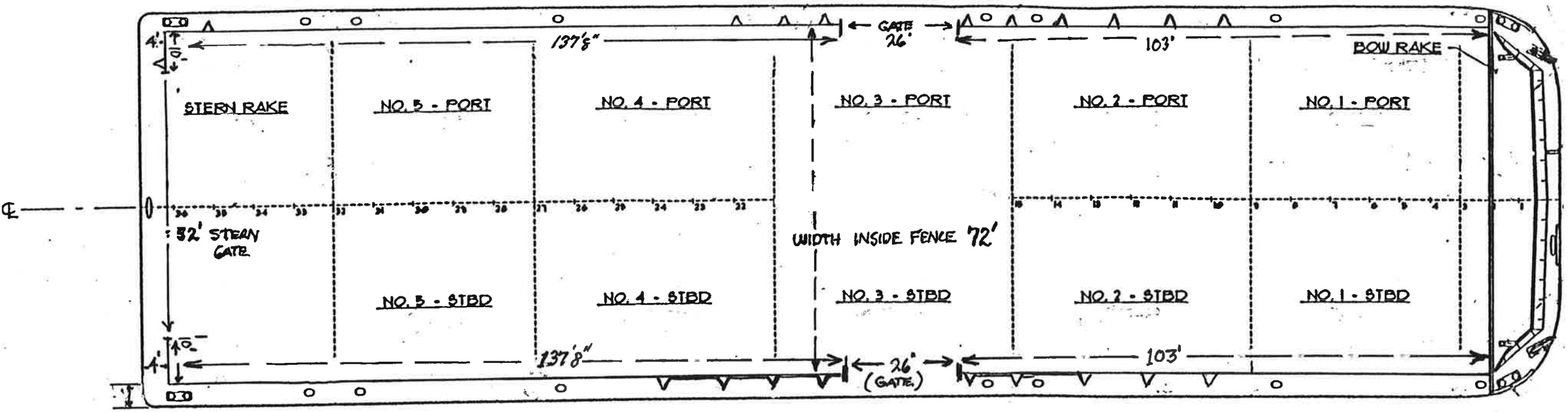
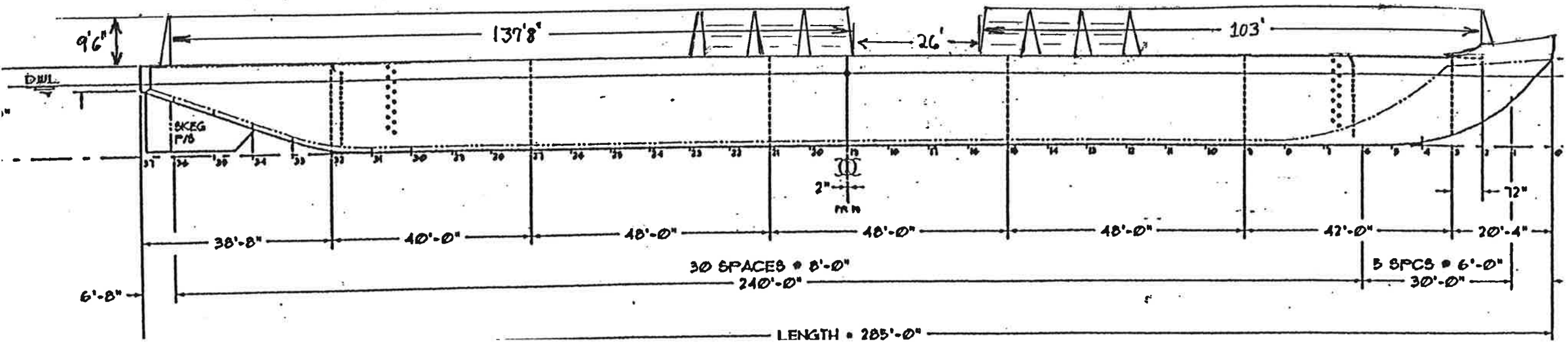
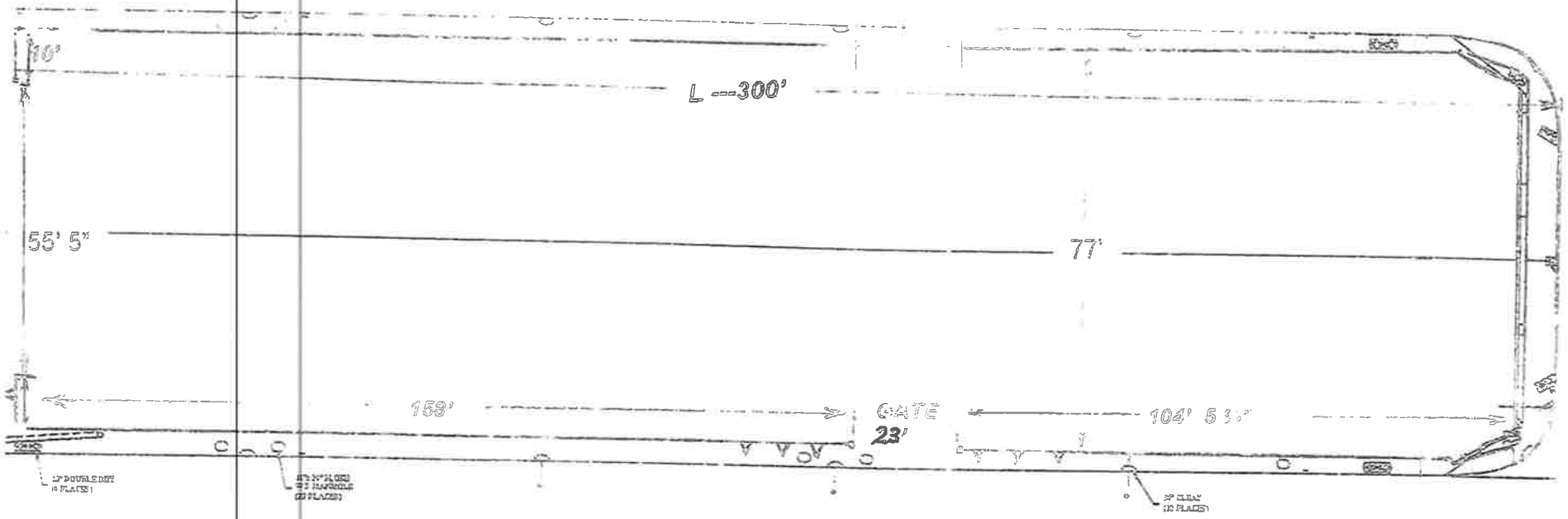
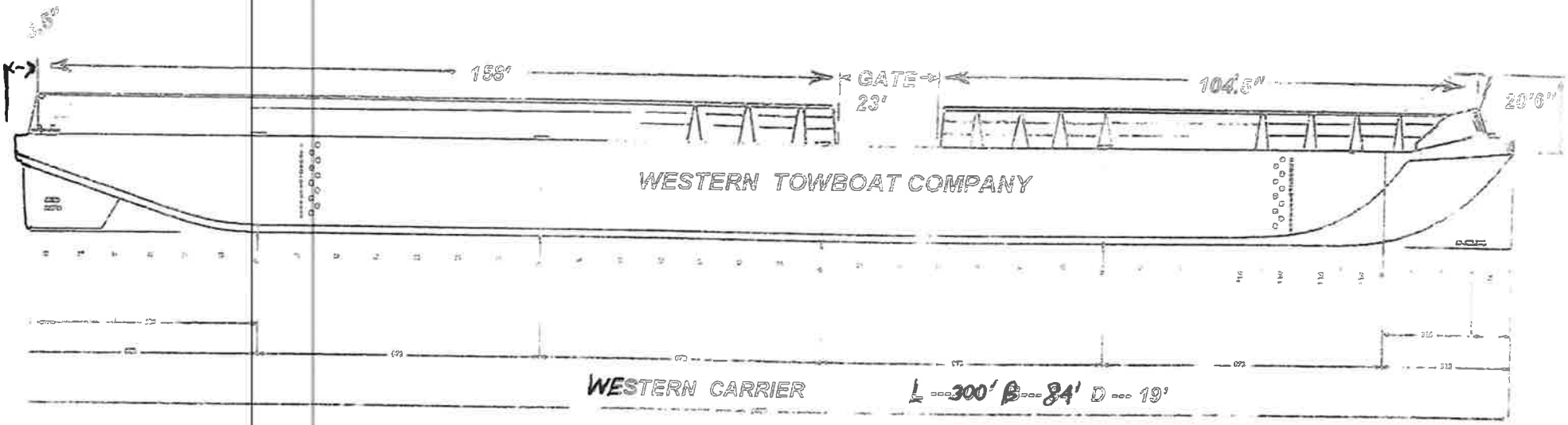

137'8"
GATE 26'
103'
BOW RAKE
STERN RAKE
NO. 5 - PORT
NO. 4 - PORT
NO. 3 - PORT
NO. 2 - PORT
NO. 1 - PORT
52' STERN GATE
WIDTH INSIDE FENCE 72'
NO. 5 - STBD
NO. 4 - STBD
NO. 3 - STBD
NO. 2 - STBD
NO. 1 - STBD
137'8"
26' (GATE)
103'

DECK PLAN


9'6"
137'8"
26'
103'
DWL
SKEG P/S
2"
72"
38'-8"
40'-0"
48'-0"
48'-0"
48'-0"
42'-0"
20'-4"
30 SPACES @ 8'-0"
240'-0"
5 SPCS @ 6'-0"
30'-0"
6'-8"
LENGTH @ 285'-0"



DECK PLAN
SCALE 3/32"=1'-0"



WESTERN CARRIER L ---300' B---84' D --- 19'

GENERAL NOTES

(3) GROUND CONDITIONS SHOWN HEREON REFLECT CONDITIONS ON THE DATE OF THE SURVEY.
(4) THIS MAP WAS PREPARED FOR THE EXCLUSIVE USE OF DESILVA GATES CONSTRUCTION, LP, INC USE BY ANY OTHER PARTY FOR ANY PURPOSE WHATSOEVER IS PROHIBITED.
(6) SOUNDINGS INTERPOLATED IN GRID FROM EXTENSIVE SOUNDING DATA COVERING LIMITS.

BASIS OF COORDINATES

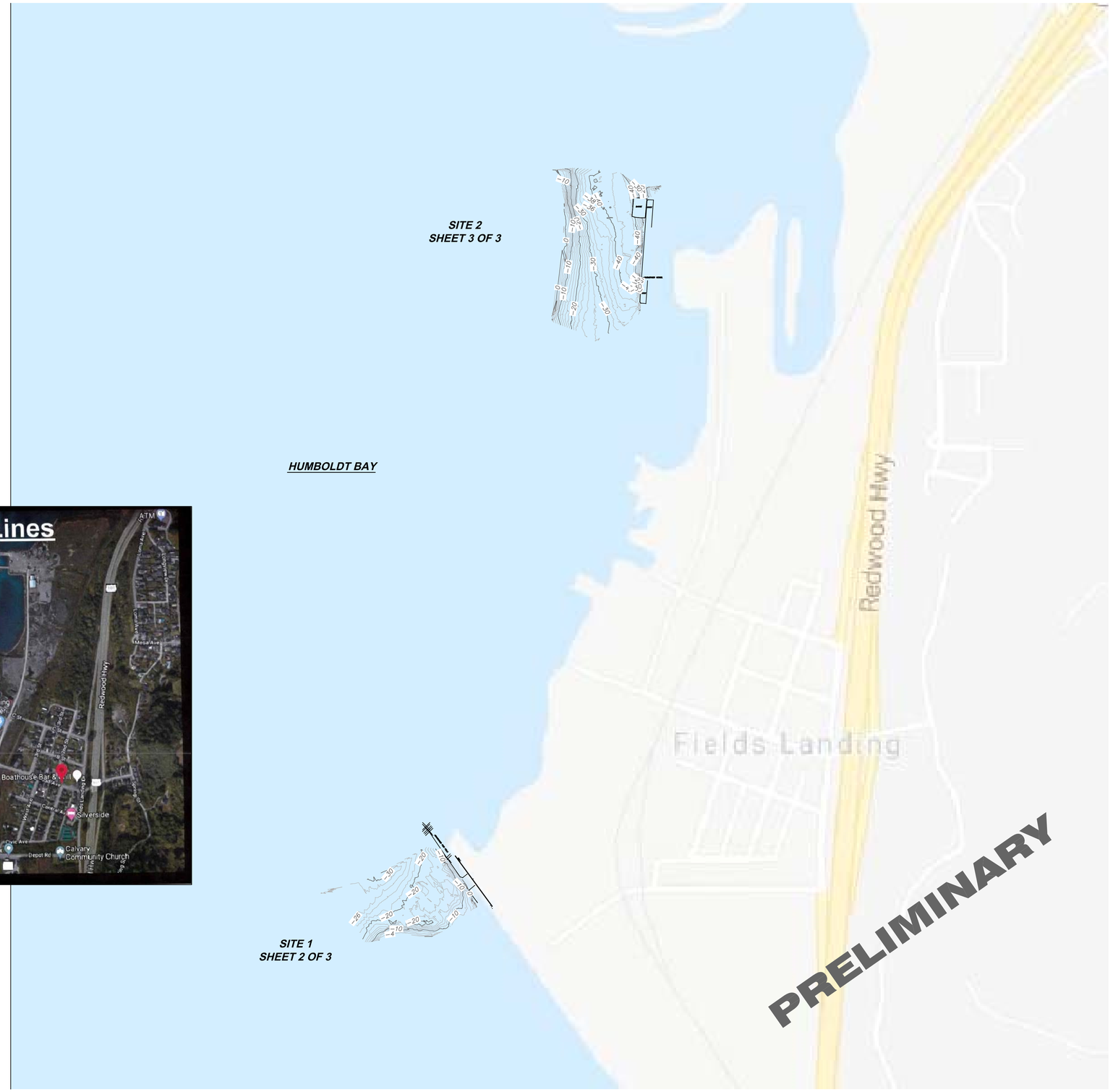
CALIFORNIA STATE PLANE ZONE 1 COORDINATE SYSTEM NAD 83 (2011) EPOCH 2010.00
HPGN D CA 01 QB
PID AC9253

BASIS OF ELEVATION

MLLW (MEAN LOW LOWER WATER)
941 8739 C TIDAL
PID LV0652
MLLW ELEVATION 9.55'
NAVD 1988 ELEVATION 9.08'

BATHYMETRIC

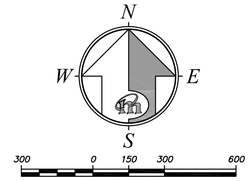
(1) (1) BATHYMETRIC DATA IS FROM A SURVEY CONDUCTED BY MERIDIAN SURVEYING ENGINEERING, INC. FROM AUGUST 23 REPRESENTS THE BAY BOTTOM CONDITIONS ON THAT DATE.
(2) (2) A TRIMBLE R8 REAL-TIME KINEMATIC GPS RECEIVER, AN SONARMITE ECHOSOUNDER WITH A SINGLE FREQUENCY TRANSDUCER AT 200 KHZ WERE USED FOR BAY BOTTOM.



SITE 2
SHEET 3 OF 3

SITE 1
SHEET 2 OF 3

KEY MAP



GRAPHIC SCALE
1 INCH = 300 FEET

LEGEND

220 CONTOUR MAJOR 10' INTERVAL
222 CONTOUR MINOR 2' INTERVAL
CONC CONCRETE
FL FLOWLINE
SPOT ELEVATION
FLOWLINE
CONTROL POINT
DIP POSITION

HYDROGRAPHIC SURVEY

FIELDS LANDING
EUREKA, CA
AT THE REQUEST OF
FOSS MARITIME COMPANY

HUMBOLDT COUNTY — CALIFORNIA
AUGUST — 2018

MERIDIAN SURVEYING ENGINEERING, INC.
2958 VAN NESS AVENUE
SAN FRANCISCO, CA 94109
(415) 440-4131
777 GRAND AVENUE, #202
SAN RAFAEL, CA 94901
(415) 456-5450

SURVEY BY:	EW/ET	PROJECT NO.:	18083
DRAWN:	RK	REVISION DATE:	08/29/2018
APPROVED:	STC	SHEET	1 OF 3
FILE NAME:	28AUG18-TIN		
SURVEY DATE:	08/24/2018		

LEGEND

220 — CONTOUR MAJOR 10' INTERVAL

222 — CONTOUR MINOR 2' INTERVAL

CONC — CONCRETE

FL — FLOWLINE

\+ — SPOT ELEVATION

FLOWLINE

CONTROL POINT

DIP POSITION

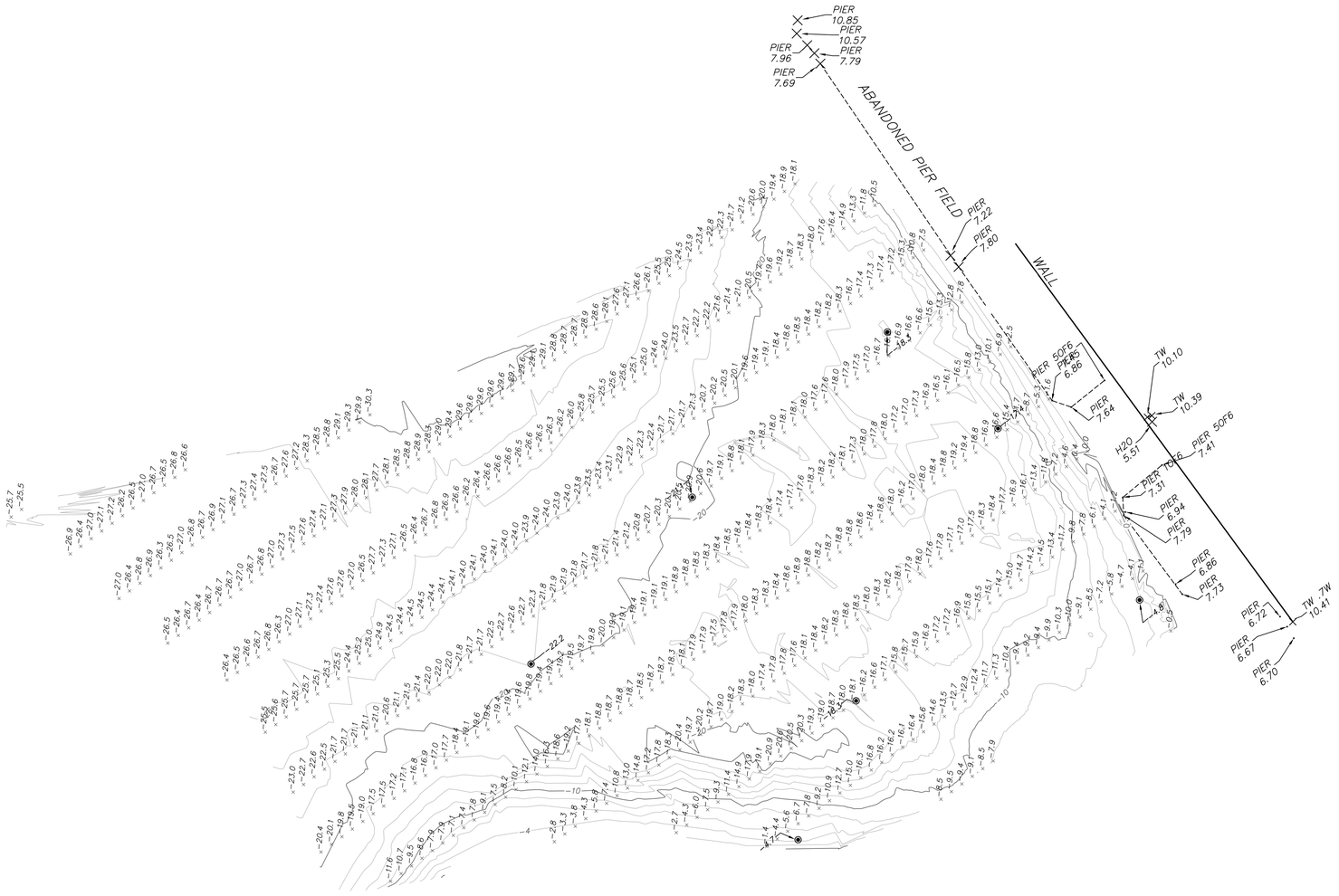
N

W E

S

50 0 25 50 100

GRAPHIC SCALE
1 INCH = 50 FEET



SITE 1

CONTOUR INTERVAL = 2'

HYDROGRAPHIC SURVEY

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AT THE REQUEST OF
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HUMBOLDT COUNTY — CALIFORNIA
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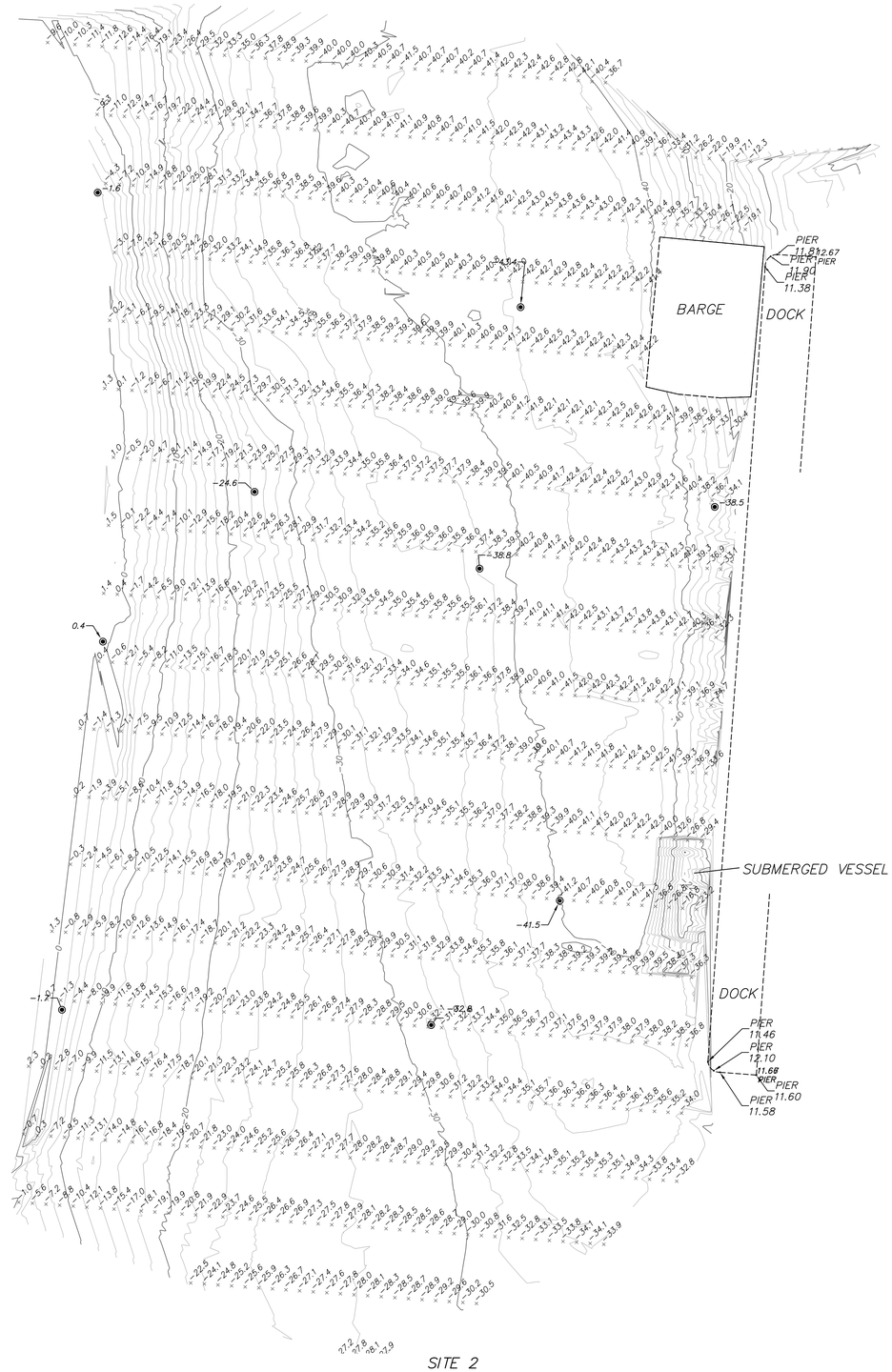
SURVEY BY:	EW/ET	PROJECT NO.:	18083
DRAWN:	RK	REVISION DATE:	08/29/2018
APPROVED:	STG	SHEET	2 OF 3
FILE NAME:	28AUG18-TIN		
SURVEY DATE:	08/24/2018		



LEGEND

- 220 — CONTOUR MAJOR 10' INTERVAL
- 222 — CONTOUR MINOR 2' INTERVAL
- CONC — CONCRETE
- FL — FLOWLINE
- \+ — SPOT ELEVATION
- FLOWLINE
- CONTROL POINT
- DIP POSITION

N W E S

50 0 25 50 100

GRAPHIC SCALE
1 INCH = 50 FEET

CONTOUR INTERVAL = 2'

HYDROGRAPHIC SURVEY

FIELDS LANDING
EUREKA, CA
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AUGUST — 2018

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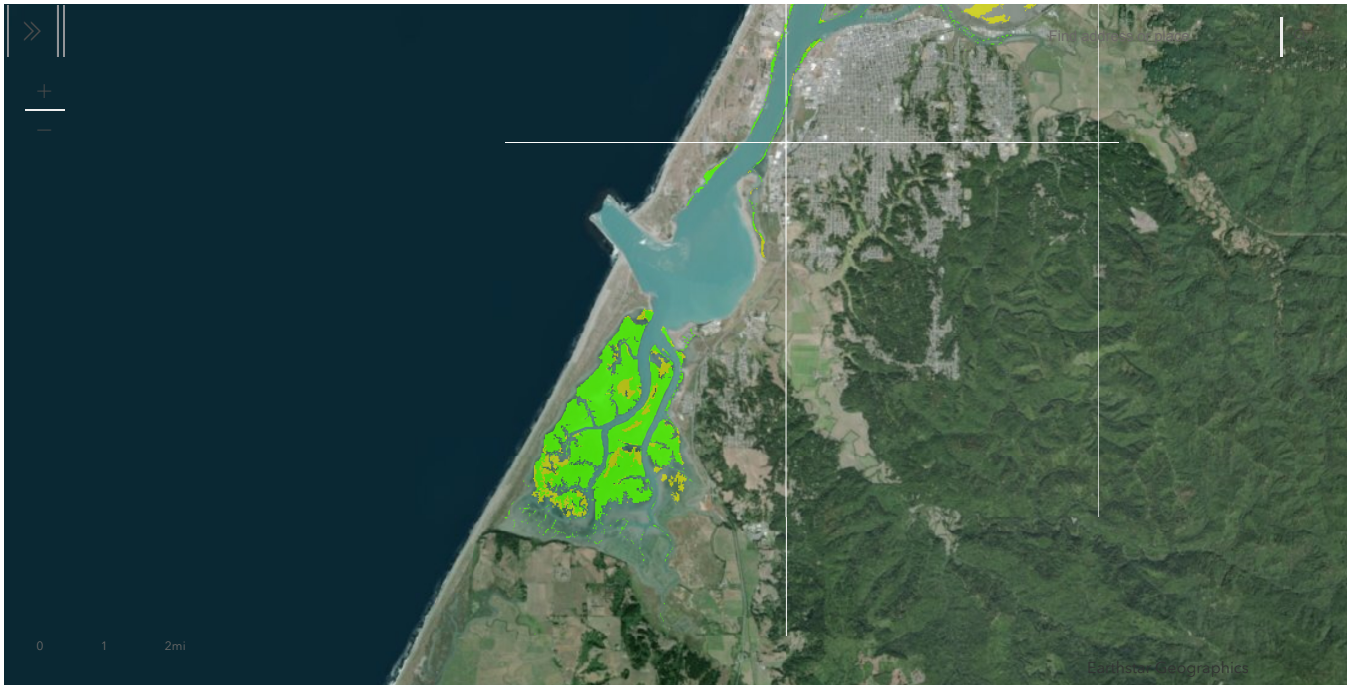
SURVEY BY:	EW/ET	PROJECT NO.:	18083
DRAWN:	RK	REVISION DATE:	08/29/2018
APPROVED:	STG	SHEET	3 OF 3
FILE NAME:	28AUG18-TIN		
SURVEY DATE:	08/24/2018		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