



**US Army Corps
of Engineers®**
Engineer Research and
Development Center

Sampling, Chemical Analysis, and Bioassessment in Accordance with CWA Section 404

Houston Ship Channel Expansion Channel Improvement Project, North of Morgan's Point Houston Ship Channel, Texas (Part 3 of 6: Appendix 2, Field Report)

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FINAL

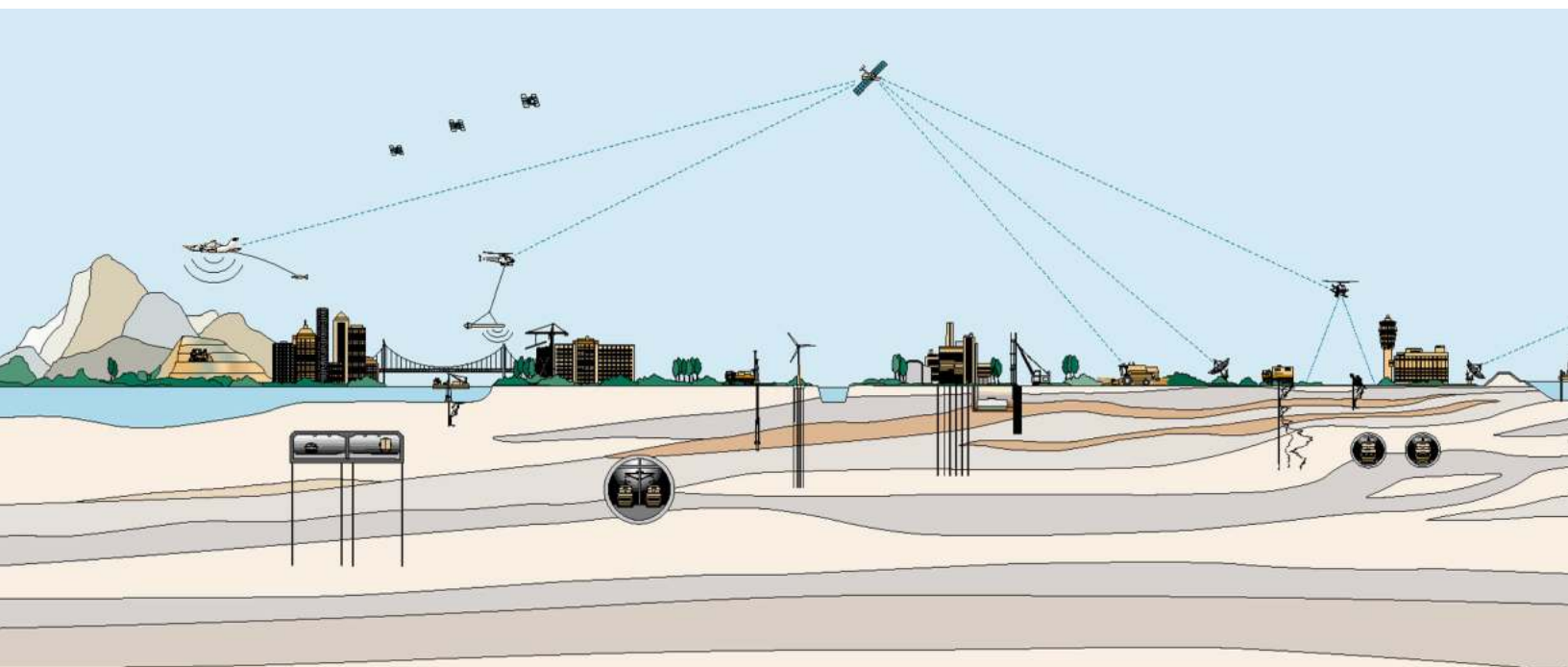
14 June 2023*

*Supersedes all previous versions. Only coversheet revised; no change to content.

Appendix 2: Fugro Field Report

**FACTUAL DATA REPORT
SEDIMENT AND WATER SAMPLING
NORTH OF MORGAN'S POINT
HOUSTON SHIP CHANNEL EXPANSION CHANNEL
IMPROVEMENT PROJECT
HOUSTON SHIP CHANNEL, TEXAS**

REPORT NO. 04.18180008-NMP





June 13, 2019

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Attention: Mr. Dan Sepulveda, P.E.

**Factual Data Report
Bediment and Water Sampling, North of Morgan's Point
Houston Ship Channel Expansion Channel Improvement Project
Houston Ship Channel, Texas**

Fugro USA Land, Inc. (Fugro) is pleased to present this Factual Data Report for Sampling at Locations North of Morgan's Point, conducted as part of the sediment and water sampling program for the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP) in the Houston Ship Channel, Texas. Mr. M. R. McGraw, P.E. of AECOM representing a Joint Venture of Turner Collie & Bacon and Gahagan & Bryant Associates, Inc. (AECOM JV) authorized our services by signing a Subcontract Agreement (AECOM Project Number 90345456, named New Study HSC/OC/IDSC) on September 5, 2018.

This report only presents factual information related to the sediment and water sampling program for Locations North of Morgan's Point. A similar report was presented for Locations South of Morgan's Point on November 8, 2018 (141810038-SMP). Collection of sediments and water samples was in accordance with the HSC ECIP Sampling Analysis and Plans. The report presents sampling procedures, custody of samples and delivery. No laboratory testing, recommendations or evaluations were requested as a part of this agreement.

Fugro appreciates the opportunity to work with you on this project and look forward to continuing as your service providers. If you need further assistance or have any questions, please contact Fugro at (713) 955-6400.



Sincerely,

FUGRO USA LAND, INC.
TBPE Firm Registration No. 299

A handwritten signature in black ink, appearing to read "Jose Aramburi".

Jose Aramburi, P.E.
Exploration Manager

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LIST OF ACRONYMS

CME	Central Mining Equipment
COC	Chain of Custody
DO	dissolved oxygen
DPR	Daily progress Reports
DTM	deck to mudline
DTW	deck to water
HAZID	Hazard Identification
HSA	Hollow Stem Augers
HSSE	Health, Safety, Security and Environment
HSC ECIP	Houston Ship Channel Expansion Channel Improvement Project
L/B	Lift Boat
MLLW	Mean Low Lower Water
NAD	North America Datum
NMP	North of Morgan's Point
ODMDS	offshore dredged material disposal site
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCP	Polychlorinated Pesticides
PEP	Project Execution Plan
POHA	Port of Houston Authority
POHPA	Port of Houston Pilots Association
QC	quality control
QHSE	Quality, Health, Safety and Environment
SAPs	Sampling and Analysis Plans
SMP	South of Morgan's Point
SMP-REF	reference sample location
SPT	sample penetration test
TOC	Total Organic Carbon
TSP	Tentatively Selected Plan
TSS	Total Suspended Solids
USACE	U.S. Army Corp of Engineers
USACE ERDC	U.S. Army Engineer Research Development Center
USCG	United States Coast Guard
VTSA	Vessel Traffic Service Authority

1.0 INTRODUCTION

1.1. Project Description

The Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP) is a federal feasibility study for the Port of Houston. The deep draft navigation study has resulted in a Tentatively Selected Plan (TSP) that will involve dredging of various channel improvements such as widening, deepening, and turning basins. The project was divided into two divisions: (1) the TSP South of Morgan's Point, and (2) TSP North of Morgan's Point.

The HSC Sampling South of Morgan's Point (SMP) program is comprised of three study segments: Channel Segment 1 (Bay Reach South of Morgan's Point), Segment 2 (Bayport Ship Channel), and Segment 3 (Barbours Cut Channel). HSC Sampling North of Morgan's Point (NMP) program is comprised of Segment 1 (Bay Reach North of Morgan's Point), Segment 4 (Boggy Bayou to Sims Bayou), Segment 5 (Sims Bayou to I-610 Bridge), and Segment 6 (I-610 Bridge to the Main Turning Basin).

Separate Sampling and Analysis Plans (SAPs) were developed by the U.S. Army Corp of Engineers (USACE) for each division, SMP and NMP, based on different requirements for dredging and placement of dredged materials. Sampling and analysis of materials SMP will include additional testing for ocean placement. The USACE provided details of the SAP for both divisions of the project. The "Sampling and Analysis Plan, Houston Ship Channel Expansion Channel Improvement Project, (HSC ECIP) Channel Segment 1 (North of Morgan's Point), Segment 4, Segment 5, and Segment 6, Houston Ship Channel, TX" dated October 2, 2018 was provided to Fugro for the field sampling effort. USACE personnel were not onboard the sampling vessel during the duration of the sampling event for NMP. Collected samples were delivered to the U.S. Army Engineer Research Development Center (USACE ERDC) in Vicksburg, MS as instructed.

This report (04.18180008-NMP) presents a factual report of our operations and sampling process North of Morgan's Point. A separate factual report was presented for the sampling operations South of Morgan's Point (04.18180008-SMP).

1.2. Purpose and Scope of Work

AECOM JV is the consultant providing planning, engineering, and environmental services to the Port of Houston Authority (POHA), the Nonfederal Sponsor for the feasibility study. AECOM JV contracted Fugro USA Land, Inc. (Fugro) for sediment and water sampling at the HSC ECIP. Fugro served in the field contractor role as outlined in Sections 3 and 4, and Attachments 2 and 3 of the SAP. Fugro's goal was to provide AECOM JV with the volume of samples required from the dredge prism with quality and in a safe and efficient manner consistent with procedures outlined in the USACE SAP.

The scope of work consists of obtaining sediment and water samples for chemical and physical laboratory analyses at 11 sampling locations throughout the HSC NMP.

A site vicinity map with the study area is presented on [Plate 1](#) of this report. [Plate 2](#) presents an overall view of the area for locations North of Morgan's Point.

AECOM also contracted Fugro to store and deliver collected samples to USACE ERDC. The "Sampling and Analysis Plan, Houston Ship Channel Expansion Channel Improvement Project, Channel Segment 1 (North of Morgan's Point), Segment 4, Segment 5, and Segment 6, Houston Ship Channel, TX" and dated October 2, 2018 were provided to Fugro for the field sampling effort. Several meetings took place ahead of and during the sampling effort to direct or amend the SAP provided. The SAP was prepared by USACE and used to conduct the field program. The field program was tailored to adequately drill, sample, and recover sediment samples and collect water samples in water depths that range from 11 to 43 ft with sample acquisition down to depths ranging between 41.5 to 46.5 ft below Mean Low Lower Water (MLLW).

1.3. Applicability of Report

Fugro has prepared this factual report for AECOM for use as reference of the conducted sampling operations. The scope of the explorations performed in this report are for locations North of Morgan's Point. No laboratory testing was conducted during the sampling operations. The intent of the sediment collections was environmental purposes and should not be used or correlated for geotechnical purposes.

1.4. Limitations

Fugro makes no claim or representation concerning any activity or condition falling outside the specified purposes to which this report is directed. Fugro has conducted our work using the standard level of care and diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances. Fugro intends for this report, including all figures, to be used in its entirety. The information presented in this report may not apply to locations not explored by borings or areas outside the project boundaries. This information should be made available to prospective users for information only, and not as a warranty of subsurface conditions.

1.5. Fugro's and Subcontractors' Roles

Fugro served as the Field Contractor described in the NMP SAP and provided the drilling services to acquire sediment samples. Fugro subcontracted Benchmark Ecological Services, Inc. (Benchmark), serving as environmental sampling consultant providing for the environmental subsampling, handling and shipment of samples, sample record keeping and chain of custody, and water sampling. Fugro also subcontracted Shallow Draft Elevating Boats, Inc. of Louisiana for lift boat services that provided the platform for sediment sampling.

2.0 FIELD PROGRAM

2.1 General

The North of Morgan's Point field program consisted of sediment sampling through soil borings and water sampling. Sampling was conducted to obtain the amount of sample specified for laboratory testing in Table 2 of the NMP SAP. The Sediment sampling services were conducted between October 1 and 8, 2018. Water sampling services were conducted at the end of the sediment sampling program on October 22, 2018 and following USACE specifications in Table 2 of the NMP SAP. Sampling was conducted at the locations initially specified in Figure 2 of the NMP SAP, that were adjusted during field work in coordination with the AECOM JV and USACE to address issues and constraints presented by the in-situ material, actual channel side slope and depths, potential drilling hazards identified during the hazard survey described in Section 2.6, and vessel traffic. These adjustments are discussed later in this report. The ultimate coordinates of these locations are provided in [Table 1](#).

The sampling program consisted of:

- Drilling and sampling sediment borings at eleven (11) sampling locations (HSCnew-NMP-01 through NMP-11), and one quality control (QC) Location NMP-03 (DUP); and
- Collecting water samples at all sampling locations (HSCnew-NMP-01 through NMP-11).

A summary of the Sampling Locations in comparison with the HSC Stations is presented below:

Sampling Locations	HSC Station
HSCNew-NMP-01	503+00
HSCNew-NMP-02	730+00
HSCNew-NMP-03	794+00
HSCNew-NMP-04	873+00
HSCNew-NMP-05	961+00
HSCNew-NMP-06	1127+00
HSCNew-NMP-07	1180+00
HSCNew-NMP-08	1200+00
HSCNew-NMP-09	1230+00
HSCNew-NMP-10	1260+00
HSCNew-NMP-11	03+00

The sample naming incorporated the sample location identification (ID) in the SMP SAP. Modifiers were added to these IDs to track iterations of the relocations of these original locations to alternate locations in response to field conditions, traffic and the hazard survey, explained in more detail in Sections 2.6 and 3.5.4. The following explains the modifiers in order of use in the sample ID:

- A and C were the subsample location for the left or right in-channel position per the SMP SAP. Center position B was discarded as explained in the next paragraph and Section 3.5.4.
- H signified subsample location alternates moved specifically due to the hazard survey to avoid anomalies that could represent pipelines or debris specifically in the HSCnew-NMP-01 location following discussions with ERDC and the AECOM JV.
- Number suffix “-1”, “-2” etc. meant repetition at a general location by locally repositioning borehole locations to obtain sufficient volume, or to deal with local field conditions encountered the day of sampling such as rig slope stability.

The sampling program was conducted following specifications contained in the NMP SAP and the prescribed sampling intervals for each location. Initial subsample positions at each location were given in Table 1 of the NMP SAP. The center position given in the table was deleted due to heavy daily vessel traffic making it impracticable to drill for samples in the middle of the Federal channel. At the JV and ERDC’s direction, the required volume from the center subsample was reapportioned to the two other subsample positions. Operations were conducted seven (7) days a week on a 10 to 12-hr schedule.

A detailed Project Execution Plan (PEP) providing our field procedures, safety, security, health, environment, and quality plans for the proposed project was submitted to AECOM on August 14, 2018. A revised version (01) was submitted to AECOM on September 10, 2018. A detailed description of our equipment/vessel details and methodologies about the exploration activities are described in our PEP. A Hazard Identification (HAZID) workshop was conducted based on our execution plan along with representatives from Benchmark, Lift Boat Personnel, and Fugro staff, including the Quality, Health, Safety and Environment (QHSE) representative, site manager, and project manager. The HAZID was conducted on August 31, 2018. A full Safety Plan was submitted to AECOM on September 9, 2018.

A brief description of various field activities is provided in the following sections of this report.

A total of fifty-nine (59) sub-sampling locations were drilled to obtain the amount of sample specified in Table 2 the NMP SAP. For sediment, 6 gallons per location, and 2 gallons for a field duplicate were specified. For water, 28 gallons per location, and 3 gallons for a field duplicate were specified. A summary of the sediment sub-sampling locations is presented on [Table 1](#) and a summary of the water sampling locations is presented on [Table 2](#), at the end of this report. Locations of sediment sampling are presented on [Plates 3](#) through [13](#) of this report. Water sampling locations were located in close proximity to the sediment sub-sampling locations and are also indicated on these plates.

Logs of Sampling from all sub-sampling locations are presented on [Plates A-1](#) through [A-59](#) in [Appendix A](#).

Daily progress Reports (DPR) detailing the daily progress of the field operations are presented in [Appendix B](#).

2.2 Vessels and Equipment

Sampling operations were conducted from:

- A subcontracted 70-foot class Lift Boat (L/B) Shallow Draft 17; and
- Benchmark's 24-foot Water Sampling Vessel.

Drilling operations were completed using Fugro's Central Mining Equipment (CME)-75 Truck-Mounted Drill Rig. The rig was positioned on the L/B such that drilling operations could be conducted over the front deck through a "stinger" and "moon pull" on the work platform. The drill rig was secured to the deck of the L/B during transits. The drilling equipment consisted of 4.5-inch diameter Hollow Stem Augers (HSA), 4.0-inch by 5-ft long Bearing Head CME continuous sample tube system, Modified California Sampler and split spoon samplers.

The L/B Shallow Draft 17 was subcontracted through Shallow Draft Elevating Boats of Louisiana. L/B Shallow Draft 17 is a 70 Class Jack Up type vessel, with a twin 671 diesel engine, length 64 ft, beam 24 ft and draft of 4.4 ft. The L/B has a 10-ton crane. Facilities aboard the L/B consist of a work deck, small tea/mess room, portable potty, and drilling and ancillary equipment. L/B operations were supported by 32-foot support boat operated by Shallow Draft and powered by Yamaha outboards with 7,000 lb deck payload capacity. The support boat was used to transport personnel from/to the land points and the sampling vessel. The support boat was on standby near the L/B during drilling operations at all times.

Water samples were collected using the aforementioned 24-foot sample vessel operated by Benchmark Ecological Services, Inc. of Houston, Texas. Benchmark's boat was used to collect water samples at all sample locations. For all sampling events, Benchmark's boat was equipped with a sub-meter Trimble Geo XH 6000 GPS unit, appropriate sample containers, coolers with ice to store processed samples, field data sheets, and drink cooler.

Specifications for the vessels and equipment used for the nearshore sampling investigation are presented in the Project Execution Plan.

2.3 Staging Areas

The L/B Shallow Draft 17 was mobilized at Martin's dock in Galveston, TX where the drill rig was driven onto, and secured to the deck. The bases of operations for the project in HSC were several marinas and public docks across the channel where supplies and personnel were loaded and unloaded during the field services on daily bases. The L/B was also demobilized at Martin's dock after concluding drilling operations on locations North of Morgan's Point.

2.4 Permits & Coordination

All permits for drilling and sampling were provided by AECOM JV prior to commencement of the project. However, Fugro was responsible and involved in meetings and calls with the United States Coast Guard (USCG), Port of Houston Authority (POHA), and the Port of Houston Pilots Association (POHPA). Fugro also handled the daily Category II Channel Obstructions request with Vessel Traffic Service Authority (VTSA) and radio communications before each vessel movement.

2.5 Surveying and Positioning

The L/B Shallow Draft 17 utilized a GPS system to position within an acceptable range of the location. Fugro personnel used a Trimble Geo XH 6000 (sub-meter GPS) to position the L/B on location. Surveyed as-built coordinates and elevations for the marine explorations including the encountered water depths, depth elevation, and penetration depths, are presented in [Tables 1 and 2](#) for sediment samples, and ambient water samples, respectively.

The coordinate system for reporting of the sampling program is North American Datum (NAD) 83 State Plane. All coordinates and dimensions are in feet.

2.6 Hazard Survey - Magnetometer

A basic Hazard Survey was conducted ahead of the sampling event to guaranty the safety of L/B positioning and drilling operations.

Fugro performed a magnetometer survey to identify the locations of ferrous debris and plausible pipelines that may impact future project operations within the sampling area. The survey commenced on September 5, 2018, and concluded on September 7, 2018. Magnetometer data in the nearshore areas were collected using a Geometrics G-882 marine magnetometer positioned using Differential GPS with proprietary Fugro corrections. All positioning and magnetometer data were recorded using the Hypack hydrographic and navigation software suite.

The magnetometer survey was collected in a grid pattern enclosing the locations of proposed sediment sampling locations. This pattern was designed to support the identification of linear hazards, such as pipelines, traversing the boring location areas. A minimum of three (3) survey transects were collected in North-South and East-West orientations around the proposed sampling locations. These transects were spaced at 500 foot intervals where possible. Transects were spaced closer in the upper reaches of the Houston Ship Channel west of HSCNew-NMP-02, where moored vessels and narrow channels prevented a larger grid spacing.

The magnetometer data was processed and interpreted using the SonarWiz geophysics software suite. Layback values were applied to all magnetometer data. Deflections from the ambient magnetic field within the survey area were interpreted as anomalies. The position, duration, and amplitude of each anomaly were recorded. The geometry of each anomaly was also described in terms of monopole, dipole, or complex. Data was also retrieved from the Texas Railroad Commission geospatial database purchased through their web site to aid in identifying possible pipelines associated with the mapped magnetic anomalies (RRC 2018).

The differences observed in the interpreted anomalies within this report could be the result of several unique variables. The nomogram in [Plates 3 through 13](#) symbolized with blue dashed lines provide a visual reference of the relationship between a ferrous object and the magnetic deflection generated by the object, symbolized as magnetic anomalies plotted along the blue lines of survey to represent a potential hazard. The amplitude and signature width (duration) of a magnetic deflection are dependent upon a variety of factors that include object size and orientation, ferrous content, and distance from the sensor (Breiner 1999). Due to the multitude of potential types of objects, debris, or infrastructure that could cause the interpreted anomalies,

reliable conclusions drawn from magnetometer data alone can be limited. Extreme caution should always be taken when conducting operations in the vicinity of the locations of identified magnetic anomalies. To reduce risk of encountering buried infrastructure or debris, some locations were revised prior to the start of the survey, such as HSCNew-NMP-01, HSCNew-NMP-05, and HSCNew-NMP-11.

2.7 Water Depth and Seabed Elevation

Once the platform was positioned at a location, water depth measurements were taken prior to the commencement of drilling operations with a weighted tape. Two measurements were taken (1) deck to mudline (DTM) and (2) deck to water (DTW), where water was the surface of the water. The difference between these two measurements is registered as the measured water depth.

Elevations associated with water depths measured were calculated using nearby tide charts to ensure that the specified elevation of 41.5 to 46.5 ft below Mean Lower Low Water (MLLW) level was met. This was accomplished by using the measured elevation of the water level and subtracting the measured depth to find seafloor mudline MLLW elevations. Seafloor elevations measured and corrected for tides are presented on the Logs of Sampling on [Plates A-1 through A-59](#) in [Appendix A](#).

2.8 Weather Forecast

The weather forecast for the sediment sampling program was provided by Fugro's metocean division in the UK. The forecast is based on Galveston 29.32N and 94.67W coordinates. This location is close to location HSCnew-SMP-REF offshore Galveston. Seas conditions presented on these reports may not correlate directly with the sea conditions encountered at the locations located in the protected waters of Galveston Bay. Forecast reports for the days of the field sediment sampling program are presented in [Appendix C](#). Appendix C also presents the weather report for the water sampling program conducted on October 22, 2018.

3.0 SAMPLING PROGRAM

3.1 Sampling Sediment Borings

A total of fifty-nine (59) sub-sediment sampling locations were drilled below the mudline line to collect the NMP SAP specified amount of sample. Summary of the completed locations is provided in [Table 1](#). The Plan of Borings per Station is found on [Plates 3](#) through [13](#), while a detailed description of soils found is provided on the Logs of Sampling in [Appendix A](#). The sediment sampling was conducted from October 1 through October 8, 2018.

Sediment sub-sampling locations were selected according to the SAP. Major deviations from the SAP approach were adjusted in consultation with ERDC and the AECOM JV personnel. These deviations from the original location area described in more detail in Section 3.5.4.

The mobilization of the L/B to North of Morgan's Point Stations was conducted on October 1, 2018. Heavy rains delayed the start of operations until October 2, 2018. Fugro was able to work every day until completion on October 6, 2018. The sampling effort started at sample location HSCnew-NMP-11, followed by sample locations HSCnew-NMP-10, 9, 8, 7, 6, 5, 4, 3, 3 (DUP), 2 and 1. The vessel transited to Martin's dock in Galveston on October 7 and demobilized on October 8, 2018.

Detailed descriptions of the soils encountered in the sampling locations drilled for this study are presented on the Logs of Sampling in [Appendix A](#) on [Plates A-1](#) through [A-59](#). A key identifying the terms and symbols used on the Logs of Sampling is presented on [Plates A-60](#) and [A-61](#). Field activities related to sampling locations, drilling and sampling methods, and borehole completion are discussed herein.

Drilling Methods. Drilling was performed through the "moon pull" of the L/B Shallow Draft 17 using a CME-75 drill rig as described in Section 2.2. Hollow Stem Augers (4.25-in) were run from deck level to the seafloor.

The objective of the drilling operations was to obtain the maximum amount of information on the subsurface conditions and to recover the SAP specified volume of core samples (up to 35 gallons) per location. Sediment sampling was accomplished by lowering a CME 4" by 5-ft long Bearing Head Continuous Sample Tube System (CME 4" sampler) through the Hollow Stem Augers into the seafloor. Once the sampler was secured inside the augers, the augers were rotated to the depth of the sampler length (about 5-ft), and the first sample was obtained. The auger was then rotated through the next 5 ft and sample obtained, with this process repeated to get through the target prism depth. Occasionally and due to very soft or very loose sediment conditions at and below seafloor, augers did not need to be rotated. Augers and samples were just lowered to the next sampling depth using their own weight or by pushing them with the drill rig.

Augers were used as casing to stabilize the upper/near surface of the boreholes. At the completion of the borehole all augers were recovered. Sampling was mainly performed with the CME 4" continuous sample tube sampler, however driven sampling techniques were used as a last resort. Sampler for driven sampling techniques included the sample penetration test (SPT) split



spoon and the Modified California Sampler (2-ft long by 3" inside diameter). The hollow stem auger and CME 4" sampler configuration was modified at one point of the investigation, in all efforts to maximize sample recovery on the loose sands and very soft clays. Hammering of the 4" sampler damaged the equipment. Fugro replaced the damaged sampler immediately by a new similar unit. No rotary wash drilling techniques were used during the sediment sampling campaign.

Fugro experienced difficulties to recover sediment samples in the near seafloor underconsolidated sediments, where very soft clays, very loose sands and/or shell hash beds are present. The large volume of sediments required by the NMP SAP did not make it feasible to use smaller diameter samplers, ideal for retaining representative amounts of these soft and very loose sediments.

Sampling Methods. Sampling was performed continuously from mudline to termination depth of the boring. Both the Fugro driller and the Fugro engineer on shift kept accurate logs of all activities performed (Appendix B) and all recovered materials (Appendix A).

The augers were lowered to the seafloor and the sampler was lowered and secured inside the augers for all augered samples using the proprietary latching device of the sampler specific for this auger. Once the system was in place the augers were rotated to the desired depths or maximum of the sampler capacity (5-ft long). The sampler was retrieved by pulling it out of the augers with the drill rig up to the deck. After retrieving the sampler, the soil sample was removed, and then the sampling process was repeated for the next 5 feet through the target prism depth. Following completion of the subsample, the sampler was rinsed and cleaned before the next subsample location as described in Section 3.3.

Hammer sampling was conducted in an effort to maximize sample recovery at difficult locations. A pneumatic hammer on top of the drill string was used to drive split spoon samplers in an effort to densify the soil and allowed it to stay inside the sampler. Blow counts from this sampling method were not recorded since it was not the purpose of the field program.

Once Fugro drillers collected the sediment sample via the "sampler," the sample tube was transferred to Benchmark personnel for processing. Benchmark personnel rinsed the outside of "sampler" with site water, placed it on a sampling table and split open. Benchmark personnel characterized, described, and photo logged the core with corresponding sample ID. Geotechnical characterizations were then performed by Fugro personnel. All data collected for each sample was recorded on a sampling data sheets with the corresponding date, time, and depth for each sample. After all field data was collected and recorded, the sample was placed into pre-cleaned five-gallon buckets and immediately placed into a refrigerated trailer unit. The buckets were labeled with sample location ID, sample date, sample time, initials of sampler, and bucket number. Immediately after sample collection, bucket lids were sealed on each sample container.

After the sample was split open, but prior to Benchmark processing the sample, pocket penetrometer tests were conducted when possible in the recovered soil materials. The unconfined compressive strength readings are reported on the respective Logs of Sampling presented in [Appendix A](#).

- **Pocket Penetrometer Tests.** This test is performed by slowly pressing a small flat-ended cylindrical metal rod (6.3-mm diameter) into the flat surface of the soil sample through a spring until it is embedded to a predetermined depth ($\frac{1}{4}$ inch of the device) within the sample. The resistance to device penetration is recorded by the spring that is calibrated to read the unconfined compressive strength of the soil based on spring compression. This testing tool is only used for soils with shear strength above 1 kips per square foot. Test results should be taken just as an indication of soil strength since none of the sediment samples were undisturbed.

3.2 Borehole Completion

Boreholes were not backfilled with grout, and the borings were allowed to cave-in once the drilling and sampling was completed.

3.3 Sample Storage and Shipping

Fugro's field engineer visually classified and logged the recovered soil samples collected at each location. Fugro personnel extruded sediment cores in either 2 or 5 foot sections. Benchmark personnel processed the sediment samples from all of the channel stations onboard the L/B. Sediment core sections were placed in PVC troughs lined with clean aluminum foil. Prior to sample processing, each sediment core section was photographed and a Fugro logger recorded sediment characteristics in a bore log. Photos of the collected samples are presented in [Appendix G](#). Pre-cleaned stainless-steel spoons and spatulas (cleaned as described in Section 3.3) were used to cut the core into 5 to 6 inch sections and placed immediately into two (2) gallon buckets. All sample containers were labeled with the sample location ID, collection date, time, and any additional information required by the analytical laboratory outlined the NMP SAP, Section 5.0, such as preservative used and analyses requested. Chain of Custody (COC) forms were completed for all samples collected and processed. The total volume of sediment collected from each channel sample location is 6 gallons. An additional 6 gallons of sediment were collected and processed from one of the channel sample locations for QA/QC analysis at HSCnew-NMP-03 (DUP).

Prior to sample collection, all containers and sampling equipment were cleaned using a new scrub brush, tap water, Alconox Detergent Powder and rinsed with distilled water based on protocols described in Plumb (1981). Any equipment that came into contact with sediment samples was deconned between channel sample locations. Care was taken to avoid contamination to sampling devices from the barge deck or other surfaces. Powderless latex or nitrile gloves were worn during sample collection and sample handling.

One (1) sediment sample equipment blank was prepared using 1) deionized water (provided by the laboratory) and 2) the pre-cleaned equipment that was in contact with the sediment samples (i.e., stainless steel spoon, core tube, nitrile glove), consistent with the frequency of one per 20 samples per environmental matrix or one per 20 samples per day, whichever is less, outlined in the NMP SAP Section 4.3.5. The equipment rinsate blank was collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment used for sample collection.

Immediately after the sediment samples had been collected and processed, the two-gallon buckets were placed in a refrigerated trailer (2-4 °C) onboard the L/B and transported to shore every three days. Once on shore the buckets were transferred to the refrigerated truck where they were delivered to the analytical laboratory at USACE ERDC in Vicksburg, Mississippi on 23 October 2018 as described in Section 3.5.1. The refrigerated trailer was only accessible by project personnel and a padlock was used on the refrigerated truck while transporting the samples to the laboratory.

3.4 Water Samples

A single site water sample was collected at each of the eleven (11) sediment sample locations shown in [Plate 2](#), chemically analyzed by the lab, and used in the preparation of elutriate samples. These were at sample locations HSCnew-NMP-01, NMP-02, NMP-03, NMP-04, NMP-05, NMP-06, NMP-07, NMP-08, NMP-09, NMP10, and NMP-11. Sediment that might have been produced during sediment sampling and processing, water samples were collected more than 24 hours after the last sediment sample was collected. Water samples were collected from Benchmark's 24ft aluminum boat equipped to collect clean water samples.

Sample containers for chemical analysis were provided by the laboratory and new five (5) gallon cubitainers were used to collect bulk water samples. Care was taken to avoid contamination to sampling devices (tubing, sample containers, pumps) from the boat deck or other surfaces, and sampling equipment deconned between sample locations as described in detail in Section 3.5.1. Powderless nitrile gloves were worn during sample collection and handling.

Prior to conducting the sampling event, actual sediment sample location coordinates were loaded onto a sub-meter GPS and used to navigate the sample vessel to each water sample location. Water samples from all water sample locations were collected on 22 October 2018.

Water samples were collected from mid-depth at each sample location. Mid-depth was determined using a weighted line and measuring tape, marking the line as needed to identify mid-depth. Water samples were collected using high-volume geo-pumps, tubing and filters. Water samples which were field filtered were those being submitted for all chemical analyses except Total Mercury, Total Selenium, and Total Suspended Solids in accordance with Section 4.3.2. In addition, filters were not used when collecting bulk water samples into 5 gallon cubitainers. New tubing and filters were used at each sample location and site water was flushed through the tubing with a volume of at least five times the volume of the sample tubing prior to using it for sample collection. Flushing water was discarded back into the ship channel after each sample was collected. Water samples were collected into laboratory-supplied pre-cleaned sample containers and new 5-gallon cubitainers.

Immediately after completing sample collection for each location, water samples were delivered to shore and loaded into a refrigerated truck. The refrigerated truck was kept at a temperature of 4°C from the time the samples were loaded into the truck starting on 22 October 2018 until the samples were delivered to the laboratory at USACE ERDC in Vicksburg, MS, on 23 October 2018.

Field parameters including dissolved oxygen (DO), pH, salinity, conductivity, and water temperature were recorded at each water sample location.

- DO – ranged from 2.74 mg/L at HSCnew-NMP-09SW to 5.63 mg/L at HSCnew-NMP-03SW;
- pH - ranged from 7.47 at HSCnew-NMP-08SW to 8.06 at HSCnew-NMP-07SW;
- Salinity – ranged from 1.13 ppt at HSCnew-NMP-11SW to 4.59 ppt at HSCnew-NMP-02SW;
- Conductivity – ranged from 2.289 mS/cm at HSCnew-NMP-07SW to 8.123 mS/cm at HSCnew-NMP-02SW; and
- Water Temperature – ranged from 19.28 °C at HSCnew-NMP-01SW to 23.09 °C at HSCnew-NMP-10SW.

In addition, field data including: sample date, sample time, water depth, sample depth, location ID, sample ID were recorded on field data sheets. Field parameters and general sample data are listed in [Table 2](#).

3.5 Quality Control Methods

3.5.1 Sample Preservation and Storage

Sediment samples were placed into pre-cleaned two (2) gallon buckets and sample jars provided by analytical laboratory. Sediment samples were collected and processed for the following analysis:

- Metals;
- Pesticides;
- Dioxins/Furans;
- PAH/PCPs;
- PCBs;
- TOC;
- Grain Size;
- Ammonia;
- pH; and
- Total Solids.

The buckets were labeled with sample location ID, sample date, sample time, initials of sampler, and bucket number. Immediately after sample collection, bucket lids were sealed on each sample container. Sealed sample buckets were placed into a refrigerated trailer located on the barge. The refrigerated trailer was kept at a temperature of 2°C to 4°C. The refrigerated box truck was locked with a padlock. Custody seals were not used on individual sample coolers. At a minimum, the temperature of the refrigerated trailer was checked once a day and recorded on a temperature log data form. Sediment samples were stored in the refrigerated trailer from the time of sample collection until they were shipped to the analytical laboratory.

Sediment samples from locations HSCnew-NMP-07, NMP-08, NMP-09, NMP-10, and NMP-11 were collected on 2 October and 3 October 2018 and shipped via FedEx on 4 October 2018 and delivered to the analytical laboratory on 6 October 2018.

Sediment samples from locations HSCnew-NMP-01, NMP-02, NMP-03, NMP-03 (DUP), NMP-4, NMP-5, and NMP-6 were collected on 4 October through 6 October 2018. Sediment samples were offloaded from the sample barge on 8 October 2018 and immediately placed in a refrigerated box truck set at 2°C to 4°C. Sediment samples were stored in the refrigerated box truck and delivered to the laboratory by Benchmark on 9 October 2018.

Water samples were collected into sample containers provided by the laboratory for the following chemical analyses:

- Dissolved Organic Carbon
- Dissolved Ammonia
- Dissolved Metals
- Dissolved Sulfides
- TPH (preserved with HCL)
- VOC (preserved with HCL)
- Chromium III and VI
- TOC (preserved with sulfuric acid)
- Total Hg and Se (preserved with nitric acid)
- TSS

Bulk water samples for the additional analysis listed above and in the NMP SAP Table 2, and elutriate samples were collected into new five (5) gallon cubitainers. A total of five (5) five (5) gallon cubitainers (in addition to the sample containers provided by the laboratory) were collected at each sample location. All sample containers were labeled with sample date, sample time, sample location, and with the initials of the sampler. Immediately after sample collection, water samples were placed into a refrigerated box truck set at 4°C. Water samples were kept at 4°C in the refrigerated truck and transported by Benchmark to the USACE ERDC laboratory at Vicksburg, MS on 23 October 2018.

Samples were delivered within the recommended holding times, as listed in the SAP. Contract personnel verified and confirmed all sample handling, storage and preservation requirements with the analytical facility performing the project analyses. The SAP describes recommended procedures for sample collection, preservation, and storage in Section 4.3 and Table 2. Sample preservation and storage methods described in the SAP were followed without deviation. Samples were homogenized by USACE ERDC at Vicksburg, MS prior to sending it to the analytical laboratory.

3.5.2 Field Quality Control

A duplicate sediment sample was collected at sediment sample location HSCnew-NMP-03. A total of six (6) two (2) gallon buckets were filled with sediment at sample location HSCnew-NMP-03 and NMP-03 (DUP).

A duplicate water sample was collected at sample location NMP-03. Two sets of sample containers provided by the laboratory and ten (10) five (5) gallon cubitainers were processed at sample location HSCnew-NMP-03.

One (1) sediment equipment blank was processed associated with the sample collection of sediment samples using the drill rig. The equipment blank was prepared by pouring deionized water (provided by the laboratory) over sample and processing equipment that came into contact with the sediment while collecting and processing the samples (e.g. drill rig sampler device, stainless steel spoon, plastic bucket, and nitrile gloves).

One (1) sample equipment blank for water was prepared using deionized water provided by the laboratory and equipment that contacted water samples (e.g. tubing, filter, and nitrile gloves).

Field duplicate and equipment blank sample data were recorded on field data sheets. Field duplicate data are listed in [Tables](#) and [2](#) for sediment and water samples, respectively.

3.5.3 Chain of Custody/Shipping

Chain of Custody (COC) protocols were followed while conducting the field sampling event. Guidance can be found in the references cited in USACE (1995) as well as Plumb (1981). COC forms and sample labels were provided by the laboratory prior to sample collection. COC forms were filled out and signed by contract personnel from Benchmark as the samples were collected and processed. COC forms were signed by laboratory personnel upon transfer of samples to the USACE ERDC laboratory at Vicksburg, MS. Copies of the COCs are included with the final laboratory data packet.

Sediment and water samples were shipped as listed in Section 3.5.1. Deviations associated with the storage and shipment of sediment samples are listed in Section 3.5.4. A temperature log for Quality Assurance purposes is presented in Appendix F.

3.5.4 Deviations from NMP SAP Procedures

The following deviations exists during the sediment collection field campaign when compared with the procedures outlined in the NMP SAP:

- **Project Area.** Sediment samples were collected at the given sample locations whenever possible. These had to be adjusted for reasons summarized below and discussed in more detail in Sections 2.1 and 3.1. At the time of sampling Fugro, AECOM JV and ERDC personnel jointly agreed to:
 - a. eliminate Samples "B" located in the middle of the HSC (NMP SAP, line 349) on all sampling locations;

- b. shift sub-sampling locations to one side of the channel ("A" or "C") at Locations HSCnew-NMP-01, and NMP-07; and
 - c. move sub-sampling locations the least distance possible from given locations, to accommodate for pipeline obstructions, steep channel slopes or difficult sampling conditions, while remaining within the dredge prism. This last agreement affected all the sampling locations except HSCnew-NMP-02, NMP-09 and NMP-11.
 - d. Sub-sample locations were relocated to avoid improve poor sediment recovery; Sub-sample locations were pulled away from existing pipelines whose locations were determined by the hazard survey described in Section 2.6; and
 - e. Sub-sample locations near existing, high occupancy ship docks were relocated, to not impede their use and to not force sampling operations to move frequently.
- **Schedule.** Sediment samples were collected in close coordination between Fugro, AECOM JV and ERDC personnel. Water samples were collected in close coordination with ERDC laboratory personnel to work with the days that favor shipment strategy and openings in the laboratory testing schedule. There were no deviations from the NMP SAP or planned Fugro schedule.
 - **Sample Storage.** Sediment sample collection was completed on October 6, 2018. Sediment samples remained on the LB in the refrigerated trailer until they were delivered to the offloading dock in Galveston, TX on Monday October 8, 2018. Benchmark employees arrived at the LB first thing Monday morning to unload the sediment samples from the refrigerated trailer into a refrigerated box truck for delivery to the ERDC laboratory in Vicksburg. At this point, it was discovered that the refrigerated trailer on the barge was not running. Benchmark employees immediately began placing ice on the samples to keep the samples cool. Benchmark employees measured the temperature in one of the smallest sample jars and the temperature was 3.9 °C which is within the acceptable temperature range of 1 to 4 °C. Benchmark notified the appropriate AECOM, USACE, ERDC, and Fugro personnel of the issue on October 8, 2018. Sediment samples were removed from the LB, placed into a refrigerated box truck and delivered to the ERDC Vicksburg laboratory on October 9, 2018.
 - **Sample Delivery.** In order to meet sample hold times, sediment samples collected on October 2 and 3, 2018 were shipped via FedEx to the ERDC Vicksburg laboratory on October 4, 2018. The samples were scheduled to be delivered to the laboratory first thing October 5, 2018. Nine coolers were packed with ice and shipped from Houston to Vicksburg. Two of the nine coolers arrived at the laboratory within temperature on October 5, 2018. The remaining seven coolers were held-up in Memphis, TN and were not delivered to the laboratory on October 5, 2018. Benchmark employees worked with FedEx employees and arranged to have the seven coolers held in Memphis to be delivered to Jackson, MS on October 6, 2018. A Benchmark employee picked the sample coolers at 0900hrs on October 6, 2018 from a FedEx shipping center. The sample coolers were opened immediately, and ice was observed in all seven coolers. The temperature of the samples was measured below 4 °C. The coolers were repacked with fresh ice and driven

to Vicksburg, MS. The sediment samples were delivered to ERDC personnel in Vicksburg midday on October 6, 2018. The sediment samples arrived within temperature, in time to conduct the analysis, and within the acceptable temperatures defined in the SAP. No impact to the analysis resulted.

- **Sampling (approach and collection).** Fugro used a 4" CME sampler in conjunction with a hollow stem auger system. This system is ideal to collect large volumes of sample throughout the soil column. There were no deviations from the NMP SAP or planned Fugro schedule. There were deviations from the originally planned sampling method Fugro proposed due to soft soil conditions. The use of hammer sampling to handle these conditions is described in Section 3.1. However, it was challenged by the soft and loose sediment located close to the mudline or within strata at deeper depths. Deviations included corrective actions taken to replace the 4" CME sampler damaged by percussive driving for which it wasn't designed during attempts to densify the material and maximize sample recovery. Fugro also attempted, the use of smaller percussion split spoon samplers in an effort to maximize sample recovery and selective re-sampling of missing sample intervals at adjacent locations. Missing sample intervals would affect sample representativeness of the intended dredged prism if not addressed.
- **Chain of Custody and Shipping.** Appropriate chain of custody protocols was followed. Samples were shipped, and samples were received in the facility with holding times met. No deviations reported on this field activity except by occurrence explained in the Sample Delivery bullet item.

Relocations proposed and discussed by AECOM JV in coordination with ERDC ensured new locations were in the same study segment and would have new work material at the same targeted depths as the original. Therefore, relocation would not impact the ability to obtain representative samples.

Sediment samples collected from sample locations HSCnew-NMP-07 through HSCnew-NMP-11 were shipped via FedEx leaving Houston on 4 October 2018. A total of nine (9) coolers were packed with ice and shipped to arrive overnight at the ERDC Vicksburg, MS laboratory. Due to a FedEx sorting error in Houston, only one cooler was delivered to the laboratory on 5 October 2018. The other eight (8) sample coolers were held in the FedEx Memphis, TN distribution center until they were delivered to the FedEx Richland, MS distribution center on 6 October 2018. Benchmark personnel retained custody of the coolers at 0900 hrs on 6 October 2018 from the Richland FedEx facility. The coolers were opened and inspected for the presence of ice and the water temperature of a temperature blank was measured and recorded. Ice was observed in all eight (8) sample coolers and the temperature blank was 1°C. Additional ice was added to each of the eight (8) coolers and the coolers were delivered to Vicksburg, MS around noon on 6 October 2018. While all the samples did not arrive at the laboratory on 5 October 2018, the samples were delivered to the analytical lab on 6 October 2018 within the appropriate temperature range and were analyzed within the appropriate hold times.

Sediment samples collected from sample locations HSCnew-NMP-01 through HSCnew-NMP-06 were collected on 4 October through 6 October 2018. The sample barge travelled from sample

location HSCnew-NMP-01 to a dock located on Pelican Island in Galveston, TX on 7 October 2018. Benchmark personnel arrived at the sample barge located on Pelican Island at 0800 hrs on 8 October 2018 and discovered the refrigerated trailer holding the sediment samples was not working when arrival. A thermometer was placed in one of the smaller sample jars and the temperature was recorded as 3.8°C. Ice was immediately placed on all the sediment samples. Sediment samples were offloaded from the sample barge on 8 October 2018 and immediately placed in a refrigerated box truck set at 2°C to 4°C. Sediment samples were stored in the refrigerated box truck and delivered to the laboratory on 9 October 2018. While the refrigerated trailer stopped working sometime between 7 October and the morning of 8 October, the samples did not exceed a temperature of 4°C. Samples were delivered to the analytical laboratory within the appropriate temperature range and were analyzed within the appropriate hold times.

4.0 GENERAL SUBSURFACE CONDITIONS

The register subsurface conditions based on our field exploration program are provided in this section. No geotechnical laboratory testing was conducted to confirm our field observations.

4.1 Subsurface Conditions

The subsurface conditions presented in this report are based on the information obtained from the Sampling Locations performed during this field program. The generalized subsurface stratigraphy at the Sampling is summarized in the following tables for each sampling location and discussed in the following paragraphs. The percentage of sample recovery was estimated based on our interpretation of the subsurface stratigraphy and length of sediment sample recovery on each of the samplers obtained at the sub-sample locations.

Sampling Location HSCnew-NMP-01 (HSC Station 500+00)

Table 4-1: Summary of Soil Conditions – HSCnew-NMP-01AH3 (1 through 4)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	0	3 to 6	100%
II	Sand – loose, with silt	3	End (5 to 6.5')	50%

Stratum I consists of silt generally extending from the mudline to a depth of about 3 to 6 ft. This stratum contains sand and it is black. Stratum II consists of loose sand with silt. Measured water depths ranged from 33.0 ft to 36.1 ft below MLLW.

Sampling Location HSCnew-NMP-02 (HSC Station 730+00)

Table 4-2A: Summary of Soil Conditions – HSCnew-NMP-02A (1 and 2)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	10	End (15)	100%

Stratum I consists of silt from mudline to 15 ft. The top 10 ft were discarded as per sampling specifications. Measured water depths ranged from 34.2 ft to 34.7 ft below MLLW.

Table 4-3C: Summary of Soil Conditions – HSCnew-NMP-02C (1)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Sandy clay – very soft	11	21	100%
II	Clay – very stiff to hard	21	End (34)	100%

Stratum I consists of soft sandy clay from 11 ft to 21 ft below mudline. Stratum II consist of very stiff to hard overconsolidated clay with calcareous and ferrous nodules. The top 11 ft were discarded as per sampling specifications. Measured water depths was 16.1 ft below MLLW.

Sampling Location HSCnew-NMP-03 (HSC Stations 791+00 and 796+00)

Table 4-4A: Summary of Soil Conditions – HSCnew-NMP-03A-1 and HSCnew-NMP-03A-1 (DUP)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Sand - loose, with plastic trash	0	5 to 7	50%
II	Clay – very stiff to hard	5 to 7	End (18 to 19)	74%

Stratum I consists of loose sand to clayey sand with plastic trash. Stratum II consists of very stiff to hard overconsolidated clay with calcareous nodules. Hard drilling was reported at 15 ft below mudline and refusal at 18 ft in one of the boring locations. Measured water depths ranged from 30.6 ft to 31.2 ft below MLLW at this sub-sample locations.

Table 4-5C: Summary of Soil Conditions – HSCnew-NMP-03C-1 and HSCnew-NMP-03C-1 (DUP)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Sand - loose, with silt and shell fragments	0	17 to 18	60%
II	Clay – very stiff to hard	17 to 18	19 to end (27)	86%
III	Sand	19	End (28)	72%

Stratum I consists of loose sand to clayey sand with silt and shell fragments. A silt layer was present at shallowest water location from mudline to 4-ft penetration and from 6- to 7.5ft penetration. Stratum II consists of stiff to hard overconsolidated clay. Stratum II was the end of drilling for HSCnew-NMP-03C-1. Stratum III was present on HSCnew-NMP-03C-1 (DUP) and

consist of dense sand. Measured water depths ranged from 19.7 ft to 22.0 ft below MLLW at this sub-sample locations.

Sampling Locations HSCnew-NMP-04 (HSC Station 873+00)

Table 4-4: Summary of Soil Conditions – HSCnew-NMP-04A (1 and 2) and 04C (1 through 5)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	1 to 14	5 to 16	76%
II	Clay – very stiff, with silt and sand	5 to 16	End (6 to 19)	80%

Stratum I consists of silt with clay and traces of sand. Hydrocarbons were noticed on Stratum I at location HSCnew-NMP-04C-3. Stratum II consists of very stiff clay with silt and sand. A thin sand layer was generally encountered between Strata I and II. Measured water depths ranged from 30.5 ft to 43.7 ft below MLLW.

Sampling Location HSCnew-NMP-05 (HSC Station 959+00)

Table 4-5A: Summary of Soil Conditions – HSCnew-NMP-05A (1 through 3)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	5 to 8	End (9 to 12)	100%

The “A” locations are characterize by the presence of silt from mudline to the final explored depths. Stratum I consists of silt with traces of clay. Measured water depths ranged from 37.7 ft to 40.5 ft below MLLW.

Table 4-5C: Summary of Soil Conditions – HSCnew-NMP-05C (1 through 3)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Interlayered Sand and Clay – dense and hard	25 to 33	End (9 to 12)	69%

The “C” locations are characterize by interlayer strata of hard overconsolidated clay and dense fine sand. Stratum I consists of layers of hard clay and dense sands. The top 25 to 33 ft were discarded as per sampling specifications. Measured water depths ranged from 11.5 ft to 19.5 ft below MLLW.

Sampling Location HSCnew-NMP-06 (HSC 1127+00)

Table 4-6A: Summary of Soil Conditions – HSCnew-NMP-06A (1 through 3)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	5 to 14	End (8 to 17)	100%

Stratum I consists of silt, with clay and organic matter. The top 5 to 14 ft were discarded as per sampling specifications. Measured water depths ranged from 27.4 ft to 36.7 ft below MLLW.

Table 4-6C: Summary of Soil Conditions – HSCnew-NMP-06C (1 and 2)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Interlayered Sand and Clay – dense and hard	29	End (33)	100%

The “C” locations are characterized by interlayer strata of hard overconsolidated clay and dense fine sand. Stratum I consists of layers of hard clay and dense sands. The top 29 ft were discarded as per sampling specifications. Measured water depths ranged from 11.6 ft to 12.0 ft below MLLW.

Sampling Location HSCnew-NMP-07 (HSC-1180+00)

Table 4-7A: Summary of Soil Conditions – HSCnew-NMP-07A (1)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silty sand to sand – loose and medium dense	4	11	83%
II	Clay– stiff, with traces of sand	11	End (14)	33%

Stratum I is characterized by the presence of medium dense silty sand to sand with clay layers and organic matter. Stratum II consists of overconsolidated stiff clay with traces of sand. The top 4 ft were discarded as per sampling specifications. Measured water depth was 32.5 ft below MLLW.

Table 4-7ALT1: Summary of Soil Conditions – HSCnew-NMP-07 (ALT1-1 through 5)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	20 to 21	22 to 24	100%
II	Silty sand – loose	22 to 24	End (25 to 26)	100%

Stratum I is characterized by the presence of silt with clay. Stratum II consists of medium dense silty sand. The top 20 to 21 ft were discarded as per sampling specifications. Measured water depths ranged from 19 ft to 20 ft below MLLW.

Sampling Location HSCnew-NMP-08 (HSC 1200+00)

Table 4-8A: Summary of Soil Conditions – HSCnew-NMP-08A (1 and 2)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Clay – very stiff	26	End (30)	100%

Stratum I consists of overconsolidated clay, very stiff. Stratum I in location HSCnew-NMP-08A-2 consist of silt with sand. The silt was found from 19 to 23 ft below mudline. The soil differs from the other location; however, samples were obtained from different elevations following sampling specifications. The top 19 to 26 ft were discarded as per sampling specifications. Measured water depths ranged from 14.7 ft to 22.1 ft below MLLW.

Table 4-8C: Summary of Soil Conditions – HSCnew-NMP-08C (1 through 4)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	2 to 3	4 to 6	86%
II	Clay – firm to very stiff, with sand pockets	4 to 6	End (7)	60%

The “C” locations are characterized by the presence of silt with organic matter on Stratum I, followed by overconsolidated firm to very stiff clay with sand pockets (Stratum II). A sand layer was found between these two strata at location HSCnew-NMP-08C-3. The top 2 to 3 ft were discarded as per sampling specifications. Measured water depths ranged from 37.6 to 38.0 ft below MLLW.

Sampling Location HSCnew-NMP-09 (HSC 1230+00)

Table 4-9: Summary of Soil Conditions – HSCnew-NMP-09A (1 through 3) and 09C (1 through 4)

Generalized Strata	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	2 to 3	3 to 5	100%
II	Clay – firm to very stiff, with sand pockets	3 to 5	End (6 to 7)	64%

All locations are characterized by the presence of silt with organic matter on Stratum I, followed by overconsolidated very stiff clay (Stratum II). The top 2 to 3 ft were discarded as per sampling specifications. Measured water depths ranged from 37.7 to 38.6 ft below MLLW.

Sampling Location HSCnew-NMP-10 (HSC Station 1260+00)

Table 4-10A: Summary of Soil Conditions – HSCnew-NMP-10A (1 through 4)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	3 to 4	End (7 to 8)	89%

Stratum I consists of silt from mudline to about 8 ft. Several wood fragments are present in this stratum. The top 3 to 4 ft were discarded as per sampling specifications. Measured water depths ranged from 36.4 ft to 37.4 ft below MLLW.

Table 4-10C: Summary of Soil Conditions – HSCnew-NMP-10C (1 and 2)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silty sand – very loose	6 to 7	7 to 9	100%
II	Clay – very stiff	7 to 9	End (11)	100%

Stratum I consists of very loose silty sand from 6 to 7 ft to 7 to 9 ft below mudline. Stratum II consist of very stiff overconsolidated clay. The top 6 to 7 ft were discarded as per sampling specifications. Measured water depths ranged from 33.6 to 34.2 ft below MLLW.

Sampling Location HSCnew-NMP-11 (HSC Station 024+00)

Table 4-11A: Summary of Soil Conditions – HSCnew-NMP-11A (1 and 2)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silt – with clay	4	7 to 8	100%
II	Sand – loose, medium grained	7 to 8	End (14)	33%

Stratum I consists of silt with clay from 4 to about 8 ft. Stratum II consists of a loose medium grained sand with organics. The top 4 ft were discarded as per sampling specifications. Measured water depths ranged from 31.3 ft to 31.4 ft below MLLW.

Table 4-11C: Summary of Soil Conditions – HSCnew-NMP-11C (1 through 3)

Generalized Stratum	General Description	Depth from Mudline		Estimated Recovery (%)
		Top (ft)	Bottom (ft)	
I	Silty sand – very loose	7	10 to 11	100%
II	Clay – stiff to very stiff	10 to 11	End (12)	80%

Stratum I consists of very loose silty sand from 7 ft to 11 ft below mudline. Stratum II consist of stiff to very stiff overconsolidated clay. A soft silty clay is present in location HSCnew-NMP-11C-1 between both strata. The top 7 ft were discarded as per sampling specifications. Measured water depths ranged from 33.1 and 33.2 ft below MLLW.

A summary of specific soil stratigraphy per sub-sample location are summarized on [Table 3](#), and in more detail on the Logs of Sampling in [Appendix B](#). A key to the terms and symbols used on the Logs of Sampling is also presented in [Appendix B](#).

4.2 Variations

Our interpretations of soil and depth-to-water conditions, as described in this report, are based on data obtained from the sampling locations. No laboratory classification tests were conducted for this program. It is possible that undisclosed variations in soil, and depth-to-water conditions may occur outside the Sampling locations.

5.0 REFERENCES

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TABLES

Table 1: Sediment Sampling Locations
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Sub-sample Locations	Coordinates ⁽¹⁾		Coordinates		Date	Sample Time	Measured Water Depth (ft)	Corrected Water Depth MLLW (ft)	Penetration Depth Below Mudline (ft)	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
			X - Easting (ft)	Y - Northing (ft)	LAT	LONG							
NMP-01	HSCNew-NMP-01AH3	HSCNew-NMP-01AH3-1	3,209,399	13,844,992			10/6/2018		38.30	36.02	5.50		500+00
		HSCNew-NMP-01AH3-2	3,209,391	13,845,001			10/6/2018		38.30	36.10	5.50		
		HSCNew-NMP-01AH3-3	3,209,382	13,844,988			10/6/2018		38.60	36.45	5.00		
		HSCNew-NMP-01AH3-4	3,209,370	13,844,967			10/6/2018		37.20	35.06	6.50		
NMP-02	HSCNew-NMP-02	HSCNew-NMP-02A-1	3,190,669	13,835,075			10/6/2018		37.20	34.73	15.00		720+00
		HSCNew-NMP-02A-2	3,190,674	13,835,065			10/6/2018		36.50	34.07	15.50		
		HSCNew-NMP-02C-1	3,190,740	13,835,560			10/6/2018		18.80	16.13	33.50		
NMP-03	HSCNew-NMP-03	HSCNew-NMP-03A-1	3,185,272	13,837,839	29 44 36.654	95 09 53.7	10/5/2018		33.20	31.18	18.00		800+00
		HSCNew-NMP-03A-1(DUP)	3,185,291	13,837,849			10/5/2018		33.40	30.63	19.00		
		HSCNew-NMP-03C-1	3,185,164	13,838,758	29 44 45.789	95 09 54.591	10/5/2018		24.10	22.00	27.50		
		HSCNew-NMP-03C-1(DUP)	3,185,164	13,838,762	29 44 45.826	95 09 54.588	10/5/2018		21.90	19.65	30.00		
NMP-04	HSCNew-NMP-04	HSCNew-NMP-04A-1	3,177,578	13,837,883			10/5/2018		32.90	30.54	19.00		915+00
		HSCNew-NMP-04A-2	3,177,560	13,837,887			10/5/2018		39.90	37.65	12.00		
		HSCNew-NMP-04C-1	3,177,446	13,838,353			10/5/2018		45.50	43.27	6.50		
		HSCNew-NMP-04C-2	3,177,448	13,838,374			10/5/2018		45.50	43.35	6.50		
		HSCNew-NMP-04C-3	3,177,473	13,838,383	29 44 44.562	95 11 21.931	10/5/2018		45.10	43.00	6.50		
		HSCNew-NMP-04C-4	3,177,493	13,838,377	29 44 44.500	95 11 21.709	10/5/2018		45.10	43.01	6.50		
NMP-05	HSCNew-NMP-05	HSCNew-NMP-04C-5	3,177,357	13,838,356	29 44 44.338	95 11 23.254	10/5/2018		45.70	43.67	6.00		970+00
		HSCNew-NMP-05A-1	3,171,789	13,832,332			10/5/2018		40.10	37.66	12.00		
		HSCNew-NMP-05A-2	3,171,785	13,832,337	29 43 46.566	95 12 28.651	10/5/2018		39.90	37.51	12.00		
		HSCNew-NMP-05A-3	3,171,778	13,832,329			10/5/2018		42.90	40.51	9.00		
		HSCNew-NMP-05C-1	3,171,351	13,832,522			10/4/2018		13.40	11.50	38.00		
		HSCNew-NMP-05C-2	3,171,367	13,832,517			10/4/2018		15.80	14.05	35.50		
NMP-06	HSCNew-NMP-06	HSCNew-NMP-05C-3	3,171,393	13,832,512			10/4/2018		21.20	19.50	30.00		1115+00
		HSCNew-NMP-06A-1	3,157,010	13,830,360			10/4/2018		29.60	27.43	17.00		
		HSCNew-NMP-06A-2	3,156,997	13,830,374	29 43 31.864	95 15 17.018	10/4/2018		36.60	34.52	10.00		
		HSCNew-NMP-06A-3	3,156,993	13,830,383	29 43 31.949	95 15 17.065	10/4/2018		38.70	36.66	8.00		
		HSCNew-NMP-06C-1	3,157,267	13,830,791			10/4/2018		13.90	11.64	33.00		
		HSCNew-NMP-06C-2	3,157,252	13,830,786			10/4/2018		14.20	11.95	33.00		
NMP-07	HSCNew-NMP-07	HSCNew-NMP-07A-1	3,151,931	13,829,808			10/2/2018		33.70	32.52	14.00		1160+00
		HSCNew-NMP-07 (ALT 1-1)	3,151,936	13,829,813	29 43 27.908	95 16 14.594	10/3/2018		21.40	19.39	25.50		
		HSCNew-NMP-07 (ALT 1-2)	3,151,936	13,829,809	29 43 27.876	95 16 14.602	10/3/2018		22.10	20.19	24.50		
		HSCNew-NMP-07 (ALT 1-3)	3,151,924	13,829,798			10/3/2018		21.70	19.83	25.00		
		HSCNew-NMP-07 (ALT 1-4)	3,151,916	13,829,792			10/3/2018		21.50	19.67	25.00		
		HSCNew-NMP-07 (ALT 1-5)	3,151,921	13,829,775			10/3/2018		21.20	19.41	25.00		
NMP-08	HSCNew-NMP-08	HSCNew-NMP-08A-1	3,149,974	13,831,274			10/3/2018		16.90	14.73	30.00		1200+00
		HSCNew-NMP-08A-2	3,150,021	13,831,253			10/3/2018		24.10	22.05	23.00		
		HSCNew-NMP-08C-1	3,150,638	13,831,379			10/3/2018		39.90	37.70	7.00		
		HSCNew-NMP-08C-2	3,150,649	13,831,382			10/3/2018		40.20	37.96	6.50		
		HSCNew-NMP-08C-3	3,150,637	13,831,389			10/3/2018		39.80	37.56	7.00		
		HSCNew-NMP-08C-4	3,150,629	13,831,393			10/3/2018		39.90	37.73	7.00		
NMP-09	HSCNew-NMP-09	HSCNew-NMP-09A-1	3,149,149	13,833,987			10/2/2018		39.70	38.22	6.00		1230+00
		HSCNew-NMP-09A-2	3,149,153	13,833,975			10/2/2018		39.10	37.67	7.00		
		HSCNew-NMP-09A-3	3,149,159	13,833,976			10/2/2018		39.10	37.76	7.00		
		HSCNew-NMP-09C-1	3,149,514	13,834,136			10/3/2018		40.40	37.98	7.00		

Table 1: Sediment Sampling Locations
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Sub-sample Locations	Coordinates ⁽¹⁾		Coordinates		Date	Sample Time	Measured Water Depth (ft)	Corrected Water Depth MLLW (ft)	Penetration _Depth_Below_Mudline (ft)	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
			X - Easting (ft)	Y - Northing (ft)	LAT	LONG							
		HSCNew-NMP-09C-2	3,149,510	13,834,140			10/3/2018		41.00	38.63	6.00		
		HSCNew-NMP-09C-3	3,149,513	13,834,137			10/3/2018		40.80	38.47	6.00		
		HSCNew-NMP-09C-4	3,149,511	13,834,149			10/3/2018		40.60	38.36	6.50		
NMP-10	HSCNew-NMP-10	HSCNew-NMP-10A-1	3,147,880	13,836,082			10/2/2018		39.00	37.39	7.00		1260+00
		HSCNew-NMP-10A-2	3,147,882	13,836,063			10/2/2018		38.50	36.92	7.50		
		HSCNew-NMP-10A-3	3,147,894	13,836,050			10/2/2018		38.00	36.44	8.00		
		HSCNew-NMP-10A-4	3,147,894	13,836,063	29 44 31.028	95 16 58.166	10/2/2018		38.00	36.44	8.00		
		HSCNew-NMP-10C-1	3,147,863	13,836,670			10/2/2018		35.40	33.59	11.00		
		HSCNew-NMP-10C-2	3,147,862	13,836,675			10/2/2018		35.90	34.22	10.50		
		HSCNew-NMP-11A-1	3,145,331	13,838,513			10/2/2018		33.50	31.30	14.00		
		HSCNew-NMP-11A-2	3,145,340	13,838,513			10/2/2018		33.50	31.36	14.00		
NMP-11	HSCNew-NMP-11	HSCNew-NMP-11C-1	3,145,773	13,839,568			10/2/2018		35.10	33.05	11.50		024+00
		HSCNew-NMP-11C-2	3,145,774	13,839,559			10/2/2018		35.20	33.20	11.50		
		HSCNew-NMP-11C-3	3,145,774	13,839,567			10/2/2018		35.10	33.20	11.50		

Notes: (1): Coordinates reported in NAD83 State Plane, Texas South Central, US Feet

(2): All stationing shown are Houston Ship Channel (HSC) stations.

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Table 2: Water Sampling Locations and Parameters
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Coordinates ⁽¹⁾		Coordinates		Date	Sample Start Time	Sample End Time	Water Depth (ft)	Sample Depth (ft)	Water Parameters		Time Sample placed in Refrigerated Truck	Comment	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
		X - Easting (ft)	Y - Northing (ft)	LAT	LONG											
NMP-01	HSCNew-NMP-01-SW	3,209,747	13,844,644			10/22/18	10:00	10:25	8.0	4.0	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	19.28 4.03 7.62 7.301 45.3 9.0 4.57 57.9 6 mph NNE	15:00			500+00
NMP-02	HSCNew-NMP-02-SW	3,190,661	13,835,567			10/22/18	10:02	10:16	7.9	3.5	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	22.84 4.59 7.56 8.123 -7.6 8.0 4.61 56.0 6 mph NE	15:00			720+00
NMP-03	HSCNew-NMP-03-SW	3,185,287	13,837,835			10/22/18	10:53	11:28	30.2	15.0	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	19.93 3.93 7.72 7.050 50.1 8.2 5.63 59.0 6 mph N	15:00	Field Duplicate Collected Sample ID: HSCNew-NMP-03-SW-Dup		800+00
NMP-04	HSCNew-NMP-04-SW	3,177,594	13,837,940			10/22/18	10:30	11:00	25.3	12.5	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	22.74 3.61 7.62 6.587 -41.6 8.4 4.50 58.0 5 mph NNE	15:00			915+00
NMP-05	HSCNew-NMP-05-SW	3,171,799	13,832,335			10/22/18	12:00	12:21	31.0	15.5	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	19.68 2.84 7.82 5.221 48.5 8.6 3.68 64.0 5 mph NNE	15:00			970+00

Table 2: Water Sampling Locations and Parameters
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Coordinates ⁽¹⁾		Coordinates		Date	Sample Start Time	Sample End Time	Water Depth (ft)	Sample Depth (ft)	Water Parameters		Time Sample placed in Refrigerated Truck	Comment	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
		X - Easting (ft)	Y -Northing (ft)	LAT	LONG											
NMP-06	HSCNew-NMP-06-SW	3,157,170	13,830,865			10/22/18	11:25	11:50	10.3	5.1	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	22.87 1.76 7.59 3.345 -23.4 9.8 4.02 61.0 2 mph NNE	15:00			1115+00

Table 2: Water Sampling Locations and Parameters
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Coordinates ⁽¹⁾		Coordinates		Date	Sample Start Time	Sample End Time	Water Depth (ft)	Sample Depth (ft)	Water Parameters		Time Sample placed in Refrigerated Truck	Comment	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
		X - Easting (ft)	Y - Northing (ft)	LAT	LONG											
NMP-07	HSCNew-NMP-07-SW	3,151,909	13,829,784			10/22/18	12:40	13:04	20.2	10.0	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	19.43 1.18 8.06 2.289 62.0 9.5 3.55 66.0 6 mph NNE	15:00			1160+00
NMP-08	HSCNew-NMP-08-SW	3,150,587	13,831,357			10/22/18	12:00	12:25	40.2	20.1	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	23.08 1.81 7.47 3.476 -30.2 7.6 3.56 62.0 2 mph NNE	15:00			1200+00
NMP-09	HSCNew-NMP-09-SW	3,149,158	13,833,963			10/22/18	13:10	13:30	40.1	20.0	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	20.24 2.32 7.71 4.458 55.0 12.1 2.74 64.0 5 mph NNE	15:00			1230+00
NMP-10	HSCNew-NMP-10-SW	3,148,043	13,836,483			10/22/18	12:30	12:55	32.6	16.0	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	23.09 1.80 7.50 3.440 -32.0 12.9 3.93 64.0 0 mph	15:00			1260+00
NMP-11	HSCNew-NMP-11-SW	3,145,766	13,839,567			10/22/18	13:40	14:00	40.3	20.1	Temp (°C): Salinity (ppt): pH: Conductivity (mS/cm): ORP (mV): Turbidity (NTU): Dissolved Oxygen (mg/L): Air Temp (°F): Wind Speed:	19.50 1.13 7.91 2.370 45.4 26.3 3.89 65.0 6 mph NNE	15:00			024+00

Table 2: Water Sampling Locations and Parameters
Houston Ship Channel - North of Morgan's Point
Houston Ship Channel, TX

Sample Locations	Sample ID	Coordinates ⁽¹⁾		Coordinates		Date	Sample Start Time	Sample End Time	Water Depth (ft)	Sample Depth (ft)	Water Parameters	Time Sample placed in Refrigerated Truck	Comment	Authorized Channel Depth MLLW (ft)	Channel Station ⁽²⁾
		X - Easting (ft)	Y -Northing (ft)	LAT	LONG										
N/A	HSCNew-NMP-EQB	N/A	N/A	N/A	N/A	10/22/18	9:00	9:20	N/A	N/A	N/A	15:00	Water Sample Equipment Blank		N/A

Notes: (1) Coordinates reported in NAD83 State Plane, Texas South Central, US Feet.

(2) All stationing shown are Houston Ship Channel (HSC) stations.

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**TABLE 3.1 - STRATIGRAPHY HSCNew-NMP-01
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP**

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-01AH3-1	10/06/18	1230	-33.0	5.5	5.3	1	0'-5.5 Silt, with sand	none	none	black and dark gray	none	3,209,399	13,844,992
HSCNew-NMP-01AH3-2	10/06/18	1300	-36.1	5.5	4.3	1	0'-3' Silt	none	none	black and dark gray	none	3,209,391	13,845,001
			-41.6				3'-5.5' Sand, loose with silt	none	none	gray	none		
HSCNew-NMP-01AH3-3	10/06/18	1315	-36.1	5.0	4.5	1	0' to 5' Silt	none	none	black and dark gray	none	3,209,382	13,844,988
HSCNew-NMP-01AH3-4	10/06/18	1345	-35.1	6.5	5.5	1	0'-6.5' Silt	none	none	black and dark gray	none	3,209,370	13,844,967

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.2 - STRATIGRAPHY HSCNew-NMP-02
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-02A-1	10/06/18	1045	-34.7	10.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,190,670	13,835,075
		1100	-44.7	5	5	1	10'-15' Silt	---	---	black	none		
HSCNew-NMP-02A-2	10/06/18	1100	-34.2	10.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,190,674	13,835,065
		1130	44.2	5.5	5	1	10'-15.5' Silt	---	---	black	none		
HSCNew-NMP-02C-1	10/06/18	0915	-16.1	11	0	1	Sample no representative of dredge prism	---	---	---	---	3,190,740	13,835,560
			-27.1	5	5	1	11'-16' Sandy Clay, very soft with shell fragments	0.227	low	gray	none		
			-32.1	5	5	1	16'-21' Sandy Clay, hard	1.09	low	light gray	none		
			-37.1	5	5	1	21'-26' Clay, hard with calcareous and ferrous nodules	0.818	low	gray and reddish brown	none		
			-42.1	5	5	1	26'-31' Clay, with gravel	1.09	low	red	none		
		1015	-47.1	2.5	2.5	1	31'-33.5' Clay, with gravel	---	low	red	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.3 - STRATIGRAPHY HSCNew-NMP-03
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-03A-1	10/05/18	1430	-31.2	5.0	3.0	1	0'-5' Sand and Clayey Sand with plastic trash	none	none	gray	none	3,185,272	13,837,839
			-36.2	5.0	5.0	1	5'-10' Clay, stiff to hard with calcarous nodules	0.40	low	greenish gray and brown	none		
			-41.2	5.0	3.3	1	10'-15' Clay, stiff to hard with sand	0.90	low	light gray	none		
		1530	-46.2	2.0	0.7	1	15'-18' Clay, stiff to hard with calcareous nodules	---	low	reddish brown	none		
HSCNew-NMP-03C-1	10/05/18	1600	-22	2	1	1	0'-2' Sand, loose with silt and clay	none	none	gray	none	3,185,164	13,838,758
			-24	5	2	1	2'-7' Sand, loose with silt and clay	none	none	gray	none		
			-29	5	2	1	12' Clayey Sand, loose with shell fragme	none	none	gray	none		
			-34	5	3	1	12'-17' Sand, loose	none	none	gray	none		
			-39	5	5	1	17'-22' Clay, stiff	0.59	low	reddish brown and gray	none		
		1700	-44	5	4	1	22'-27' Clay, hard	1.09	low	red and yellowish red	none		
HSCNew-NMP-03A-1 (DUP)	10/05/18	0800	-30.6	5	2.5	1	0'-5' Silty Sand, loose	---	---	dark gray	none	3,185,291	13,837,849
			-35.6	5	5	1	5'-10' Clay, very stiff with silt	0.7727	low	dark gray	none		
			-40.6	5	2.5	1	10'-15' Clay, stiff to very stiff	0.5454	low	light gray	none		
		0845	-45.6	4	4	1	15'-24' Clay, stiff to very stiff	0.7272	low	brown and greenish gray	none		
HSCNew-NMP-03C-1 (DUP)	10/05/18	1700	-19.7	4	2	1	0'-4' Silt, with sand	---	---	black	none	3,185,164	13,838,762
			-23.7	5	5	1	4'- 9' Sand	---	---	gray	none		
			-28.7	5	2	1	9'-14' Sand	---	---	gray	none		
			-33.7	5	4.5	1	14'-19' Sand	---	---	gray	none		
			-38.7	5	3	1	19'-24' Sand	---	---	gray	none		
		1800	-43.7	4	3.5	1	24'-28' Sand	---	---	gray	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.4 - STRATIGRAPHY HSCNew-NMP-04
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-04A-1	10/05/18	1000	-30.5	14.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,177,578	13,837,883
		1015	-44.5	5.0	4.0	1	14'-19' Silt, Sand, and Clay	0.77	low	black, gray, and red	none		
HSCNew-NMP-04A-2	10/05/18	1030	-37.7	7.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,177,560	13,837,887
		1045	-44.7	5.0	4.0	1	7'-12' Silt, with sand	---	---	black	none		
HSCNew-NMP-04C-1	10/05/18	1100	-43.3	1.5	0	1	Sample no representative of dredge prism	---	---	---	---	3,177,446	13,838,353
		1115	-44.8	5	2.5	1	1.5'-6.5' Silt, with clay	---	---	black	none		
HSCNew-NMP-04C-2	10/05/18	1130	-43.4	1.5	0	1	Sample no representative of dredge prism	---	---	---	---	3,177,448	13,838,374
		1145	-44.9	5	5	1	1.5'-6.5' Silt, with clay	---	---	black	none		
HSCNew-NMP-04C-3	10/05/18	1200	-43	1.5	0	1	Sample no representative of dredge prism	---	---	---	---	3,177,473	13,838,383
		1215	-44.5	5	1.5	1	1.5'-6.5' Silt, with hydrocarbons sheen	---	---	black	none		
HSCNew-NMP-04C-4	10/05/18	1230	-43	1	0	1	Sample no representative of dredge prism	---	---	---	---	3,177,493	13,838,377
		1245	-44	5	5	1	---	---	---	---	---		
HSCNew-NMP-04C-5	10/05/18	1315	-43.7	1	0	1	Sample no representative of dredge prism	---	---	---	---	3,177,357	13,838,356
		1345	-44.7	5	5	1	1'-6' Silt, with very stiff clay	---	---	black	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.5 - STRATIGRAPHY HSCNew-NMP-05
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-05A-1	10/05/18	0730	-37.7	8.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,789	13,832,332
		0800	-45.7	4.0	4.0	1	8'-12' Silt with clay	---	---	black and dark gray	none		
HSCNew-NMP-05A-2	10/05/18	0815	-39.5	8.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,785	13,832,337
		0830	-47.5	4.0	4.0	1	8'-12' Silt with clay	---	---	black and dark gray	none		
HSCNew-NMP-05A-3	10/05/18	0845	-40.5	5.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,778	13,832,329
		0900	-45.5	4.0	4.0	1	5'-9' Silt with clay	---	---	black and dark gray	none		
HSCNew-NMP-05C-1	10/04/18	1215	-11.5	33.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,351	13,832,522
		1315	-44.5	5.0	2.5	1	33'-38' Clay, hard with sand	2.0	low	gray and red	none		
HSCNew-NMP-05C-2	10/04/18	1330	-14.1	30.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,367	13,832,517
		1430	-44.6	5.0	4.8	1	30.5'-33.0' Sand with clay pockets	---	---	brown and red	none		
			-49.6				33.0'-35.5' Clay with cemented nodules	1.7	low	red and light gray	none		
HSCNew-NMP-05C-3	10/04/18	1500	-19.5	25.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,171,393	13,832,512
		1530	-44.5	5.0	3.0	1	25'-30' Sand, fine-grained	---	---	red and gray	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

**TABLE 3.6 - STRATIGRAPHY HSCNew-NMP-06
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP**

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-06A-1	10/04/18	0945	-27.4	14.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,157,010	13,830,360
		1015	-41.4	3.0	3.0	1	14'-17' Silt with organic matter	---	---	black and gray	none		
HSCNew-NMP-06A-2	10/04/18	1015	-34.5	7.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,156,997	13,830,374
		1030	-41.5	3.0	3.0	1	7'-10' Silt with clay	---	---	black and dark gray	none		
HSCNew-NMP-06A-3	10/04/18	1030	-36.7	5.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,156,993	13,830,383
		1045	-41.7	3.0	3.0	1	5'-9' Silt with clay and organic matter	---	---	black and dark gray	none		
HSCNew-NMP-06C-1	10/04/18	0745	-11.6	29.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,157,267	13,830,791
		0830	-40.6	4.0	4.0	1	29'-33' Clayey Sand with sandy clay	---	---	yellowish red	none		
HSCNew-NMP-06C-2	10/04/18	0845	-12.0	29.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,157,252	13,830,786
		0930	-41.0	4.0	4.0	1	29'-33' Sandy Clay with sand	0.95	low	yellowish red	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.7 - STRATIGRAPHY HSCNew-NMP-07
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-07A-1	10/02/18	0800	-32.5	4.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,151,931	13,829,808
			-36.5	5	3.8	1	4'-9' Silt Sand with organic matter	1.05	---	black, dark gray and brown	none		
		845	-41.5	5	3	1	9'-14' Clay, stiff with sand	0.409	low	red	none		
HSCNew-NMP-07(ALT1-1)	10/03/18	1315	-19.4	21.5	0	1	Sample no representative of dredge prism	---	---	---	---	3,151,936	13,829,813
		1345	-40.9	4	4	1	21.5'-23.5' Silt with clay	---	---	black	none		
			-44.9	-	-	-	23.5'-25.5' Silty Sand, loose	---	---	black, brown, and gray	none		
HSCNew-NMP-07(ALT1-2)	10/03/18	1400	-20.2	20.5	0	1	Sample no representative of dredge prism	---	---	---	---	3,151,936	13,829,809
		1415	-40.7	4	4	1	20.5'-22' Silt, very soft, with clay and organic material	---	---	black and dark gray	none		
		1415	-44.7	-	-	-	22'-24.5' Silty Sand, loose	---	---	black, brown, and gray	none		
HSCNew-NMP-07(ALT1-3)	10/03/18	1430	-19.8	21	0	1	Sample no representative of dredge prism	---	---	---	---	3,151,924	13,829,798
		1500	-40.8	4	4	1	21'-23' Silt with clay	---	---	black	none		
			-44.8	-	-	-	23'-25' Silt Sand, loose	---	---	gray and brown	none		
HSCNew-NMP-07(ALT1-4)	10/03/18	1515	-19.7	21	0	1	Sample no representative of dredge prism	---	---	---	---	3,151,916	13,829,792
		1530	-40.7	4	4	1	21'-22' Silt with organic matter	---	---	black and dark gray	none		
			-44.7	-	-	-	22'-25' Silt Sand, loose with organic matter	---	---	gray and dark gray	none		
HSCNew-NMP-07(ALT1-5)	10/03/18	1530	-19.4	21	0	1	---	---	---	---	---	3,151,921	13,829,775
		1600	-40.4	4	4	1	21'-24' Silt with sand and clay	---	---	black and dark gray	none		
			-44.4	-	-	-	24'-25' Sand with silt	---	---	gray	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.7 - STRATIGRAPHY HSCNew-NMP-07
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

TABLE 3.8 - STRATIGRAPHY HSCNew-NMP-08
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-08A-1	10/03/18	1115	-14.7	26.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,974	13,831,274
		1200	-40.7	4.0	4.0	1	26'-30' Clay, very stiff	1.25	Low	red	---		
HSCNew-NMP-08A-2	10/03/18	1215	-22.1	19.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,150,021	13,831,253
		1245	-41.1	4.0	4.0	1	19'-23' Silt, very soft with little sand and organics	none	none	black and dark gray	petroleum		
HSCNew-NMP-08C-1	10/03/18	0930	-37.7	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,150,638	13,831,379
		0945	-40.7	4.0	2.5	1	3'-6' Silt, very soft with organics	0.34	none	black and dark gray	none		
HSCNew-NMP-08C-2	10/03/18	1000	-38.0	2.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,150,649	13,831,382
		1015	-40.5	4.0	2.8	1	2.5'-6.5' Clay, very stiff with silt layer	0.91	Low	red	none		
HSCNew-NMP-08C-3	10/03/18	1015	-37.6	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,150,637	13,831,389
		1030	-40.6	4.0	4.0	1	3'-7' Sand, with silt at top and clay at bottom	none	none	black and gray	none		
HSCNew-NMP-08C-4	10/03/18	1030	-37.7	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,150,629	13,831,393
		1100	-40.7	4.0	2.3	1	3'-7' Clay, very stiff with silt layer at top	1.02	Low	red	none		

FOOTNOTES:

- (a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.
(b) Date when work started on the sub-sample location.
(c) Time when work started on the sub-sample location.
(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.
(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.
(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable
ft. = feet
MLLW = mean lower low water

TABLE 3.9 - STRATIGRAPHY HSCNew-NMP-09
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-09A-1	10/02/18	1600	-38.2	2.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,149	13,833,987
		1630	-40.2	4.0	3.3	1	2-5' Silt, very soft with clay		none	black and brown	organic		
			-44.2				5-6' Clay, very stiff	1.25	none	red	organic		
HSCNew-NMP-09A-2	10/02/18	1630	-37.7	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,153	13,833,975
		1700	-40.7	4.0	3.0	1	3'-7' Clay, very stiff with silt at top	1.48	Low	red	none		
HSCNew-NMP-09A-3	10/02/18	1700	-37.8	2.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,159	13,833,976
		1715	-40.3	4.0	2.3	1	2.5'-6.5' Clay, very stiff with silt at top	none	Low	red	none		
HSCNew-NMP-09C-1	10/03/18	0715	-38.0	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,514	13,834,136
		745	-41.0	4.0	3.0	1	3'-7' Silt, very soft with clay at bottom	none	none	dark brown	none		
HSCNew-NMP-09C-2	10/03/18	0745	-38.6	2.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,510	13,834,140
		0800	-40.6	4.0	2.5	1	2'-6' Silt, very soft with organics	1.14	none	black and brown	none		
HSCNew-NMP-09C-3	10/03/18	0800	-38.5	2.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,513	13,834,137
		0830	-40.5	4.0	2.5	1	2'-6' Silt, very soft with clay at bottom 1.5	1.25	none	black and dark gray	none		
HSCNew-NMP-09C-4	10/03/18	0830	-38.4	2.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,149,511	13,834,149
		0845	-40.9	4.0	4.0	1	2'-6' Silt, with organics and very stiff clay at bottom 2'	1.36	none	black and dark gray	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

**TABLE 3.10 - STRATIGRAPHY HSCNew-NMP-10
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP**

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-10A-1	10/02/18	1415	-37.4	3.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,147,880	13,836,082
		1430	-40.4	4.0	3.0	1	3'-7' Silt, with some clay and trace sand	none	none	black and dark gray	none		
HSCNew-NMP-10A-2	10/02/18	1445	-36.9	3.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,148,882	13,836,063
		1500	-40.4	4.0	4.0	1	3.5'-7.5' Silt, very soft, with organics	none	none	black and dark gray	organic		
HSCNew-NMP-10A-3	10/02/18	1500	-36.4	4.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,147,894	13,836,050
		1515	-40.4	4.0	3.5	1	4'-8' Silt, with trace clay, sand, and organics	none	none	black and dark gray	none		
HSCNew-NMP-10A-4	10/02/18	1515	-36.4	4.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,147,894	13,836,063
		1530	-40.4	4.0	3.0	1	4'-8' Silt, very soft with trace clay and organics	none	none	black and dark gray	none		
HSCNew-NMP-10C-1	10/02/18	1300	-33.6	7.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,147,863	13,836,670
		1315	-40.6	4.0	4.0	1	7'-9' Silty sand, loose	---	---	dark gray	none		
			-44.6				9'-11' Clay, very stiff	1.14	Low	red	none		
HSCNew-NMP-10C-2	10/02/15	1330	-34.2	6.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,147,862	13,836,675
		1345	-40.7	4.0	4.0	1	6.5'-10.5' Clay, very stiff with silty sand on top 1"	1.10	Low	red	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

ft. = feet

MLLW = mean lower low water

TABLE 3.11 - STRATIGRAPHY HSCNew-NMP-11
SUMMARY OF LITHOLOGIC SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification ^(a)	Date ^(b)	Time ^(c)	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.) ^(d)	Recovery (ft.) ^(e)	Total Number of Pushes or Drops	Typical Description	Strength (tons / sq. ft.) ^(f)	Plasticity	Color	Odor	GPS Coordinates (Actual) NAD83	
												X (ft)	Y (ft)
HSCNew-NMP-11A-1	10/02/18	0730	-31.4	4.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,145,331	13,838,513
		0830	-35.4	5.0	4.3	1	4'-8' Silt, with clay and sand	none	none	black and dark gray	none		
			-40.4	5.0	2.0	1	8'-14' Sand, medium-grained with few organics	none	none	dark gray	none		
HSCNew-NMP-11A-2	10/02/18	0915	-31.3	4.0	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,145,340	13,838,513
		1015	-35.3	5.0	4.3	1	4'-8' Silt, with clay and sand	none	none	black and dark gray	none		
		1030	-40.3	5.0	2.0	1	8'-14' Sand, medium-grained with few organics	none	none	dark gray	none		
HSCNew-NMP-11C-1	10/02/18	1100	-33.1	7.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,145,773	13,839,568
		1115	-40.6	4.0	4.0	1	7.5'-8.5' Silty sand, very loose			brown and dark gray	none		
			-44.6			1	8.5'-11.5' Silty clay and clay	1.00	none	red	none		
HSCNew-NMP-11C-2	10/02/18	1130	-33.2	7.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,145,774	13,839,559
		1145	-40.7	4.0	4.0	1	7.5'-10' Silty sand	none	none	black, brown, and dark gray	none		
			-44.7			1	10' to 11.5' Clay, very stiff	none	none	red	none		
HSCNew-NMP-11C-3	10/02/18	1200	-33.2	7.5	0.0	1	Sample no representative of dredge prism	---	---	---	---	3,145,774	13,839,567
		1230	-40.7	4.0	2.8	1	7.5'-11' Silty sand, very loose	none	none	brown and dark gray	none		
			-44.7				11' to 11.5' Clay, stiff to very stiff	none	none	red	none		

FOOTNOTES:

(a) See lithologic logs in Appendix A – Field Forms, Lithologic Logs for specific details.

(b) Date when work started on the sub-sample location.

(c) Time when work started on the sub-sample location.

(d) Core length represents the depth 4" CME sampler was augered or split-spoons were driven.

(e) Recovery is the measured length of the sediments, which may be compacted, not the depth the sampler was driven.

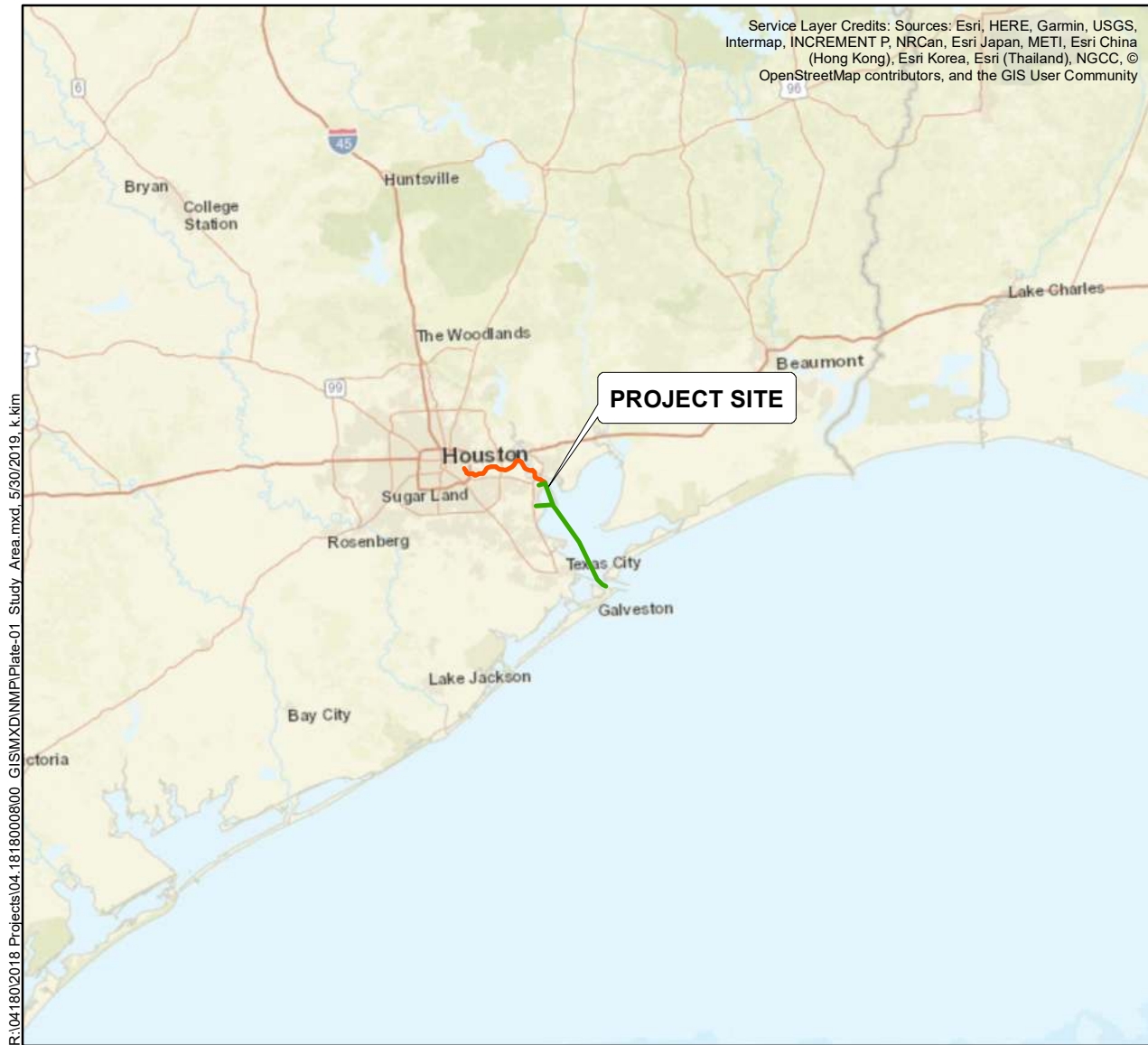
(f) Strength (ton/square foot) is not accurate due to sampling method.

NA = Not Applicable

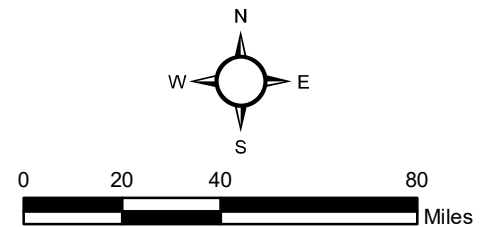
ft. = feet

MLLW = mean lower low water

FIGURES



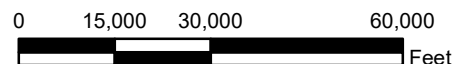
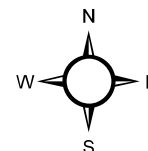
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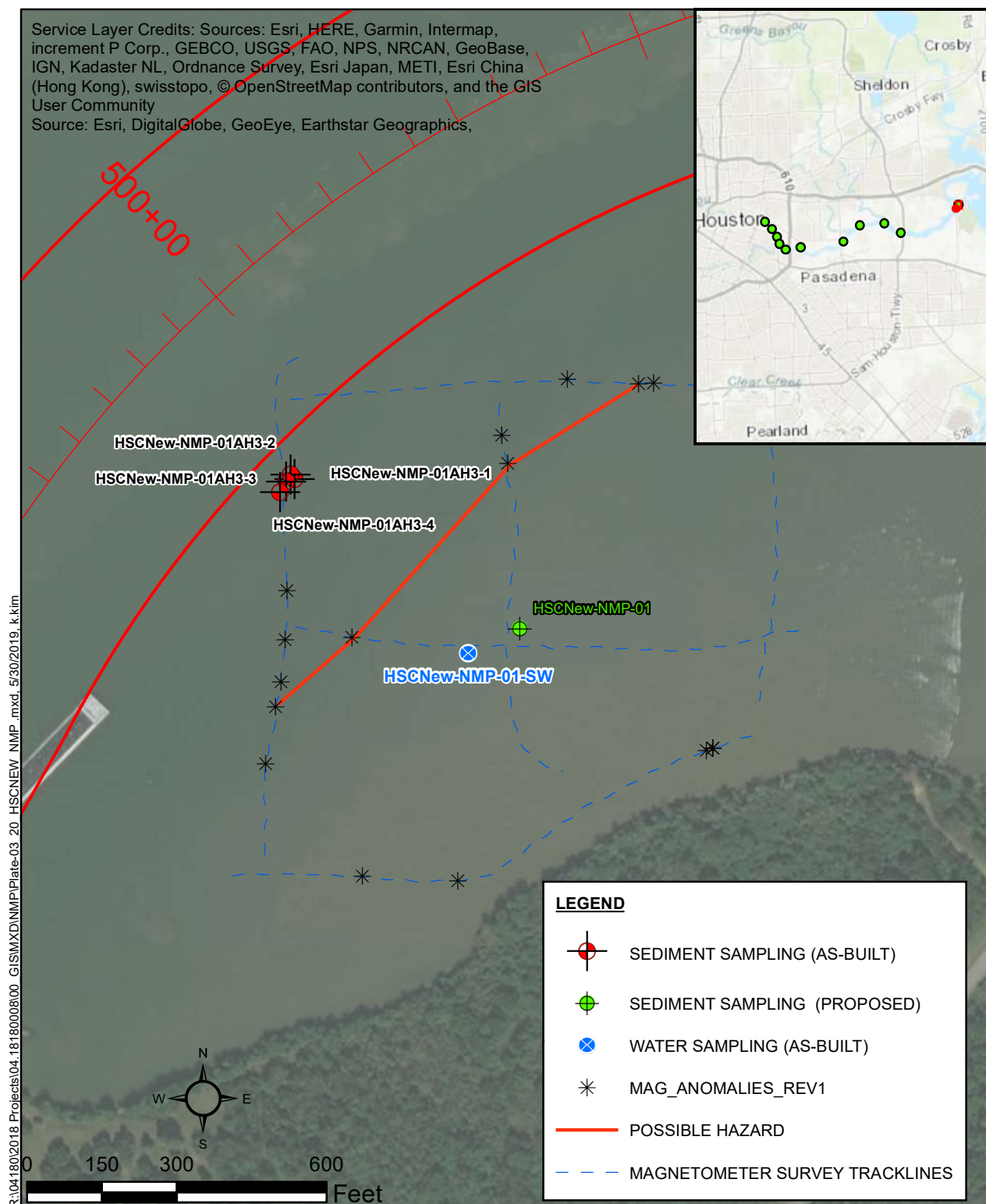
STUDY AREA
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



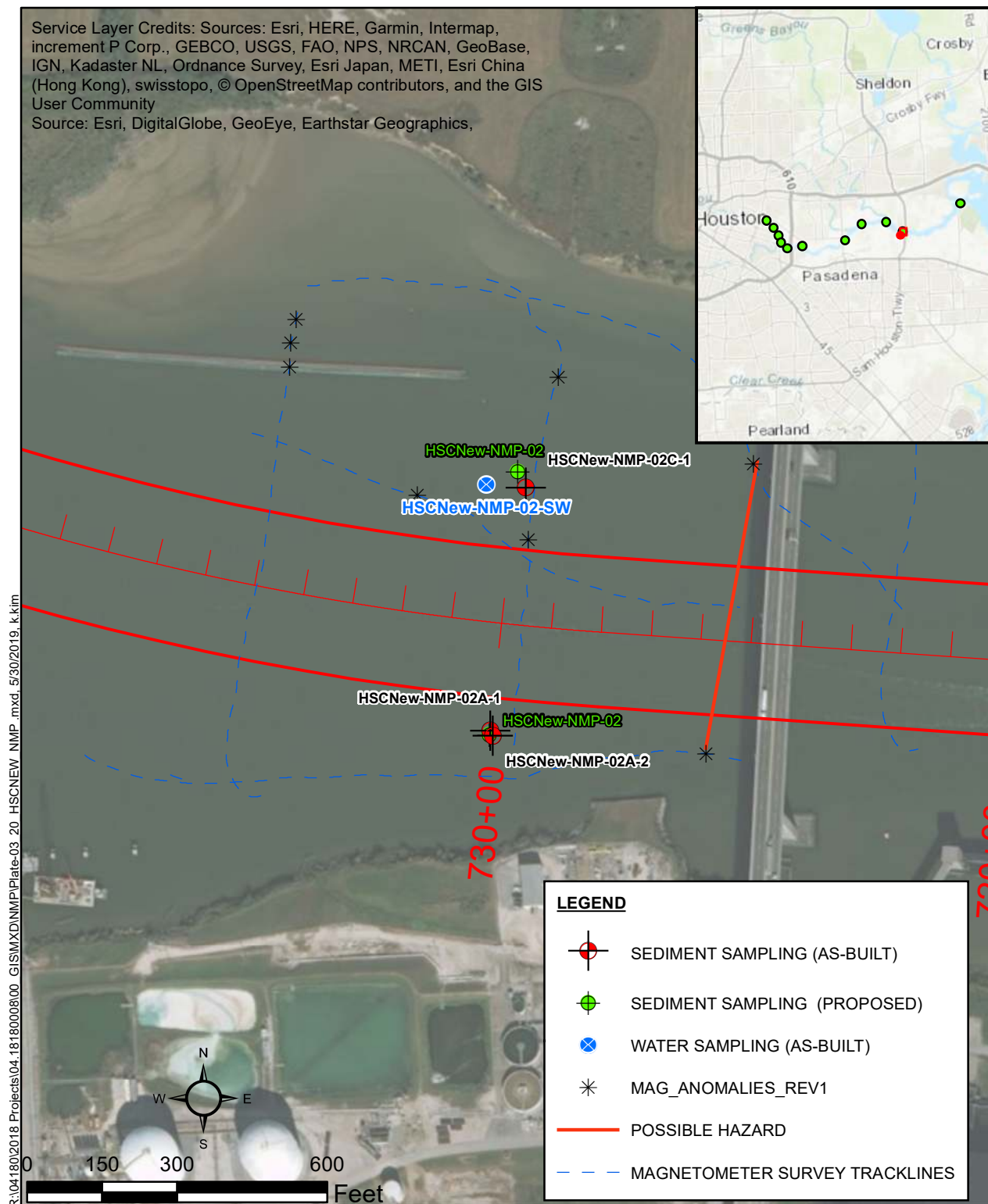
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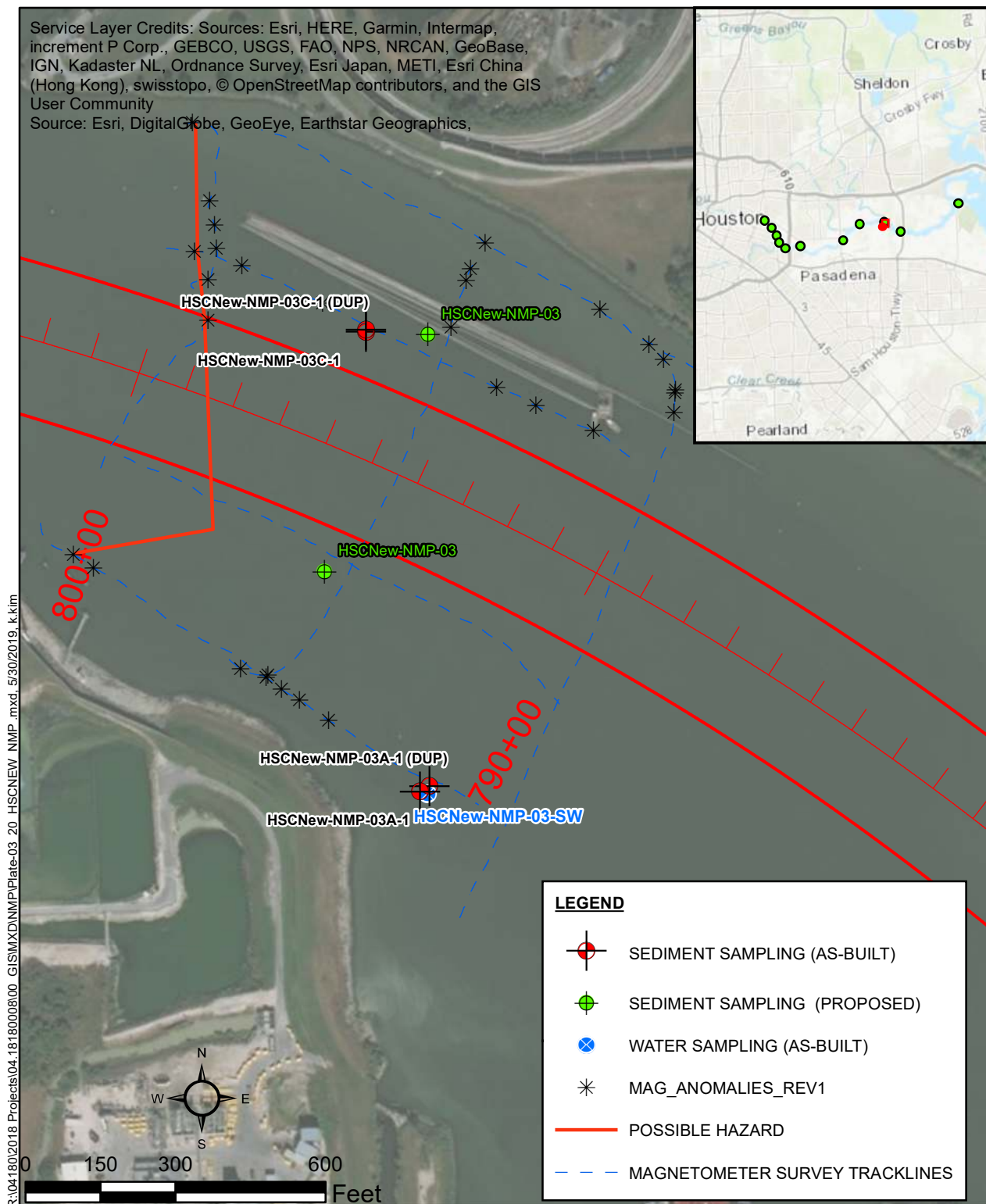
NORTH OF MORGANS POINT STUDY AREA
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



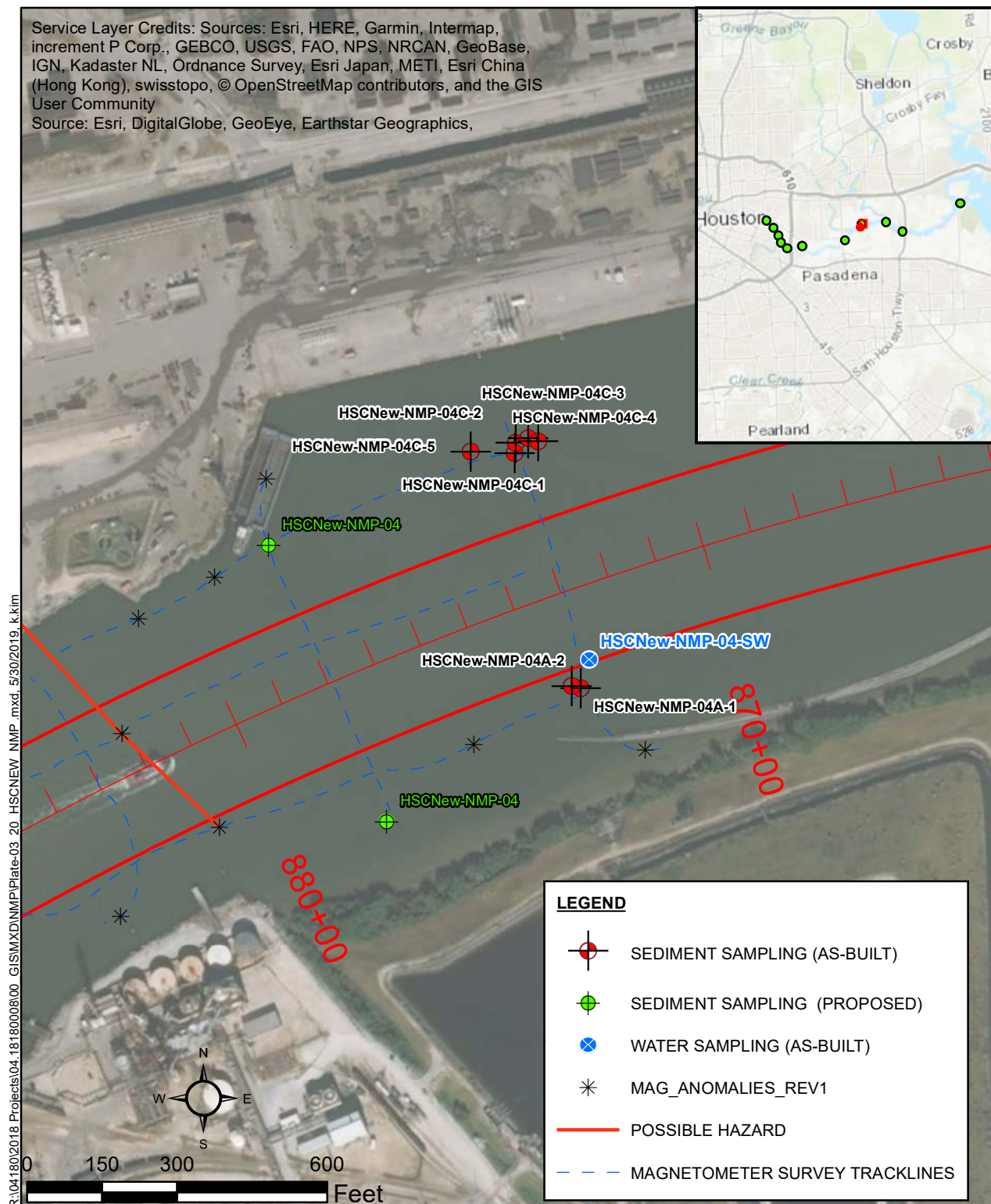
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SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



LOCATION HSCNEW-NMP-02
SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



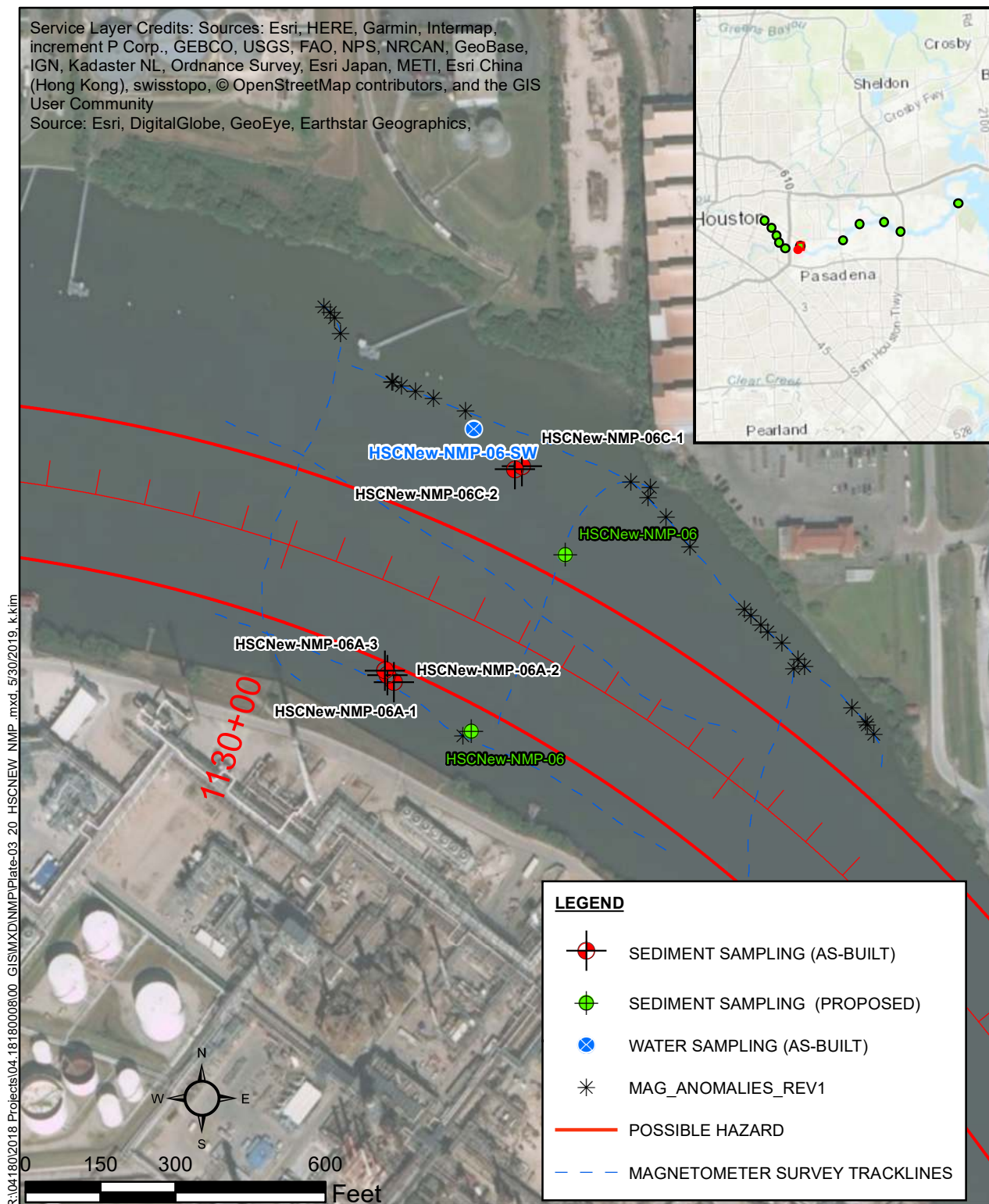
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SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



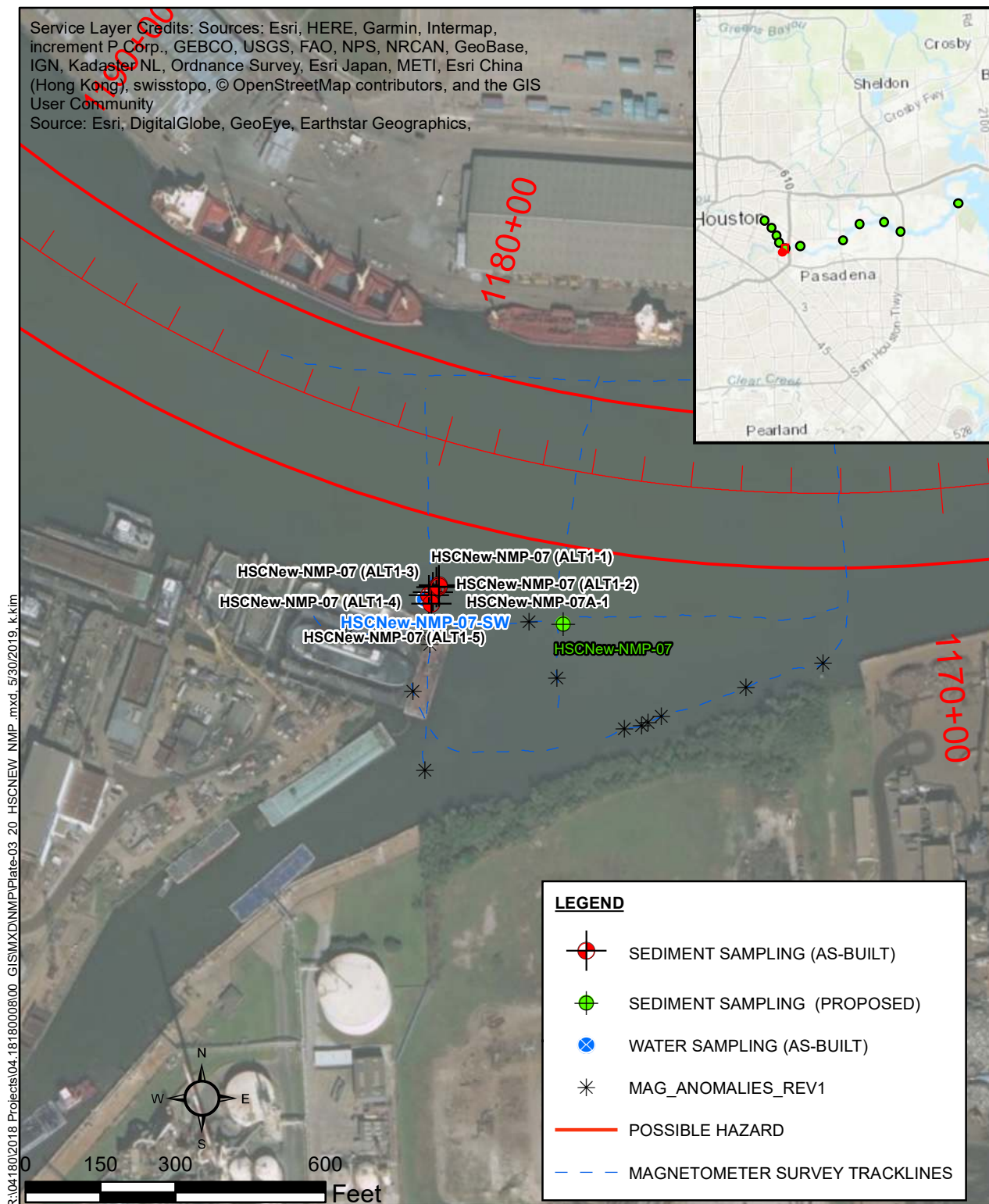
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SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



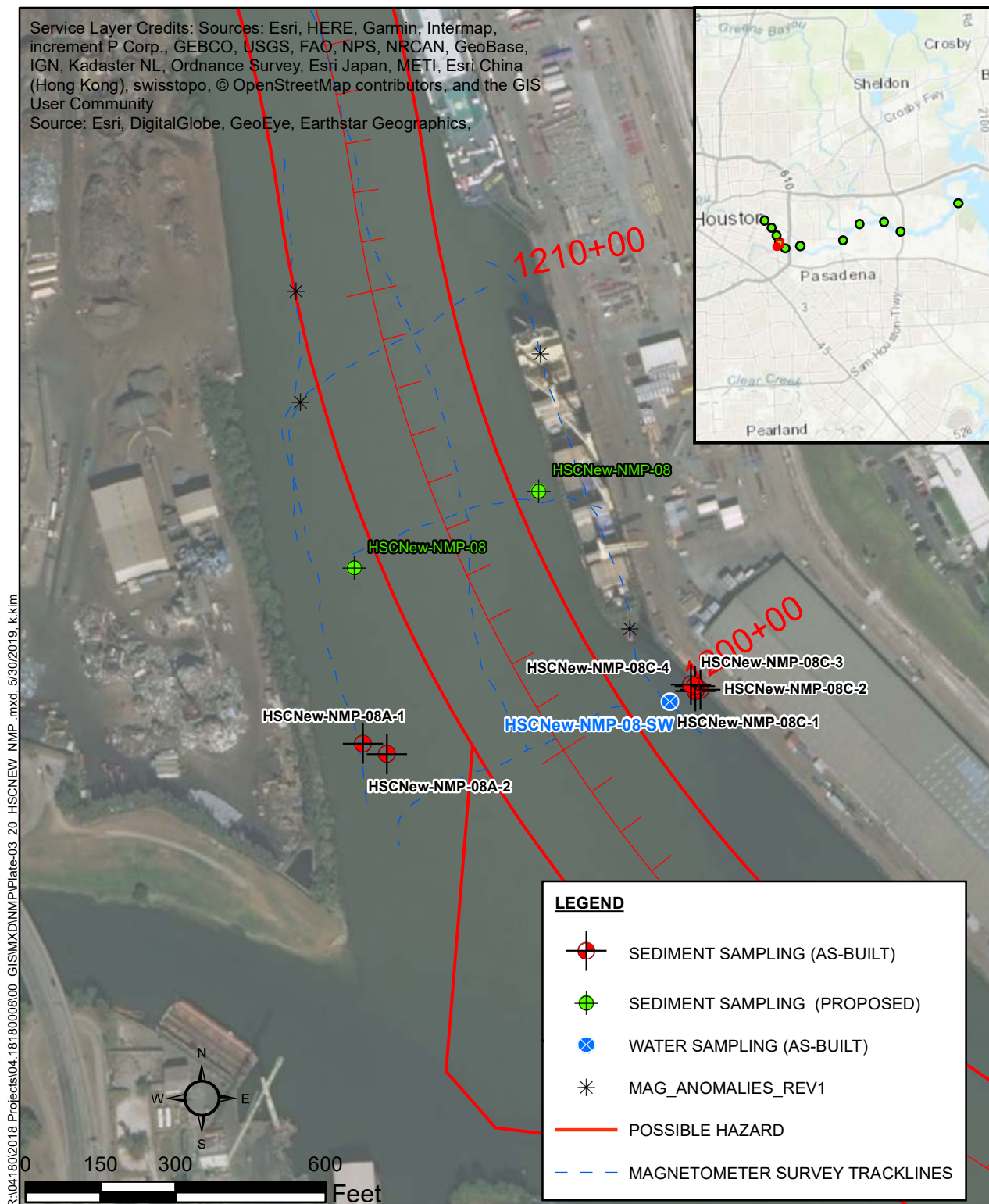
PLATE 7



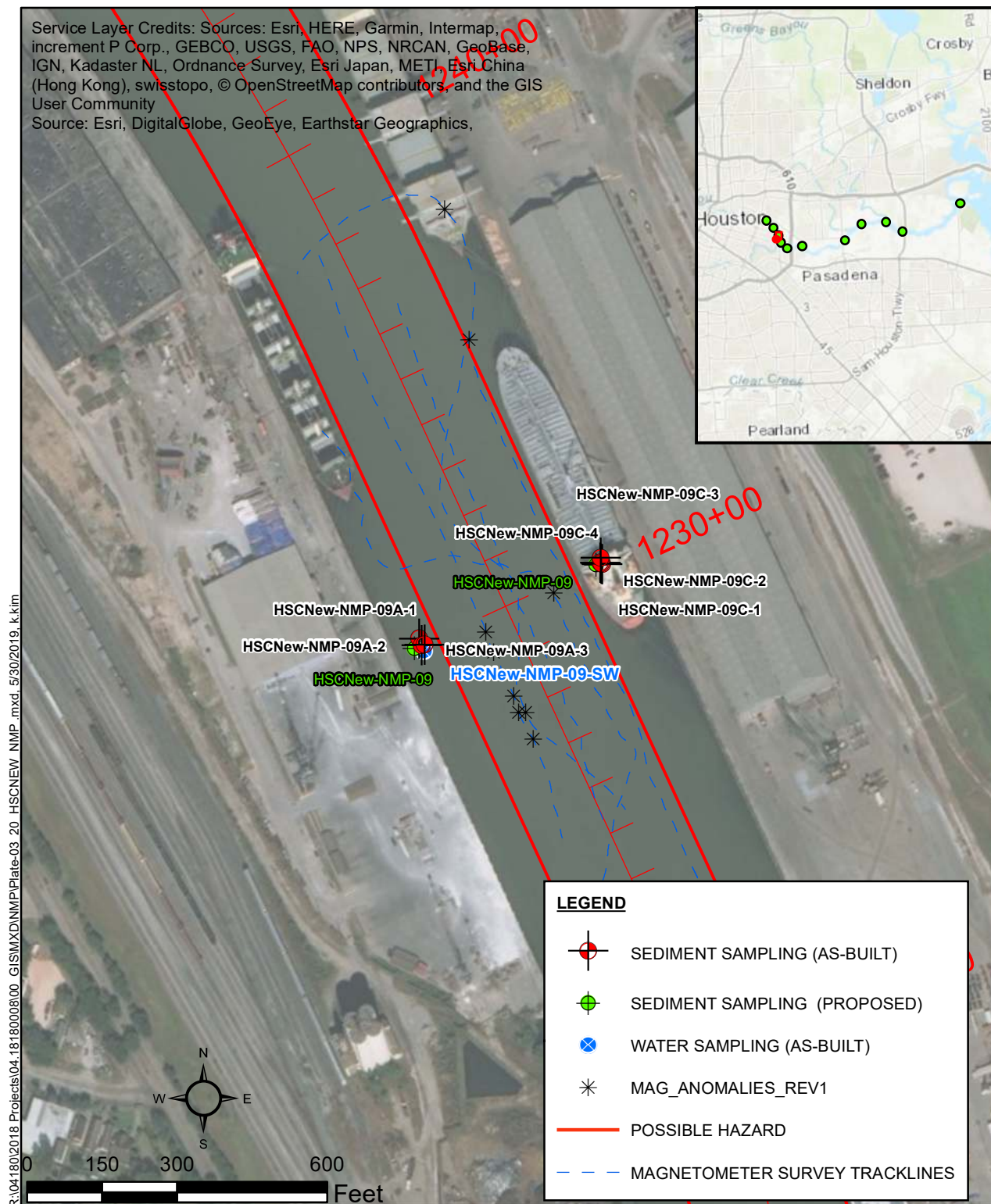
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SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



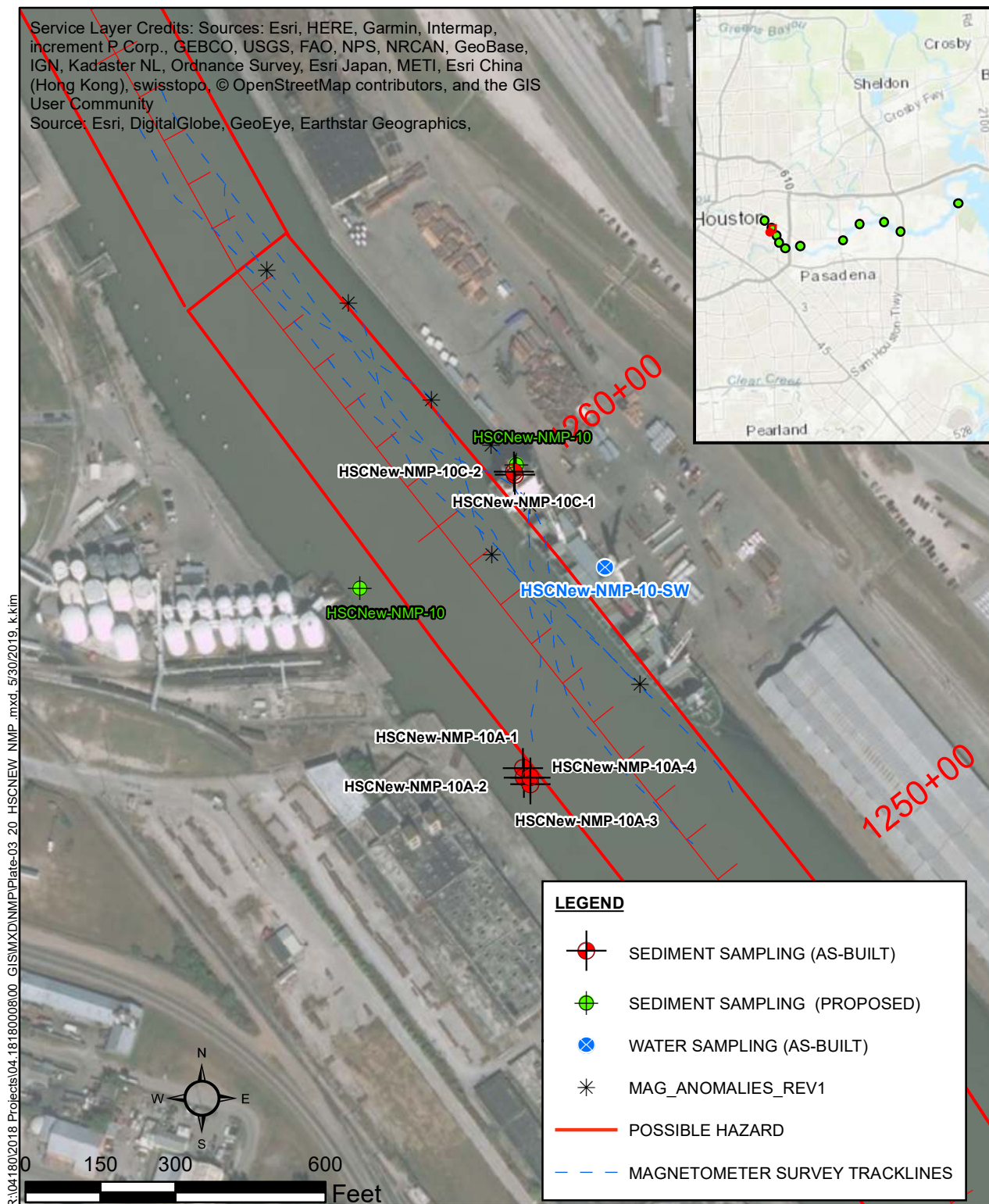
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SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



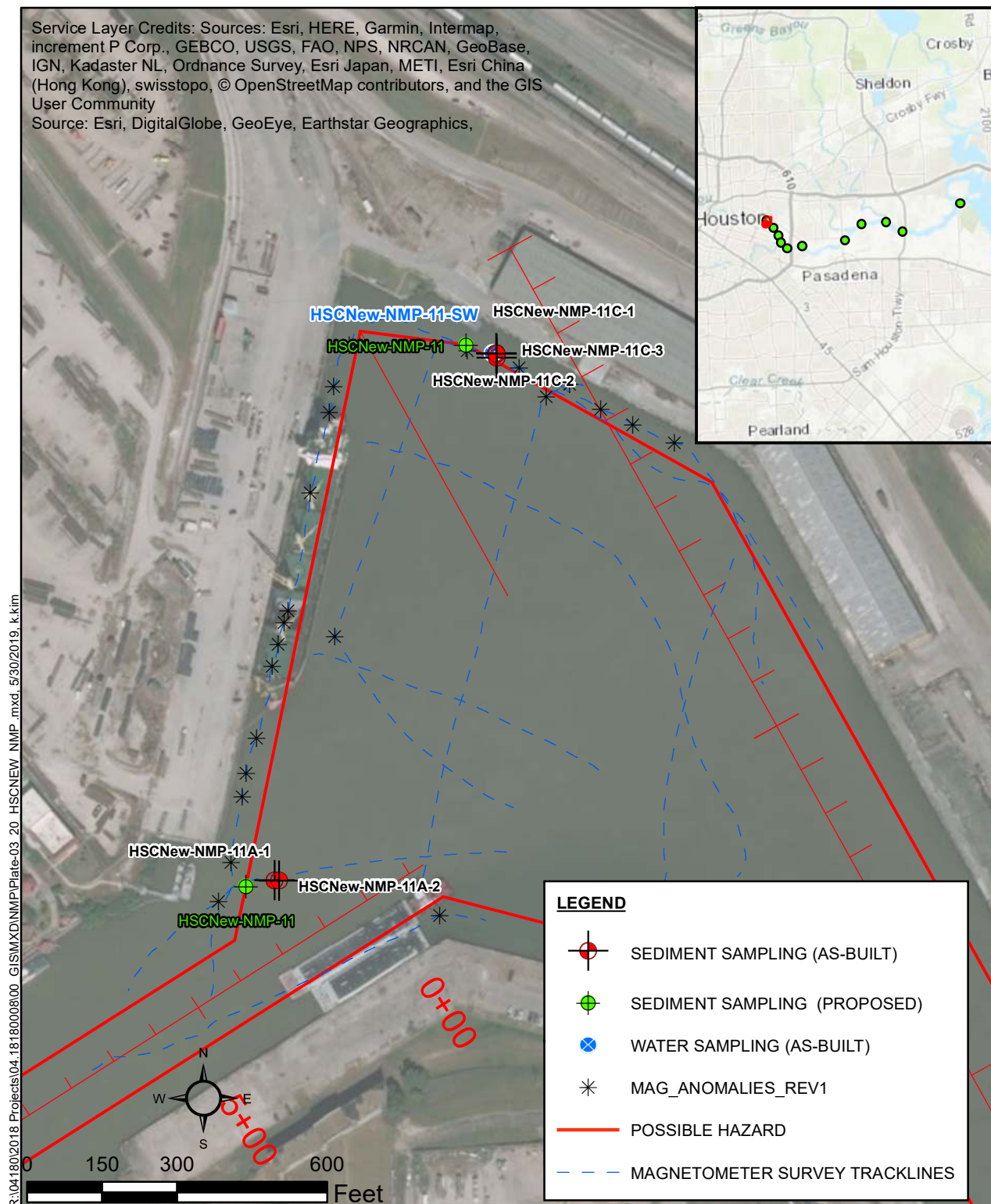
LOCATION HSCNEW-NMP-08
SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



LOCATION HSCNEW-NMP-09
SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



LOCATION HSCNEW-NMP-10
SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



LOCATION HSCNEW-NMP-11
SEDIMENT AND WATER SAMPLING LOCATIONS
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS

APPENDIX A

LOGS OF SAMPLING

Log of Sampling.....	A-1 thru A-59
Key to Terms and Symbols.....	A-60 and A-61

Project specific notes used in Sample Logs:

1. WD = Water Depth

2. Sampling specifications refers to *Sampling And Analysis Plan, Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP) Channel Segment 1 (North of Morgan's Point), Segment 4, Segment 5, and Segment 6 Houston Ship Channel, TX* listed in the report references.



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,209,399' Y = 13,844,992' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				5.3'	SILT (ML): black and dark gray, with sand								0.5	1.0	1.5	2.0	2.5
5																	
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 33.0' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 5.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 5.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-01AH3-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,209,391' Y = 13,845,001' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				4.3'	SILT (ML): black and dark gray												
5					SAND (SP): loose, gray, with silt												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.1' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 5.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 5.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-01AH3-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,209,382' Y = 13,844,988' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				4.5'	SILT (ML): black and dark gray												
5					- with a sand layer, 4.5' to 5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.1' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-01AH3-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,209,370' Y = 13,844,967' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				5.5'	SILT (ML): black and dark gray												
5					- with a sand layer, 6' to 6.5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 35.1' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-01AH3-4
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,190,670' Y = 13,835,075' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 10' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10					SILT (ML): black												
15				5.0'													
20																	
25																	
30																	
35																	
NOTES: - WD = 34.7' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 15' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 15' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-02A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,190,674' Y = 13,835,065' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 10.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10																	
15				5.0'	SILT (ML): black												
20																	
25																	
30																	
35																	
NOTES: - WD = 34.2' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 15.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 15.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-02A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS

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PLATE A-7



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,185,272' Y = 13,837,839' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
				3.0'	SAND (SP): gray and dark gray												
					CLAYEY SAND (SC): light gray, with plastic trash												
5					CLAY (CL): stiff to hard, greenish gray, brown, and red, with calcareous nodules												
				5.0'	- greenish gray below 8'												
10																	
				3.3'	- light gray, with a sand layer, 12' to 12.5'												
					- reddish brown and tan at 12.5'												
15																	
				0.7'	- reddish brown, with calcareous nodules below 16'												
20																	
25																	
30																	
35																	
NOTES: - WD = 31.2' (MLLW) - Refusal at 18.0 ft penetration. Over 150 blows.							DATE: October 5, 2018 TOTAL DEPTH: 18' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 18' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-03A-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,185,291' Y = 13,837,849' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
				2.5'	SILTY SAND (SM): loose, dark gray												
5					SAND (SP): loose, dark gray, with traces of silt												
				5.0'	CLAY (CL): very stiff, greenish gray												
10					SAND (SP): light gray												
				2.5'	CLAY (CL): stiff to very stiff, light gray, brown, and tan												
15					- brown, greenish gray, and light gray below 15'												
				4.0'													
20																	
25																	
30																	
35																	
NOTES: - WD = 30.6' (MLLW)							DATE: October 6, 2018 TOTAL DEPTH: 19' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 19' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-03A-1 (DUP)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,185,164' Y = 13,838,758' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
				1.0'	SAND (SP): loose, gray, with silt and traces of clay												
				2.0'													
5																	
				2.0'	CLAYEY SAND (SC): loose, gray, with shell fragments SAND (SP): loose, gray												
10																	
				3.0'													
15																	
				5.0'	CLAY (CL): stiff, reddish brown and gray												
20																	
				4.0'	SANDY CLAY (CL): stiff, reddish brown CLAY (CL): hard, red and yellowish red												
25																	
30																	
35																	
NOTES: - WD = 22.0' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 27.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 27.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-03C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,185,164' Y = 13,838,762' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
				2.0'	SILT (ML): black - with a sand layer, 0' to 0.5'												
5					SAND (SP): gray												
				5.0'	SILT (ML): black												
					SANDY CLAY (CL): soft, light brown, gray, and greenish gray												
10				2.0'	SAND (SP): gray												
15				4.5'													
					CLAY (CL): stiff, gray and brown												
20				3.0'	SAND (SP): gray												
25				3.5'													
30																	
35																	

NOTES:

- WD = 19.7' (MLLW)

DATE: October 5, 2018

TOTAL DEPTH: 30'

CAVED DEPTH: Not Applicable

DRY AUGER: 0 to 30'

WET ROTARY: N/A

BACKFILL: N/A

LOGGER: A. Bull

DRILL RIG: CME 75

LOG OF SAMPLING NO. NMP-03C-1 (DUP)
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,578' Y = 13,837,883' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 14' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10																	
15				4.0'	SILT (ML): black												
					SAND (SP): gray												
					CLAY (CL): very stiff, red, with silt and sand												
20																	
25																	
30																	
35																	
NOTES: - WD = 30.5' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 19' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 19' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-04A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,560' Y = 13,837,887' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 7' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
					SILT (ML): black, with traces of sand												
10																	
					SAND (SP): gray and brown												
					CLAY (CL): very stiff, red												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.7' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 12' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 12' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,446' Y = 13,838,353' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				2.5'	NOTE: SAMPLES FROM 0' TO 1.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black, with traces of clay												
5																	
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 43.3' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,448' Y = 13,838,374' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				5.0'	NOTE: SAMPLES FROM 0' TO 1.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black, with traces of clay												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 43.4' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04C-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,473' Y = 13,838,383' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				1.5'	NOTE: SAMPLES FROM 0' TO 1.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black, with hydrocarbons sheen												
5																	
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 43.0' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04C-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,493' Y = 13,838,377' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				5.0'	NOTE: SAMPLES FROM 0' TO 1.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS NO RECOVERY; drill stem snapped.												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 43.0' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04C-4
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,177,357' Y = 13,838,356' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 1' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black, with traces of clay												
5				5.0'	CLAY (CL): very stiff, red												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 43.7' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 6' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-04C-5
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,171,789' Y = 13,832,332' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 8' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10				4.0'	SILT (ML): black and dark gray', with traces of clay												
15					- with traces of cemented nodules and a sand layer at 12'												
20																	
25																	
30																	
35																	
NOTES: - WD = 37.7' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 12' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 12' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-05A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,171,785' Y = 13,832,337' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 8' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10				4.0'	SILT (ML): black and dark gray, with traces of clay												
15					- with a sand layer and cemented nodules at 12'												
20																	
25																	
30																	
35																	
NOTES: - WD = 39.5' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 12' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 12' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-05A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,171,778' Y = 13,832,329' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black, with traces of clay												
10					- with traces of sand at 9'												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 40.5' (MLLW)							DATE: October 5, 2018 TOTAL DEPTH: 9' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 9' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-05A-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,171,351' Y = 13,832,522' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH					
								UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT					
5						NOTE: SAMPLES FROM 0' TO 33' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS													
10																			
15																			
20																			
25																			
30																			
35					2.5'	CLAY (CL): hard, gray and red - with traces of sand at 33'													
						- with cemented sand at 38'													

NOTES:

- WD = 11.5' (MLLW)

DATE: October 4, 2018

TOTAL DEPTH: 38'

CAVED DEPTH: Not Applicable

DRY AUGER: 0 to 38'

WET ROTARY: N/A

BACKFILL: N/A

LOGGER: A. Bull

DRILL RIG: CME 75

LOG OF SAMPLING NO. NMP-05C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS

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PLATE A-23



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,171,393' Y = 13,832,512' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 25' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
10																	
15																	
20																	
25				3.0'	CLAY (CL): very stiff, red and gray, with cemented nodules SAND (SP): red and gray, fine grained												
30																	
35																	
NOTES: - WD = 19.5' (MLLW)							DATE: October 4, 2018 TOTAL DEPTH: 30' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 30' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-05C-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,157,010' Y = 13,830,360' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
						STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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LOG OF SAMPLING NO. NMP-06A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,156,997' Y = 13,830,374' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 7' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
				3.0'	SILT (ML): black and dark gray, with clay												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 34.5' (MLLW)							DATE: October 4, 2018 TOTAL DEPTH: 10' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 10' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-06A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,156,993' Y = 13,830,383' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				3.0'	NOTE: SAMPLES FROM 0' TO 5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black and dark gray, with some clay and organic matter												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.7' (MLLW)							DATE: October 4, 2018 TOTAL DEPTH: 8' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 8' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-06A-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,157,267' Y = 13,830,791' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
						UNIT DRY WT, PCF		PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

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LOG OF SAMPLING NO. NMP-06C-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,157,252' Y = 13,830,786' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
						STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
														0.5	1.0	1.5	2.0	2.5
5						NOTE: SAMPLES FROM 0' TO 29' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
10																		
15																		
20																		
25																		
30					4.0'	SANDY CLAY (CL): soft, yellowish red and red, with cemented sand												
						SAND (SP): yellowish red and red, with traces of clay												
						CLAY (CL): very stiff, red and yellowish red												
35																		
NOTES: - WD = 12.0' (MLLW)								DATE: October 4, 2018 TOTAL DEPTH: 33' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 33' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-06C-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,931' Y = 13,829,808' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 4' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				3.8'	SILTY SAND (SM): black and dark gray												
10				3.0'	SAND (SP): brown, with organic matter - clay layers at 6.5'												
15					CLAY (CL): stiff, red, with traces of sand												
20																	
25																	
30																	
35																	
NOTES: - WD = 32.5' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 14' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 14' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,936' Y = 13,829,813' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 21.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10																	
15																	
20																	
25				4.0'	SILT (ML): black, with clay												
					SILTY SAND (SM): loose, brown, gray, and black												
30																	
35																	
NOTES: - WD = 19.4' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 25.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 25.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07 (ALT1-1)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,936' Y = 13,829,809' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 20.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS								0.5	1.0	1.5	2.0	2.5
5																	
10																	
15																	
20																	
25				4.0'	SILT (ML): black and dark gray, with clay and organic matter SILTY SAND (SM): loose, black, gray, and brown												
30																	
35																	
NOTES: - WD = 20.2' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 24.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 24.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07 (ALT1--2)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,924' Y = 13,829,798' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 21' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10																	
15																	
20																	
25					SILT (ML): black and dark gray, with clay												
					SILTY SAND (SM): loose, gray and brown												
30																	
35																	
NOTES: - WD = 19.8' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 25' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 25' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07 (ALT1-3)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,916' Y = 13,829,792' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 21' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10																	
15																	
20																	
25				4.0'	SILT (ML): black and dark gray, with organic matter SILTY SAND (SM): loose, gray and dark gray, with organic matter												
30																	
35																	
NOTES: - WD = 19.7' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 25' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 25' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07 (ALT1-4)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,151,921' Y = 13,829,775' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 21' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
10																	
15																	
20																	
				4.0'	SILT (ML): black and dark gray, with traces of sand and clay												
25					SAND (SP): gray, with some silt												
30																	
35																	
NOTES: - WD = 19.4' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 25' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 25' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-07 (ALT1-5)
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,974' Y = 13,831,274' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 26' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
10																	
15																	
20																	
25																	
26					CLAY (CL): very stiff, red												
27				4.0'													
30																	
35																	
NOTES: - WD = 14.7' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 30' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 30' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-08A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,150,021' Y = 13,831,253' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 19' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
10																	
15																	
20				4.0'	SILT (ML): black and dark gray, with traces of sand and organic matter												
25					- with hydrocarbons odor and clay at 23'												
30																	
35																	
NOTES: - WD = 22.1' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 23' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 23' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-08A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,150,638' Y = 13,831,379' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				2.5'	SILT (ML): dark gray and black, with organic matter												
					CLAY (CL): firm, red, with sand pockets												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.7' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-08C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,150,649' Y = 13,831,382' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				2.8'	NOTE: SAMPLES FROM 0' TO 2.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS CLAY (CL): very stiff, red - with a silt layer at 2' - with wood fragments at 6.5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.0' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-08C-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,150,637' Y = 13,831,389' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black and dark gray												
5				4.0'	SAND (SP): black, gray, and light brown - with a layer of clay at 4.3'												
					CLAY (CL): very stiff, red												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.6' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-08C-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,150,629' Y = 13,831,393' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				2.3'	SILT (ML): black and dark gray, with organic matter CLAY (CL): stiff, red												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.7' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-08C-4
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,149' Y = 13,833,987' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 2' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black and brown, with clay and organic odor												
					CLAY (CL): very stiff, red												
5				3.3'													
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.2' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 6' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-09A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,153' Y = 13,833,975' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				3.0'	CLAY (CL): very stiff, red - with a silt layer at 3'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.7' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-09A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,159' Y = 13,833,976' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				2.3'	NOTE: SAMPLES FROM 0' TO 2.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS CLAY (CL): very stiff, red - with a layer of silt at 2.5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.8' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-09A-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,514' Y = 13,834,136' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				3.0'	SILT (ML): dark brown												
					CLAY (CL): very stiff, red and tan												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.0' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-09C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,510' Y = 13,834,140' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 2' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black and brown, with organic matter and plastic trash												
					CLAY (CL): very stiff, red												
5				3.5'													
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.6' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 6' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-09C-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,513' Y = 13,834,137' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
5				3.0'	NOTE: SAMPLES FROM 0' TO 2' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black and dark gray CLAY (CL): very stiff, red												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.5' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 6' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-09C-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,149,511' Y = 13,834,149' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 2.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILT (ML): black, dark gray, and brown, with organic matter												
5				4.0'	CLAY (CL): very stiff, red												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 38.4' (MLLW)							DATE: October 3, 2018 TOTAL DEPTH: 6.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 6.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

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LOG OF SAMPLING NO. NMP-09C-4
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,880' Y = 13,836,082' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				4.0'	NOTE: SAMPLES FROM 0' TO 3' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black and dark gray, with some clay and traces of sand - with a layer of wood at 6.7'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 37.4' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 7' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-10A-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,882' Y = 13,836,063' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5				3.8'	NOTE: SAMPLES FROM 0' TO 3.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS SILT (ML): black and dark gray, with traces of clay and organic matter - with wood at 7.5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.9' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 7.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 7.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

R:041802018 PROJECTS\04.18180008\00_GIS\GINT\04.18180008 - NORTH.GPJ HOU SHIP CHANNEL 11/15/2018

LOG OF SAMPLING NO. NMP-10A-2
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,894' Y = 13,836,050' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 4' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				3.5'	SILT (ML): dark gray and black, with traces of clay, sand, and organic matter												
					- with wood at 7.5'												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.4' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 8' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 8' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-10A-3
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,894' Y = 13,836,063' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 4' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				3.0'	SILT (ML): dark gray and black, with traces of clay and organic matter												
10																	
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 36.4' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 8' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 18' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-10A-4
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,863' Y = 13,836,670' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
5					NOTE: SAMPLES FROM 0' TO 7' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILTY SAND (SM): very loose, dark gray and dark brown, with traces of clay												
10				4.0'	CLAY (CL): very stiff, red												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 33.6' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 11' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 11' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-10C-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,147,862' Y = 13,836,675' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 6.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10				4.0'	CLAY (CL): very stiff, red - with a layer of silty sand at 6.5'												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 34.2' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 10.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 10.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-10C-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,145,331' Y = 13,838,513' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 4.0' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				4.3'	SILT (ML): black, brown and very dark gray, with clay and some sand												
10				1.7'	medium grained SAND (SP): brown, with few organic leaves - medium to fine grained, dark gray below 9' - with 3" of clay at bottom												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 31.30' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 14' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 14' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-11A-1
 HOUSTON SHIP CHANNEL ECIP
 HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,145,340' Y = 13,838,513' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 4' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5				4.3'	SILT (ML): black, brown, and dark gray, with clay and sand												
10				1.7'	SAND (SP): brown, medium grained, with few organics - dark gray, fine to medium grained below 10' - with clay layer at 12.0'												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 31.4' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 14' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 14' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-11A-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,145,773' Y = 13,839,568' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
													□ Penetrometer Unconfined ▼ ◇ Torvane Triaxial ● △ Field Vane Miniature Vane ▲				
													0.5	1.0	1.5	2.0	2.5
5					NOTE: SAMPLES FROM 0' TO 7.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
					SILTY SAND (SM): very loose, dark gray and brown												
10				4.0'	SILTY CLAY (CL-ML): soft, gray and black												
					CLAY (CL): stiff to very stiff, red												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 33.1' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 11.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 11.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-11C-1
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,145,774' Y = 13,839,559' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 7.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10				4.0'	SILTY SAND (SM): dark gray, brown, and black												
					CLAY (CL): stiff to very stiff, red												
15																	
20																	
25																	
30																	
35																	
NOTES: - WD = 33.2' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 11.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 11.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

LOG OF SAMPLING NO. NMP-11C-2
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS

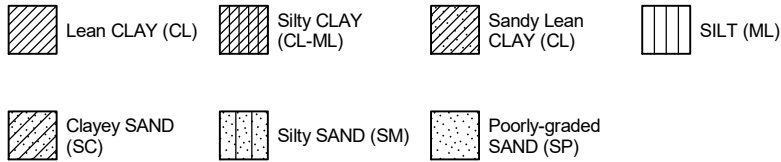


DEPTH, FT	WATER LEVEL SYMBOL	SAMPLER TYPE	SAMPLE RECOVERY	RECOVERY LENGTH (ft)	LOCATION: HSC, TEXAS COUNTY: HARRIS COORDINATES: X = 3,145,774' Y = 13,839,567' SURFACE EL.: Not Available	STRATUM ELEVATION, FT	CLASSIFICATION						SHEAR STRENGTH				
					STRATUM DESCRIPTION		UNIT DRY WT, POF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
					NOTE: SAMPLES FROM 0' TO 7.5' WERE DISCARDED AS PER SAMPLING SPECIFICATIONS												
5																	
10				2.8'	SILTY SAND (SM): very loose, gray and dark gray												
15					CLAY (CL): stiff to very stiff, red												
20																	
25																	
30																	
35																	
NOTES: - WD = 33.2' (MLLW)							DATE: October 2, 2018 TOTAL DEPTH: 11.5' CAVED DEPTH: Not Applicable DRY AUGER: 0 to 11.5' WET ROTARY: N/A BACKFILL: N/A LOGGER: A. Bull DRILL RIG: CME 75										

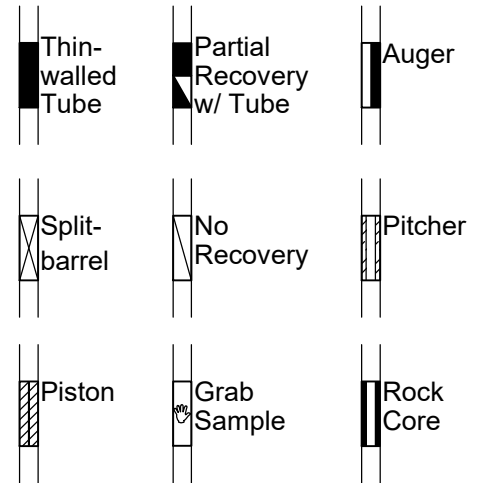
LOG OF SAMPLING NO. NMP-11C-3
HOUSTON SHIP CHANNEL ECIP
HOUSTON SHIP CHANNEL, TEXAS



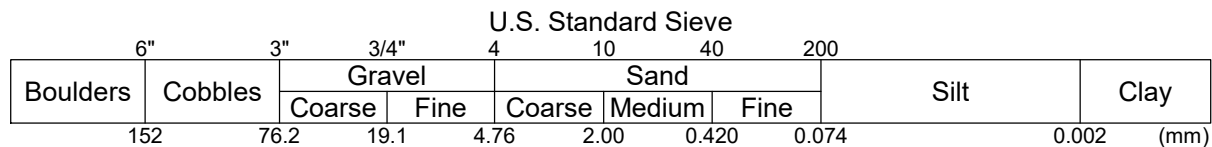
SOIL TYPES



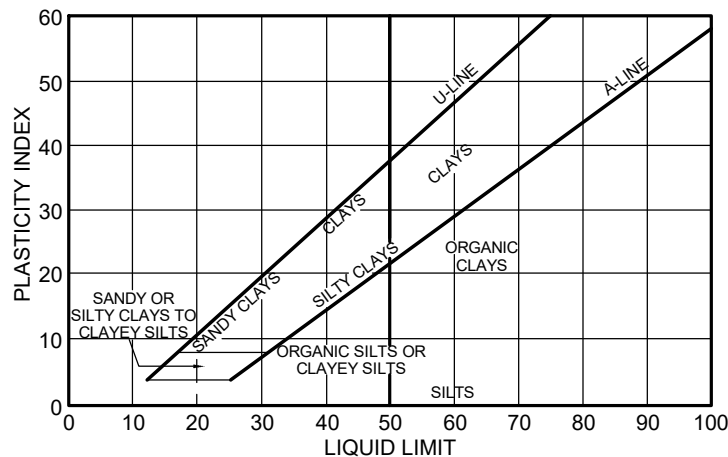
SAMPLER TYPES



SOIL GRAIN SIZE



PLASTICITY CHART



SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (1 of 2)



STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

DENSITY OF GRANULAR SOILS

Descriptive Term	*Relative Density, %	**Blows Per Foot (SPT)
Very Loose	< 15	0 to 4
Loose	15 to 35	5 to 10
Medium Dense	35 to 65	11 to 30
Dense	65 to 85	31 to 50
Very Dense	> 85	> 50

*Estimated from sampler driving record.

**Requires correction for depth, groundwater level, and grain size.

STRENGTH OF COHESIVE SOILS

Term	Undrained Shear Strength, ksf	Blows Per Foot (SPT) (approximate)
Very Soft	< 0.25	0 to 2
Soft	0.25 to 0.50	2 to 4
Firm	0.50 to 1.00	4 to 8
Stiff	1.00 to 2.00	8 to 16
Very Stiff	2.00 to 4.00	16 to 32
Hard	> 4.00	> 32

SHEAR STRENGTH TEST METHOD

U - Unconfined Q = Unconsolidated - Undrained Triaxial
P = Pocket Penetrometer T = Torvane V = Miniature Vane F = Field Vane

HAND PENETROMETER CORRECTION

Our experience has shown that the hand penetrometer generally overestimates the in-situ undrained shear strength of over consolidated Pleistocene Gulf Coast clays. These strengths are partially controlled by the presence of macroscopic soil defects such as slickensides, which generally do not influence smaller scale tests like the hand penetrometer. Based on our experience, we have adjusted these field estimates of the undrained shear strength of natural, overconsolidated Pleistocene Gulf Coast soils by multiplying the measured penetrometer reading by a factor of 0.6. These adjusted strength estimates are recorded in the "Shear Strength" column on the boring logs. Except as described in the text, we have not adjusted estimates of the undrained shear strength for projects located outside of the Pleistocene Gulf Coast formations.

Information on each boring log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the time and places indicated, and can vary with time, geologic condition, or construction activity.

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (2 of 2)

APPENDIX B

DAILY PROGRESS REPORTS

DAILY ACTIVITY REPORT

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(Continued on page 2)

(Continued on page 41)

DAILY ACTIVITY REPORT

[illegible]

12/24/2017 10:10 AM

DAILY ACTIVITY REPORT

[illegible]

(Continued on back)



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DAILY ACTIVITY REPORT

DATE: 9/15/18		JOB NUMBER: 14-18170008		PROJECT: H2C. ECTP	
CREW					
DRILLER: D. Edwards				PAYROLL: 100	
HOLEFEED: W. Bretzel & W. Wilburn				PERFORM: 100	
EQUIPMENT: A. Bull				PERFORM: 100	
BORING RESULTS					
BORING NUMBER		FEED RATE		COMPLETED	
		FEET		YES	
		IN		NO	
				WATER USED	
				GALLONS	
				O HLR	
SMPO2A-1		0 34'		✓	
				WD = 16.17' MCLW	
SMPO2A-2		0 31'		✓	
				WD = 16.05' MCLW	
SMPO2C-2		0 38'		✓	
				WD = 17.04' MCLW	
SMPO2C-3		0 38'		✓	
				WD = 12.81' MCLW	
SMPO2A-1		0		✓	
TIME SUMMARY					
TIME		DESCRIPTION OF ACTIVITY			
FROM	TO				
06:30	07:00	Travel to Topwater Grill/Marina			
07:00	07:15	Wait on USACE / Refuel / JHA			
07:15	07:30	JHA			
07:30	08:00	Transit to jack-up boat			
08:00	08:30	Position jack up onto SMPO2C-2			
08:30	08:45	Allow jack up boat to settle			
08:45	11:00	Drill & sample SMPO2C-2 Down to 51' Below MCLW			
11:00	11:15	Pull augers / pipe out of hole			
11:15	11:30	Reposition jack up onto SMPO2C-3			
11:30	12:00	Allow jack up to settle & move spare outboard out of the way to move ideal location			
12:00	13:15	Drill & sample SMPO2C-3 down to -50' MCLW			
13:15	13:30	Pull up pipe / augers			
13:30	14:00	Relocate jack up to SMPO2A-1			
14:00	14:15	Align jack up to hole			
14:15	16:00	Drill & sample SMPO2A-1 to -50' MCLW			
16:00	16:15	& Pull pipe & auger			
16:15	16:30	Reposition jack up on location SMPO2A-2			
16:30	16:45	Allow jack up to settle			
16:45	18:00	Drill & sample down SMPO2A-2 down to -50' MCLW			
18:00	18:30	Pick up pipe & auger			
18:30	18:45	Discuss time of action for tomorrow & Load upon support vessel			
18:45	19:15	Travel to Topwater Grill/Marina			
19:15	19:45	Travel to Hotel			

(Continued on back)

DAILY ACTIVITY REPORT

[illegible]

(Continued on back)



(Continued on back)



DAILY ACTIVITY REPORT

DATE: 9/18/98		JOB NUMBER: 0148604		PROJECT: HSC BRIDGE	
CREW					
DRILLER: D. Edwards				PAYROLL: 17	
HELPER: W. Butzel & W. Wilburn				PER DIEM: 0 YES 1 NO	
TENDRMAN: A. B-1				1% 0 YES 1 NO	
TENDRMAN: A. B-1				1% 0 YES 1 NO	
BURNING GRILLED					
TIME		COMPLETED		MATERIALS USED	
FROM TO		YES NO		MATERIALS USED	
3 MP01-3		11 35'		ND = 15.44' MLLW	
3 MP01-4		11 15'		ND = 15.48' MLLW	
3 MP01-5		11 15'		ND = 15.46' MLLW	
TIME SUMMARY:					
TIME		DESCRIPTION OF ACTIVITY		INVOICE DATA	
FROM TO		DESCRIPTION OF ACTIVITY		INVOICE DATA	
06:30 07:00		Travel to Texas City Over lunch			
07:00 07:15		SMA			
07:15 07:30		Wait for Cheryl Andrews sampling point & plan functions for today			
07:30 07:45		Transport to jack up boat			
07:45 08:00		Arrival & set up on jack up			
08:00 08:15		Position jack up on SMP01-3 (North side position)			
08:15 11:30		Drill & sample SMP01-3 down to -50' MLLW			
10:30 10:45		Pick up pipe & Auger			
10:45 11:00		Reposition Barge on SMP01-4			
11:00 12:00		Drill & sample down to 15' Below Mudline to collect sample washed out previously on H-12.5			
12:00 12:15		Pull pipe & Auger			
12:15 12:30		Reposition on SMP01-3			
12:30 13:00		Drill & sample down to 15' Below mudline to collect 2nd sample from previous hole location			
13:00 13:15		pull pipe & Auger			
13:15 13:30		Decontaminate drilling tools & sampling tools			
		Unload samples from ODMs & Ref stations			
		Load up to go back / transport to dock			
13:30 14:30		Travel to Gulf Copper to pick up packages			
14:30 15:00		Travel to Hotel			

(Continued on back)

DAILY ACTIVITY REPORT

DATE: 09/19/18	MARK NUMBER: 04.18.80037	PROJECT: H&C ECI-P
CREW: D. Edwards		REVIEW: YES
HELPER: W. Grotzke / S. Wilbur		DATE: YES
TTC IN CHARGE: A. Bull		TIME: YES
BUNINGS ENDED		
SCENE NUMBER:	LOCATION	COMPLETION
SMPO30-1	0 40'	✓
SMPO30-2	0 39'	✓
SMPO30-3	0 30'	✓
WD = 10.6' M.L.W.		
WD = 10.3' M.L.W.		
WD = 12.5' M.L.W. (Hair-terminator only b/c of refusal)		
TIME SUMMARY:		
FROM	TO	DESCRIPTION OF ACTIVITY
06:00	06:30	Travel to Eagle Pt Fishing Club Dock
06:30	06:45	Load up Boat
06:45	07:00	JFA / Safety meeting
07:00	07:15	Travel to jack up
07:15	07:30	Unload gear & supplies
07:30	07:45	Position jack up on location SMPO30-1
07:45	11:45	Drill & Sample down to -50' M.L.W. at SMPO30-1
11:45	12:00	Put pipe & Augers
12:00	12:30	Discuss Ho. to proceed b/c of lack of recovery
12:30	12:45	Position jack up on SMPO30-2
12:45	13:45	Drill & sample down to -50' M.L.W. on SMPO30-2
13:45	14:00	Put pipe & augers
14:00	14:15	Load up & support boat
14:15	16:30	Travel to Eagle Pt. Fishing Club Dock
16:30	17:35	Travel to hotel

([Go back](#))

(Continued)

DAILY ACTIVITY REPORT

DATE		JOB NUMBER		PROJECT			
9/21/18		041818008		HSC EQUIP			
CREW					PAYROLL	PERCENT	
DRILLER: D. Edwards					12	100	
DIE PER: W. Birtso! & W. Wilkins					0%	0%	
TENDRMAN: A. Bull					100	100	
BORINGS DRILLED							
		FOOTAGE		COMP FEET		MATERIALS USED	
BORING NUMBER	FROM	TO	YES	NO	FOOT	GRAVEL	
SMP04C-1	0	40'	✓		WD = 10.70'	MILLW	
SMP04C-2	0	40'	✓		WD = 9.45'	MILLW	
SMP04A-1	0	36'	✓		WD = 11.13'	MILLW	
TIME SUMMARY:							
TIME		DESCRIPTION OF ACTIVITY				INVOICE DATA	
FROM	TO					ITEM	TIME/PERCENTAGE
06:00	06:30	Travel to Eagle Pt Dock to Drop off Eriette					
06:30	07:00	Travel to Sylvan Beach Launch					
07:00	07:30	Wait for Eriette to arrive w/ Supplies & Boat					
07:30	07:45	Load up on support Boat / JHA					
07:45	08:15	Travel to jack up near SMP04C					
08:15	08:30	Position Jack up on location # SMP04C-1					
08:30	10:30	Drill & sample down to -50' MLLW on SMP04C-1					
10:30	10:45	Reposition on SMP04C-2					
10:45	12:15	Drill & sample SMP04C-2 down to -50' MLLW					
12:15	12:45	Pull pipe & Augers					
12:45	13:00	Move to SMP04A-1					
13:00	15:00	Drill Weather Standby (Rain & Lightning)					
15:00	15:15	Drill & sample SMP04A-1 down to -50' MLLW					
15:15	15:45	Travel Back to Sylvan Beach Launch					
15:45	16:00	Unload & figure out where to tie off Boat					
16:00	16:30	Travel Back to hotel					

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DAILY ACTIVITY REPORT

DATE: 9/24/18		JOB NUMBER: 0718180208		PROJECT: HSR E.C.C.P				
DRILLER: D. Edwards					PAYROLL		PER DIEM	
HELPER: W. Bretzel & W. Wilburn					hrs		YES NO	
TECHNICIAN: A. Bull					hrs		YES NO	
BORINGS DRILLED								
BORING NUMBER	FOOTAGE		COMPLETED		INTERVAL USED			
	FROM	TO	YES	NO	MUD	SEA F	OTHER	
SMP05A-1	0	37'	✓		WD = 13.59'	MCLW		
SMP05A-2	0	37'	✓		WD = 14.12'	MCLW		
SMP05C-1	0	39'	✓		WD = 11.88'	MCLW		
SMP05C-2	0	15'	✓		WD = 9.23'	MCLW (replaces last sample from SMP05C-1)		
SMP05C-3	0	41'	✓		WD = 9.6'	MCLW		
SMP06RZ-1	0	41'	✓		WD = 10.06'	MCLW		
TIME SUMMARY:								
TIME		DESCRIPTION OF ACTIVITY					INVOICE DATA	
FROM	TO						TIME	TIME/FOOTAGE
06:30	06:30	Travel to Sylvan Beach Dock						
06:30	06:45	Load up & JHA						
06:45	07:15	Travel to Jack up Boat & extend						
07:00	07:30	Unload & Position jack upon SMP05A-1						
07:30	08:45	Drill & Sample SMP05A-1 down to -50' MCLW						
08:45	09:00	Pick up pipe/augers & Reposition on SMP05A-2						
09:00	10:00	Drill & sample SMP05A-2 down to -50' MCLW						
10:00	10:15	Pick up augers & pipe						
10:15	10:30	Relocate Barge to SMP05C-1						
10:30	11:45	Drill & sample down to SMP05C-1 down to -50' MCLW						
11:45	12:00	Pick up pipe & augers						
12:00	12:15	Reposition on SMP05C-2						
12:15	13:00	Drill & sample SMP05C-2 down to -15' MCLW (complete rep. sample from SMP05C-1)						
13:00	13:15	Reposition on SMP05C-3						
13:15	14:30	Drill & sample SMP05C-3 down to -50' MCLW						
14:30	15:15	Relocate to SMP06RZ-1						
15:15	16:45	Drill & sample SMP06RZ-1						
16:45	17:00	Pick up pipe & augers						
17:00	17:15	Finish putting samples in Buckets						
17:15	17:30	Load up & support boat						
17:30	17:45	Travel Back to Sylvan Beach Dock						
17:45	18:00	Travel to Hotel						

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DATE:		JOB NUMBER:		PROJECT		
9/25/18		04.18100002		HSC GULF		
CREW					PAYROLL	PER DIEM
CAPTAIN D. Edwards					TH	PER
HELPER W. Brattton & W. Wilburn					TH	PER
TENDERS:					TH	PER
BORINGS DRILLED						
BORING NUMBER	FOURAGE		COMPLETED		MATERIALS USED	
	FROM	TO	YES	NO	LOG	TIME
SMPOGR2-2	0'	40'	✓		WD = 10.41' MLLW	
SMPOGR2-3	0'	41'	✓		WD = 10.12' MLLW	
SMPOGR2-4	0'	10'		✓	WD = 10.00' MLLW (sliding back into SMPOGR2-3)	
SMPOGR2-5	0'	40'	✓		WD = 10.00' MLLW	moved barge for next
TIME SUMMARY:						
TIME		DESCRIPTION OF ACTIVITY			INVOICE DATA	
FROM	TO				LN	INVOICE PAGE
06:00	06:30	Travel to dock				
06:30	06:45	Load up on support boat/JHA				
06:45	07:00	Travel in jetties				
07:00	07:15	Unload & position on SMPOGR2-2				
07:15	07:30	Drill & sample SMPOGR2-2 down to -50' MLLW				
07:30	07:45	Pick up augers & pipe				
07:45	08:00	Reposition on SMPOGR2-3				
08:00	10:00	Load Parla Periscope up on support vessel to bring to dock to get serviced				
10:00	10:15	Drill & sample down to SMPOGR2-3 down to				
10:15	12:15	Weather Standby (Rain)				
12:15	12:30	Continue drilling SMPOGR2-3				
12:30	12:45	Weather Standby; Rain				
12:45	1:00	Pick up pipe & augers / Transfer parlapette				
1:00	1:15	Reposition Barge on SMPOGR2-4				
1:15	1:30	Wait on Rep Support vessel to return from getting gas				
1:30	1:45	Drill & sample SMPOGR2-4 cancelled @ 10' below Mudline				
1:45	1:50	Drill & sample SMPOGR2-5 Down to -5' MLLW				
1:50	1:55	Pick up pipe & augers				
1:55	1:58	Pick up / clean deck / Finish packing in sample				
1:58	1:59	Travel to Dock (Sylvan Beach)				
1:59	1:59	Unload				
1:59	1:59	Travel to Bayview Marina for next docking location				
1:59	1:59	Travel to Hotel				

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DAILY ACTIVITY REPORT

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DAILY ACTIVITY REPORT

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DAILY ACTIVITY REPORT

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DAILY ACTIVITY REPORT

DATE: 10/2/18	JOB NUMBER: 04.18180008	MULTIPLY: HSC ECIIP	pg 1/2		
CREW:			DAYSON	PERCENT	
DRILLER: D. Edwards			1%	0%	0%
TIFFER: W. Bretzel & L. Willis			1%	0%	0%
TECHNICIAN: A. Bull			1%	0%	0%
BORING & DRILL LOG					
BORING NUMBER	DEPTH		COMPLETE		WATER USED
	FROM	TO	YES	NO	GROUT OTHER
NMP11A-1	04'	14'	✓		WD = 32.52' MLLW
NMP11A-2	4'	14'	✓		WD = 31.36' MLLW
NMP11C-1	7.5'	11.5'	✓		WD = 33.25' MLLW
NMP11C-2	7.5'	11.5'	✓		WD = 33.21' MLLW
NMP11C-3	7.5'	11.5'	✓		WD = 33.21' MLLW
NMP11C-1	7.5'	11.0'	✓		WD = 33.59' MLLW
NMP11C-2	6.5'	10.5'	✓		WD = 34.12' MLLW
NMP11A-1	3'	7'	✓		WD = 37.39' MLLW
NMP11A-2	3.5'	7.5'	✓		WD = 36.92' MLLW
NMP11A-3	4'	8'	✓		WD = 36.14' MLLW
TIME SUMMARY:					
TIME		DESCRIPTION OF ACTIVITY			IMAGE DATA
FROM	TO				ITEM TIME/FOOTAGE
06:00	06:30	Travel to Houston Mooring Company			
06:30	06:45	Load up on support vessel			
06:45	07:15	JHA & Travel to Jack up			
07:15	07:30	Unload onto jack up			
07:30	07:45	Position jack up on NMP11A-1			
07:45	08:00	Allow jack up to settle			
08:00	08:45	Drill & sample NMP11A-1 down to 44.5' MLLW			
08:45	09:00	pull pipe & augers			
09:00	09:15	Reposition on NMP11A-2			
09:15	10:15	Drill & sample NMP11A-2 down to 44.5' MLLW			
10:15	10:30	Pick up pipe & augers			
10:30	10:45	relocate to NMP11C-1			
10:45	11:00	allow jack up to settle			
11:00	11:15	Drill & sample from 40.5' to 44.5' MLLW (NMP11C-1)			
11:15	11:30	pick up pipe/augers & rotate barge to NMP11C-2			
11:30	12:00	Drill & sample NMP11C-2 40.5' to 44.5' Below MLLW			
12:00	12:30	Position & Drill/Sample NMP11C-3 to 40.5' to 44.5' MLLW			
12:30	13:00	Travel to NMP11C-1 / Position on location			
13:00	13:15	Drill & sample NMP11C-1 40.5' to 44.5' MLLW			
13:15	13:30	pull pipe/augers & reposition on NMP11C-2			
13:30	14:00	Drill/Sample down to 40.5' to 44.5' MLLW @ NMP11C-2			
14:00	14:15	Relocate to NMP11A-1 (move ~ 500' of cords b/c of ship docked)			
14:15	14:45	Drill & sample NMP11A-1 40.5' to 44.5' & relocate to NMP11A-2			
14:45	15:00	Drill & sample NMP11A-2 40.5' to 44.5' & relocate to NMP11A-3			
15:00	15:15	Drill & sample NMP11A-3 40.5' to 44.5'			
15:15	15:45	Drill & sample NMP11A-4 & Pick up pipe & Decon			
15:45	16:00	Relocate to NMP11A-1			
					pg 1/2



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DAILY ACTIVITY REPORT

DATE:	LOG NUMBER:	PROJECT:			
10/3/18	04.M1800-3	NSE GC2-7	pg. 1/2		
CREW				PAYROLL	PER DIEM
DILLER				hrs	DAYS
HELPER				hrs	DAYS
TECHNICIAN				hrs	DAYS
BORINGS UNLEAD					
BORING NUMBER	FOOTAGE		COMPLIANCE		MATERIALS USED
	FROM	TO	FE	WC	GRIT
NMP09C-1	3	7'	✓		WD = 37.93' MLLW
NMP09C-2	2	6'	✓		WD = 38.03' MLLW
NMP09C-3	2	6'	✓		WD = 38.43' MLLW
NMP09C-4	2.5	6.5'	✓		WD = 38.30' MLLW
NMP08C-1	3'	7'	✓		WD = 39.4'
NMP08C-2	2.5'	6.5'	✓		WD = 37.96' MLLW
NMP08C-3	3	7'	✓		WD = 37.56' MLLW
NMP08C-4	3	7'	✓		WD = 37.77' MLLW
NMP08A-1	20	30	✓		WD = 14.73' MLLW
NMP08A-2	19'	27'	✓		WD = 20.15' MLLW
TIME SUMMARY:					
TIME		DESCRIPTION OF ACTIVITY			INVOICE DATA
FROM	TO				PER
06:30	08:30	Travel to Houston Logging Company Dock			
08:30	08:45	Set up & load up on support vessel			
08:45	09:35	Travel to jack up & unload			
09:35	09:45	Drill & sample NMP09C-1 -40.5' to -44.5' MLLW			
09:45	09:50	Drill & sample NMP09C-2 (-40.5' to -44.5' MLLW)			
09:50	09:52	Drill & sample NMP09C-3 (-40.5' to -44.5' MLLW)			
09:52	09:55	Drill & sample			
09:55	09:58	Pick up augers & pipe			
09:58	09:30	Relocate to NMP08C-1 11.94' East of coord. (not enough soil / too deep @ given coord)			
09:30	09:45	Drill & sample NMP08C-1 -40.5' to -44.5' MLLW			
09:45	09:50	Pick up & move to NMP08C-2			
09:50	10:15	Drill & sample NMP08C-2 -40.5' to -44.5' MLLW			
10:15	10:30	Drill & sample NMP08C-3 -40.5' to -44.5' MLLW			
10:30	11:00	Drill & sample NMP08C-4 -40.5' to -44.5' MLLW			
11:00	11:15	Relocate to NMP08A-1			
11:15	12:00	Drill & sample NMP08A-1			
12:00	12:15	Pick up pipe / augers			
12:15	12:45	Drill & sample NMP08A-2 -40.5' to -44.5'			
12:45	13:00	Pick up pipe / augers			
13:00	13:15	Travel to NMP07AH1-1			
13:15	13:45	Drill & sample NMP07AH1-1 (-40.5' to -44.5' MLLW)			
13:45	14:00	Pick up & shift to NMP07AH1-2			
14:00	14:05	Drill & sample NMP07AH1-2 -40.5' to -44.5'			
14:05	14:30	Pick up augers & pipe			
14:30	15:00	Reposition & Drill NMP07AH1-3 10.5' to -44.5' MLLW			
15:00	15:05	Pick up pipe & Reposition to NMP07AH1-4			

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DAILY ACTIVITY REPORT

DATE 10/4/18		WELL NUMBER 04J518008		PROJECT HSC ECLIP		
CRP#					PAVRE#	PERVIEW
DRILLER D. Edwards					1%	0 Yrs 0 Ws
LOG PER W. Bretzel & L. W. L. L.					1%	0 Yrs 0 Ws
TRIP MAN A. Bull					1%	0 Yrs 0 Ws
BORINGS DRILLED						
BORING NUMBER		FOOTAGE		COMPLETED		N° LITHALS USED
		DOWN	UP	YES	NO	RT 123
NMP06C-1		21	183	✓		MD = 11.64' MLLW
NMP06C-2		29	93	✓		MD = 11.15' MLLW
NMP06A-1		14	171	✓		MD = 37.43' MLLW
NMP06A-2		87	18	✓		MD = 31.52' MLLW
NMP06A-3		5	8	✓		MD = 36.86' MLLW
NMP05C-1		33	38	✓		MD = 11.17' MLLW
NMP05C-2		30.5	35.5	✓		MD = 11.05' MLLW
NMP05C-3		25	30	✓		MD = 14.5' MLLW
LINE SUMMARY						
TIME		DESCRIPTION OF ACTIVITY				RYDGE DATA
FROM	TO					LEN
06:00	06:30	Travel to Houston Moring Company Dock				
06:30	06:45	Load up on Boat & JHA				
06:45	06:50	Travel to jack up Bnt.				
06:50	06:55	Unload onto JHA				
06:55	07:15	Get coords. input onto GPS				
07:15	07:45	Travel & position in NMP06C-1				
07:45	08:30	Drill & sample NMP06C-1				
08:30	08:45	Pick up pipe & augers				
08:45	09:30	Shift to NMP06C-2 & Drill & sample				
09:30	09:45	Pick up pipe, Move to NMP06A-1				
09:45	10:15	Drill & sample NMP06A-1 (-41.5' to -44.5')				
10:15	10:30	Drill & sample NMP06A-2 (" " ")				
10:30	10:45	Drill & sample NMP06A-3				
10:45	11:00	Pick up pipe				
11:00	11:15	from Decem Group.				
11:15	11:30	Move to NMP05C-1				
11:30	13:15	Drill & sample NMP05C-1 (-44.5' to -49.5' MLLW)				
13:15	13:30	Pull pipe & Redom. in NMP05C-1				
13:30	14:30	Drill & sample NMP05C-2 (-44.5' to -49.5' MLLW)				
14:30	14:45	Pull pipe & Augers				
14:45	15:00	Relocate to NMP05C-3				
15:00	15:30	Drill & sample NMP05C-3 (-44.5' to -49.5' MLLW)				
15:30	15:45	Pick up pipe & Augers				
15:45	16:00	Wash off Deck / pack up samples / pick up				
16:00	16:30	Load up & travel to Dock (Houston Moring)				
16:30	17:00	Travel to Hotel				

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DAILY ACTIVITY REPORT

DATE: 10/5/12 JOB NUMBER: 011518008 PROJECT: HSC ECIIP pg 1/2

CREW			PAYROLL	PER DIEM
DRILLER	D. Edwards		hrs	DAY
HELPER:	W. Broedel & L. Willis		hrs	DAY
TECHNICIAN:	A. Bull		hrs	DAY

BORINGS DRILLED		FOOTAGE		COMPLETED		MATERIALS USED	
BORING NUMBER		FROM	TO	YES	NO	MUD	GROUT
NMPO5A-1		8	12	✓		WD = 37.65'	MLLW
NMPO5A-2		8	12	✓		WD = 37.51'	MLLW
NMPO5A-3		5	9	✓		WD = 40.51'	MLLW
NMPO4A-1		14	19	✓		WD = 38.54'	MLLW
NMPO4A-2		7	12	✓		WD = 37.65'	MLLW
NMPO4C-1		1.5	6.5	✓		WD = 43.27'	MLLW
NMPO4C-2		1.5	6.5	✓		WD = 43.35'	MLLW
NMPO4C-3		1.5	6.5	✓		WD = 43.0'	MLLW
NMPO4C-4		1.5	6.5		✓	WD = 43.01'	MLLW (drill stem broke)
NMPO5C-5		1.0	6.0	✓		WD = 43.67'	MLLW

TIME SUMMARY: TMC

FROM	TO	DESCRIPTION OF ACTIVITY	INVOICE DATA	
			ITEM	TIME/FOOTAGE
06:00	06:30	Travel to Houston Mearing Company Dock		
06:30	06:45	Load up & JHA		
06:45	07:00	Travel to jack up		
07:00	07:15	Unload ppl. & equip.		
07:15	07:30	Position on NMPO5A-1		
07:30	08:00	Drill & sample NMPO5A-1 (-45.5 to -49.5 MLLW)		
08:00	08:15	Pull pipe & augers		
08:15	08:30	Drill & sample NMPO5A-2 (-45.5 to -49.5 MLLW)		
08:30	08:45	Pick up pipe & relocate to NMPO5A-3		
08:45	09:00	Drill & sample NMPO5A-3		
09:00	10:00	Move to NMPO4A-1		
10:00	10:15	Drill & sample NMPO4A-1 -44.5' to -48.5'		
10:15	10:30	Pick up pipe/augers move to NMPO4A-2		
10:30	10:45	Drill & sample NMPO4A-2		
10:45	11:00	Pull pipe & relocate to NMPO4C-1		
11:00	11:15	Drill & sample NMPO4C-1		
11:15	11:30	pick up pipe & relocate		
11:30	11:45	Drill & sample NMPO4C-2		
11:45	12:00	Weather Standby; Rain		
12:00	12:15	Drill & sample NMPO4C-3		
12:15	12:30	pick up & shift to NMPO4C-4		
12:30	12:45	Standby Mechanical Drill & sample NMPO4C-4		
12:45	12:55	Mechanical Standby (Drill stem Brake)		
13:15	13:45	Drill & sample NMPO5C-5		
13:45	14:00	Pull up pipe		
14:00	14:30	Travel to NMPO3A-1		
14:30	14:30	Drill & sample NMPO3A-1		

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DAILY ACTIVITY REPORT

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DAILY ACTIVITY REPORT

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APPENDIX C

WEATHER FORECAST

FUGRO

Fugro House
Hithercroft Road, Wallingford
Oxfordshire, OX10 9RB, UK

Tel : +44 (0) 1491 820 515
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Email : forecast@fugro.com



To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 12 Sep 2018
Tropical Advisory: Tropical disturbance just N off the Yucatan Peninsula has 50% chance of cyclone formation in the next 48 hours.

Met Situation: A frontal trough lying SW-NE over the NW GoM and N GoM coast remains in situ, filling for a time overnight (Next 48 hours) but deepening again through the mornings/afternoons. An active showery trough N of the Yucatan Peninsula moves WNW across the central GoM, combining with the frontal trough from tomorrow morning. The showery trough lies over the NW GoM on Friday.

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Thundery showers, heavy at times and perhaps easing for a time late evenings.
(Next 48 hours)

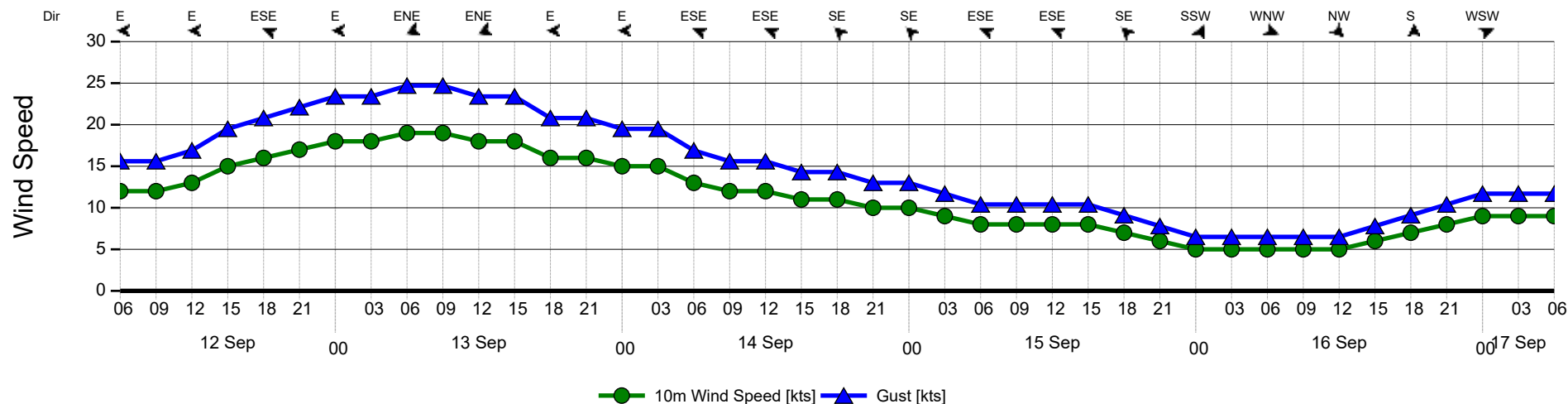
Confidence: Fairly high for trend but moderate for peak wind/wave detail a tropical disturbance moves toward the NW GoM. Low overall by late period. Stronger gusts possible in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
12/0600	E	12	16	0.3	SE	0.3	5	-	0.0	-	0.5	0.8
12/0900	ENE	12	16	0.5	SSE	0.3	5	-	0.0	-	0.6	1.0
12/1200	E	13	17	0.4	SSE	0.4	5	-	0.0	-	0.6	0.9
12/1500	E	15	20	0.7	SSE	0.3	5	-	0.0	-	0.7	1.2
12/1800	ESE	16	21	0.8	SSE	0.2	5	-	0.0	-	0.8	1.3
12/2100	ESE	17	22	0.8	SSE	0.2	5	-	0.0	-	0.9	1.4
13/0000	E	18	23	0.6	SSE	0.4	6	-	0.0	-	0.8	1.3
13/0300	E	18	23	0.6	SE	0.4	6	-	0.0	-	0.8	1.3
13/0600	ENE	19	25	0.7	SE	0.4	6	-	0.0	-	0.8	1.4
13/0900	ENE	19	25	0.7	SE	0.4	6	-	0.0	-	0.8	1.4
13/1200	ENE	18	23	0.9	SE	0.2	6	-	0.0	-	0.9	1.5
13/1500	E	18	23	0.9	-	0.0	-	-	0.0	-	0.9	1.5
13/1800	E	16	21	0.8	-	0.0	-	-	0.0	-	0.8	1.3
13/2100	E	16	21	0.8	-	0.0	-	-	0.0	-	0.8	1.3
14/0000	E	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
14/0300	E	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
14/0600	ESE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
14/0900	ESE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
14/1200	ESE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
14/1500	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
14/1800	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
14/2100	SE	10	13	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
15/0000	SE	10	13	0.3	SE	0.3	5	-	0.0	-	0.4	0.7
15/0300	ESE	9	12	0.2	SE	0.3	5	-	0.0	-	0.4	0.6
15/0600	ESE	8	10	0.2	SE	0.3	5	-	0.0	-	0.4	0.6
15/0900	SE	8	10	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
15/1200	ESE	8	10	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
15/1500	SE	8	10	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
15/1800	SE	7	9	0.2	SE	0.2	5	-	0.0	-	0.3	0.4
15/2100	SSE	6	8	0.1	SE	0.2	5	-	0.0	-	0.2	0.4
16/0000	SSW	5	7	0.1	SE	0.2	5	-	0.0	-	0.2	0.4
16/0300	W	5	7	0.1	SSE	0.2	5	-	0.0	-	0.2	0.4
16/0600	WNW	5	7	0.0	SSE	0.2	5	-	0.0	-	0.2	0.3
16/0900	NW	5	7	0.0	SSE	0.2	5	-	0.0	-	0.2	0.3
16/1200	NW	5	7	0.0	SSE	0.1	5	-	0.0	-	0.1	0.2
16/1500	SW	6	8	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
16/1800	S	7	9	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
16/2100	SSW	8	10	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
17/0000	WSW	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
17/0300	W	9	12	0.0	SSE	0.1	4	-	0.0	-	0.1	0.2
17/0600	WNW	9	12	0.0	SSE	0.1	4	-	0.0	-	0.1	0.2

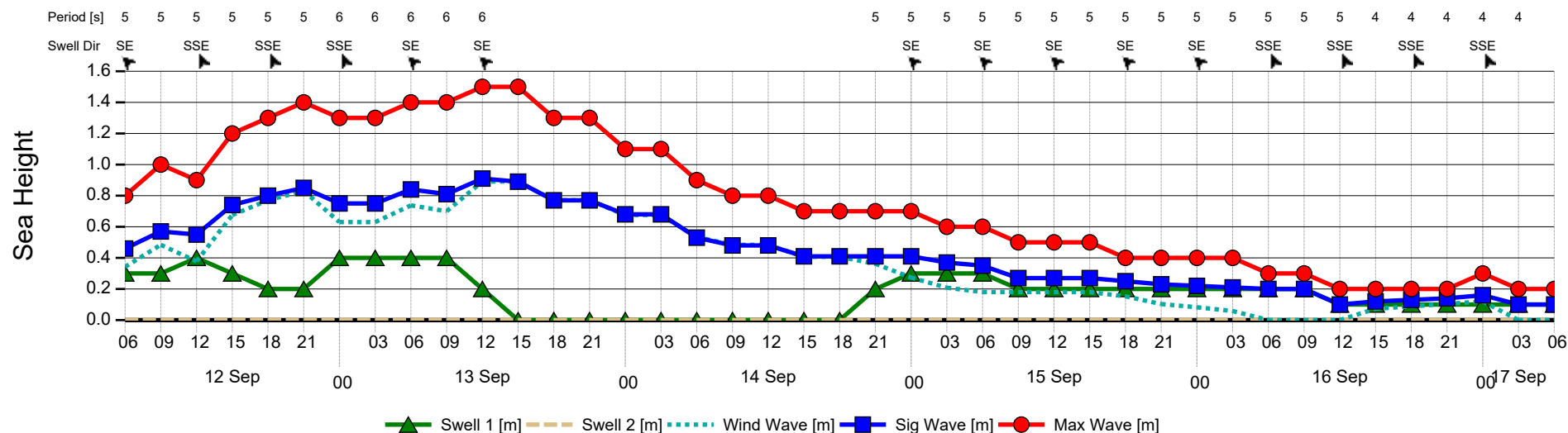
Forecaster: Jack Wade

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



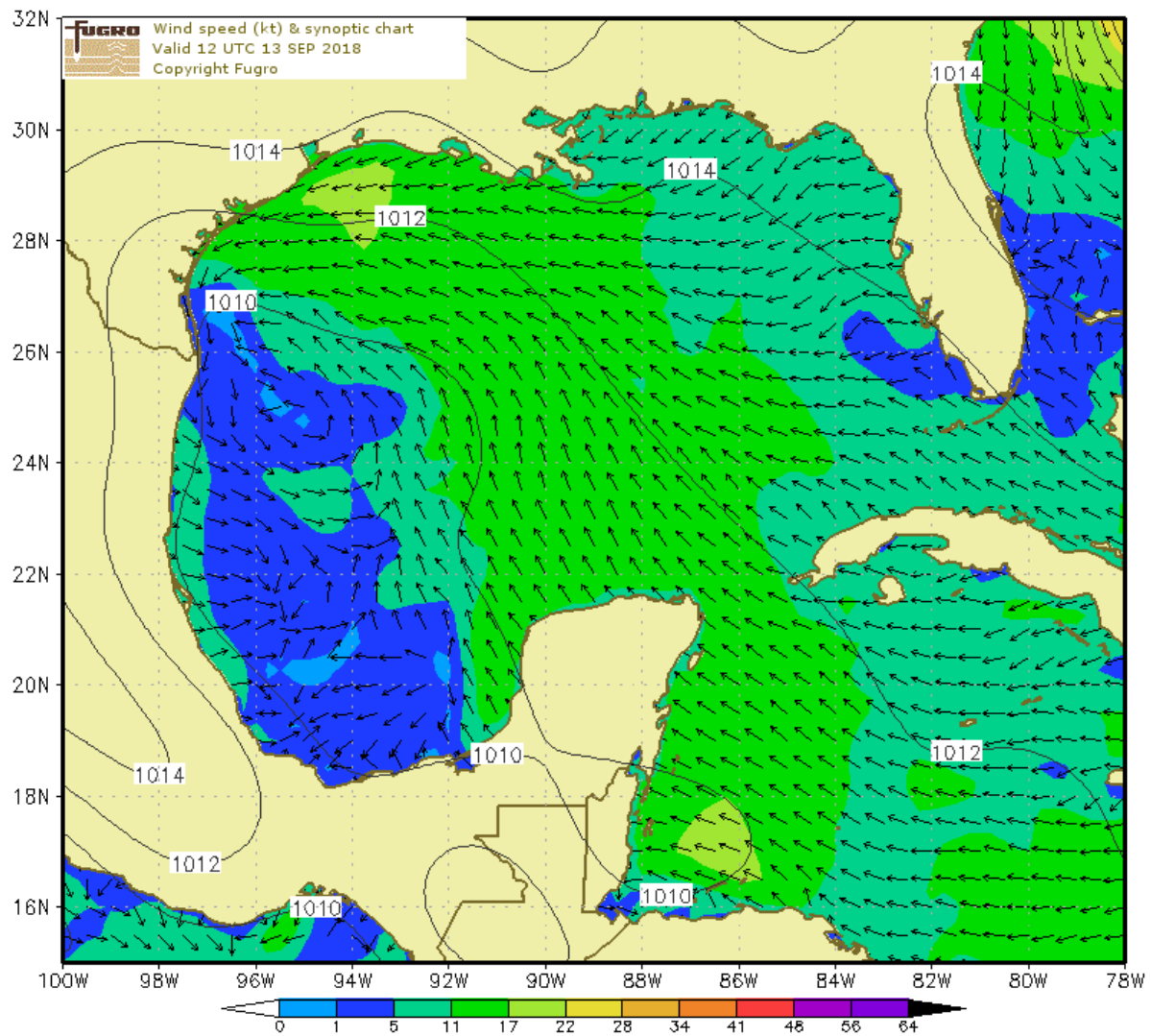
Wave Chart



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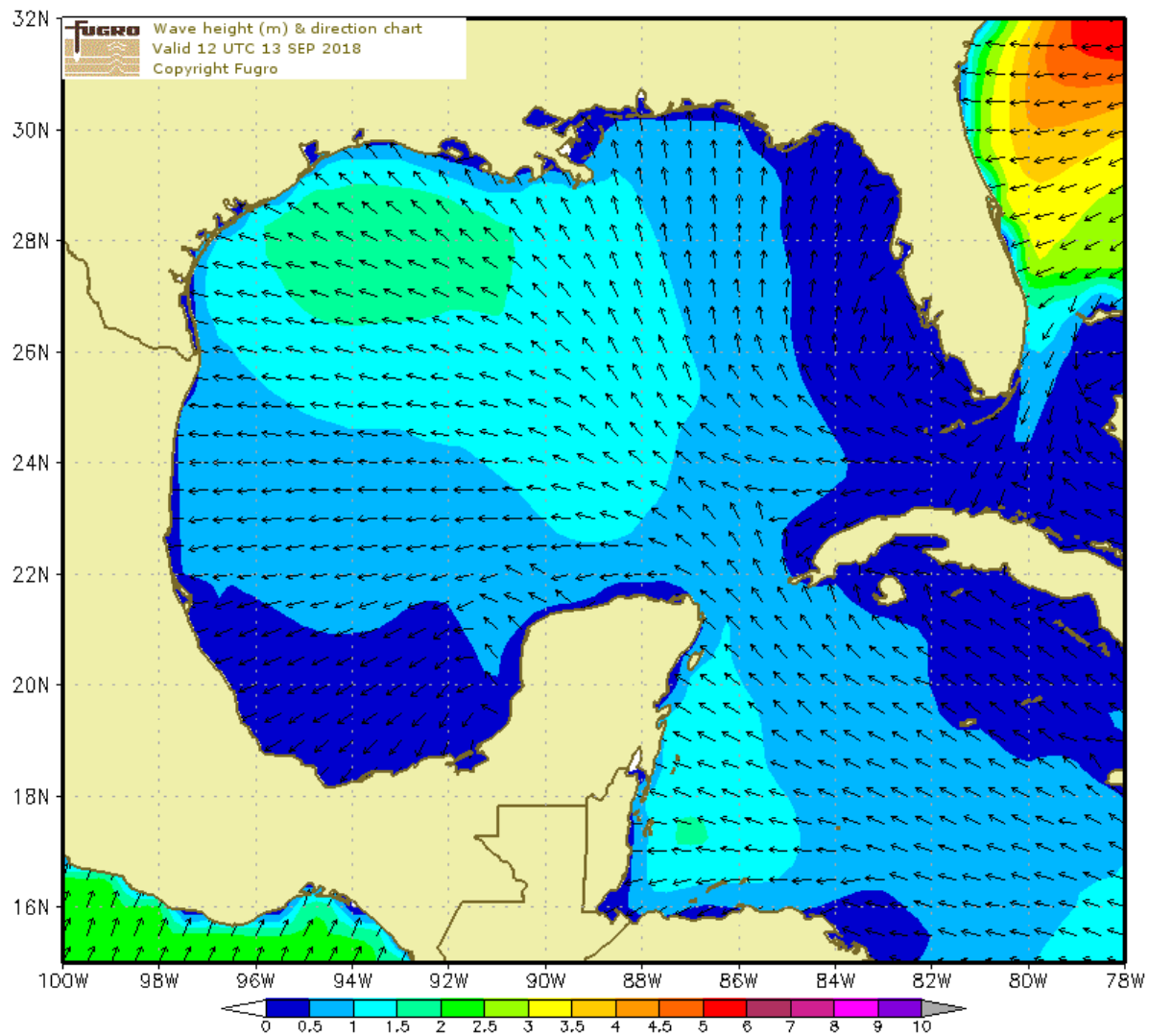
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 13 Sep 2018

Tropical Advisory: A tropical disturbance over the central GoM has a 60% chance of cyclone formation in the next 48 hours.

Met Situation: A fragmented showery trough lying over the N GoM is absorbed by a tropical disturbance over the central GoM during today, as the disturbance deepens and moves NW to lie over the W GoM from this evening. This then clears over Mexico/Texas tomorrow, as a ridge from the central USA extends SSE towards the N GoM. This persists into Saturday morning.

WARNINGS: THUNDERSTORMS. SQUALLS.

(Next 24 hours)

Weather: Showers, heavy at thundery at times.

(Next 48 hours)

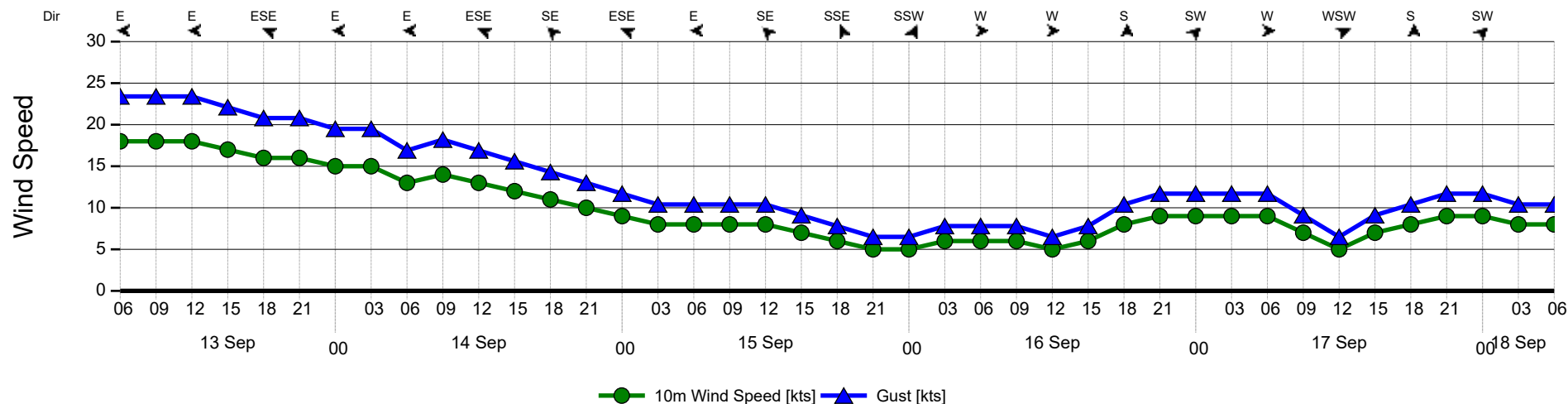
Confidence: Fairly high for trend but moderate for peak wind/wave detail due to the tropical disturbance. Low overall by late period. Stronger gusts possible in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
13/0600	E	18	23	0.9	SE	0.5	6	-	0.0	-	1.0	1.7
13/0900	E	18	23	0.9	SE	0.5	6	-	0.0	-	1.0	1.7
13/1200	E	18	23	0.8	SE	0.4	6	-	0.0	-	0.9	1.5
13/1500	ESE	17	22	0.8	-	0.0	-	-	0.0	-	0.8	1.4
13/1800	ESE	16	21	0.8	-	0.0	-	-	0.0	-	0.8	1.3
13/2100	E	16	21	0.8	-	0.0	-	-	0.0	-	0.8	1.3
14/0000	E	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
14/0300	E	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
14/0600	E	13	17	0.6	-	0.0	-	-	0.0	-	0.6	1.0
14/0900	ESE	14	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
14/1200	ESE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
14/1500	SE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
14/1800	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
14/2100	ESE	10	13	0.3	SE	0.3	5	-	0.0	-	0.4	0.7
15/0000	ESE	9	12	0.2	SE	0.3	5	-	0.0	-	0.4	0.6
15/0300	ESE	8	10	0.2	SE	0.3	5	-	0.0	-	0.4	0.6
15/0600	E	8	10	0.2	SE	0.4	5	-	0.0	-	0.4	0.7
15/0900	ESE	8	10	0.2	SE	0.4	5	-	0.0	-	0.4	0.7
15/1200	SE	8	10	0.2	SE	0.4	5	-	0.0	-	0.4	0.7
15/1500	SSE	7	9	0.2	SE	0.4	5	-	0.0	-	0.4	0.7
15/1800	SSE	6	8	0.1	SE	0.4	5	-	0.0	-	0.4	0.7
15/2100	SSE	5	7	0.1	SE	0.4	5	-	0.0	-	0.4	0.7
16/0000	SSW	5	7	0.1	SE	0.3	5	-	0.0	-	0.3	0.5
16/0300	WSW	6	8	0.1	SSE	0.3	5	-	0.0	-	0.3	0.5
16/0600	W	6	8	0.1	SSE	0.3	5	-	0.0	-	0.3	0.5
16/0900	WNW	6	8	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
16/1200	W	5	7	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
16/1500	SW	6	8	0.1	SSE	0.2	4	-	0.0	-	0.2	0.4
16/1800	S	8	10	0.1	SSE	0.2	4	-	0.0	-	0.2	0.4
16/2100	SSW	9	12	0.1	SSE	0.2	4	-	0.0	-	0.2	0.4
17/0000	SW	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
17/0300	WSW	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
17/0600	W	9	12	0.1	S	0.1	3	SSE	0.1	4	0.2	0.3
17/0900	W	7	9	0.0	S	0.1	3	SSE	0.1	4	0.1	0.2
17/1200	WSW	5	7	0.0	S	0.1	3	SSE	0.1	4	0.1	0.2
17/1500	SSW	7	9	0.2	SE	0.1	4	S	0.1	4	0.2	0.4
17/1800	S	8	10	0.2	SE	0.1	5	-	0.0	-	0.2	0.4
17/2100	SSW	9	12	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
18/0000	SW	9	12	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
18/0300	SW	8	10	0.2	S	0.1	3	-	0.0	-	0.2	0.4
18/0600	W	8	10	0.1	S	0.1	3	-	0.0	-	0.1	0.2

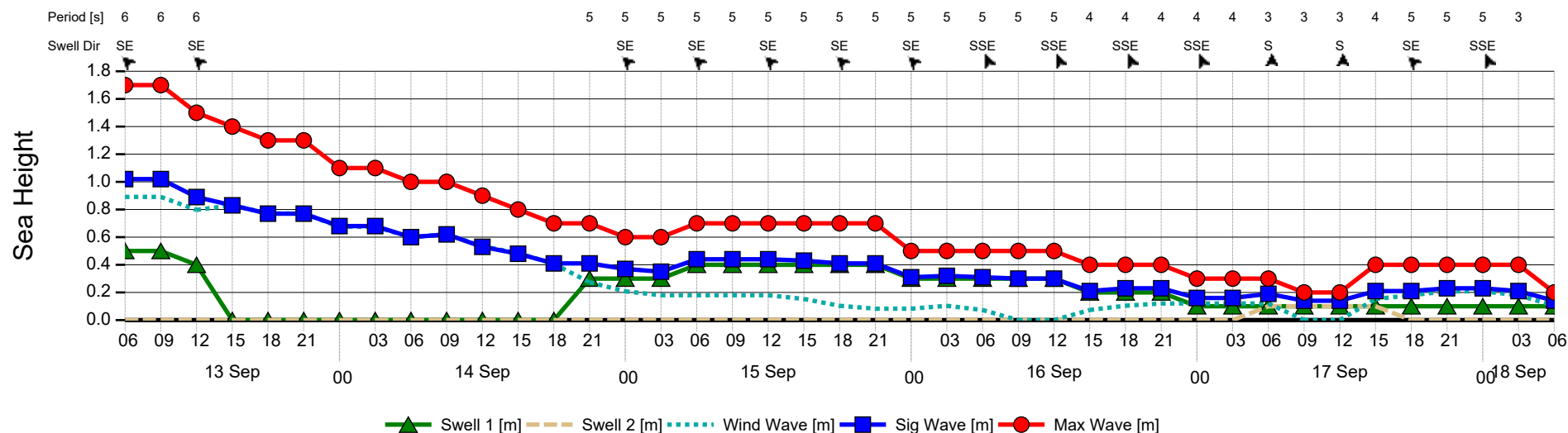
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



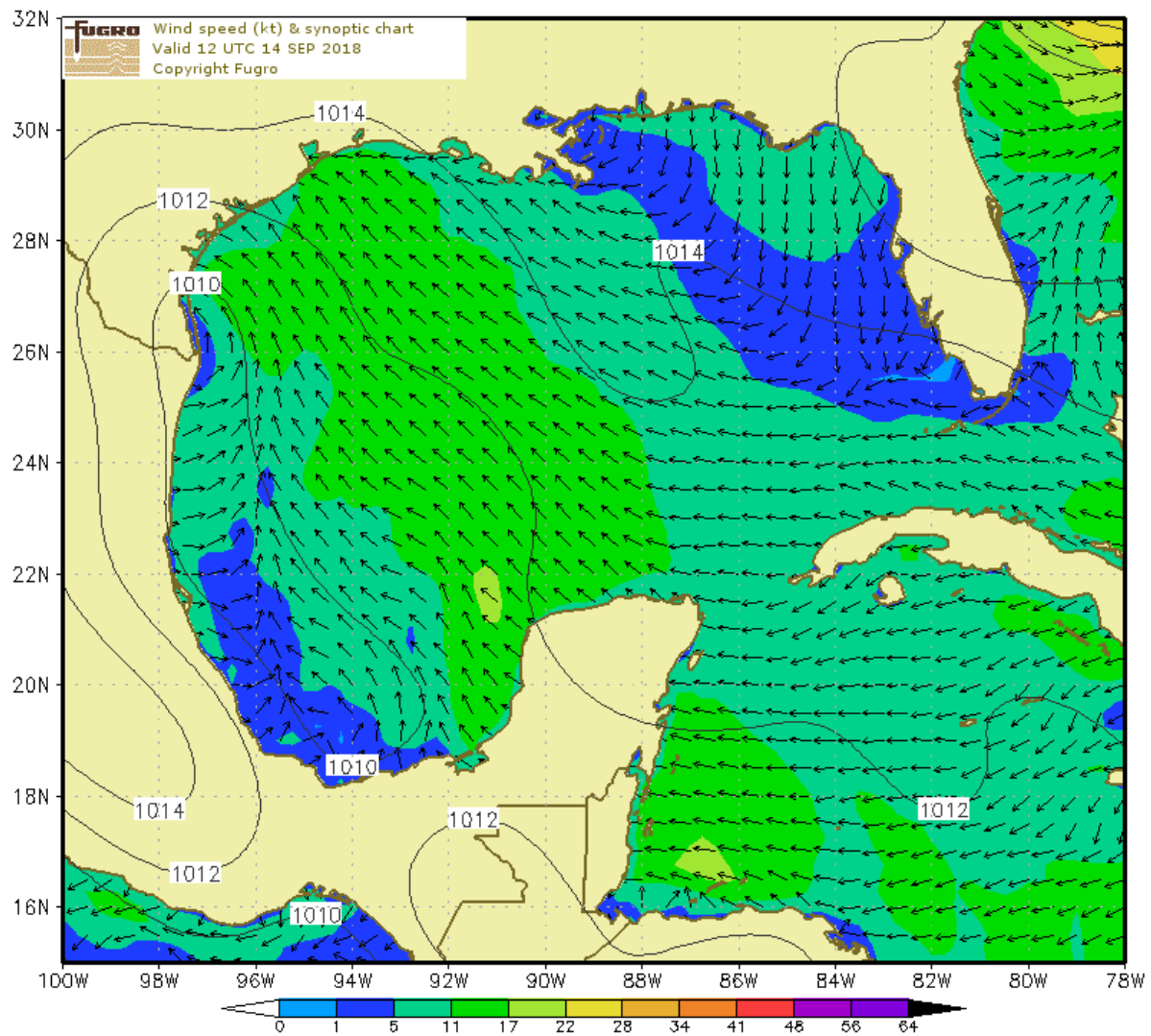
Wave Chart



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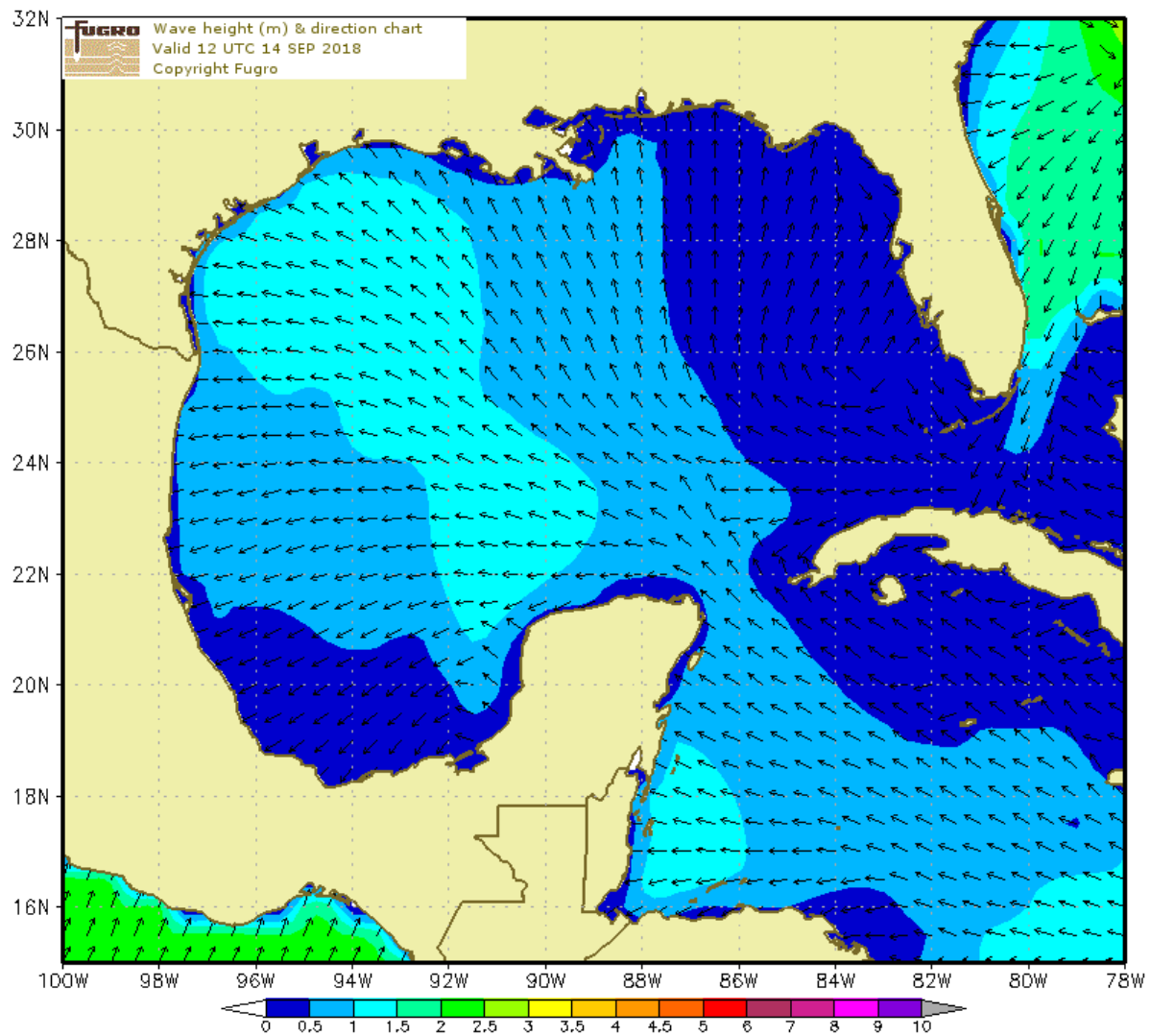
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 14 Sep 2018

Tropical Advisory: A Tropical Disturbance over the W GoM has a 30% chance of cyclone formation in the next 48 hours.

Met Situation: A weakening tropical disturbance over the W GoM clears NW over the Mexico/Texas border this morning. (Next 48 hours) Meanwhile, a ridge builds SSE towards the N GoM, becoming orientated SE from tomorrow evening. Overnight the associated high drifts W slightly into the central USA, allowing a trough to become oriented SW into the NE GoM by Sunday morning.

WARNINGS: THUNDERSTORMS. SQUALLS.

(Next 24 hours)

Weather: Risk of heavy and thundery showers through today, before these ease in intensity overnight and during (Next 48 hours) tomorrow morning. Clearing then mainly fair from tomorrow afternoon.

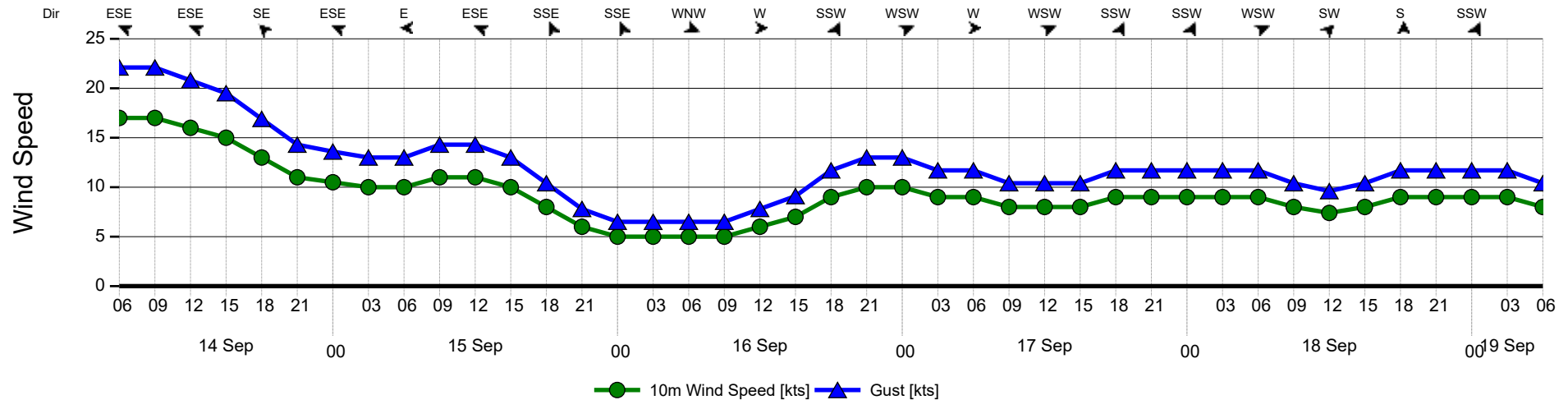
Confidence: Fairly high for trend, but moderate for peak wind/wave detail due to uncertainty in the track of the Tropical Disturbance. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
14/0600	ESE	17	22	0.9	-	0.0	-	-	0.0	-	1.0	1.6
14/0900	ESE	17	22	0.9	-	0.0	-	-	0.0	-	1.0	1.6
14/1200	ESE	16	21	0.9	-	0.0	-	-	0.0	-	0.9	1.6
14/1500	SE	15	20	0.9	SE	0.1	6	-	0.0	-	0.9	1.5
14/1800	SE	13	17	0.8	SE	0.2	6	-	0.0	-	0.9	1.4
14/2100	ESE	11	14	0.7	SE	0.3	6	-	0.0	-	0.7	1.2
15/0000	ESE	11	14	0.6	SE	0.3	6	-	0.0	-	0.7	1.1
15/0300	E	10	13	0.5	SE	0.3	6	-	0.0	-	0.6	1.0
15/0600	E	10	13	0.5	SE	0.4	6	-	0.0	-	0.6	1.0
15/0900	E	11	14	0.4	SE	0.4	6	-	0.0	-	0.6	1.0
15/1200	ESE	11	14	0.4	SE	0.4	6	-	0.0	-	0.6	0.9
15/1500	SE	10	13	0.3	SE	0.4	6	-	0.0	-	0.5	0.8
15/1800	SSE	8	10	0.2	SSE	0.4	5	SSW	0.1	4	0.5	0.8
15/2100	SSE	6	8	0.1	SSE	0.4	5	SSW	0.2	4	0.4	0.7
16/0000	SSE	5	7	0.1	SSE	0.3	5	SSW	0.2	4	0.4	0.6
16/0300	SW	5	7	0.0	SSE	0.3	5	SSW	0.1	4	0.3	0.5
16/0600	WNW	5	7	0.0	SSE	0.3	5	SSW	0.1	4	0.3	0.5
16/0900	NW	5	7	0.0	SSE	0.3	5	SSW	0.1	4	0.3	0.5
16/1200	W	6	8	0.1	SSE	0.3	5	SSW	0.1	4	0.3	0.5
16/1500	SSW	7	9	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
16/1800	SSW	9	12	0.1	SSE	0.2	5	-	0.0	-	0.2	0.4
16/2100	SW	10	13	0.1	SSE	0.2	5	-	0.0	-	0.2	0.4
17/0000	WSW	10	13	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/0300	W	9	12	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/0600	W	9	12	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.3
17/0900	W	8	10	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.3
17/1200	WSW	8	10	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/1500	SSW	8	10	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
17/1800	SSW	9	12	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
17/2100	SSW	9	12	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
18/0000	SSW	9	12	0.2	SSE	0.1	5	-	0.0	-	0.2	0.4
18/0300	SW	9	12	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
18/0600	WSW	9	12	0.1	SSE	0.2	4	-	0.0	-	0.2	0.4
18/0900	WNW	8	10	0.0	SSE	0.2	3	SSW	0.1	4	0.2	0.4
18/1200	SW	7	10	0.1	SSE	0.1	3	SSW	0.1	4	0.2	0.3
18/1500	S	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
18/1800	S	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
18/2100	S	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
19/0000	SSW	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
19/0300	SSW	9	12	0.1	SSE	0.1	4	-	0.0	-	0.2	0.3
19/0600	SW	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3

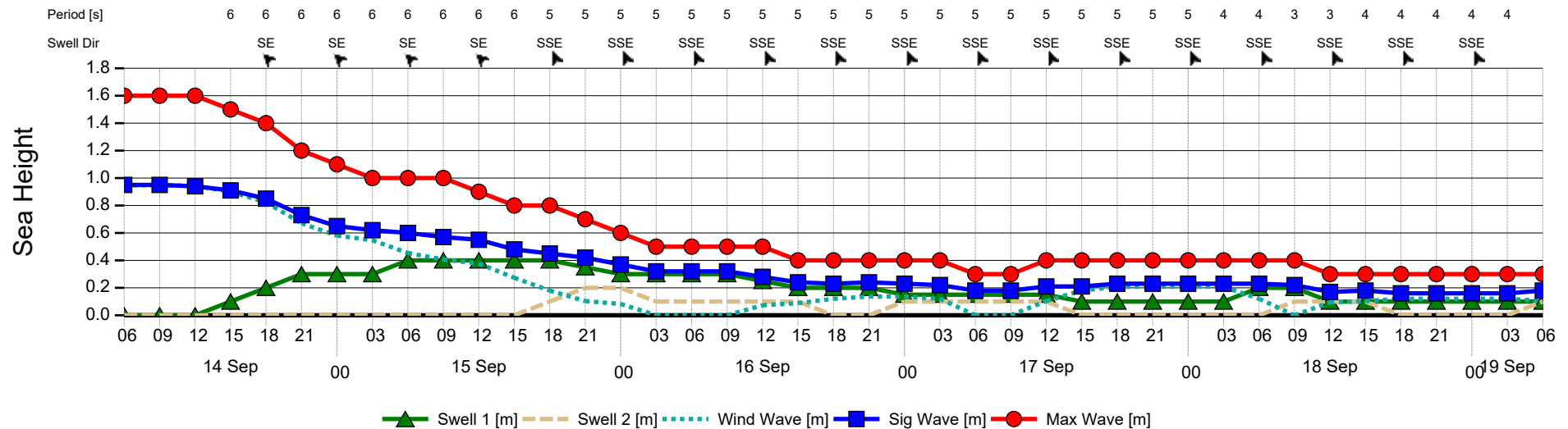
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



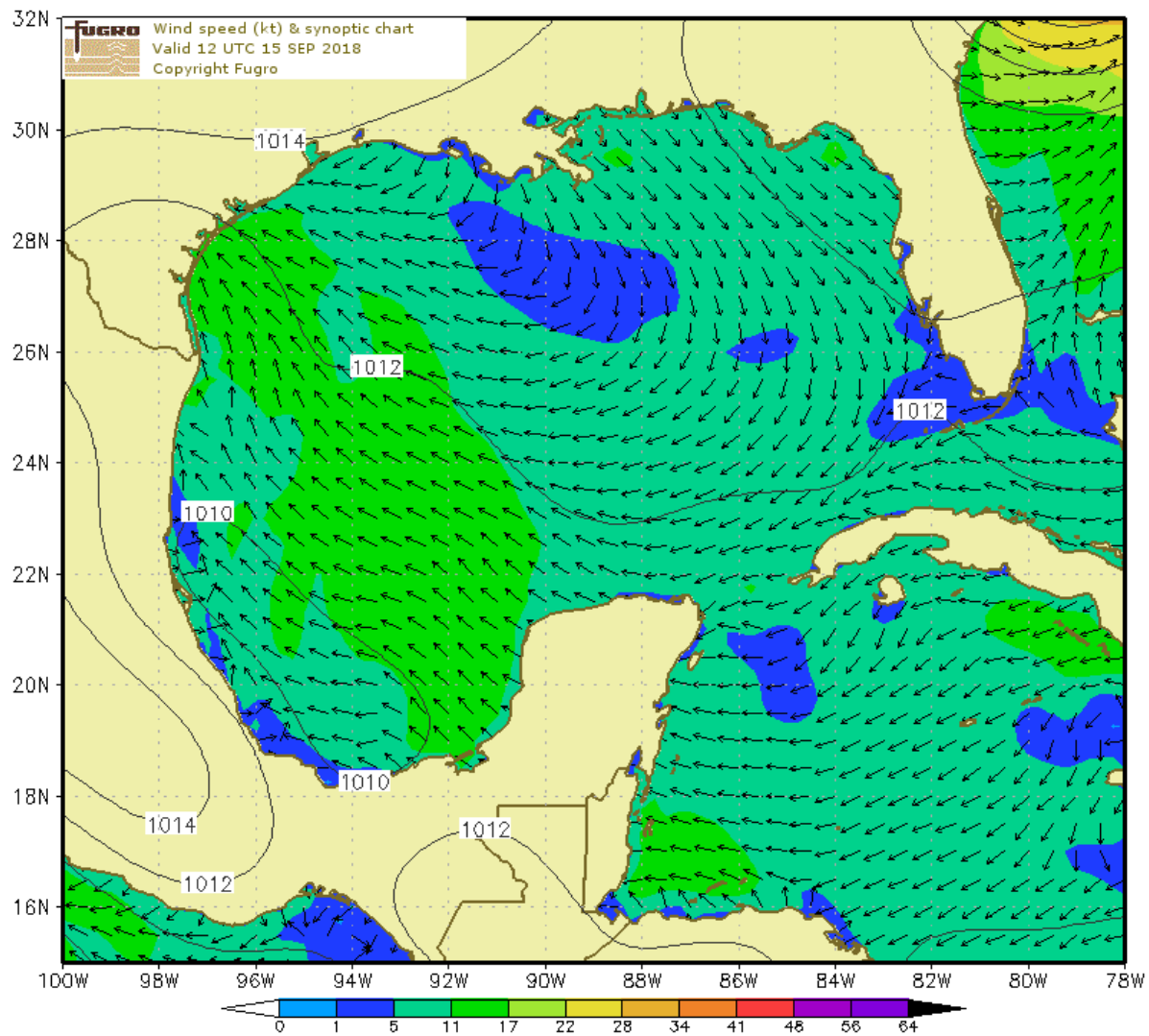
Wave Chart



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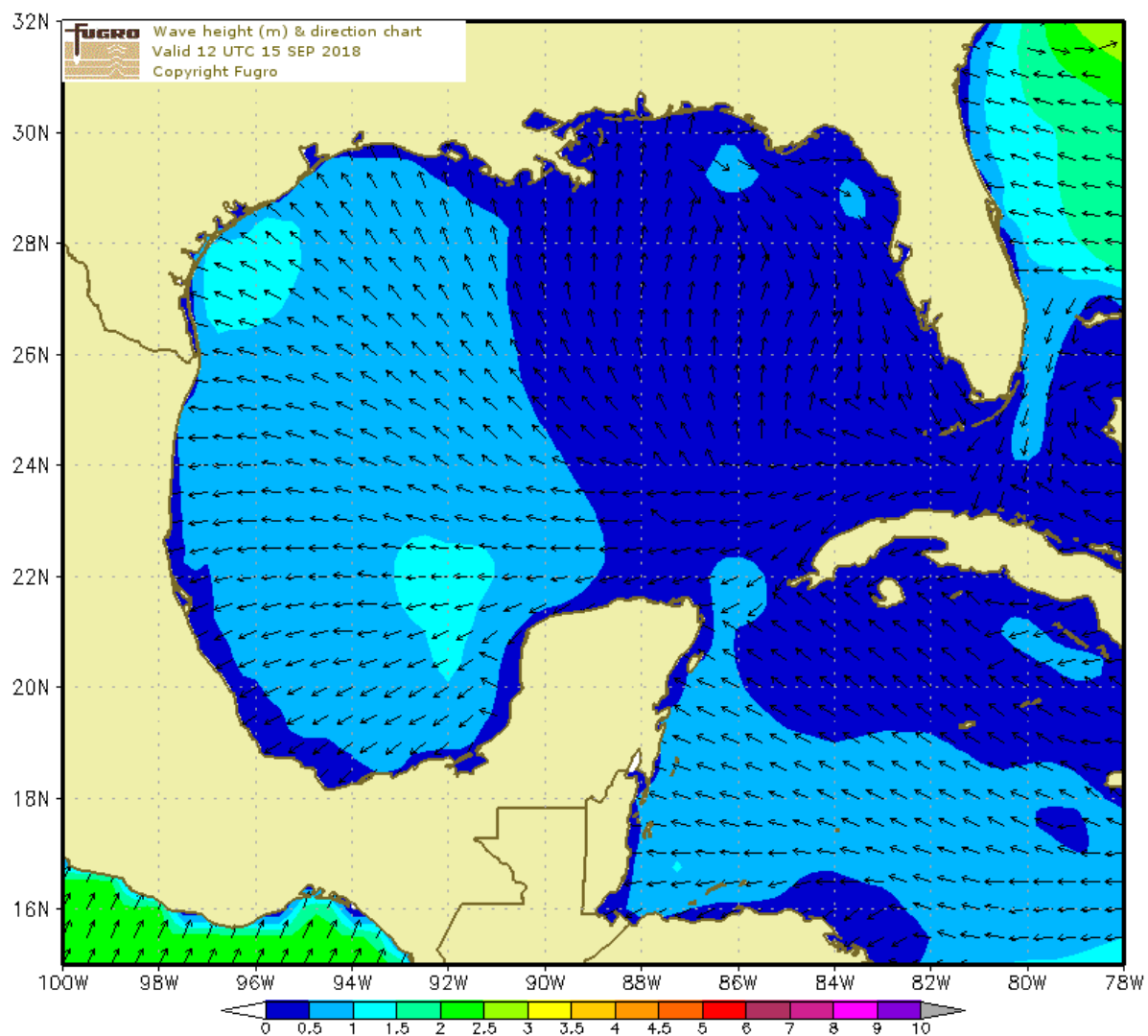
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 15 Sep 2018

Tropical NIL.

Advisory:

Met Situation: A ridge extends SE towards the N GoM, as the parent high drifts W slightly into the central USA during this afternoon, allowing a trough to deepen SW into the NE GoM by tomorrow morning. This remains in situ throughout Sunday before filling overnight as the pressure gradient becomes slack into Monday morning.
(Next 48 hours)

WARNINGS: THUNDERSTORMS. SQUALLS.

(Next 24 hours)

Weather: Risk of heavy and thundery showers through this morning. Clearing mainly fair from this afternoon.
(Next 48 hours)

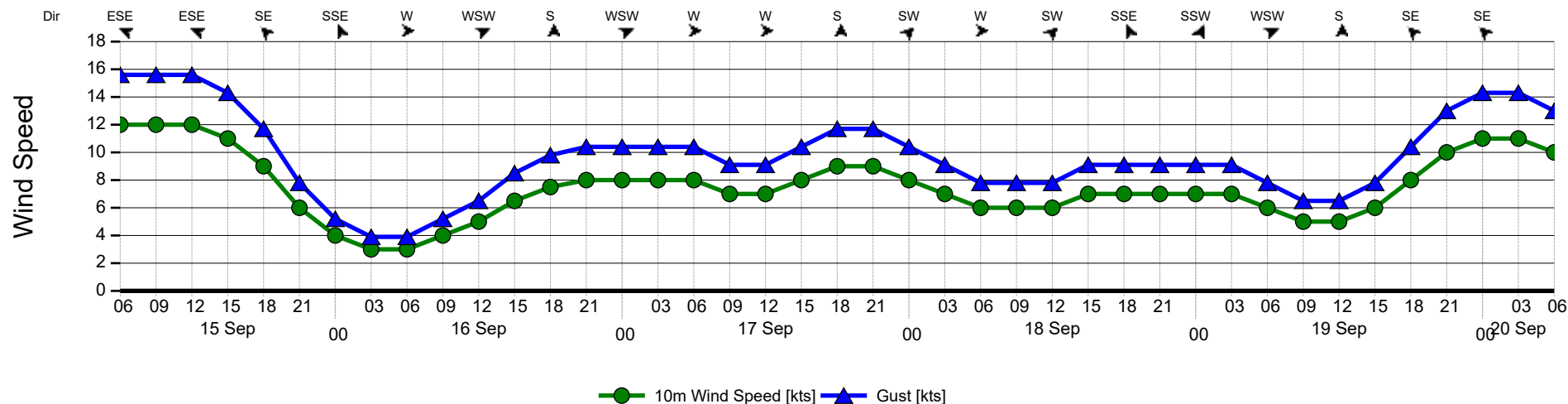
Confidence: Fairly high for trend, falling moderate for detail by mid-period. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
15/0600	ESE	12	16	0.3	SE	0.6	6	-	0.0	-	0.7	1.2
15/0900	ESE	12	16	0.5	SE	0.5	6	-	0.0	-	0.7	1.2
15/1200	ESE	12	16	0.5	SE	0.4	6	-	0.0	-	0.6	1.1
15/1500	SE	11	14	0.4	SE	0.4	6	-	0.0	-	0.6	1.0
15/1800	SE	9	12	0.2	SSE	0.5	5	SSW	0.1	4	0.6	0.9
15/2100	SE	6	8	0.1	SSE	0.5	5	SSW	0.2	4	0.5	0.9
16/0000	SSE	4	5	0.0	SSE	0.4	5	SSW	0.2	5	0.5	0.8
16/0300	SSW	3	4	0.0	SSE	0.4	5	SSW	0.2	5	0.5	0.8
16/0600	W	3	4	0.0	SSE	0.4	5	SSW	0.2	5	0.4	0.7
16/0900	NNW	4	5	0.0	SSE	0.3	5	SSW	0.2	5	0.4	0.6
16/1200	WSW	5	7	0.1	SSE	0.3	5	SSW	0.2	5	0.3	0.6
16/1500	S	7	9	0.1	SSE	0.3	5	SSW	0.2	5	0.3	0.6
16/1800	S	8	10	0.1	SSE	0.3	5	SSW	0.1	5	0.3	0.6
16/2100	SSW	8	10	0.1	SSE	0.3	5	SSW	0.1	4	0.3	0.6
17/0000	WSW	8	10	0.1	SSE	0.3	5	SSW	0.1	4	0.3	0.5
17/0300	W	8	10	0.1	SSE	0.2	5	SSW	0.1	4	0.3	0.4
17/0600	W	8	10	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/0900	WNW	7	9	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/1200	W	7	9	0.1	SSE	0.2	4	SSW	0.1	4	0.2	0.4
17/1500	SSW	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
17/1800	S	9	12	0.1	SSE	0.1	4	SE	0.1	4	0.2	0.3
17/2100	SSW	9	12	0.1	SSE	0.1	4	SE	0.1	4	0.2	0.3
18/0000	SW	8	10	0.2	S	0.1	4	SE	0.1	4	0.2	0.4
18/0300	WSW	7	9	0.2	S	0.1	4	SE	0.1	4	0.2	0.4
18/0600	W	6	8	0.0	S	0.2	4	SSW	0.1	3	0.2	0.4
18/0900	WNW	6	8	0.0	S	0.2	4	SSW	0.1	3	0.2	0.4
18/1200	SW	6	8	0.1	S	0.1	4	SSW	0.1	3	0.2	0.3
18/1500	S	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
18/1800	SSE	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
18/2100	S	7	9	0.1	S	0.1	5	-	0.0	-	0.1	0.2
19/0000	SSW	7	9	0.1	S	0.1	5	-	0.0	-	0.1	0.2
19/0300	SSW	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0600	WSW	6	8	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0900	SW	5	7	0.0	S	0.1	5	-	0.0	-	0.1	0.2
19/1200	S	5	7	0.0	S	0.1	5	-	0.0	-	0.1	0.2
19/1500	SSE	6	8	0.1	S	0.1	5	-	0.0	-	0.1	0.2
19/1800	SE	8	10	0.1	S	0.1	5	-	0.0	-	0.1	0.2
19/2100	SE	10	13	0.1	S	0.1	5	-	0.0	-	0.2	0.3
20/0000	SE	11	14	0.2	S	0.2	5	-	0.0	-	0.3	0.4
20/0300	SSE	11	14	0.2	S	0.3	5	-	0.0	-	0.3	0.5
20/0600	SSE	10	13	0.1	S	0.3	5	-	0.0	-	0.3	0.6

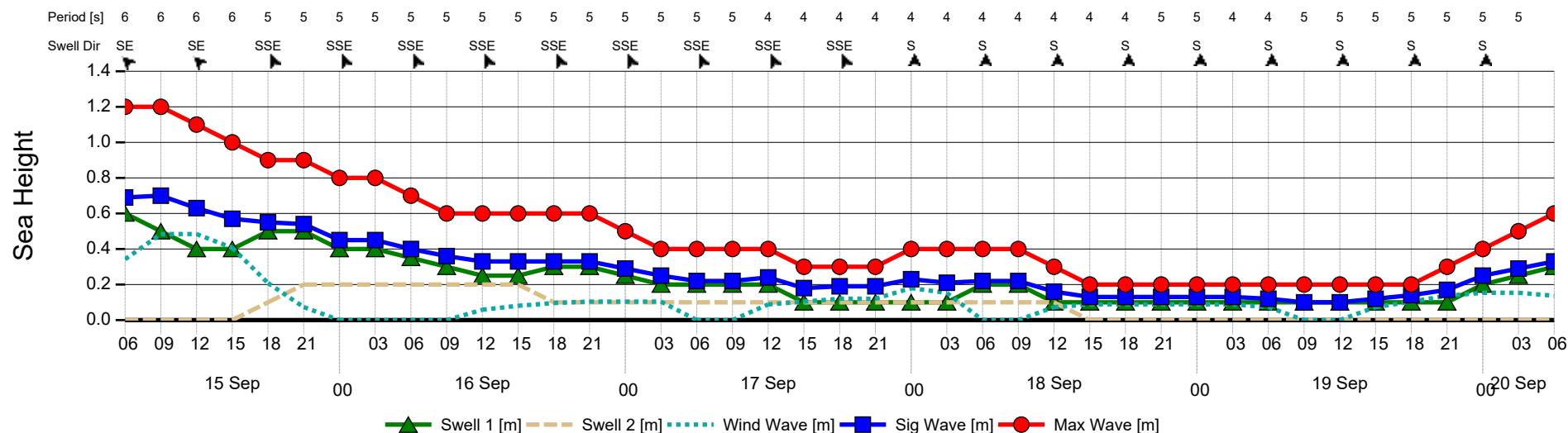
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



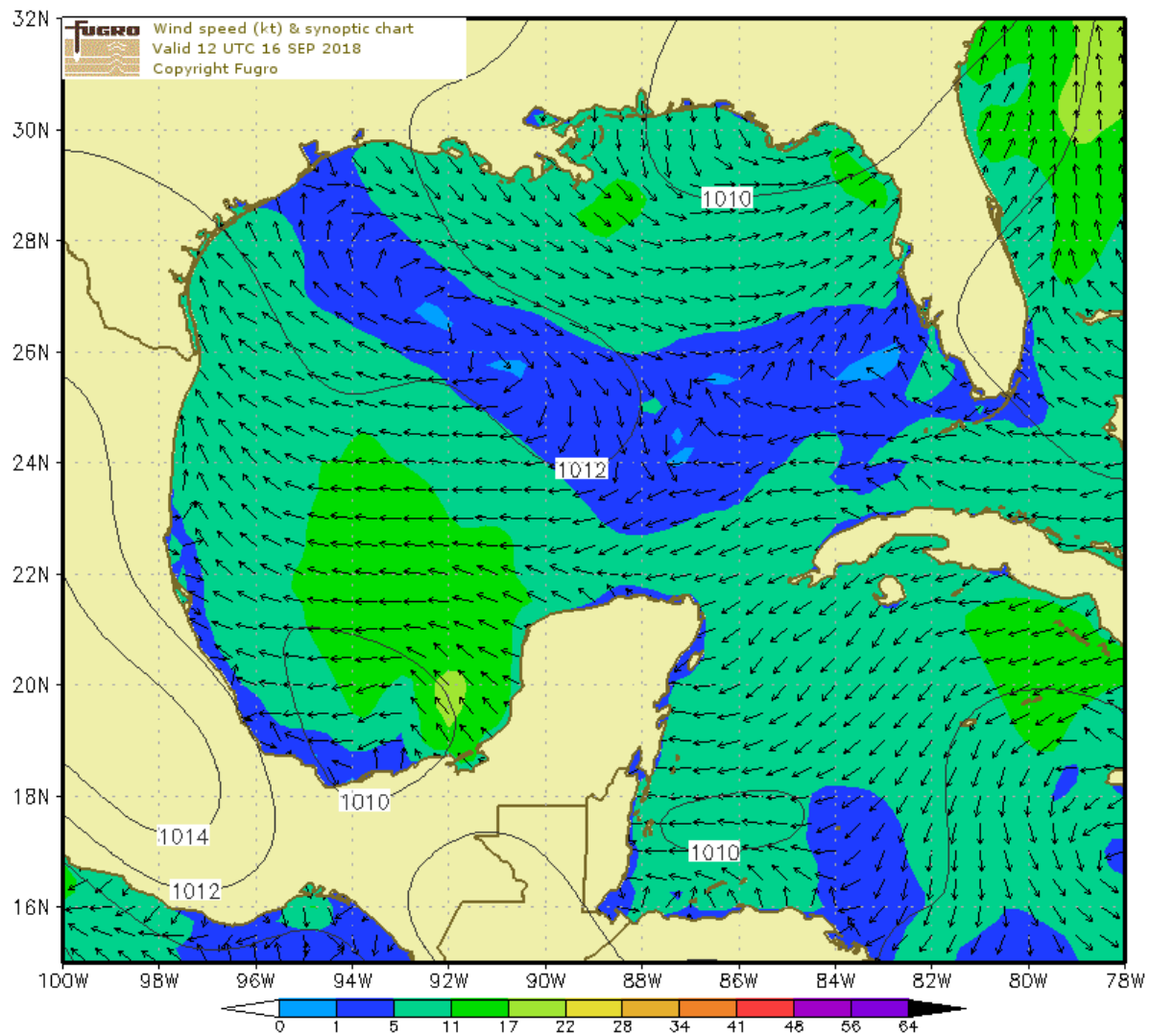
Wave Chart



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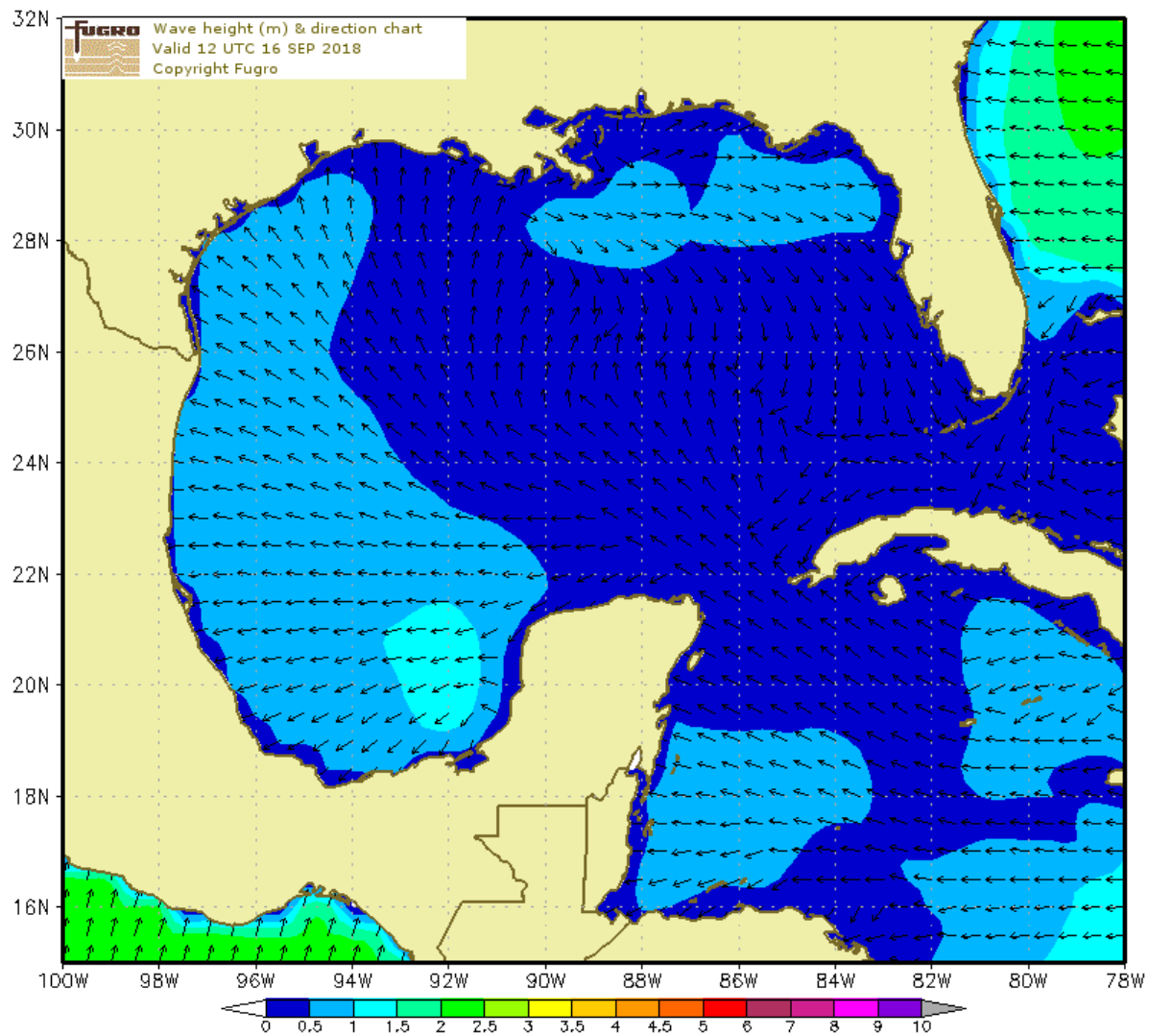
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 16 Sep 2018
Tropical Advisory: NIL.

Met Situation: During this morning a trough deepens SW into the NE GoM, and this remains in situ throughout today before filling overnight. From tomorrow morning a weak ridge associated with a high over the central Atlantic extends W-SW into the N GoM, and this persists into Tuesday morning.
(Next 48 hours)

WARNINGS: THUNDERSTORMS.
(Next 24 hours)

Weather: Generally fair today. Risk of a few showers/thunderstorms tomorrow morning/afternoon before clearing fair again through the evening. Risk of further showers/thunderstorms on Tuesday morning.
(Next 48 hours)

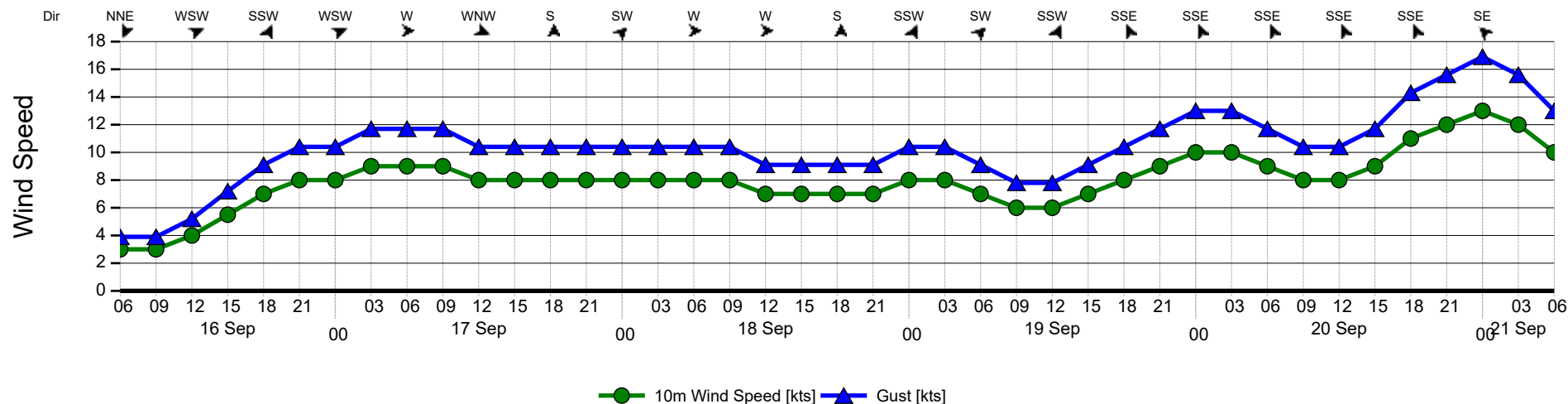
Confidence: Fairly high for trend, falling moderate for peak wind/wave detail by mid-period. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
16/0600	NNE	3	4	0.0	SSE	0.4	5	SSW	0.2	5	0.4	0.7
16/0900	N	3	4	0.0	SSE	0.3	5	SSW	0.2	5	0.4	0.6
16/1200	WSW	4	5	0.1	SSE	0.3	5	SSW	0.2	5	0.3	0.6
16/1500	SSW	6	7	0.1	SSE	0.3	5	SSW	0.2	5	0.3	0.6
16/1800	SSW	7	9	0.1	SSE	0.2	5	SSW	0.2	5	0.3	0.5
16/2100	SW	8	10	0.1	SSE	0.2	5	SSW	0.2	5	0.3	0.5
17/0000	WSW	8	10	0.1	SSE	0.2	5	SSW	0.1	4	0.3	0.4
17/0300	W	9	12	0.1	SSE	0.2	5	SSW	0.1	4	0.3	0.4
17/0600	W	9	12	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/0900	WNW	9	12	0.0	SSE	0.2	4	SSW	0.1	5	0.2	0.4
17/1200	WNW	8	10	0.0	SSE	0.2	4	SSW	0.1	5	0.2	0.4
17/1500	SW	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
17/1800	S	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
17/2100	SSW	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
18/0000	SW	8	10	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
18/0300	WSW	8	10	0.1	SSE	0.1	4	S	0.1	4	0.2	0.3
18/0600	W	8	10	0.1	SSW	0.1	3	S	0.1	4	0.2	0.3
18/0900	WNW	8	10	0.0	SSW	0.1	3	S	0.1	4	0.1	0.2
18/1200	W	7	9	0.1	SSW	0.1	3	-	0.0	-	0.1	0.2
18/1500	SSW	7	9	0.1	SSW	0.1	3	-	0.0	-	0.1	0.2
18/1800	S	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
18/2100	S	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0000	SSW	8	10	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0300	SW	8	10	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0600	SW	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/0900	WSW	6	8	0.1	S	0.1	3	-	0.0	-	0.1	0.2
19/1200	SSW	6	8	0.1	S	0.1	3	-	0.0	-	0.1	0.2
19/1500	S	7	9	0.1	S	0.1	4	-	0.0	-	0.1	0.2
19/1800	SSE	8	10	0.1	S	0.1	5	-	0.0	-	0.1	0.2
19/2100	SSE	9	12	0.1	S	0.1	5	-	0.0	-	0.2	0.3
20/0000	SSE	10	13	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
20/0300	SSE	10	13	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
20/0600	SSE	9	12	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
20/0900	SSE	8	10	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
20/1200	SSE	8	10	0.2	SSE	0.1	4	-	0.0	-	0.2	0.4
20/1500	SSE	9	12	0.3	SSE	0.1	5	-	0.0	-	0.3	0.5
20/1800	SSE	11	14	0.4	SSE	0.1	5	-	0.0	-	0.4	0.7
20/2100	SE	12	16	0.4	SSE	0.2	5	-	0.0	-	0.5	0.8
21/0000	SE	13	17	0.5	SSE	0.3	5	-	0.0	-	0.6	0.9
21/0300	SSE	12	16	0.4	SSE	0.4	5	-	0.0	-	0.6	1.0
21/0600	ESE	10	13	0.3	SSE	0.5	5	-	0.0	-	0.6	1.0

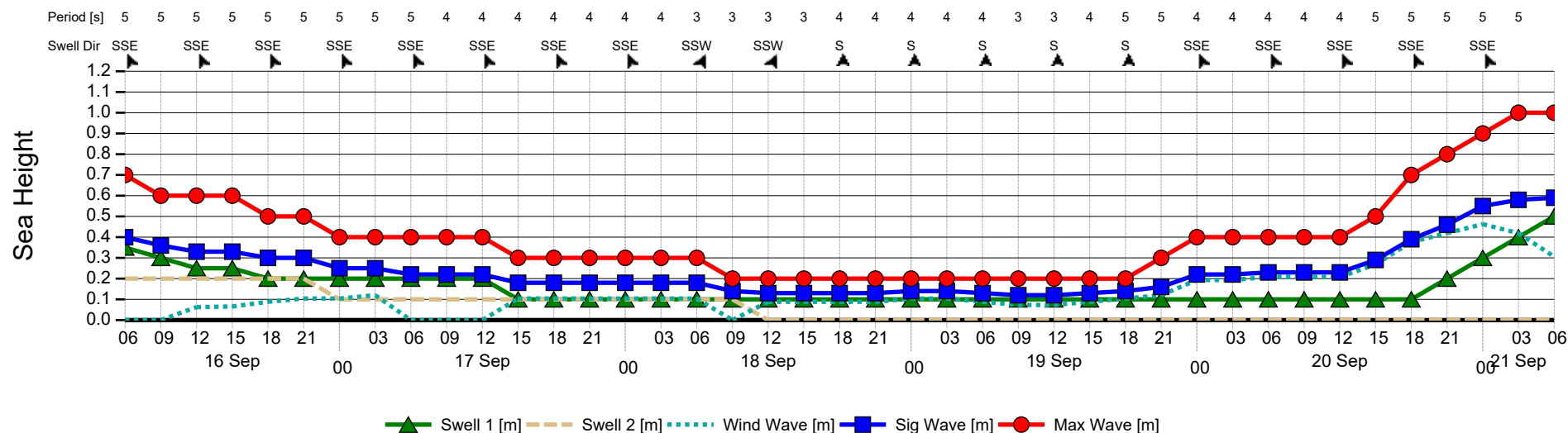
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



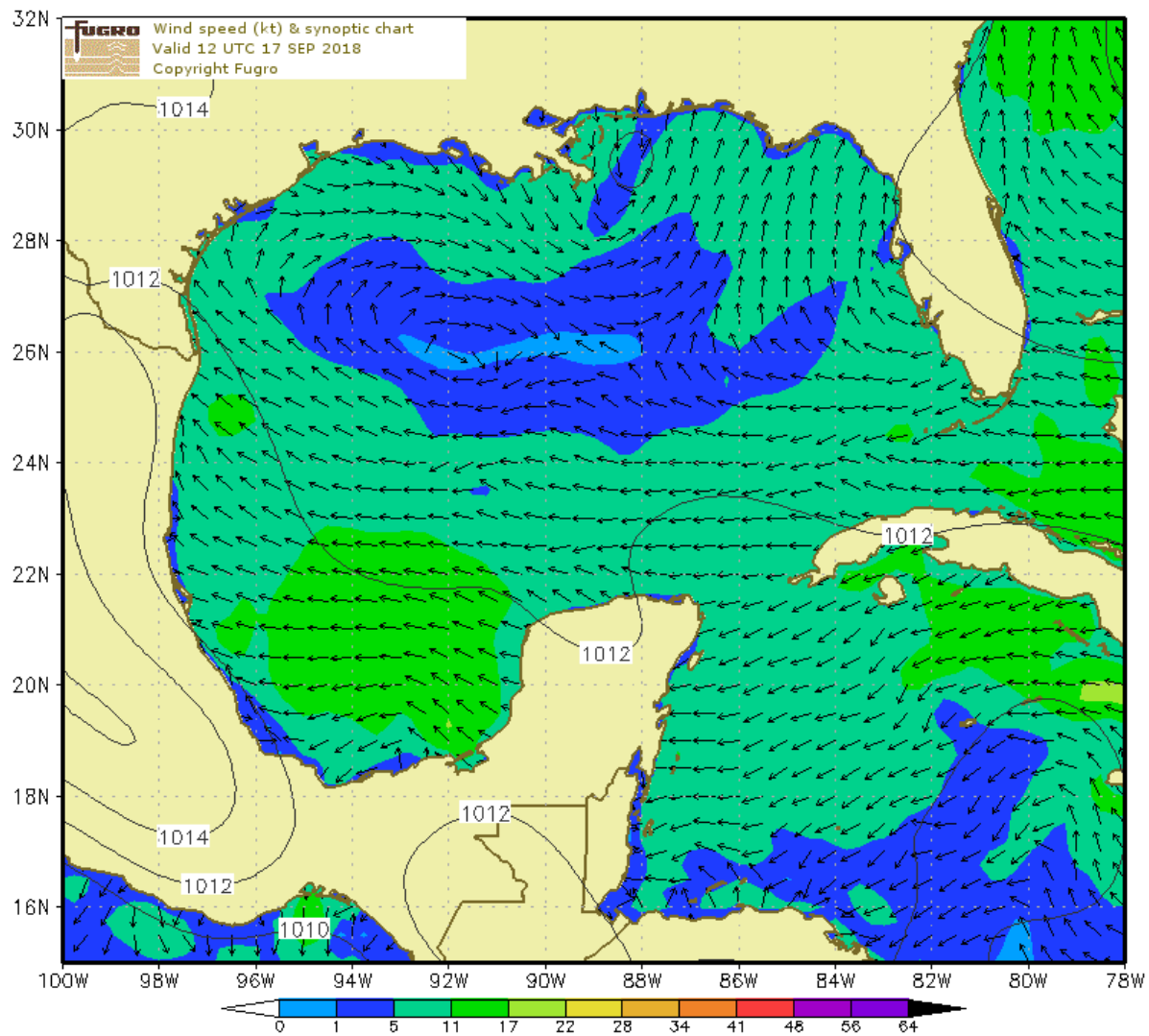
Wave Chart



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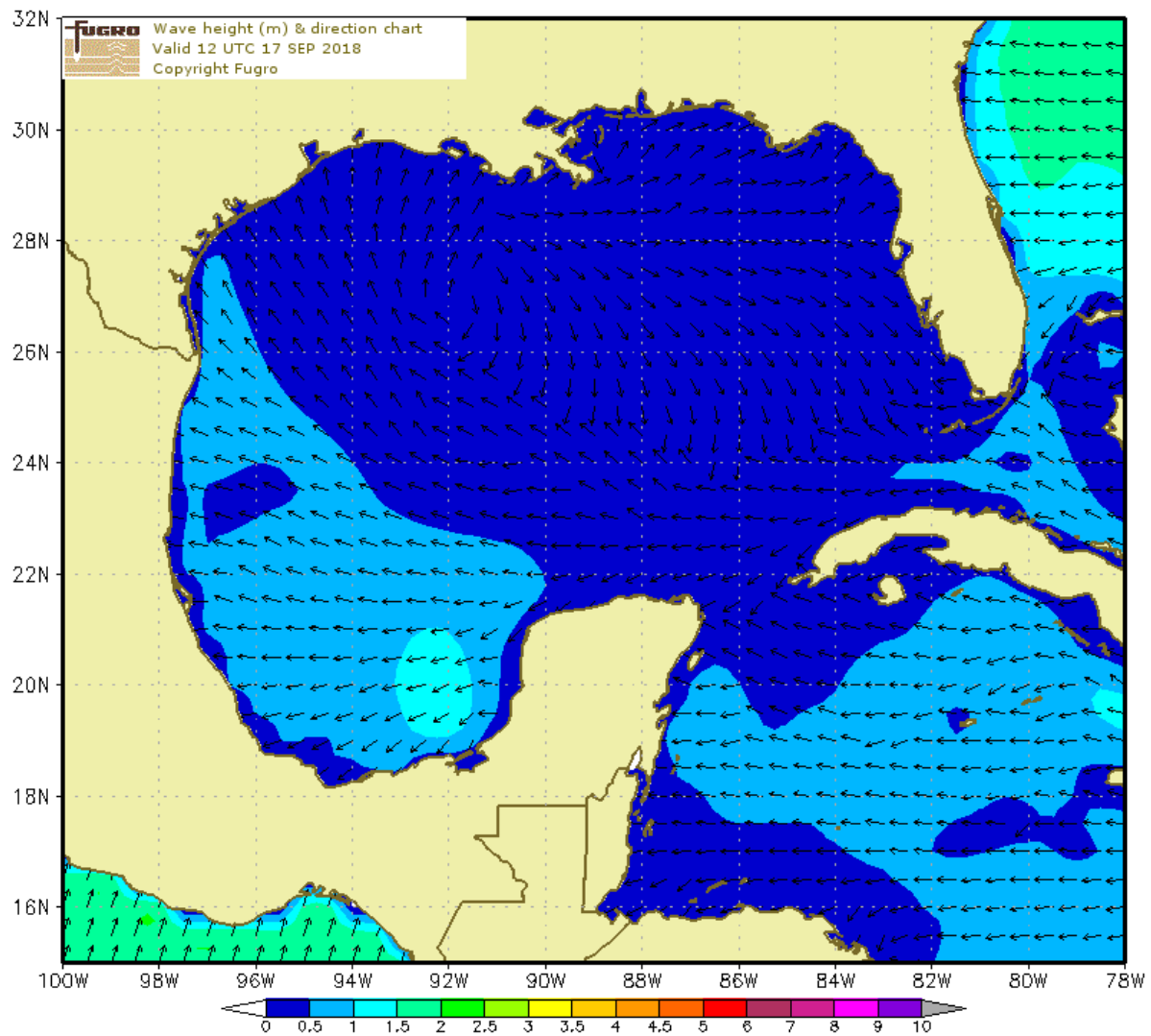
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 17 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak trough lies SW over N Florida and gradually fills to leave a slack pressure gradient across the basin (Next 48 hours) today. From early on Tuesday and into Wednesday, a weak ridge extends S-SSW across the basin. At the same time, weak showery troughs drift WNW over the central GoM.

WARNINGS: THUNDERSTORMS.
(Next 24 hours)

Weather: A low risk of thundery showers during the late mornings/early afternoons. Otherwise fair.
(Next 48 hours)

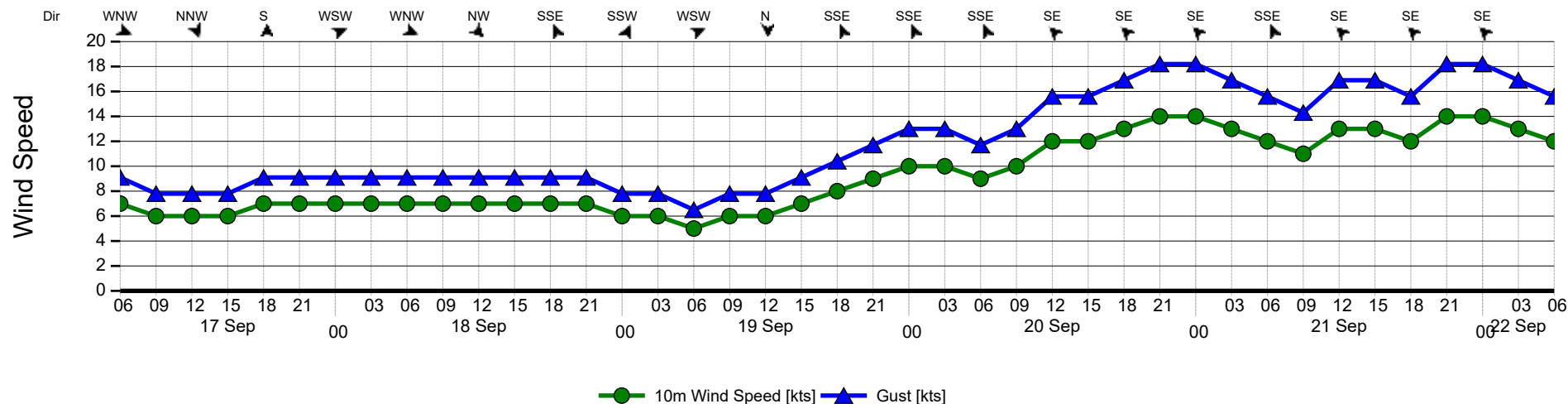
Confidence: Fairly high for trend, falling moderate for detail by mid-period. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
17/0600	WNW	7	9	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
17/0900	NW	6	8	0.0	SSE	0.2	4	SSW	0.1	4	0.2	0.4
17/1200	NNW	6	8	0.0	SSE	0.2	4	SSW	0.1	4	0.2	0.4
17/1500	N	6	8	0.0	SSE	0.1	4	SSW	0.1	4	0.1	0.2
17/1800	S	7	9	0.1	SSE	0.1	4	SSW	0.1	4	0.2	0.3
17/2100	SSW	7	9	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
18/0000	WSW	7	9	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
18/0300	W	7	9	0.1	SSE	0.1	4	-	0.0	-	0.1	0.2
18/0600	WNW	7	9	0.0	SSW	0.1	3	-	0.0	-	0.1	0.2
18/0900	NW	7	9	0.0	SSW	0.1	3	-	0.0	-	0.1	0.2
18/1200	NW	7	9	0.0	-	0.0	-	-	0.0	-	0.0	0.0
18/1500	ESE	7	9	0.2	-	0.0	-	-	0.0	-	0.2	0.3
18/1800	SSE	7	9	0.2	-	0.0	-	-	0.0	-	0.2	0.3
18/2100	S	7	9	0.2	-	0.0	-	-	0.0	-	0.2	0.3
19/0000	SSW	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/0300	SW	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/0600	WSW	5	7	0.1	-	0.0	-	-	0.0	-	0.1	0.1
19/0900	NW	6	8	0.0	-	0.0	-	-	0.0	-	0.0	0.0
19/1200	N	6	8	0.0	-	0.0	-	-	0.0	-	0.0	0.0
19/1500	SE	7	9	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/1800	SSE	8	10	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/2100	SSE	9	12	0.2	-	0.0	-	-	0.0	-	0.2	0.4
20/0000	SSE	10	13	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0300	SSE	10	13	0.4	-	0.0	-	-	0.0	-	0.4	0.6
20/0600	SSE	9	12	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0900	SE	10	13	0.4	-	0.0	-	-	0.0	-	0.4	0.6
20/1200	SE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
20/1500	SE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
20/1800	SE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
20/2100	SE	14	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/0000	SE	14	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/0300	SE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/0600	SSE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.2
21/0900	SE	11	14	0.6	-	0.0	-	-	0.0	-	0.6	1.1
21/1200	SE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/1500	SE	13	17	0.8	-	0.0	-	-	0.0	-	0.8	1.4
21/1800	SE	12	16	0.8	-	0.0	-	-	0.0	-	0.8	1.4
21/2100	SE	14	18	1.1	-	0.0	-	-	0.0	-	1.1	1.8
22/0000	SE	14	18	1.1	-	0.0	-	-	0.0	-	1.1	1.8
22/0300	SE	13	17	0.9	SE	0.2	5	-	0.0	-	1.0	1.6
22/0600	SE	12	16	0.8	SE	0.3	5	-	0.0	-	0.9	1.5

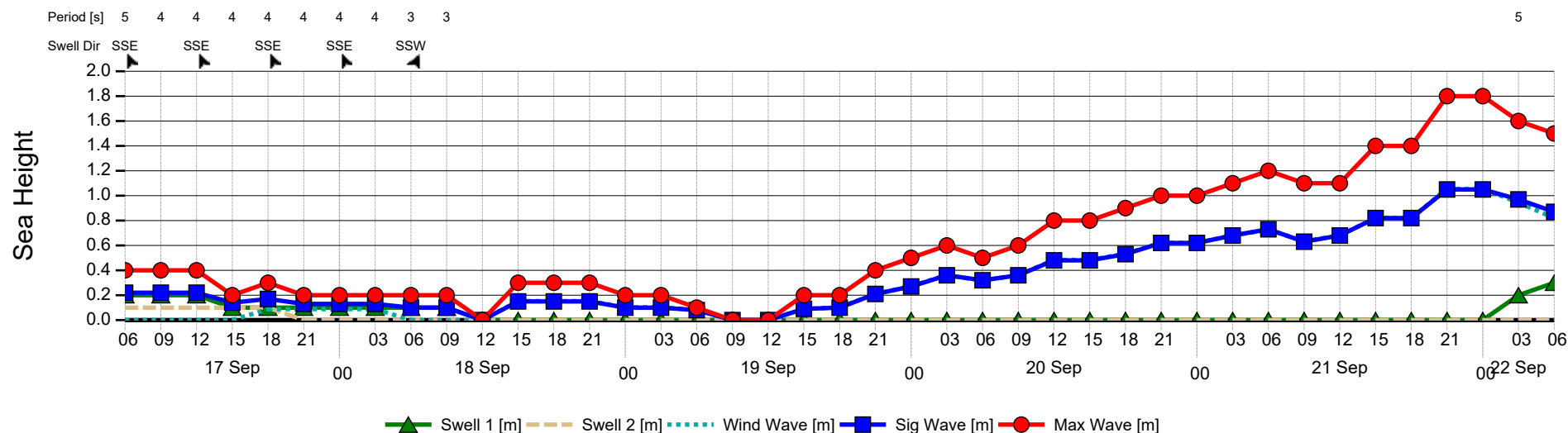
Forecaster: Jack Wade

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



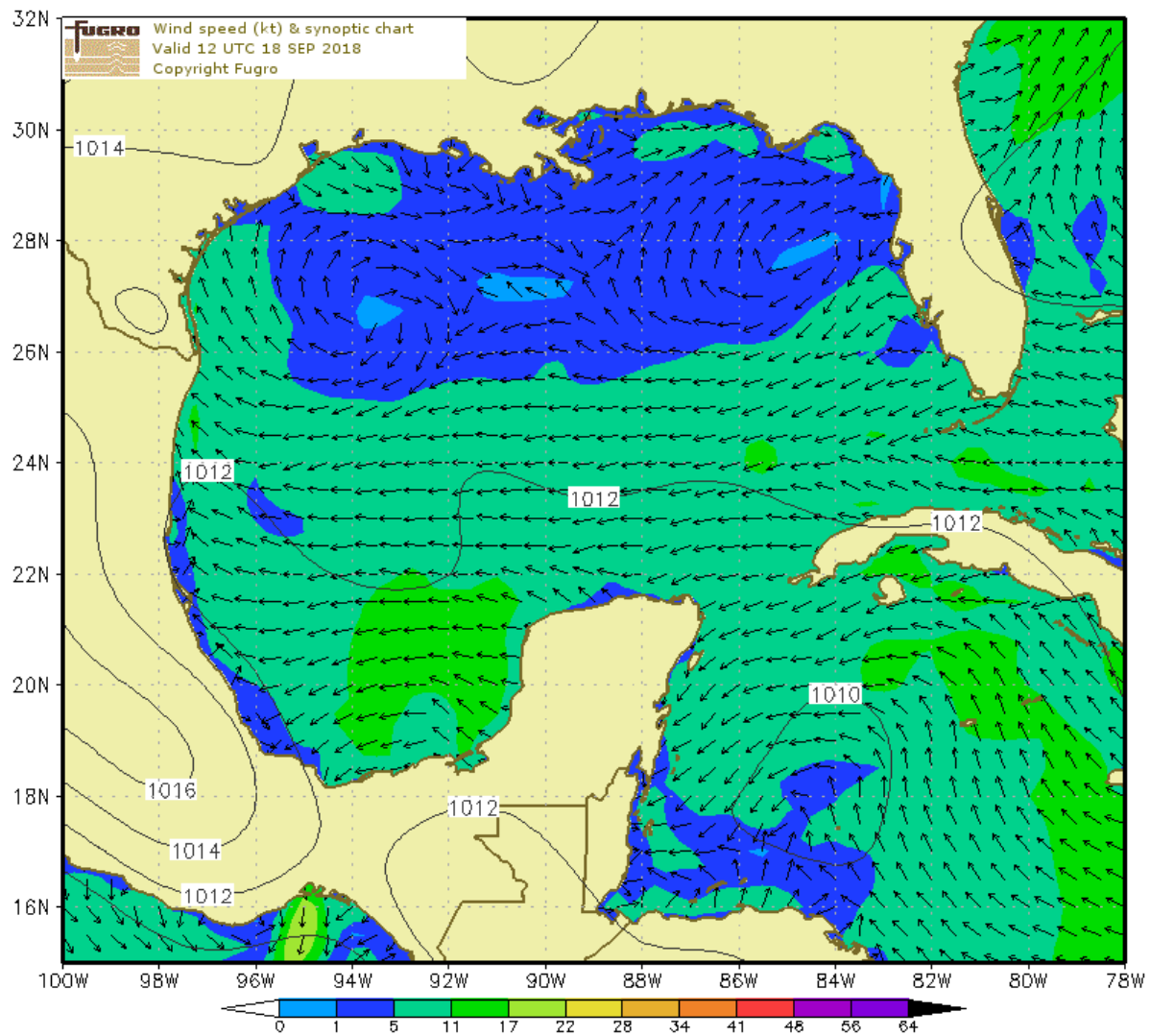
Wave Chart



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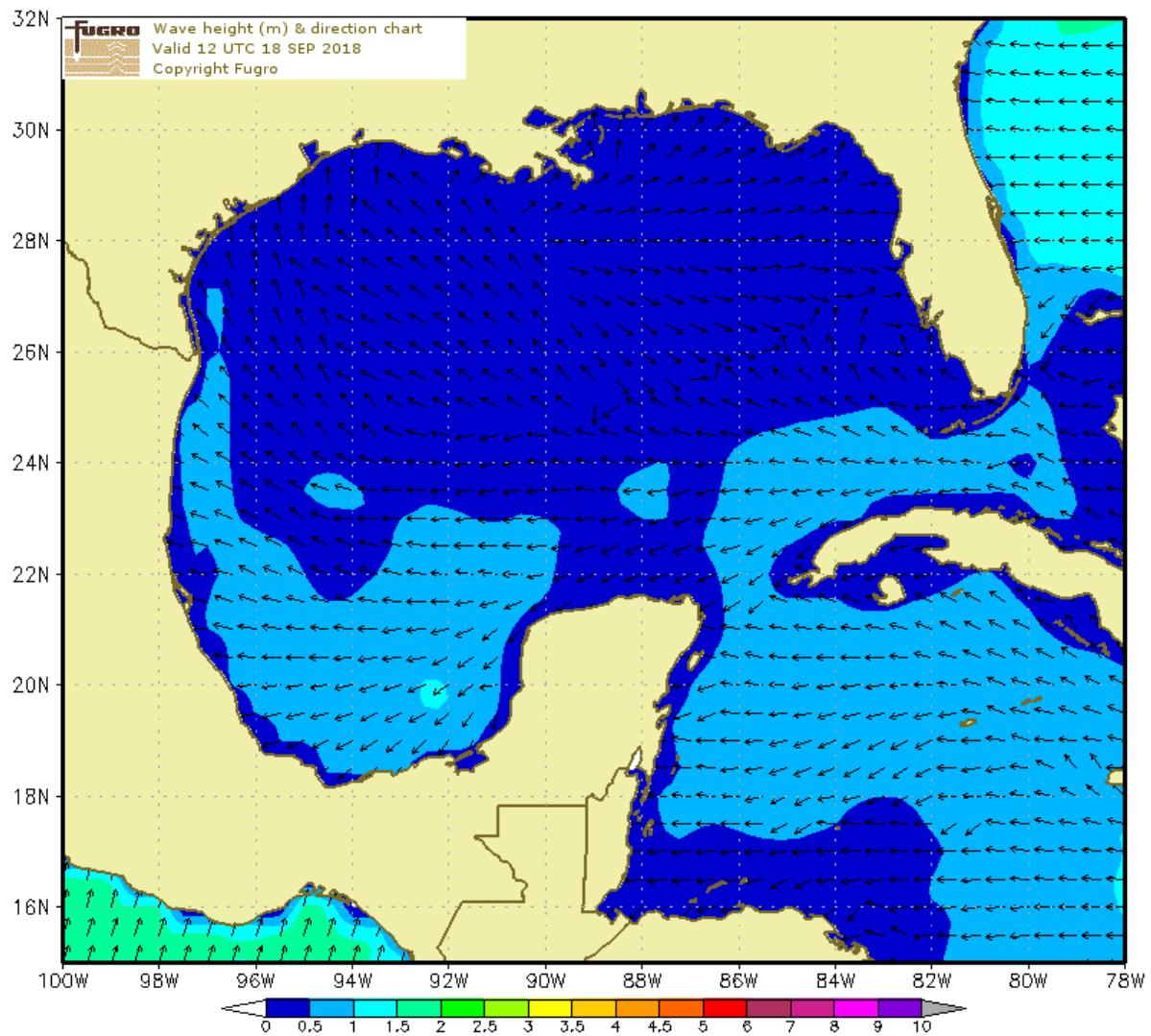
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 18 Sep 2018

Tropical NIL.

Advisory:

Met Situation: A weak ridge gradually builds SSW over the N GoM over the next few days and becomes orientated WSW (Next 48 hours) on Thursday as the parent high moves E. At the same time, weak showery troughs drift WNW over the central GoM.

WARNINGS: THUNDERSTORMS.

(Next 24 hours)

Weather: A low risk of thundery showers during the late mornings/early afternoons. Otherwise fair.

(Next 48 hours)

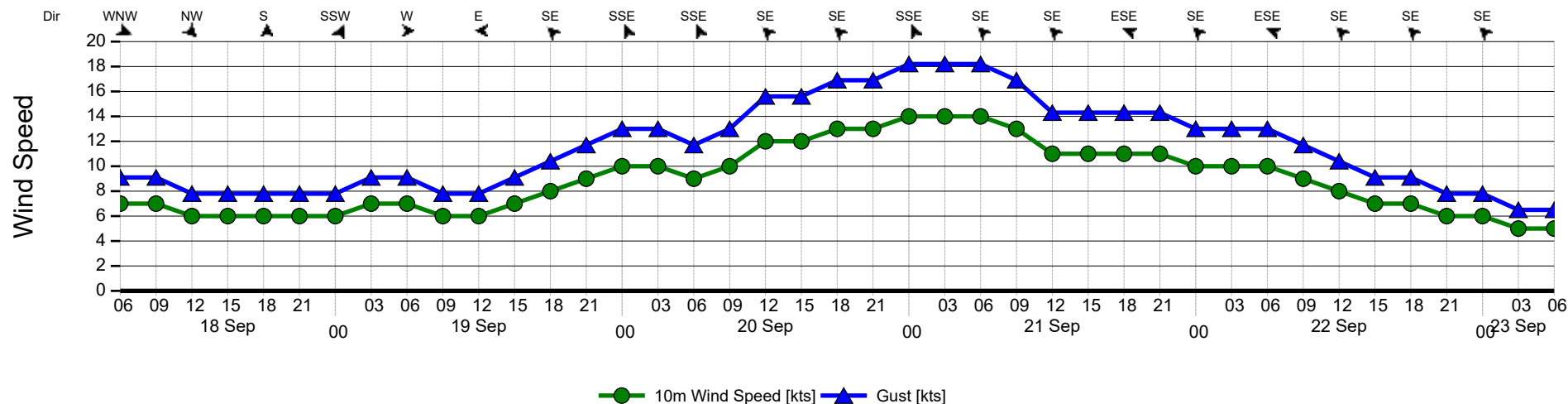
Confidence: Fairly high for trend, falling moderate for detail by mid-period. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
18/0600	WNW	7	9	0.0	SSW	0.1	3	-	0.0	-	0.1	0.2
18/0900	NW	7	9	0.0	SSW	0.1	4	-	0.0	-	0.1	0.2
18/1200	NW	6	8	0.0	SSW	0.1	4	-	0.0	-	0.1	0.2
18/1500	SE	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
18/1800	S	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
18/2100	S	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/0000	SSW	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/0300	SW	7	9	0.2	-	0.0	-	-	0.0	-	0.2	0.3
19/0600	W	7	9	0.0	-	0.0	-	-	0.0	-	0.0	0.0
19/0900	WNW	6	8	0.0	-	0.0	-	-	0.0	-	0.0	0.0
19/1200	E	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/1500	SE	7	9	0.2	-	0.0	-	-	0.0	-	0.2	0.3
19/1800	SE	8	10	0.2	-	0.0	-	-	0.0	-	0.2	0.3
19/2100	SE	9	12	0.2	-	0.0	-	-	0.0	-	0.2	0.4
20/0000	SSE	10	13	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0300	SSE	10	13	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0600	SSE	9	12	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0900	SE	10	13	0.4	-	0.0	-	-	0.0	-	0.4	0.6
20/1200	SE	12	16	0.3	-	0.0	-	-	0.0	-	0.3	0.6
20/1500	SE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
20/1800	SE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
20/2100	SE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
21/0000	SSE	14	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/0300	SSE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.2
21/0600	SE	14	18	0.8	-	0.0	-	-	0.0	-	0.8	1.3
21/0900	SE	13	17	0.8	-	0.0	-	-	0.0	-	0.8	1.4
21/1200	SE	11	14	0.7	SE	0.3	5	-	0.0	-	0.8	1.3
21/1500	ESE	11	14	0.6	SE	0.3	5	-	0.0	-	0.7	1.2
21/1800	ESE	11	14	0.6	SE	0.2	5	-	0.0	-	0.7	1.1
21/2100	ESE	11	14	0.6	SE	0.2	5	-	0.0	-	0.7	1.1
22/0000	SE	10	13	0.5	SE	0.2	5	-	0.0	-	0.6	1.0
22/0300	SE	10	13	0.5	SE	0.2	5	-	0.0	-	0.6	1.0
22/0600	ESE	10	13	0.5	SE	0.3	5	-	0.0	-	0.5	0.9
22/0900	SE	9	12	0.4	SE	0.3	5	-	0.0	-	0.5	0.9
22/1200	SE	8	10	0.3	SE	0.4	5	-	0.0	-	0.5	0.9
22/1500	SE	7	9	0.3	SE	0.4	5	-	0.0	-	0.5	0.8
22/1800	SE	7	9	0.3	SE	0.4	5	-	0.0	-	0.5	0.8
22/2100	SE	6	8	0.3	SE	0.4	5	-	0.0	-	0.5	0.8
23/0000	SE	6	8	0.3	SE	0.4	5	-	0.0	-	0.5	0.8
23/0300	SE	5	7	0.2	SE	0.4	5	-	0.0	-	0.4	0.7
23/0600	SE	5	7	0.2	SE	0.4	6	-	0.0	-	0.4	0.7

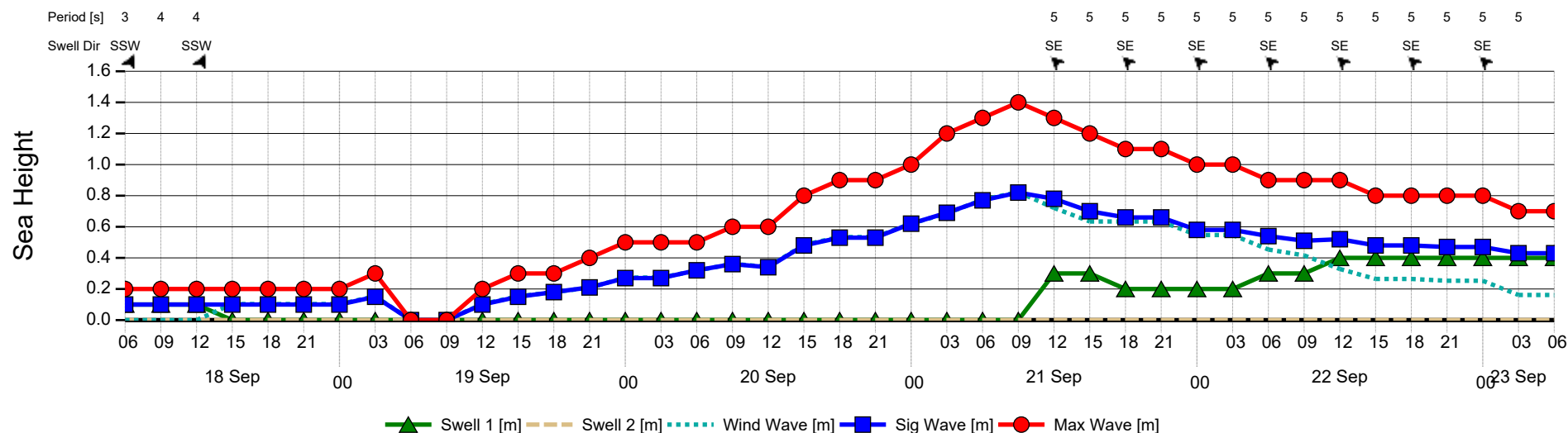
Forecaster: Jack Wade

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



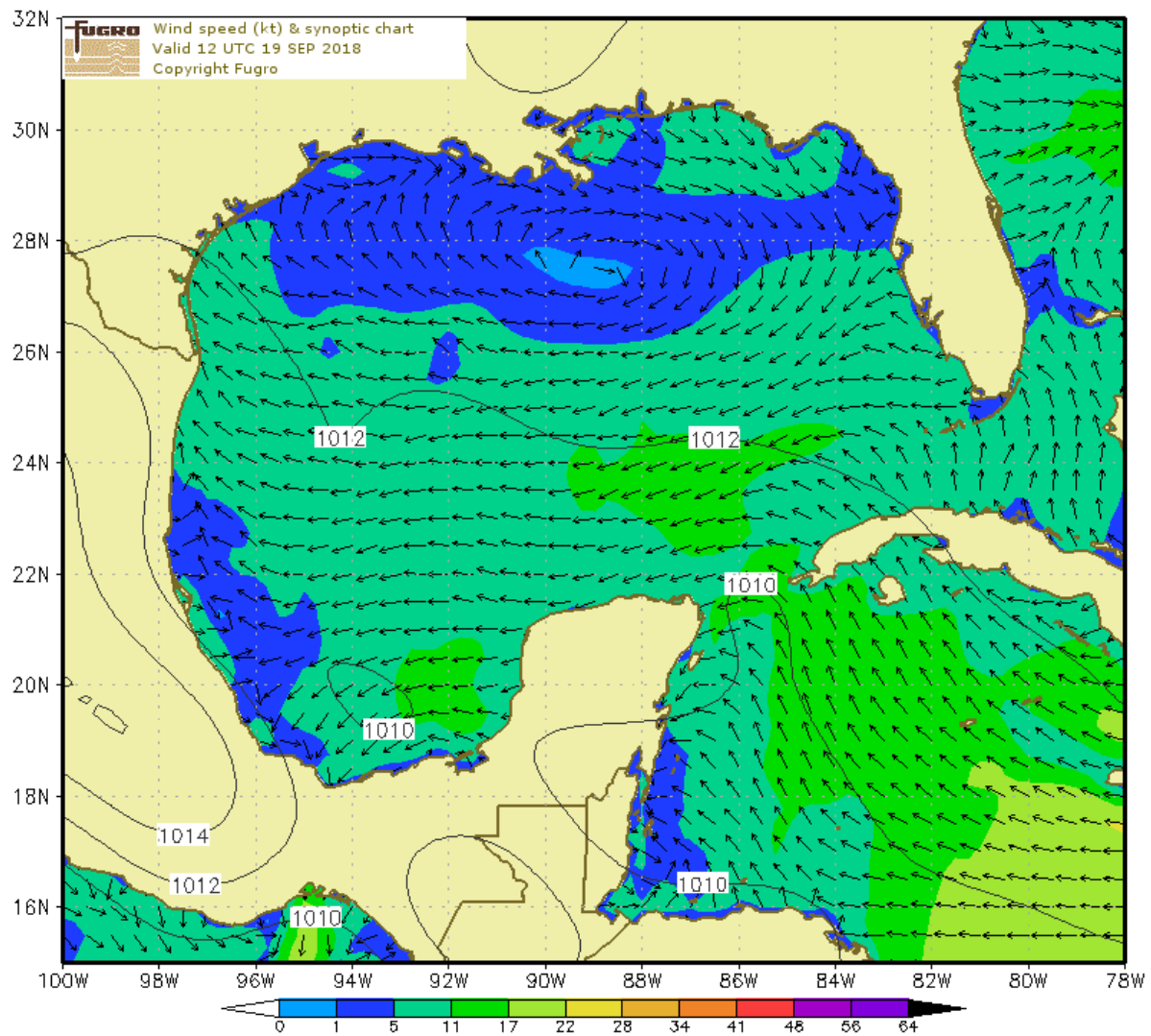
Wave Chart



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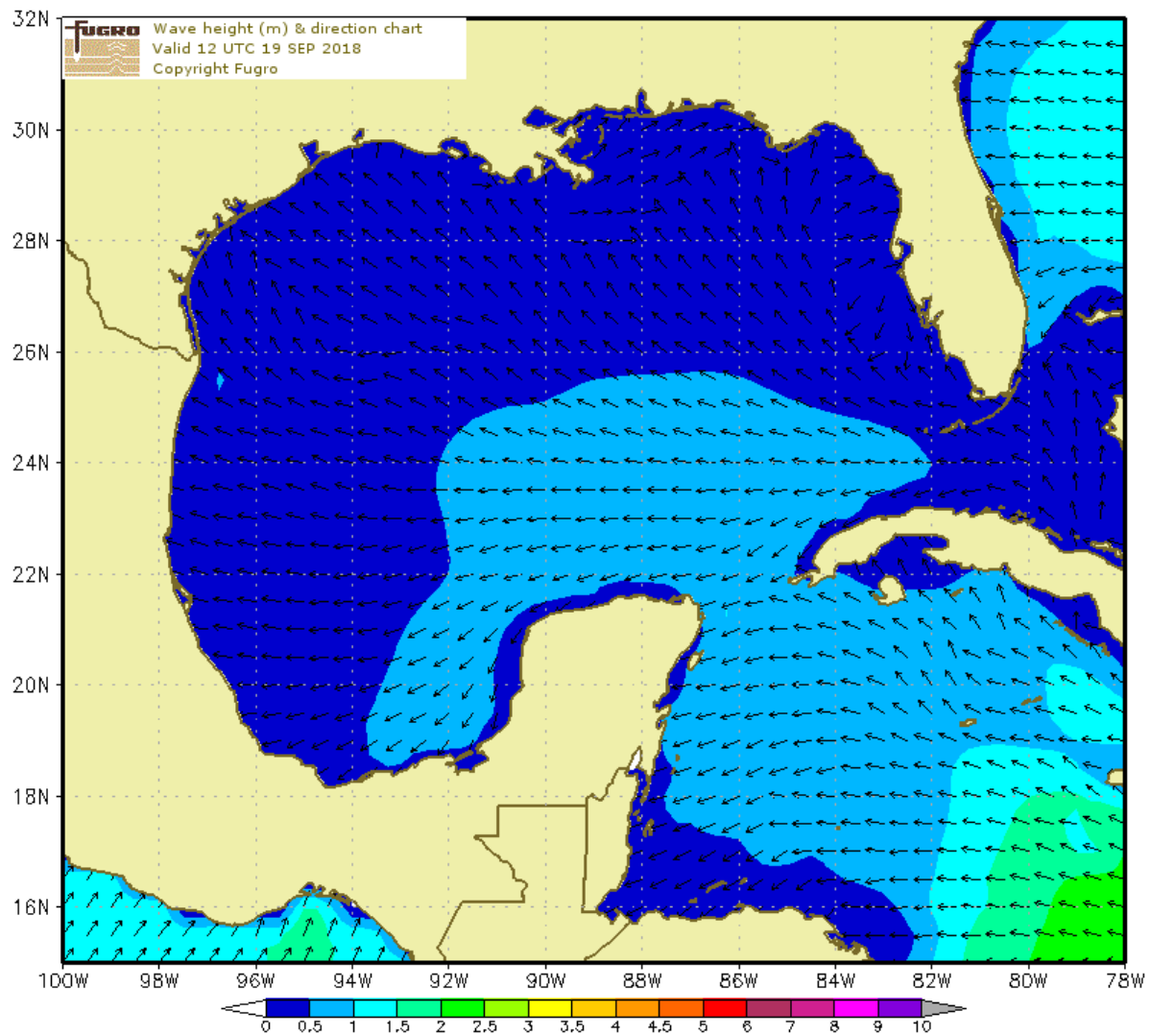
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Email : forecast@fugro.com



To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 19 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak ridge gradually builds SW over the N GoM over the next few days, becoming orientated WSW from tomorrow as the parent high moves E. At the same time weak showery troughs drift WNW over the central GoM. By Friday morning the ridge decays ENE a little, allowing a few showery troughs to track NNW into the N GoM.

WARNINGS: THUNDERSTORMS.
(Next 24 hours)

Weather: Generally fair today. Low risk of a few showers/thunderstorms at times tomorrow, before this risk increases by Friday morning.
(Next 48 hours)

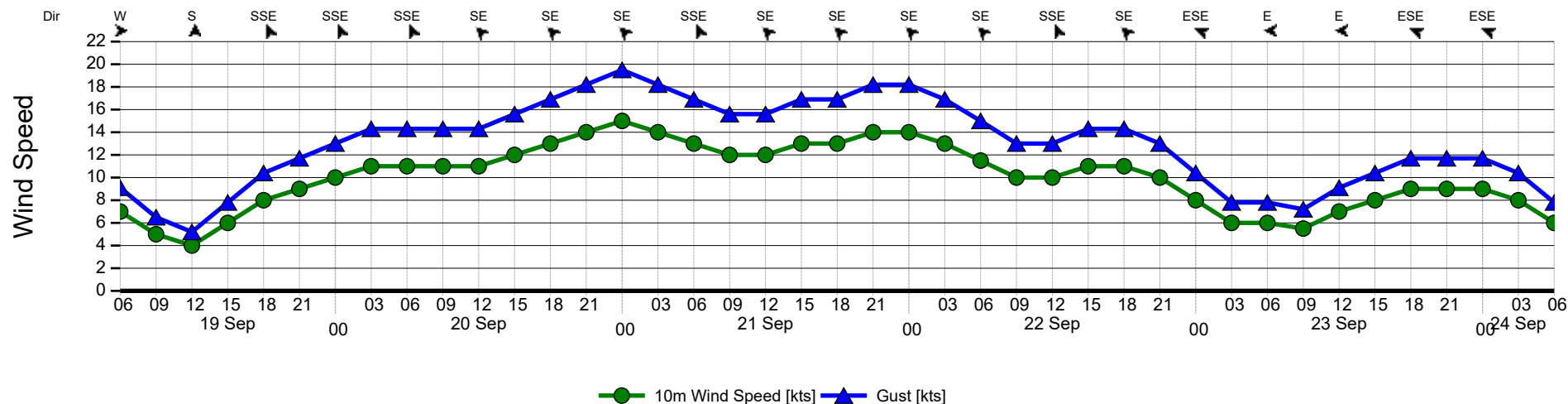
Confidence: Fairly high for trend, falling moderate for detail by tomorrow night as the ridge decays and showery troughs move near to your site. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
19/0600	W	7	9	0.1	SSE	0.1	5	-	0.0	-	0.1	0.2
19/0900	W	5	7	0.1	SSE	0.1	5	-	0.0	-	0.1	0.2
19/1200	S	4	5	0.1	SSE	0.1	5	-	0.0	-	0.1	0.2
19/1500	SE	6	8	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/1800	SSE	8	10	0.1	-	0.0	-	-	0.0	-	0.1	0.2
19/2100	SSE	9	12	0.1	-	0.0	-	-	0.0	-	0.1	0.2
20/0000	SSE	10	13	0.2	-	0.0	-	-	0.0	-	0.2	0.3
20/0300	SSE	11	14	0.2	-	0.0	-	-	0.0	-	0.2	0.4
20/0600	SSE	11	14	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/0900	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.6
20/1200	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.6
20/1500	SE	12	16	0.4	-	0.0	-	-	0.0	-	0.4	0.7
20/1800	SE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.8
20/2100	SE	14	18	0.5	-	0.0	-	-	0.0	-	0.6	0.9
21/0000	SE	15	20	0.6	-	0.0	-	-	0.0	-	0.6	1.1
21/0300	SSE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.2
21/0600	SSE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/0900	SE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/1200	SE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/1500	SE	13	17	0.6	-	0.0	-	-	0.0	-	0.6	1.1
21/1800	SE	13	17	0.6	-	0.0	-	-	0.0	-	0.6	1.1
21/2100	SE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.1
22/0000	SE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.1
22/0300	SE	13	17	0.6	SSE	0.1	5	-	0.0	-	0.6	1.1
22/0600	SE	12	15	0.6	SSE	0.3	5	-	0.0	-	0.6	1.0
22/0900	SSE	10	13	0.5	SSE	0.4	5	-	0.0	-	0.6	1.0
22/1200	SSE	10	13	0.4	SSE	0.5	5	-	0.0	-	0.6	1.0
22/1500	SSE	11	14	0.3	SSE	0.5	5	-	0.0	-	0.6	1.0
22/1800	SE	11	14	0.3	SSE	0.5	5	-	0.0	-	0.6	1.0
22/2100	SE	10	13	0.3	SSE	0.5	5	-	0.0	-	0.5	0.9
23/0000	ESE	8	10	0.3	SSE	0.4	5	-	0.0	-	0.5	0.8
23/0300	ESE	6	8	0.2	SSE	0.4	6	-	0.0	-	0.5	0.8
23/0600	E	6	8	0.2	SSE	0.4	6	-	0.0	-	0.4	0.7
23/0900	E	6	7	0.1	SSE	0.4	6	-	0.0	-	0.4	0.7
23/1200	E	7	9	0.2	SSE	0.4	5	-	0.0	-	0.4	0.7
23/1500	ESE	8	10	0.2	SSE	0.4	5	SE	0.1	6	0.4	0.7
23/1800	ESE	9	12	0.2	SSE	0.3	5	SE	0.2	6	0.4	0.7
23/2100	ESE	9	12	0.2	SSE	0.3	5	SE	0.2	6	0.4	0.7
24/0000	ESE	9	12	0.2	SE	0.4	5	SSE	0.1	6	0.5	0.8
24/0300	SE	8	10	0.2	SE	0.4	5	SSE	0.1	6	0.5	0.8
24/0600	SE	6	8	0.1	SE	0.5	5	-	0.0	-	0.5	0.8

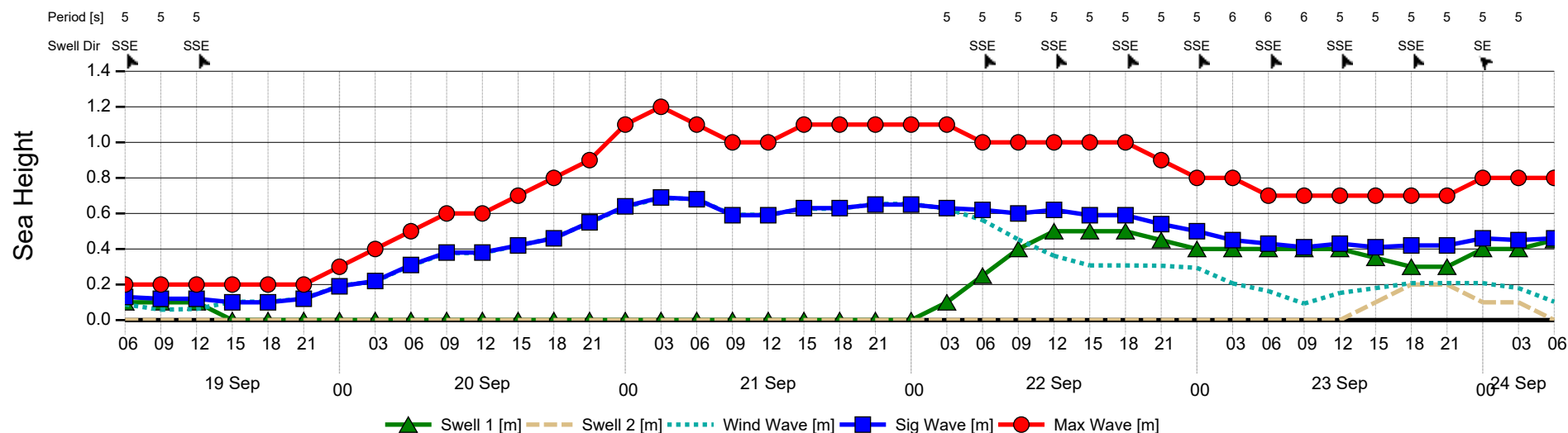
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



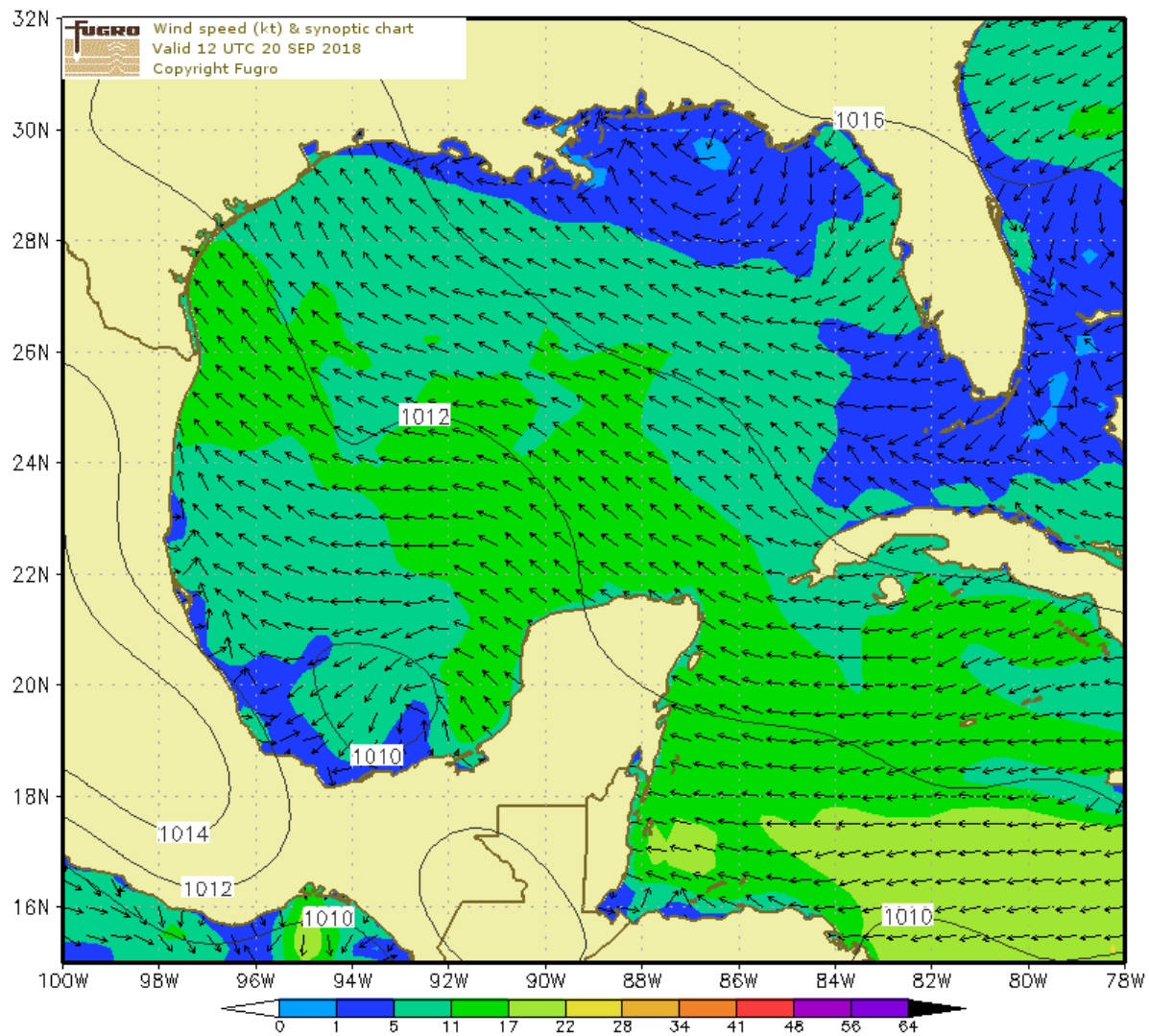
Wave Chart



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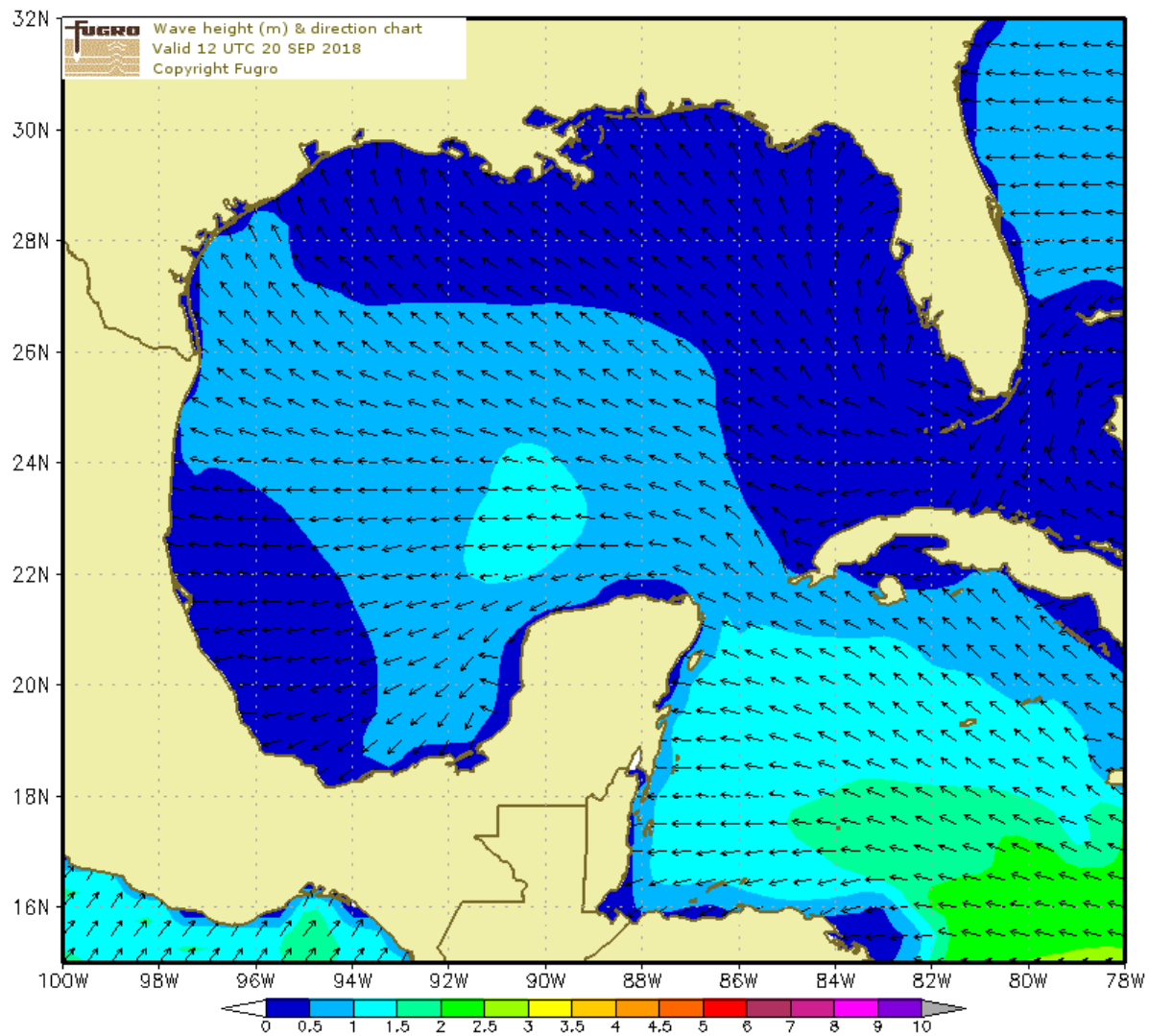
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 20 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak ridge lies SW over the N GoM during today, becoming orientated WSW from tomorrow morning as the parent high moves E. At the same time weak showery troughs drift WNW over the central GoM. By tomorrow afternoon/evening the ridge decays slightly ENE, allowing showery troughs to track NNW into the N GoM.
(Next 48 hours)

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Largely fair today. Risk of showers/thunderstorms from this evening. These ease for a time overnight, before risk of further showers/thunderstorms from tomorrow morning.
(Next 48 hours)

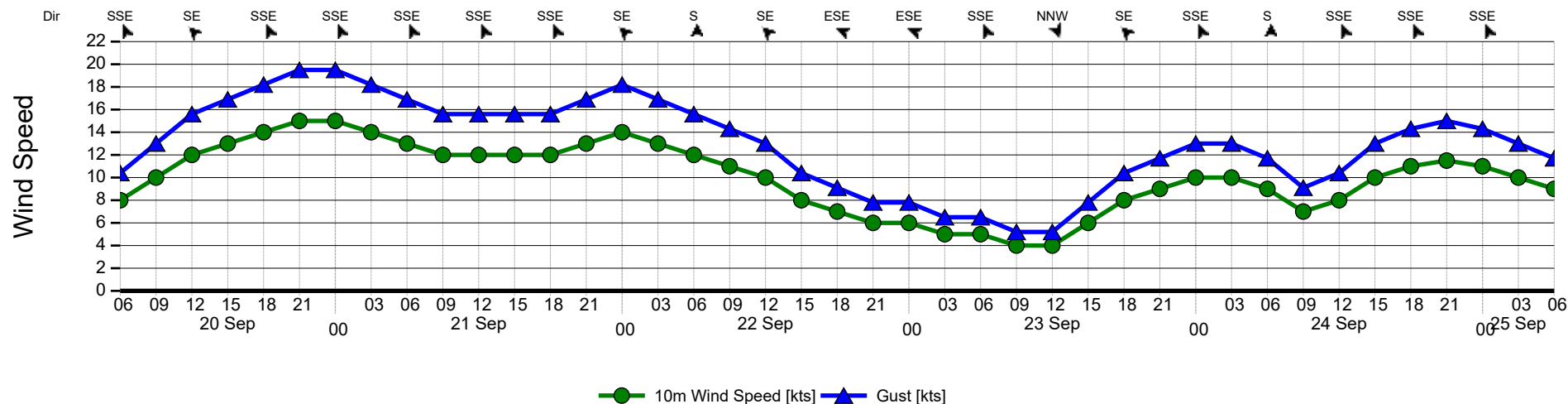
Confidence: Fairly high for trend, falling moderate for detail by tonight as the ridge decays and showery troughs move near to your site. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
20/0600	SSE	8	10	0.3	-	0.0	-	-	0.0	-	0.3	0.4
20/0900	SE	10	13	0.3	-	0.0	-	-	0.0	-	0.3	0.5
20/1200	SE	12	16	0.3	-	0.0	-	-	0.0	-	0.3	0.6
20/1500	SE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.8
20/1800	SSE	14	18	0.5	-	0.0	-	-	0.0	-	0.6	0.9
20/2100	SSE	15	20	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/0000	SSE	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/0300	SSE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.2
21/0600	SSE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/0900	SSE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/1200	SSE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
21/1500	SSE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/1800	SSE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.1
21/2100	SE	13	17	0.6	SSE	0.1	5	-	0.0	-	0.6	1.1
22/0000	SE	14	18	0.7	SSE	0.2	5	-	0.0	-	0.7	1.2
22/0300	SSE	13	17	0.6	SSE	0.3	5	-	0.0	-	0.7	1.2
22/0600	S	12	16	0.5	SSE	0.4	5	-	0.0	-	0.6	1.1
22/0900	SSW	11	14	0.4	SSE	0.5	5	-	0.0	-	0.6	1.1
22/1200	SE	10	13	0.3	SSE	0.5	5	-	0.0	-	0.6	1.0
22/1500	ESE	8	10	0.2	SSE	0.5	5	-	0.0	-	0.5	0.9
22/1800	ESE	7	9	0.2	SSE	0.5	5	-	0.0	-	0.5	0.9
22/2100	ESE	6	8	0.1	SSE	0.5	5	-	0.0	-	0.5	0.8
23/0000	ESE	6	8	0.2	SSE	0.4	5	-	0.0	-	0.4	0.7
23/0300	SE	5	7	0.1	SSE	0.4	5	-	0.0	-	0.4	0.6
23/0600	SSE	5	7	0.1	SSE	0.4	5	-	0.0	-	0.4	0.6
23/0900	SSE	4	5	0.1	SSE	0.3	5	-	0.0	-	0.3	0.5
23/1200	NNW	4	5	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
23/1500	SE	6	8	0.1	SSE	0.3	5	-	0.0	-	0.3	0.5
23/1800	SE	8	10	0.1	SSE	0.3	5	S	0.1	6	0.3	0.5
23/2100	SSE	9	12	0.2	SSE	0.2	5	S	0.1	6	0.3	0.5
24/0000	SSE	10	13	0.2	SSE	0.2	5	S	0.1	5	0.3	0.5
24/0300	S	10	13	0.2	SSE	0.2	5	S	0.1	5	0.3	0.5
24/0600	S	9	12	0.1	SSE	0.2	4	S	0.2	5	0.3	0.5
24/0900	S	7	9	0.1	SSE	0.2	4	S	0.2	5	0.3	0.5
24/1200	SSE	8	10	0.2	SSE	0.2	5	S	0.1	5	0.3	0.5
24/1500	SSE	10	13	0.3	SSE	0.1	5	-	0.0	-	0.3	0.5
24/1800	SSE	11	14	0.3	SSE	0.1	5	-	0.0	-	0.3	0.5
24/2100	SSE	12	15	0.3	SE	0.1	5	-	0.0	-	0.3	0.6
25/0000	SSE	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
25/0300	S	10	13	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
25/0600	S	9	12	0.3	SE	0.3	5	-	0.0	-	0.4	0.7

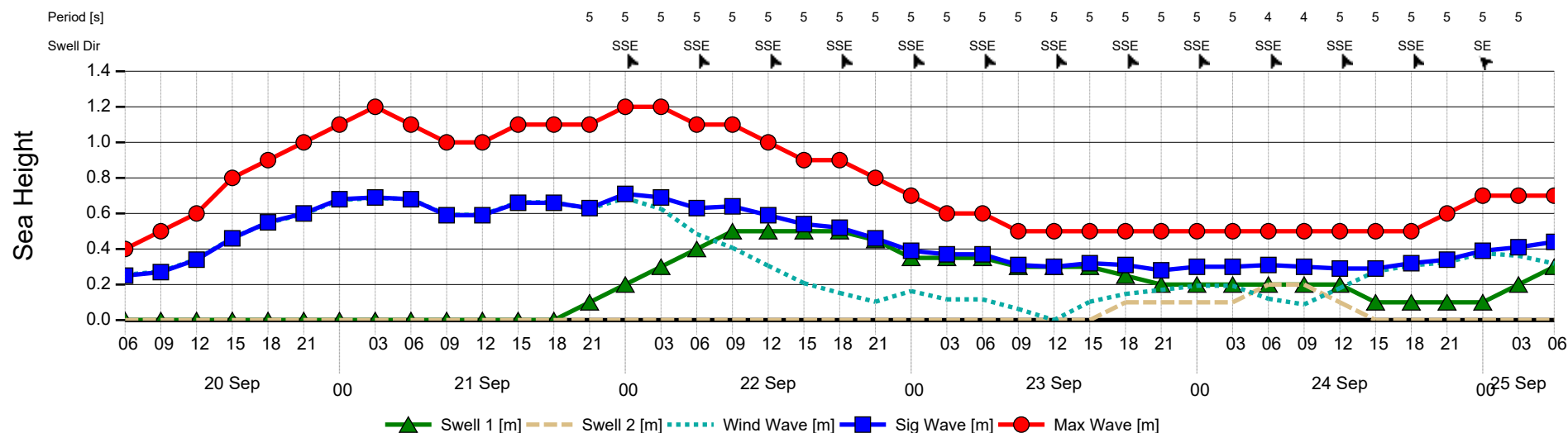
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



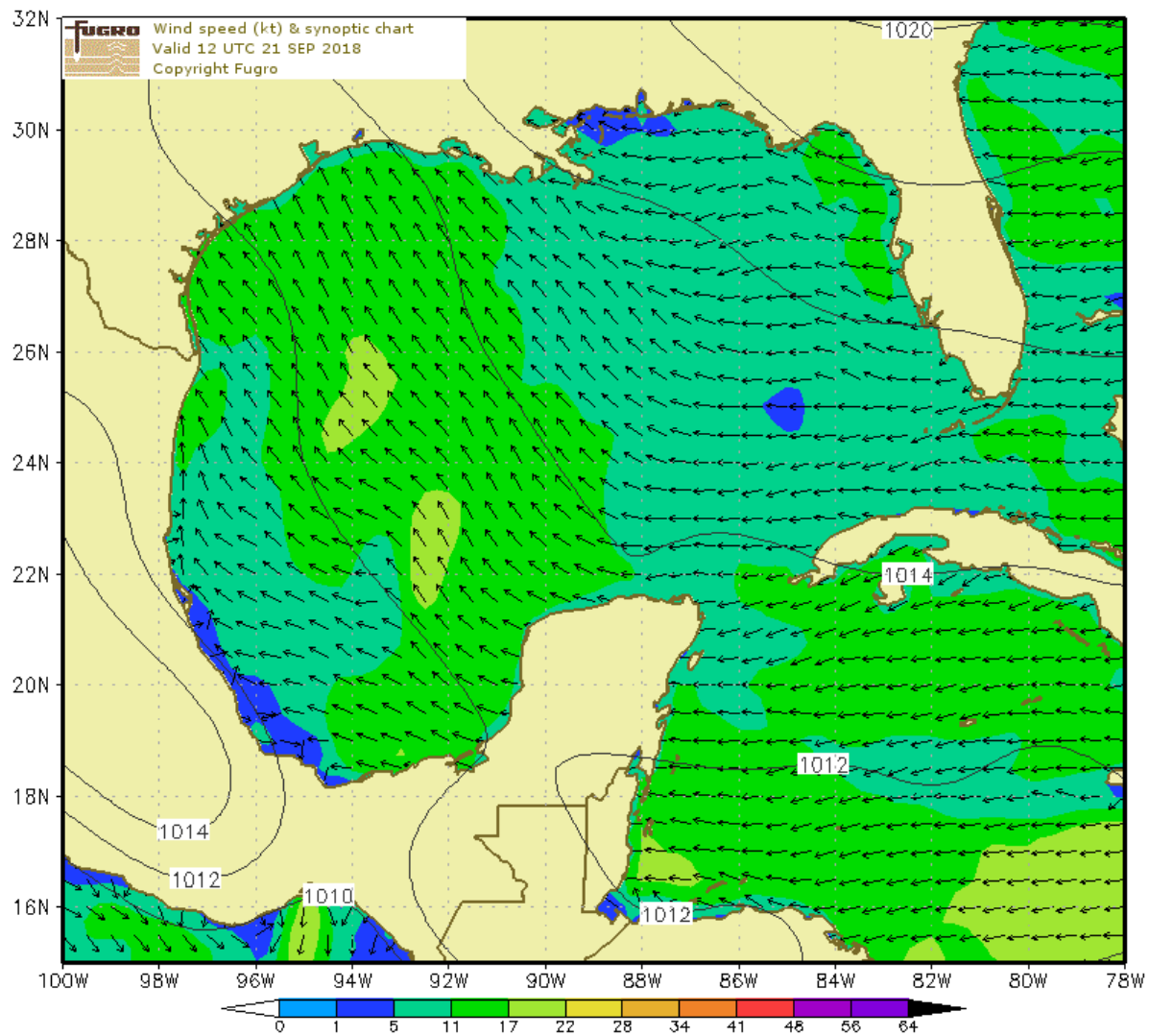
Wave Chart



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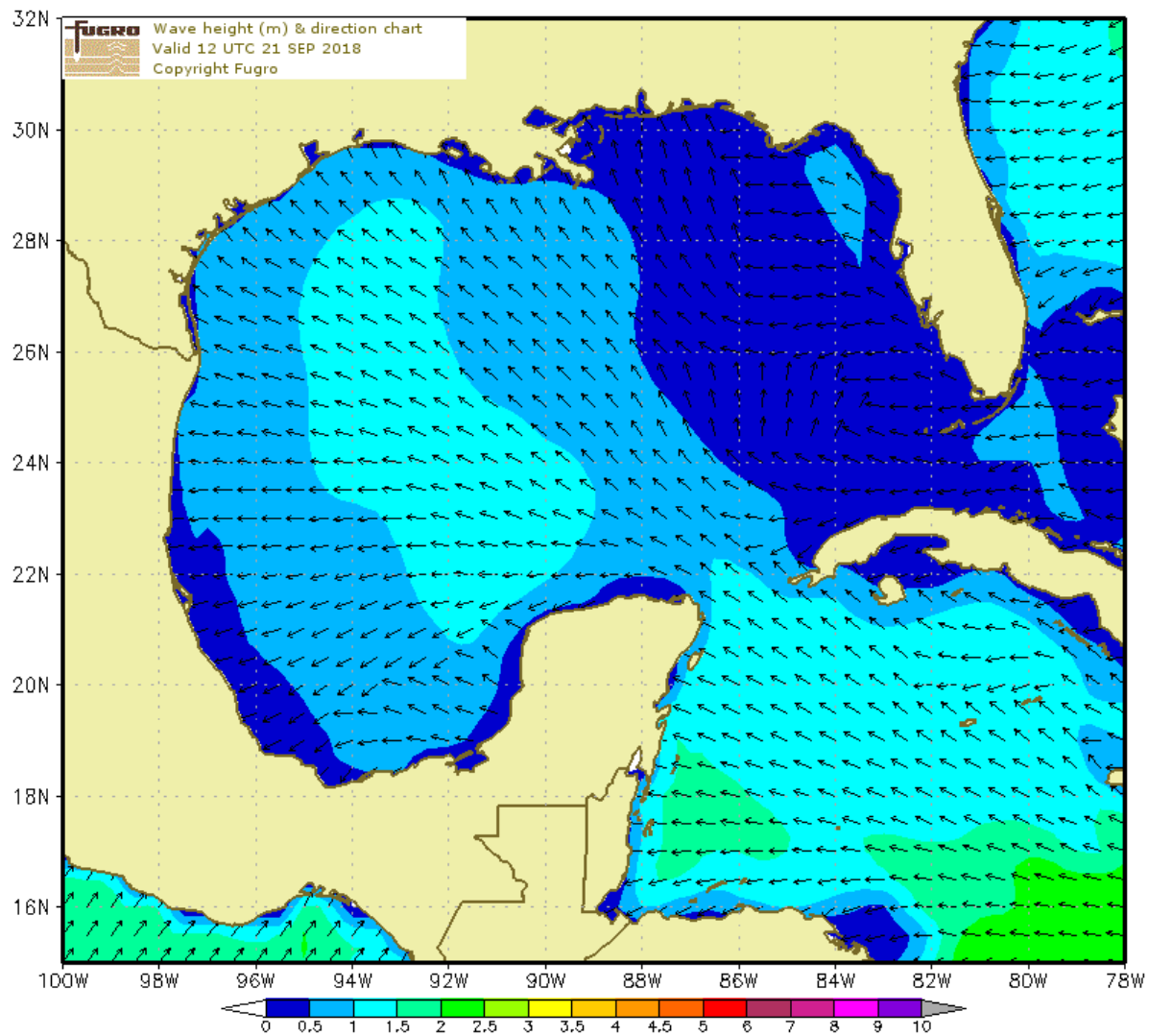
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 21 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak ridge extending WSW-W along the N GoM coast drifts N whilst a series of showery troughs move (Next 48 hours) WNW across the central GoM this morning. From the afternoon the ridge decays ENE slightly, allowing showery troughs to track N towards the N GoM.

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Risk of showers throughout, and these may be heavy and thundery at times.
(Next 48 hours)

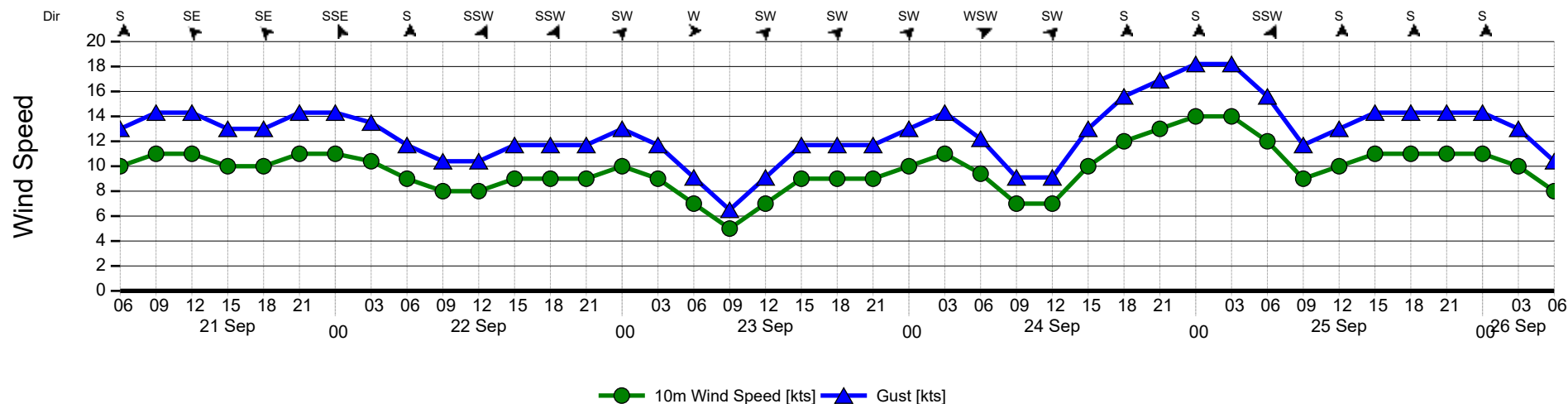
Confidence: Fairly high for trend, but only moderate for detail as showery troughs move across the N GoM. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
21/0600	S	10	13	0.3	SE	0.4	5	S	0.4	4	0.6	1.1
21/0900	SSE	11	14	0.4	SE	0.3	5	S	0.3	4	0.6	1.0
21/1200	SE	11	14	0.5	SE	0.3	5	S	0.2	4	0.6	1.0
21/1500	SE	10	13	0.5	SE	0.4	5	S	0.1	4	0.6	1.0
21/1800	SE	10	13	0.5	SE	0.4	5	-	0.0	-	0.6	1.0
21/2100	SE	11	14	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
22/0000	SSE	11	14	0.4	SE	0.3	5	-	0.0	-	0.5	0.9
22/0300	SSE	10	14	0.4	SSE	0.4	5	-	0.0	-	0.5	0.9
22/0600	S	9	12	0.3	SSE	0.4	5	-	0.0	-	0.5	0.9
22/0900	SSW	8	10	0.3	SSE	0.4	5	-	0.0	-	0.5	0.8
22/1200	SSW	8	10	0.2	SSE	0.4	5	-	0.0	-	0.5	0.8
22/1500	SSW	9	12	0.3	SSE	0.4	5	-	0.0	-	0.5	0.8
22/1800	SSW	9	12	0.2	SSE	0.4	5	-	0.0	-	0.5	0.8
22/2100	SSW	9	12	0.2	SSE	0.4	5	-	0.0	-	0.5	0.8
23/0000	SW	10	13	0.3	SSE	0.4	5	-	0.0	-	0.4	0.7
23/0300	WSW	9	12	0.1	SSE	0.4	5	S	0.1	4	0.4	0.6
23/0600	W	7	9	0.1	SE	0.3	5	S	0.2	4	0.4	0.6
23/0900	WSW	5	7	0.1	SE	0.3	5	S	0.2	4	0.4	0.6
23/1200	SW	7	9	0.2	SE	0.3	5	S	0.1	5	0.4	0.6
23/1500	SW	9	12	0.2	SE	0.3	5	S	0.1	6	0.4	0.6
23/1800	SW	9	12	0.2	SE	0.3	5	S	0.1	6	0.3	0.5
23/2100	SW	9	12	0.2	SSE	0.2	6	S	0.1	6	0.3	0.5
24/0000	SW	10	13	0.3	SSE	0.2	6	SE	0.1	5	0.4	0.6
24/0300	WSW	11	14	0.3	SSE	0.2	6	SE	0.1	5	0.4	0.6
24/0600	WSW	9	12	0.1	SSE	0.3	6	SE	0.2	5	0.4	0.6
24/0900	W	7	9	0.0	SSE	0.3	6	SE	0.2	5	0.4	0.6
24/1200	SW	7	9	0.2	SSE	0.3	6	SE	0.2	6	0.4	0.6
24/1500	S	10	13	0.3	SSE	0.2	6	SE	0.1	6	0.4	0.6
24/1800	S	12	16	0.3	SSE	0.2	6	-	0.0	-	0.4	0.7
24/2100	S	13	17	0.5	SE	0.2	5	-	0.0	-	0.5	0.8
25/0000	S	14	18	0.5	SE	0.2	5	-	0.0	-	0.6	1.0
25/0300	S	14	18	0.6	SE	0.2	5	-	0.0	-	0.7	1.1
25/0600	SSW	12	16	0.5	SE	0.3	4	-	0.0	-	0.6	1.0
25/0900	S	9	12	0.4	SE	0.3	4	-	0.0	-	0.5	0.8
25/1200	S	10	13	0.4	SE	0.2	4	-	0.0	-	0.4	0.7
25/1500	S	11	14	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
25/1800	S	11	14	0.4	SE	0.2	5	S	0.1	7	0.4	0.7
25/2100	S	11	14	0.4	SE	0.2	6	S	0.1	7	0.4	0.7
26/0000	S	11	14	0.4	SE	0.2	6	-	0.0	-	0.4	0.7
26/0300	SSW	10	13	0.4	SE	0.2	6	-	0.0	-	0.4	0.7
26/0600	SW	8	10	0.3	SE	0.3	6	S	0.1	7	0.4	0.7

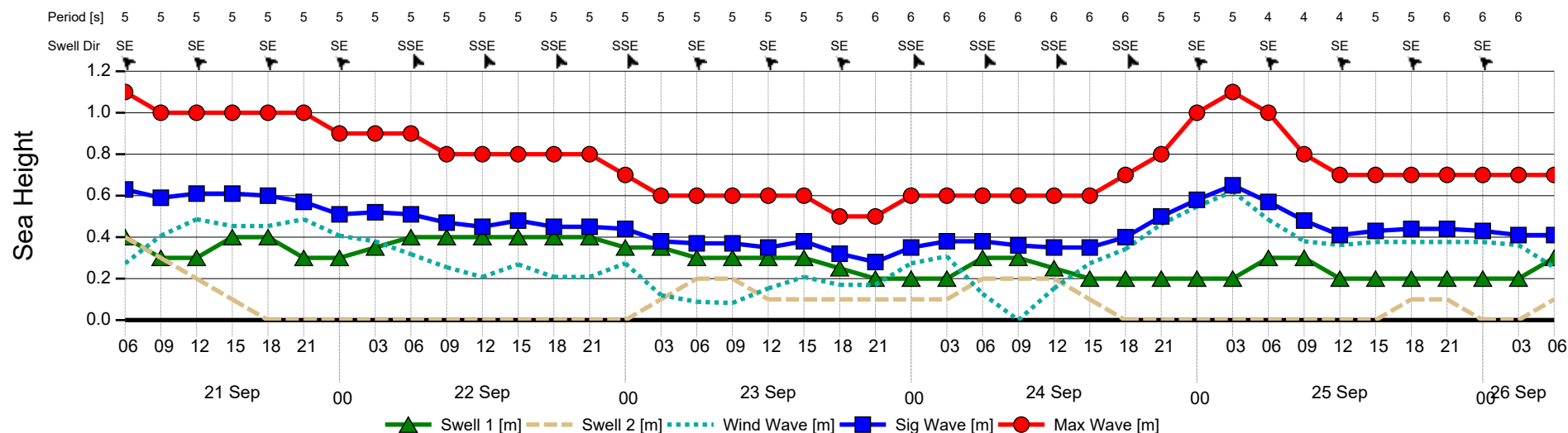
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



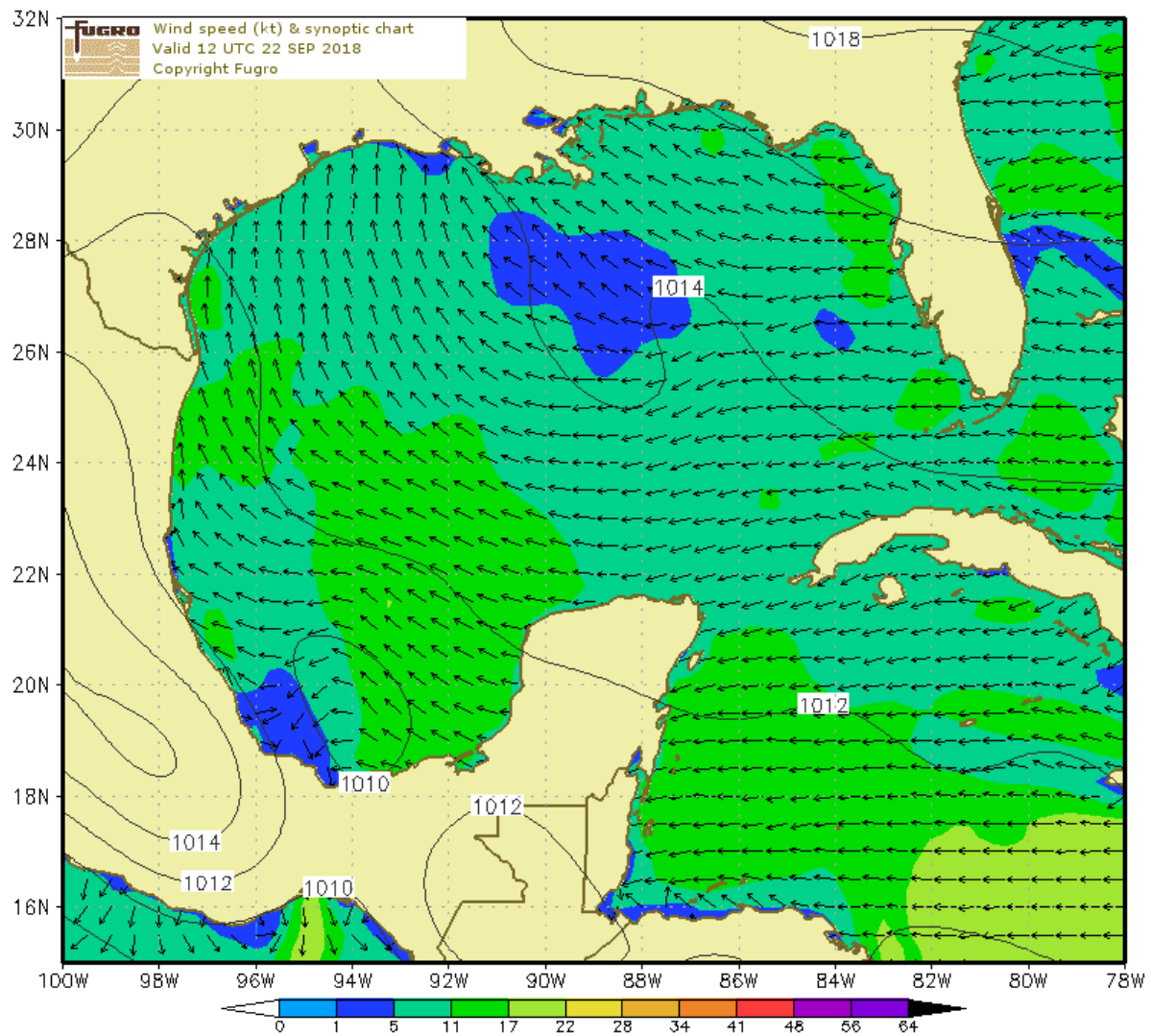
Wave Chart



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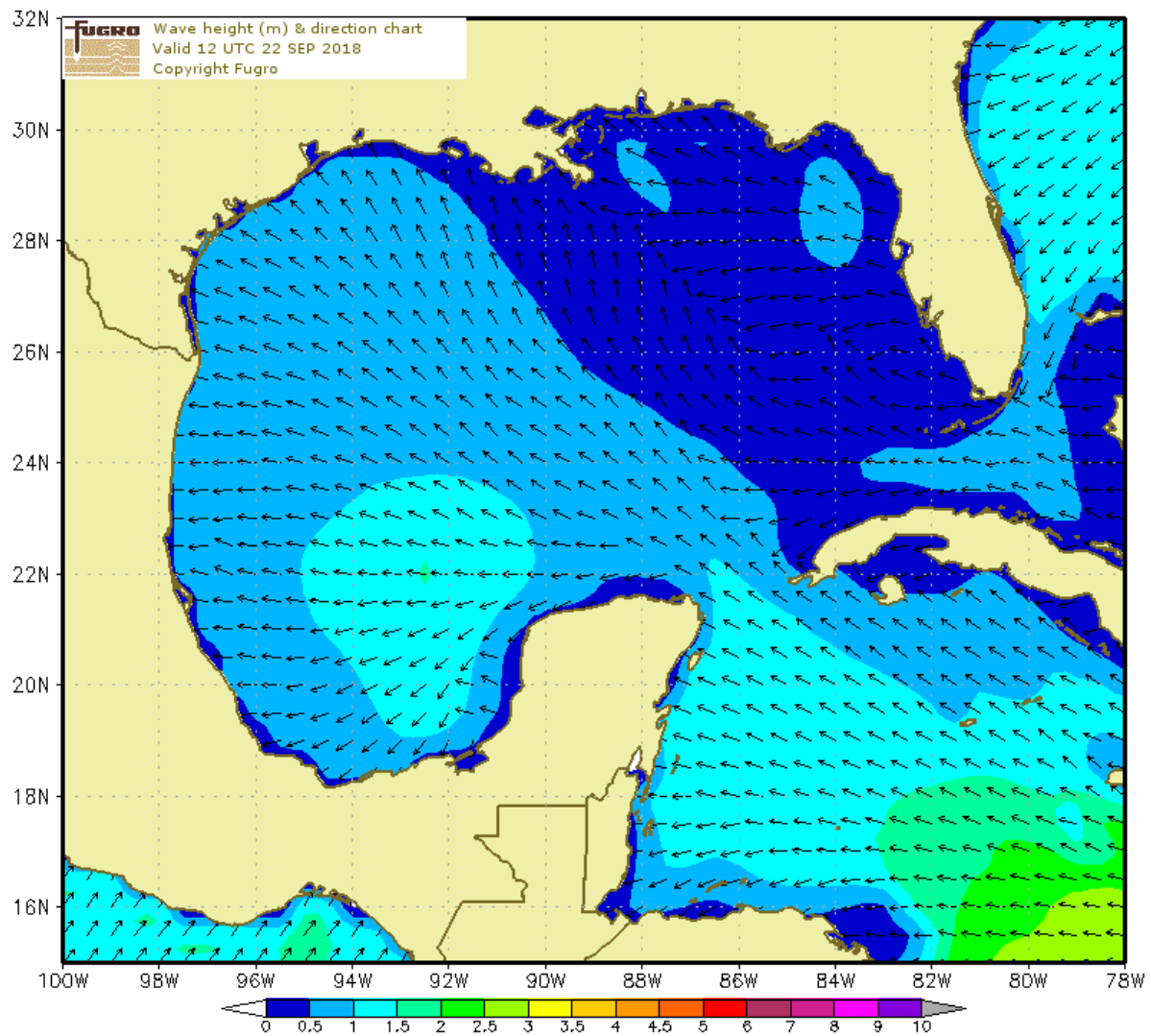
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 22 Sep 2018
Tropical Advisory: NIL.

Met Situation: A ridge extending SSW-SW across the SE USA gradually decays today whilst a series of fragmented showery troughs move across the GoM throughout. More organised showery trough over Texas moves E over the S States from this morning to lie over Mississippi by tomorrow afternoon. From Monday, the ridge rebuilds SW into the NE GoM.
(Next 48 hours)

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Risk of showers throughout, and these may be heavy and thundery at times.
(Next 48 hours)

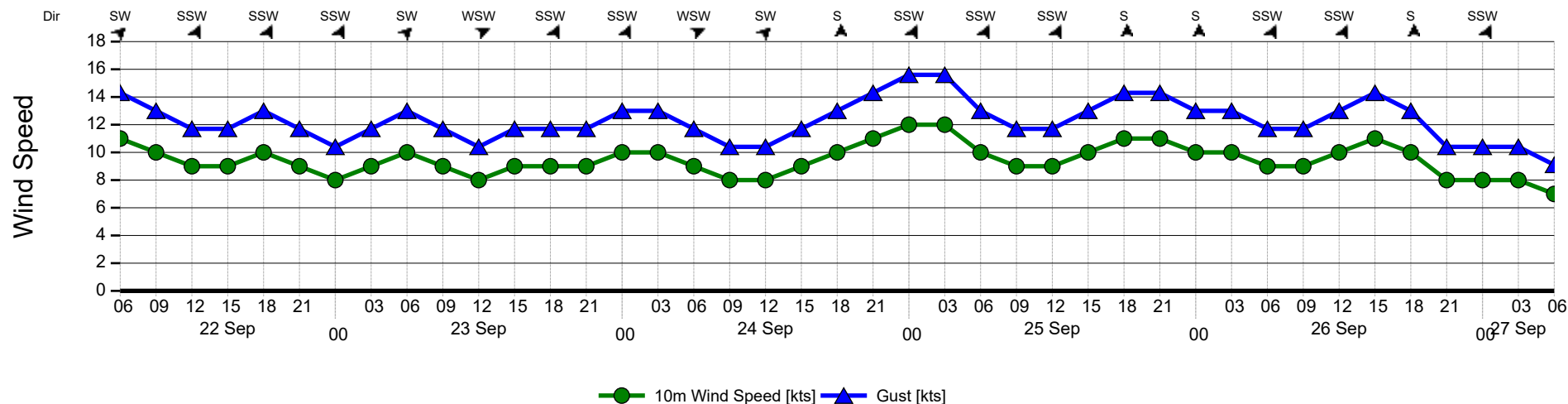
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as showery troughs move across your area. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
22/0600	SW	11	14	0.4	SSE	0.4	5	-	0.0	-	0.6	1.0
22/0900	SW	10	13	0.3	SSE	0.6	5	-	0.0	-	0.6	1.0
22/1200	SSW	9	12	0.3	SSE	0.5	5	-	0.0	-	0.6	1.0
22/1500	S	9	12	0.3	SSE	0.4	5	-	0.0	-	0.5	0.8
22/1800	SSW	10	13	0.2	SSE	0.4	5	-	0.0	-	0.4	0.7
22/2100	SSW	9	12	0.2	SSE	0.4	5	-	0.0	-	0.4	0.7
23/0000	SSW	8	10	0.2	SSE	0.4	5	-	0.0	-	0.4	0.7
23/0300	SW	9	12	0.2	SSE	0.4	5	S	0.1	4	0.4	0.7
23/0600	SW	10	13	0.3	SE	0.3	5	S	0.1	4	0.4	0.7
23/0900	WSW	9	12	0.1	SE	0.3	5	S	0.2	4	0.4	0.6
23/1200	WSW	8	10	0.2	SE	0.3	5	S	0.1	5	0.4	0.6
23/1500	SSW	9	12	0.2	SE	0.3	5	S	0.1	6	0.4	0.6
23/1800	SSW	9	12	0.2	SE	0.3	5	S	0.1	6	0.3	0.5
23/2100	SSW	9	12	0.2	SSE	0.2	6	S	0.1	6	0.3	0.5
24/0000	SSW	10	13	0.3	SSE	0.2	6	SE	0.1	5	0.4	0.6
24/0300	SW	10	13	0.4	SSE	0.2	6	SE	0.1	5	0.4	0.7
24/0600	WSW	9	12	0.2	SSE	0.3	6	SE	0.2	5	0.4	0.6
24/0900	WSW	8	10	0.2	SSE	0.3	6	SE	0.2	5	0.3	0.6
24/1200	SW	8	10	0.2	SSE	0.3	6	SE	0.2	6	0.3	0.6
24/1500	SSW	9	12	0.2	SSE	0.2	6	SE	0.1	6	0.3	0.5
24/1800	S	10	13	0.3	SSE	0.2	6	-	0.0	-	0.3	0.6
24/2100	S	11	14	0.3	SE	0.2	5	-	0.0	-	0.4	0.6
25/0000	SSW	12	16	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
25/0300	SSW	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
25/0600	SSW	10	13	0.5	-	0.0	-	-	0.0	-	0.5	0.8
25/0900	SSW	9	12	0.4	-	0.0	-	-	0.0	-	0.4	0.6
25/1200	SSW	9	12	0.4	SE	0.1	4	-	0.0	-	0.4	0.7
25/1500	S	10	13	0.4	SE	0.1	5	-	0.0	-	0.4	0.6
25/1800	S	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
25/2100	S	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
26/0000	S	10	13	0.4	SE	0.1	5	-	0.0	-	0.4	0.6
26/0300	SSW	10	13	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
26/0600	SSW	9	12	0.3	SE	0.3	5	-	0.0	-	0.4	0.7
26/0900	SSW	9	12	0.3	SE	0.3	5	-	0.0	-	0.4	0.7
26/1200	SSW	10	13	0.3	SE	0.2	5	-	0.0	-	0.3	0.6
26/1500	S	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.6
26/1800	S	10	13	0.4	-	0.0	-	-	0.0	-	0.4	0.7
26/2100	SSW	8	10	0.3	SE	0.1	5	-	0.0	-	0.3	0.6
27/0000	SSW	8	10	0.3	SE	0.1	5	-	0.0	-	0.3	0.5
27/0300	SSW	8	10	0.3	SE	0.2	5	-	0.0	-	0.3	0.5
27/0600	SSW	7	9	0.2	SE	0.3	5	-	0.0	-	0.3	0.6

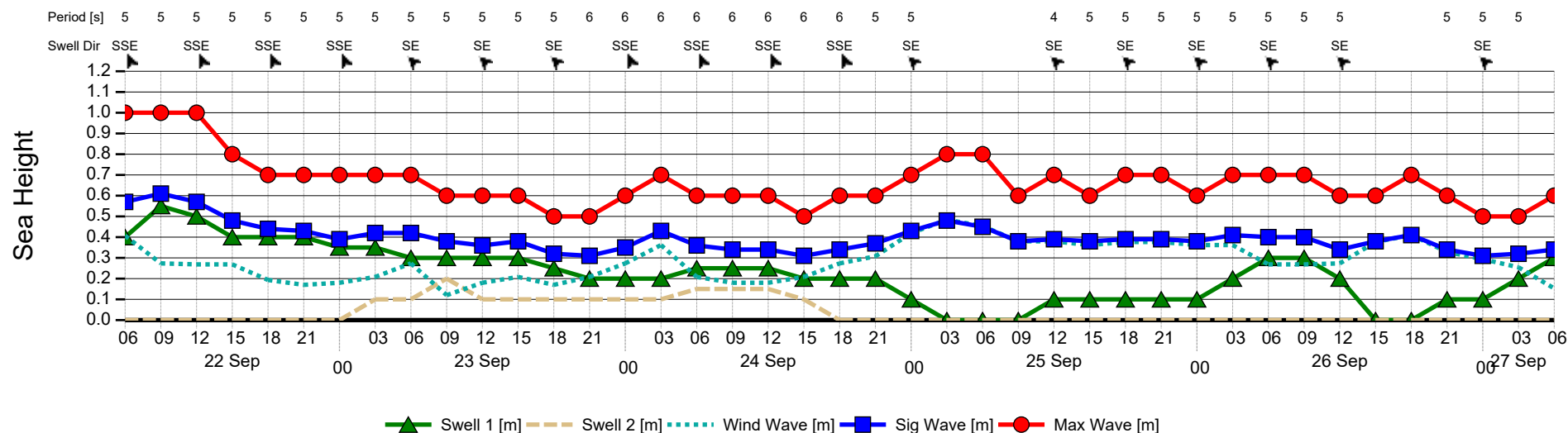
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



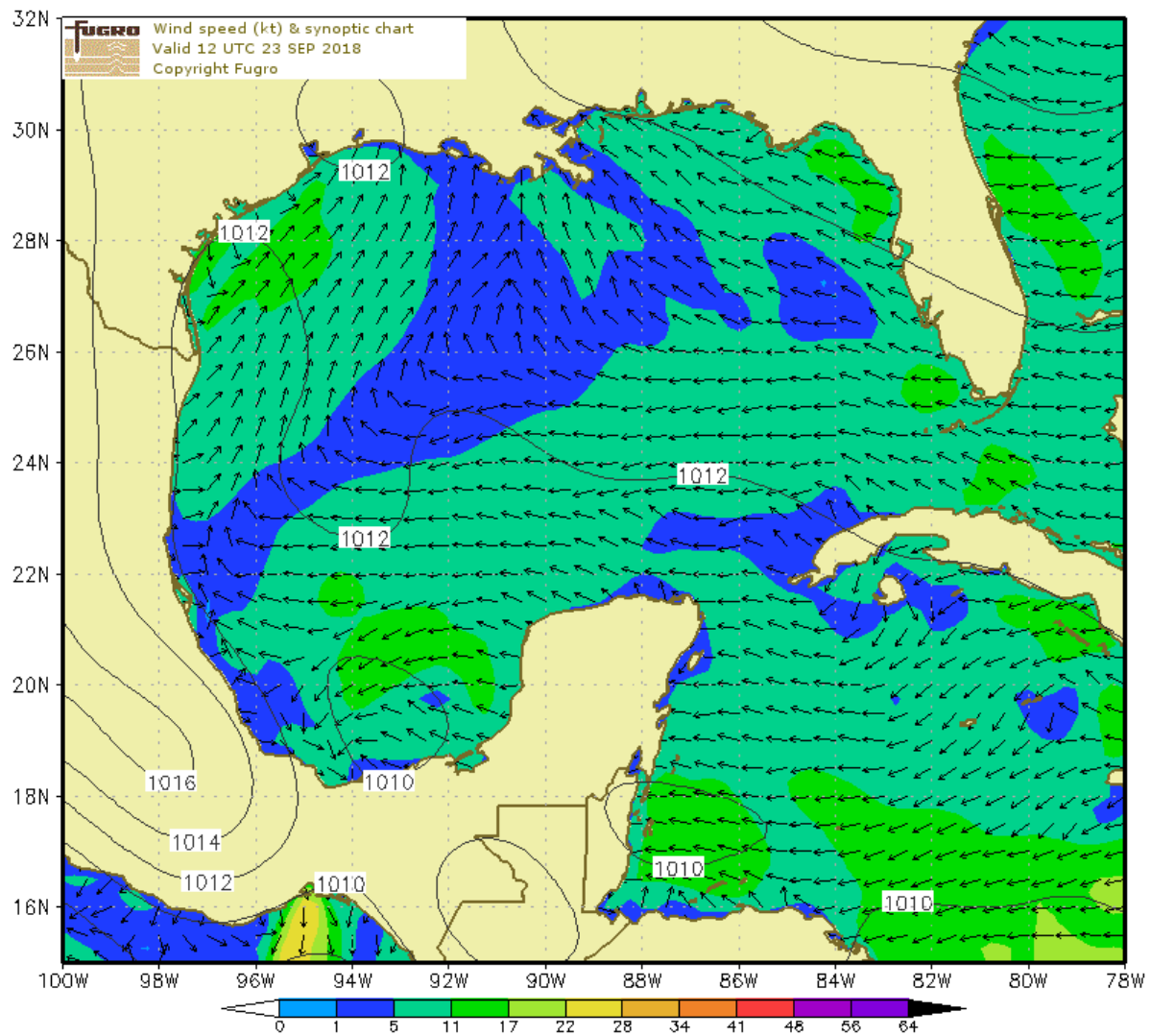
Wave Chart



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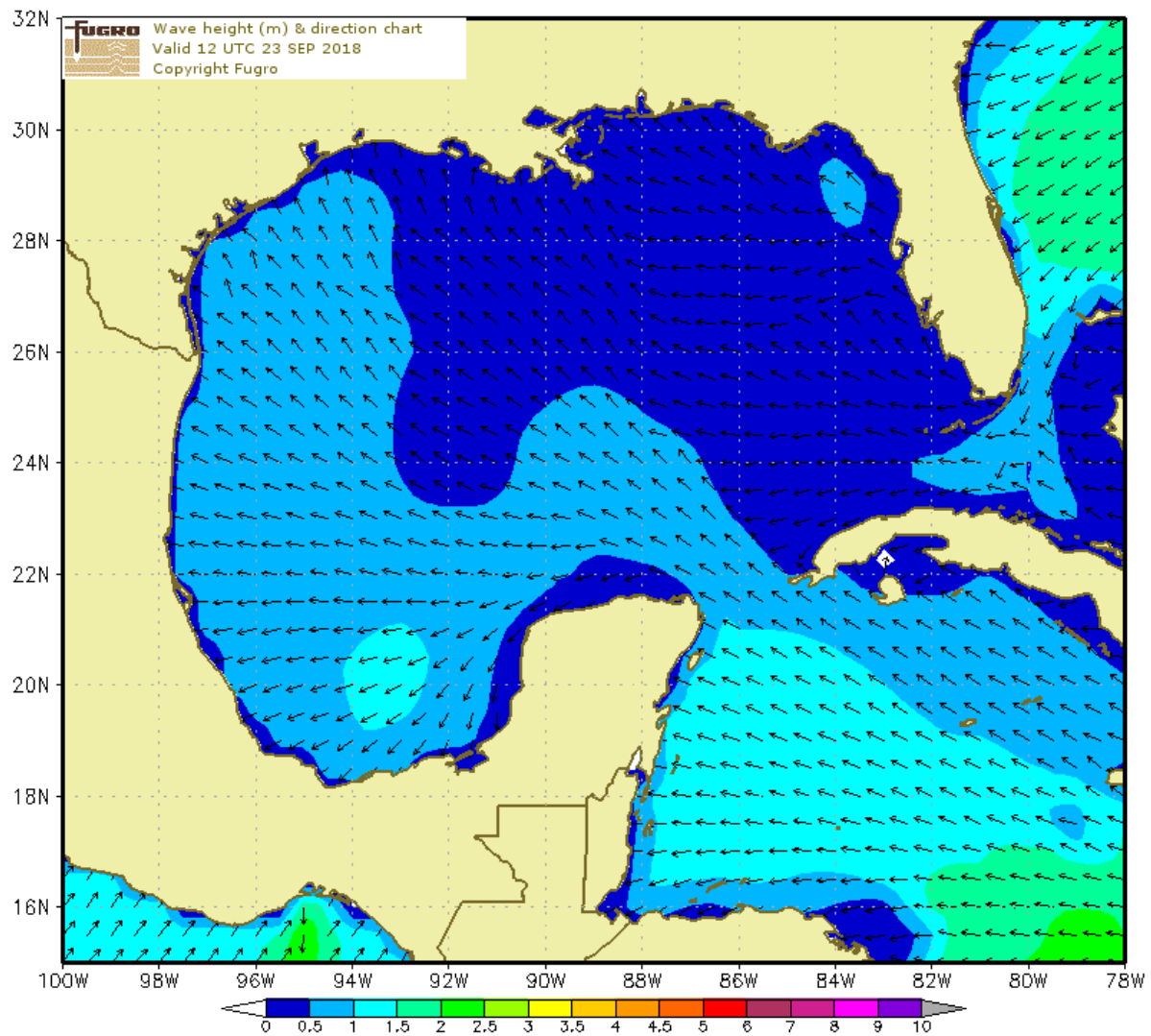
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 23 Sep 2018

Tropical NIL.

Advisory:

Met Situation: An organised showery trough over Texas moves E over the S States to lie over Mississippi by the afternoon, (Next 48 hours) then fills as a weak ridge extends SW into the NE GoM tomorrow. Meanwhile a series of fragmented showery troughs move across the GoM throughout.

WARNINGS: THUNDERSTORMS. SQUALLS.

(Next 24 hours)

Weather: Showers, heavy and thundery at times. Clearing mainly fair by Monday afternoon.

(Next 48 hours)

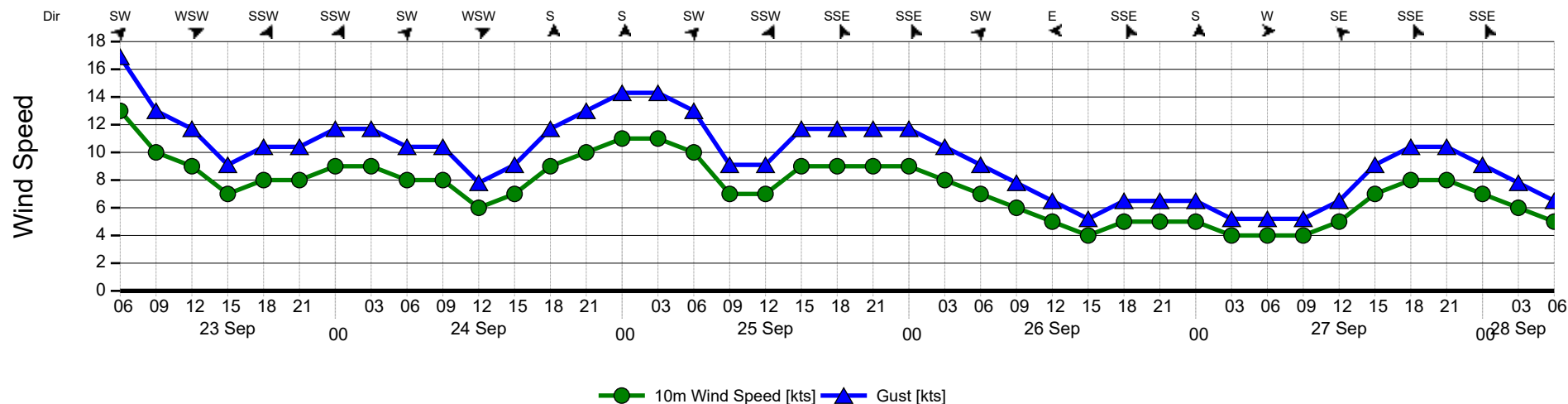
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as showery troughs move across your area. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
23/0600	SW	13	17	0.7	SE	0.3	5	-	0.0	-	0.7	1.2
23/0900	SW	10	13	0.5	SE	0.4	5	S	0.1	4	0.6	1.0
23/1200	WSW	9	12	0.1	SE	0.4	5	S	0.3	5	0.5	0.9
23/1500	SW	7	9	0.2	SE	0.3	5	S	0.2	6	0.4	0.7
23/1800	SSW	8	10	0.3	SE	0.2	5	S	0.1	6	0.4	0.7
23/2100	SSW	8	10	0.3	SSE	0.2	5	SE	0.1	6	0.3	0.6
24/0000	SSW	9	12	0.2	SSE	0.2	5	SE	0.1	5	0.3	0.5
24/0300	SW	9	12	0.2	SSE	0.2	6	SE	0.1	5	0.3	0.5
24/0600	SW	8	10	0.2	SSE	0.2	6	SE	0.1	5	0.3	0.5
24/0900	W	8	10	0.1	SSE	0.2	6	SE	0.1	5	0.3	0.5
24/1200	WSW	6	8	0.2	SSE	0.2	6	SE	0.1	6	0.3	0.5
24/1500	SSW	7	9	0.2	SSE	0.2	6	-	0.0	-	0.3	0.4
24/1800	S	9	12	0.2	SSE	0.2	6	-	0.0	-	0.3	0.5
24/2100	S	10	13	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
25/0000	S	11	14	0.3	SE	0.1	5	-	0.0	-	0.3	0.5
25/0300	SSW	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
25/0600	SW	10	13	0.4	SE	0.1	5	-	0.0	-	0.4	0.6
25/0900	SW	7	9	0.3	SE	0.2	5	SSW	0.1	4	0.4	0.6
25/1200	SSW	7	9	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
25/1500	S	9	12	0.3	SE	0.1	5	SSW	0.1	4	0.3	0.5
25/1800	SSE	9	12	0.3	SE	0.1	5	SSW	0.1	4	0.3	0.5
25/2100	SSE	9	12	0.3	SE	0.1	5	SSW	0.1	4	0.3	0.5
26/0000	SSE	9	12	0.3	SE	0.1	5	SSW	0.1	4	0.3	0.5
26/0300	S	8	10	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
26/0600	SW	7	9	0.2	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/0900	SW	6	8	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/1200	E	5	7	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/1500	SE	4	5	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/1800	SSE	5	7	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/2100	S	5	7	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
27/0000	S	5	7	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
27/0300	SSW	4	5	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
27/0600	W	4	5	0.0	SSE	0.2	4	SSW	0.2	4	0.3	0.5
27/0900	WNW	4	5	0.0	SSE	0.2	4	SSW	0.1	4	0.2	0.4
27/1200	SE	5	7	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.3
27/1500	SSE	7	9	0.2	SSE	0.2	5	-	0.0	-	0.2	0.4
27/1800	SSE	8	10	0.2	SSE	0.2	5	SSW	0.1	4	0.3	0.4
27/2100	SSE	8	10	0.2	SSE	0.2	5	SSW	0.1	4	0.3	0.5
28/0000	SSE	7	9	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/0300	SSE	6	8	0.2	SSE	0.2	5	S	0.1	4	0.3	0.5
28/0600	ESE	5	7	0.1	SSE	0.3	5	SSW	0.1	4	0.3	0.5

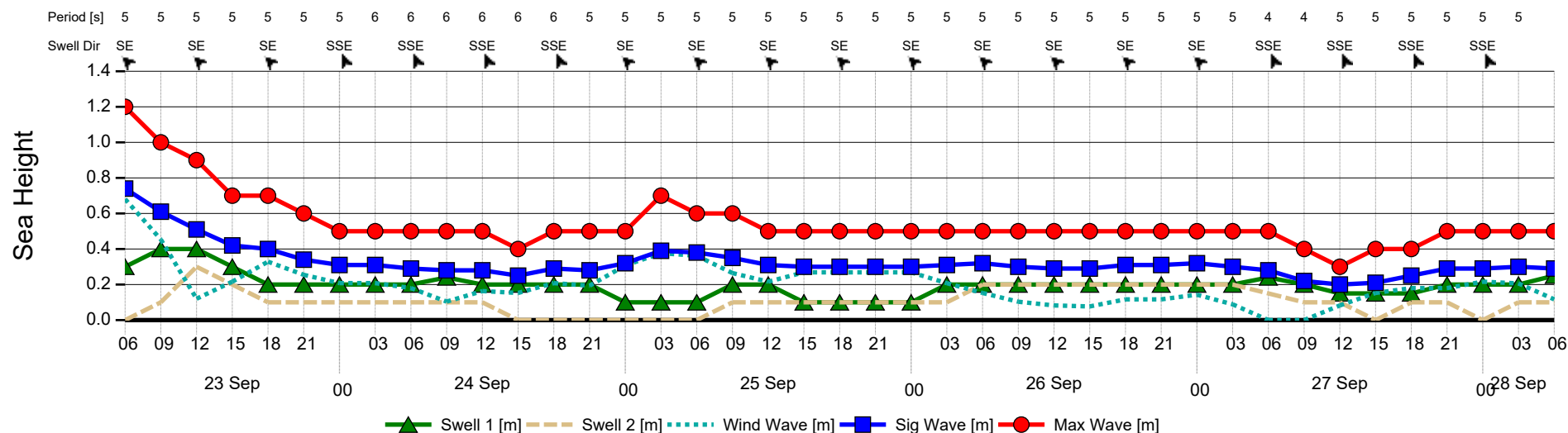
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



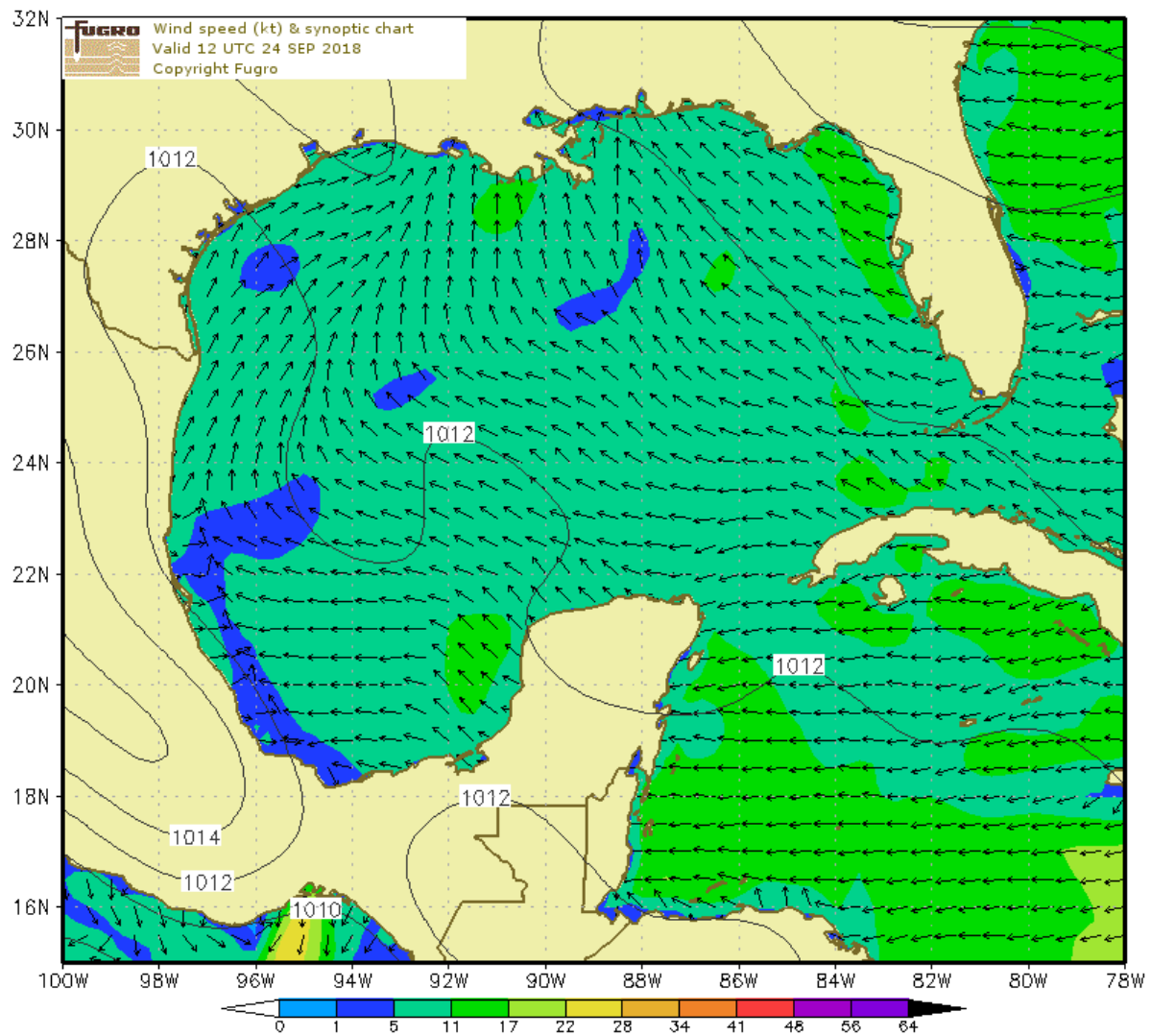
Wave Chart



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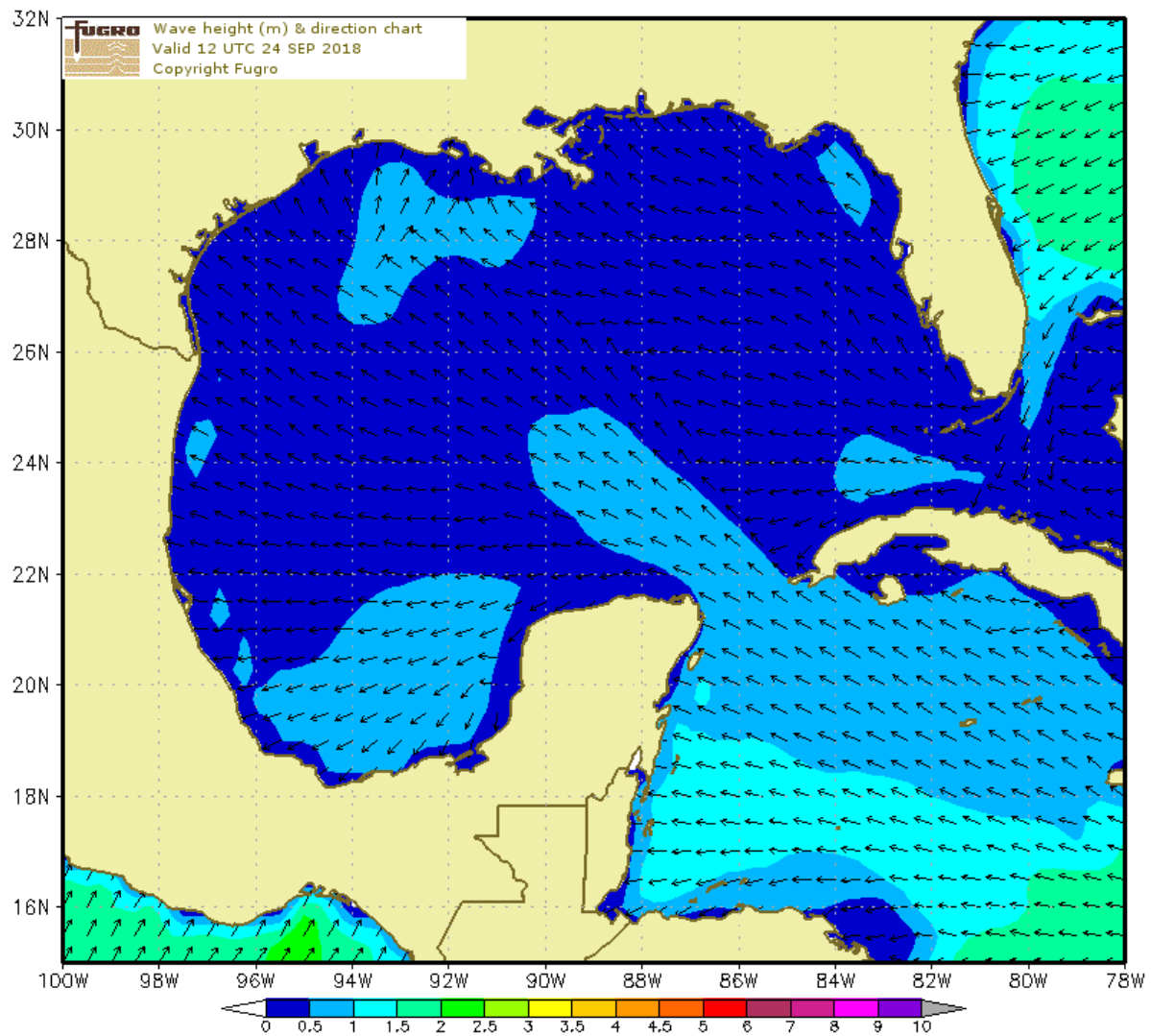
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 24 Sep 2018
Tropical Advisory: NIL.

Met Situation: A showery trough over the S States gradually fills as a weak ridge extends SW into the NE GoM from today.
(Next 48 hours) Meanwhile a series of fragmented showery troughs move across the GoM throughout.

WARNINGS: NIL.
(Next 24 hours)

Weather: Occasional showers, becoming more frequent and perhaps thundery for a time Tuesday morning.
(Next 48 hours)

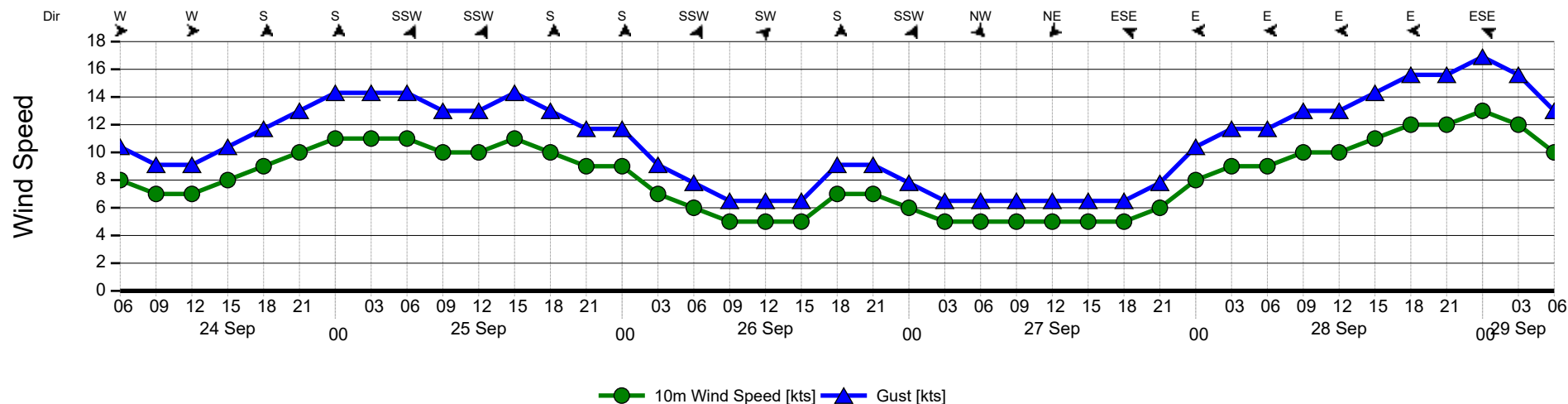
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as showery troughs at times develop and move across the area. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
24/0600	W	8	10	0.1	SSE	0.3	5	SE	0.1	5	0.3	0.5
24/0900	W	7	9	0.1	SSE	0.2	5	SE	0.2	5	0.3	0.5
24/1200	W	7	9	0.1	SSE	0.2	5	SE	0.2	5	0.3	0.5
24/1500	SW	8	10	0.2	SSE	0.2	5	SE	0.1	5	0.3	0.4
24/1800	S	9	12	0.2	SSE	0.2	5	-	0.0	-	0.2	0.4
24/2100	S	10	13	0.3	SE	0.1	5	-	0.0	-	0.3	0.5
25/0000	S	11	14	0.3	SE	0.1	5	-	0.0	-	0.3	0.5
25/0300	S	11	14	0.3	SE	0.1	5	-	0.0	-	0.3	0.5
25/0600	SSW	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
25/0900	SSW	10	13	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
25/1200	SSW	10	13	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
25/1500	S	11	14	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
25/1800	S	10	13	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
25/2100	SSE	9	12	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
26/0000	S	9	12	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
26/0300	S	7	9	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
26/0600	SSW	6	8	0.1	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/0900	WNW	5	7	0.0	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/1200	SW	5	7	0.1	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/1500	S	5	7	0.1	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/1800	S	7	9	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
26/2100	S	7	9	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
27/0000	SSW	6	8	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
27/0300	W	5	7	0.1	SE	0.2	5	SSW	0.1	4	0.2	0.4
27/0600	NW	5	7	0.0	SSE	0.2	4	SSW	0.1	4	0.2	0.4
27/0900	NNW	5	7	0.0	SSE	0.2	4	SSW	0.1	4	0.2	0.4
27/1200	NE	5	7	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
27/1500	E	5	7	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
27/1800	ESE	5	7	0.1	SSE	0.2	5	SSW	0.1	4	0.2	0.4
27/2100	E	6	8	0.1	SSE	0.2	5	SSW	0.1	4	0.3	0.4
28/0000	E	8	10	0.2	SSE	0.2	5	SSW	0.1	4	0.3	0.5
28/0300	E	9	12	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/0600	E	9	12	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/0900	E	10	13	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/1200	E	10	13	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/1500	E	11	14	0.3	SSE	0.2	5	-	0.0	-	0.4	0.6
28/1800	E	12	16	0.3	SSE	0.2	5	-	0.0	-	0.4	0.7
28/2100	ESE	12	16	0.3	SSE	0.2	5	-	0.0	-	0.4	0.7
29/0000	ESE	13	17	0.5	SSE	0.2	5	-	0.0	-	0.5	0.8
29/0300	ESE	12	16	0.5	SSE	0.2	5	-	0.0	-	0.6	1.0
29/0600	ESE	10	13	0.5	SSE	0.2	5	-	0.0	-	0.5	0.9

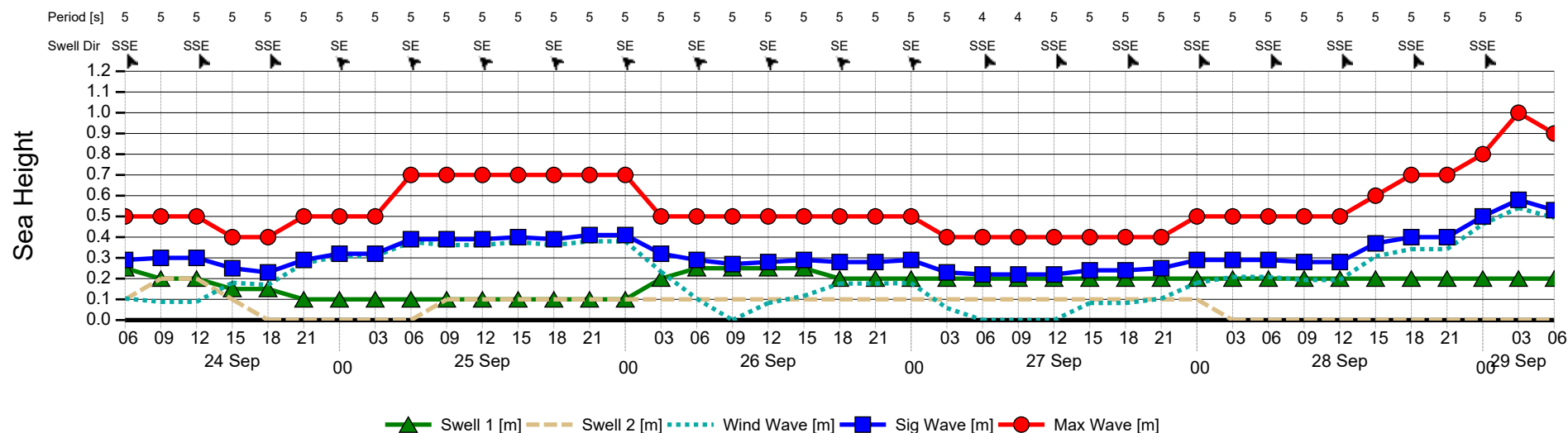
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



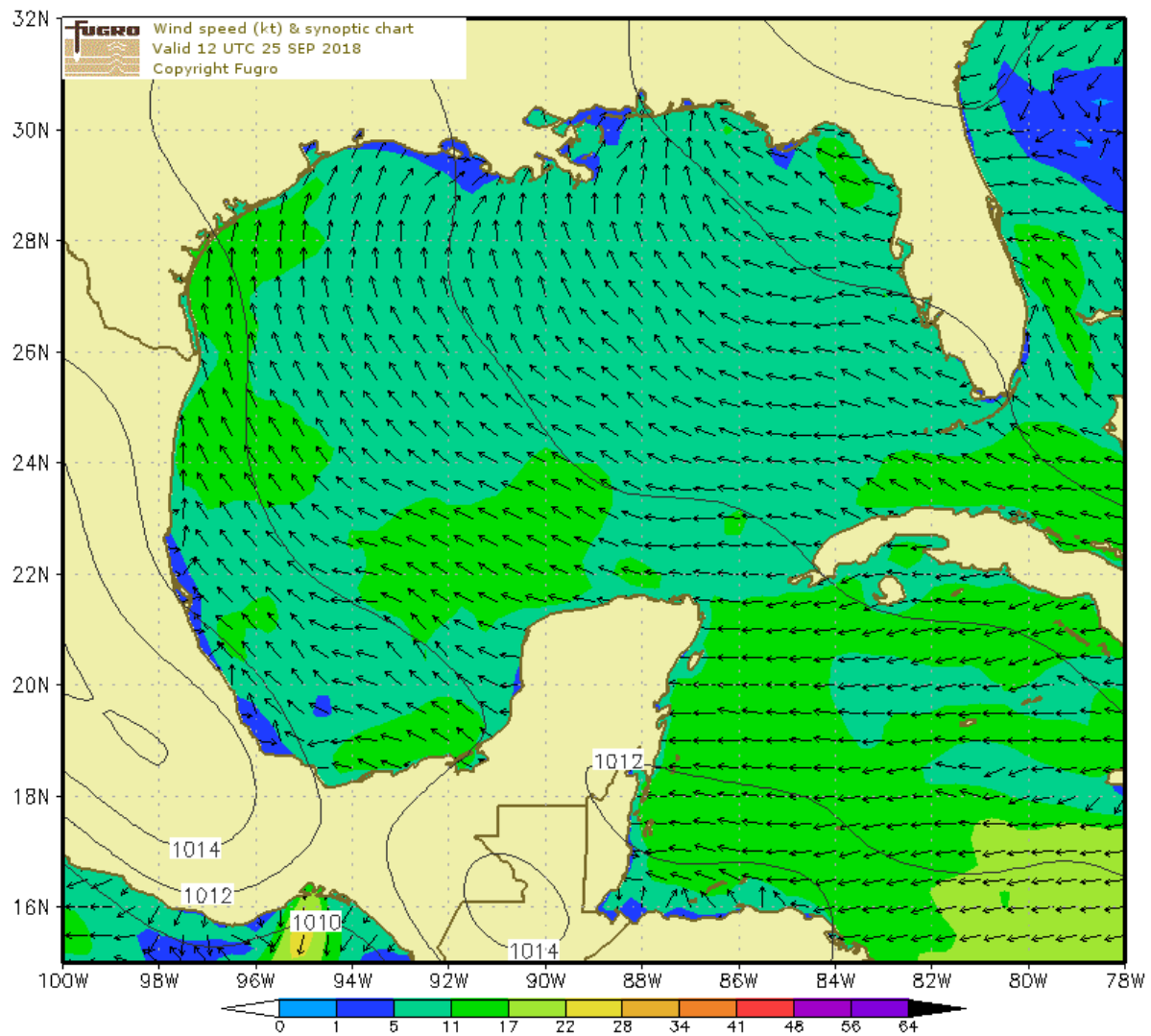
Wave Chart



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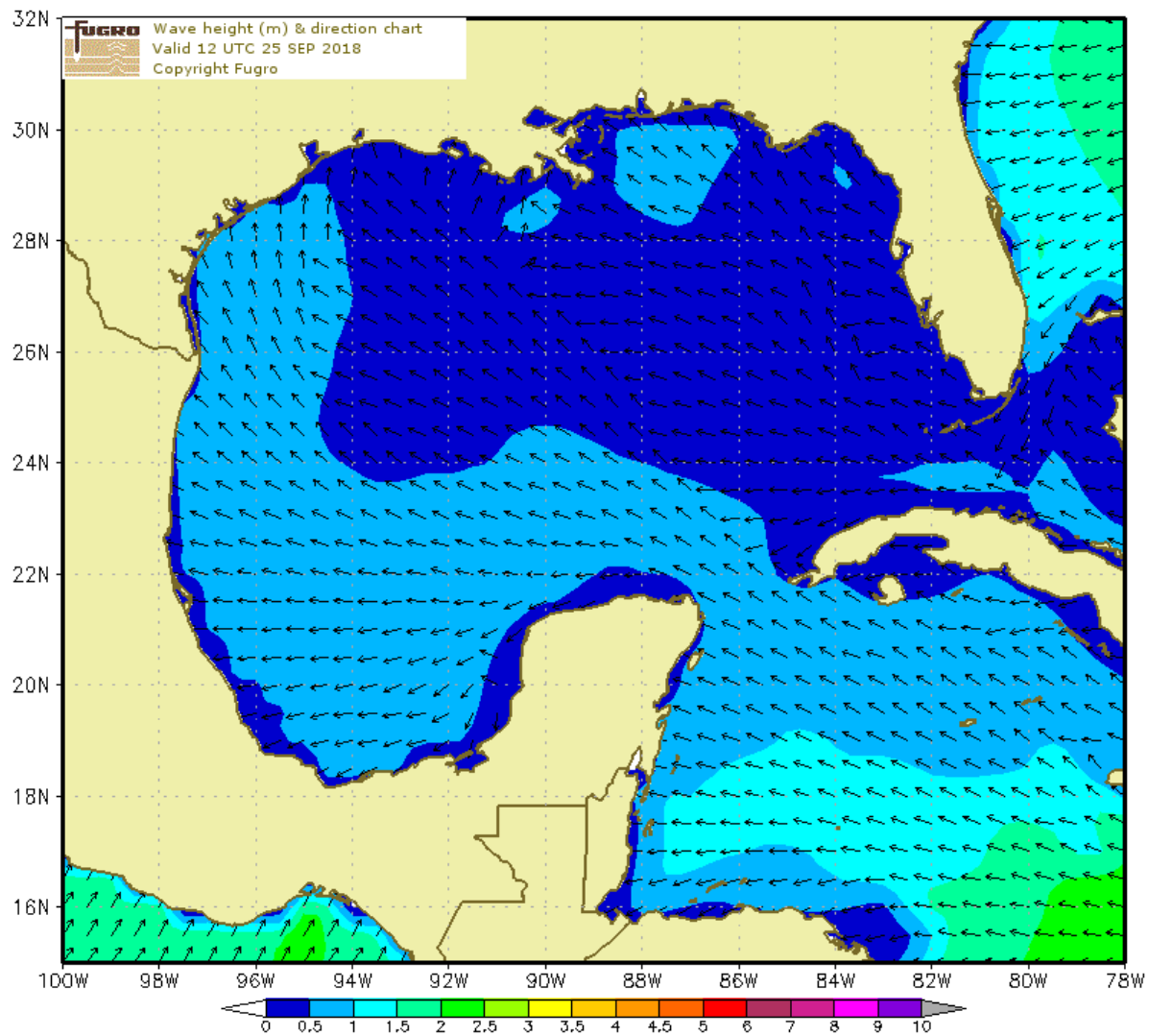
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Email : forecast@fugro.com



To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 25 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak ridge extends SW into the NE GoM while a series of fragmented showery troughs move across the GoM throughout. Tomorrow, with a more organised frontal trough moves E over the S States, gradually filling over Mississippi on Thursday.
(Next 48 hours)

WARNINGS: THUNDERSTORMS.
(Next 24 hours)

Weather: Occasional showers, becoming more frequent and thundery for a time in the mornings.
(Next 48 hours)

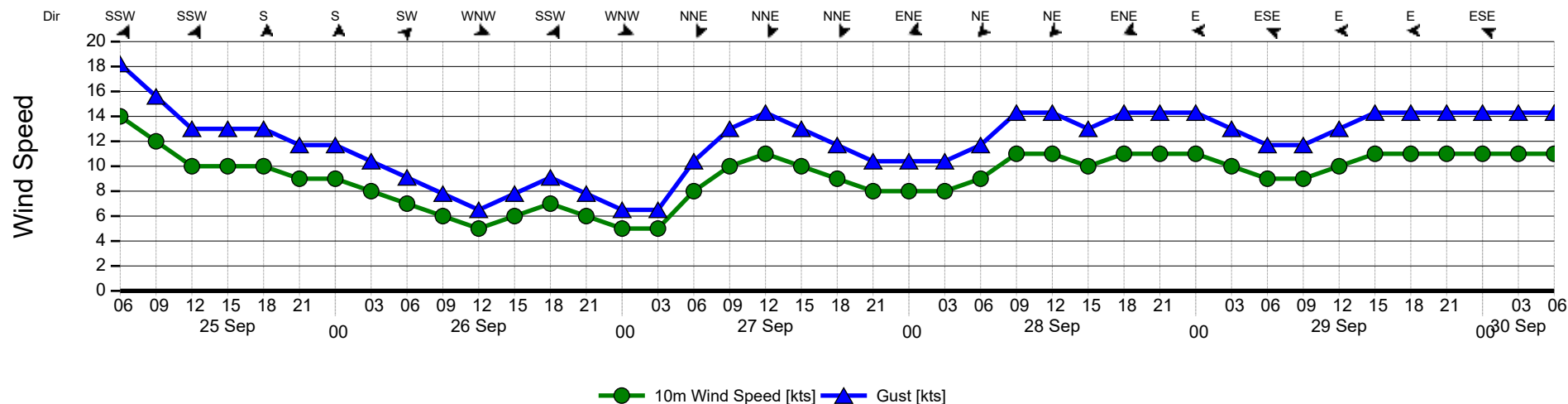
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as showery troughs at times develop and move across the area. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
25/0600	SSW	14	18	0.5	SE	0.2	5	-	0.0	-	0.6	1.0
25/0900	SSW	12	16	0.5	SE	0.3	5	SSW	0.1	4	0.6	1.0
25/1200	SSW	10	13	0.4	SE	0.3	5	SSW	0.1	4	0.5	0.8
25/1500	S	10	13	0.5	SE	0.2	5	SSW	0.1	4	0.5	0.8
25/1800	S	10	13	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
25/2100	S	9	12	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
26/0000	S	9	12	0.4	SE	0.1	5	SSW	0.1	4	0.4	0.7
26/0300	S	8	10	0.3	SE	0.2	5	SSW	0.1	4	0.3	0.6
26/0600	SW	7	9	0.2	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/0900	WNW	6	8	0.0	SE	0.3	5	SSW	0.1	4	0.3	0.5
26/1200	WNW	5	7	0.0	SE	0.3	5	SSW	0.2	4	0.3	0.5
26/1500	SSW	6	8	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/1800	SSW	7	9	0.2	SE	0.2	5	SSW	0.2	4	0.3	0.5
26/2100	WSW	6	8	0.1	SE	0.2	5	SSW	0.2	4	0.3	0.5
27/0000	WNW	5	7	0.0	SE	0.2	5	SSW	0.2	4	0.3	0.5
27/0300	NNW	5	7	0.0	SE	0.2	5	SSW	0.1	4	0.3	0.4
27/0600	NNE	8	10	0.0	SSE	0.2	4	SSW	0.1	4	0.3	0.4
27/0900	NNE	10	13	0.0	SSE	0.2	4	SSW	0.1	4	0.3	0.4
27/1200	NNE	11	14	0.0	SSE	0.2	5	SSW	0.1	4	0.3	0.4
27/1500	NNE	10	13	0.0	SSE	0.2	5	SSW	0.1	4	0.3	0.4
27/1800	NNE	9	12	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
27/2100	NE	8	10	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
28/0000	ENE	8	10	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
28/0300	ENE	8	10	0.0	SSE	0.2	5	SSW	0.1	4	0.2	0.4
28/0600	NE	9	12	0.0	SSE	0.2	5	-	0.0	-	0.2	0.4
28/0900	NE	11	14	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
28/1200	NE	11	14	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
28/1500	ENE	10	13	0.0	SSE	0.3	5	-	0.0	-	0.3	0.5
28/1800	ENE	11	14	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
28/2100	E	11	14	0.2	SSE	0.2	5	-	0.0	-	0.3	0.5
29/0000	E	11	14	0.3	SSE	0.2	4	-	0.0	-	0.4	0.6
29/0300	ESE	10	13	0.4	SSE	0.2	4	-	0.0	-	0.4	0.7
29/0600	ESE	9	12	0.4	SSE	0.2	4	-	0.0	-	0.4	0.7
29/0900	E	9	12	0.4	SSE	0.1	4	-	0.0	-	0.4	0.7
29/1200	E	10	13	0.4	SSE	0.1	4	-	0.0	-	0.4	0.7
29/1500	E	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
29/1800	E	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
29/2100	ESE	11	14	0.5	-	0.0	-	-	0.0	-	0.5	0.8
30/0000	ESE	11	14	0.5	-	0.0	-	-	0.0	-	0.5	0.9
30/0300	ESE	11	14	0.5	-	0.0	-	-	0.0	-	0.5	0.9
30/0600	ESE	11	14	0.5	-	0.0	-	-	0.0	-	0.5	0.9

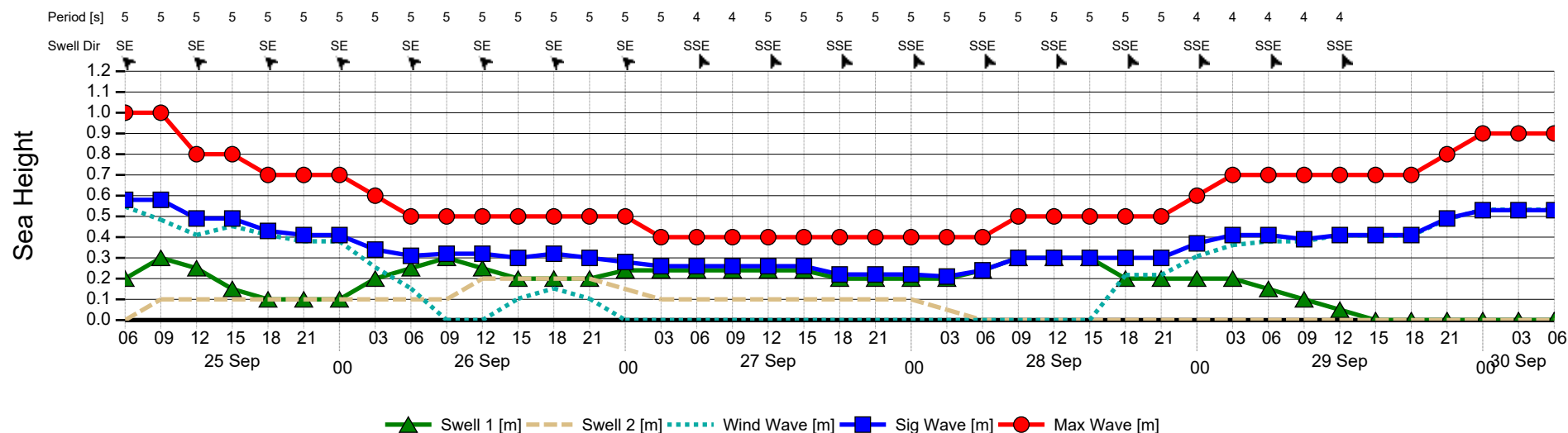
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



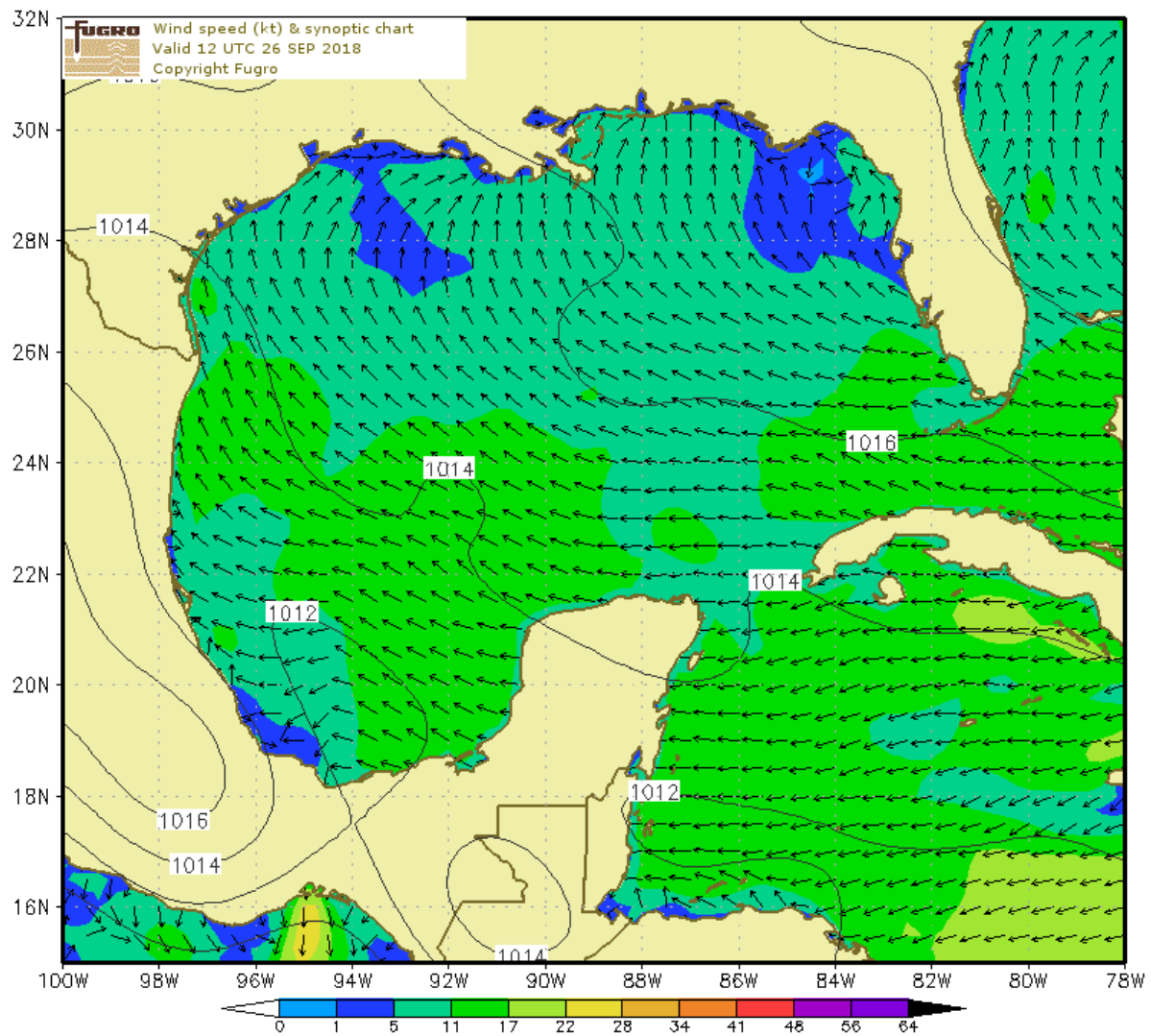
Wave Chart



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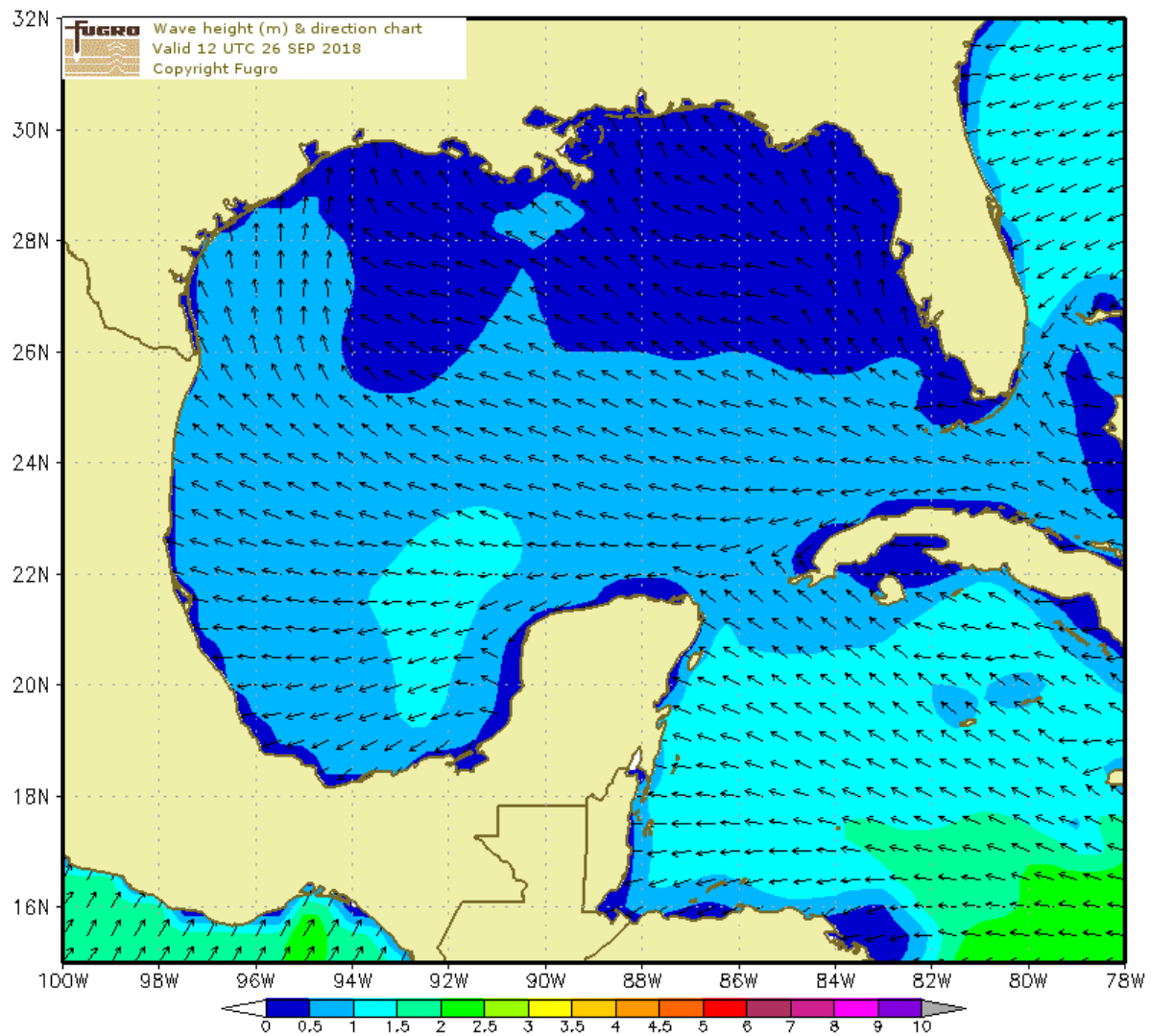
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 26 Sep 2018
Tropical Advisory: NIL.

Met Situation: A weak ridge extends SW-WSW into the NE GoM while a series of fragmented showery troughs move across the GoM throughout. A more organised frontal trough moves E over the S States from this morning, gradually filling by Friday morning.
(Next 48 hours)

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Occasional showers/thunderstorms, becoming more frequent for a time in the mornings.
(Next 48 hours)

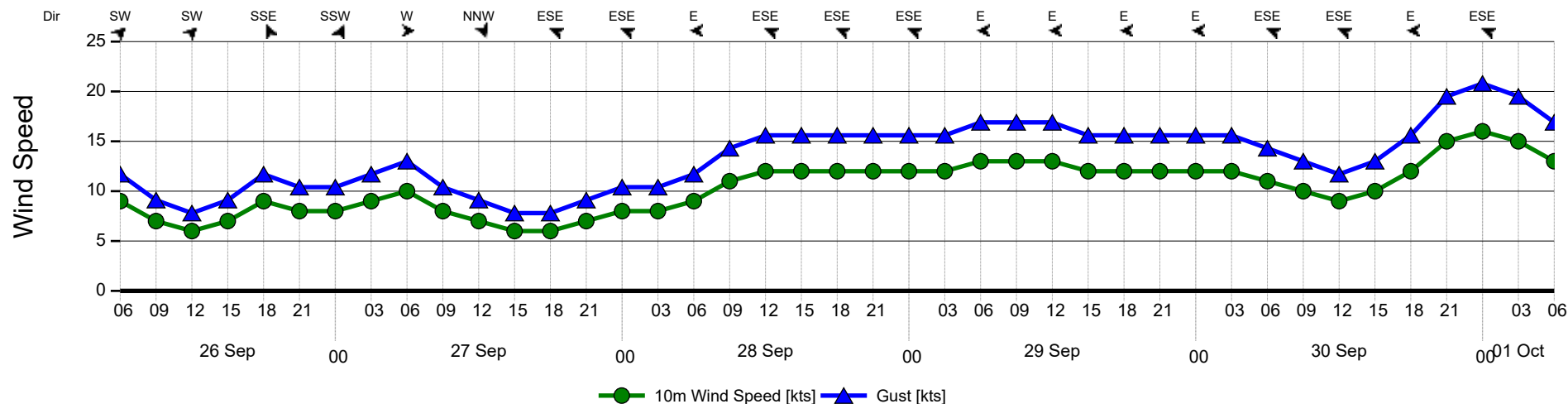
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as showery troughs at times develop and move across the area. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
26/0600	SW	9	12	0.2	SSW	0.3	4	SE	0.3	5	0.4	0.7
26/0900	WSW	7	9	0.1	SSW	0.3	4	SE	0.3	5	0.4	0.7
26/1200	SW	6	8	0.1	SSW	0.3	4	SE	0.3	5	0.4	0.7
26/1500	S	7	9	0.2	SSW	0.3	4	SE	0.2	4	0.4	0.7
26/1800	SSE	9	12	0.2	SSW	0.3	5	SE	0.2	4	0.4	0.7
26/2100	S	8	10	0.2	SSW	0.3	5	SE	0.2	4	0.4	0.7
27/0000	SSW	8	10	0.2	S	0.2	5	SE	0.2	4	0.4	0.6
27/0300	SW	9	12	0.2	S	0.2	5	SE	0.2	4	0.4	0.6
27/0600	W	10	13	0.1	S	0.2	5	SE	0.2	4	0.3	0.6
27/0900	NW	8	10	0.0	S	0.2	5	SE	0.2	5	0.3	0.5
27/1200	NNW	7	9	0.0	S	0.2	5	SE	0.2	5	0.3	0.5
27/1500	ENE	6	8	0.0	S	0.2	5	SE	0.2	5	0.3	0.5
27/1800	ESE	6	8	0.1	S	0.2	5	SE	0.1	5	0.3	0.4
27/2100	E	7	9	0.1	SE	0.2	4	SSW	0.1	5	0.2	0.4
28/0000	ESE	8	10	0.1	SE	0.2	4	SSW	0.1	5	0.3	0.4
28/0300	SE	8	10	0.1	SE	0.2	4	SSW	0.1	4	0.3	0.4
28/0600	E	9	12	0.1	SE	0.2	5	SSW	0.1	4	0.3	0.4
28/0900	E	11	14	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
28/1200	ESE	12	16	0.2	S	0.2	5	SSW	0.1	4	0.3	0.6
28/1500	ESE	12	16	0.3	S	0.2	5	SSW	0.1	4	0.4	0.7
28/1800	ESE	12	16	0.3	S	0.2	5	-	0.0	-	0.4	0.7
28/2100	ESE	12	16	0.3	SSE	0.2	6	-	0.0	-	0.4	0.7
29/0000	ESE	12	16	0.3	SSE	0.2	6	-	0.0	-	0.4	0.7
29/0300	ESE	12	16	0.3	SE	0.2	7	-	0.0	-	0.4	0.7
29/0600	E	13	17	0.5	SE	0.2	7	-	0.0	-	0.5	0.8
29/0900	ENE	13	17	0.5	SE	0.1	7	-	0.0	-	0.5	0.9
29/1200	E	13	17	0.5	SE	0.1	7	-	0.0	-	0.5	0.9
29/1500	E	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
29/1800	E	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.8
29/2100	E	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.9
30/0000	E	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.9
30/0300	ESE	12	16	0.5	SE	0.1	5	-	0.0	-	0.6	0.9
30/0600	ESE	11	14	0.5	SE	0.2	5	-	0.0	-	0.5	0.9
30/0900	SE	10	13	0.4	SE	0.3	5	-	0.0	-	0.5	0.9
30/1200	ESE	9	12	0.3	SE	0.4	5	-	0.0	-	0.5	0.9
30/1500	E	10	13	0.4	SE	0.4	5	-	0.0	-	0.5	0.9
30/1800	E	12	16	0.5	SE	0.3	4	-	0.0	-	0.6	1.0
30/2100	E	15	20	0.6	SE	0.2	4	-	0.0	-	0.6	1.1
01/0000	ESE	16	21	0.6	SE	0.1	4	-	0.0	-	0.7	1.1
01/0300	SE	15	20	0.7	-	0.0	-	-	0.0	-	0.7	1.1
01/0600	SE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1

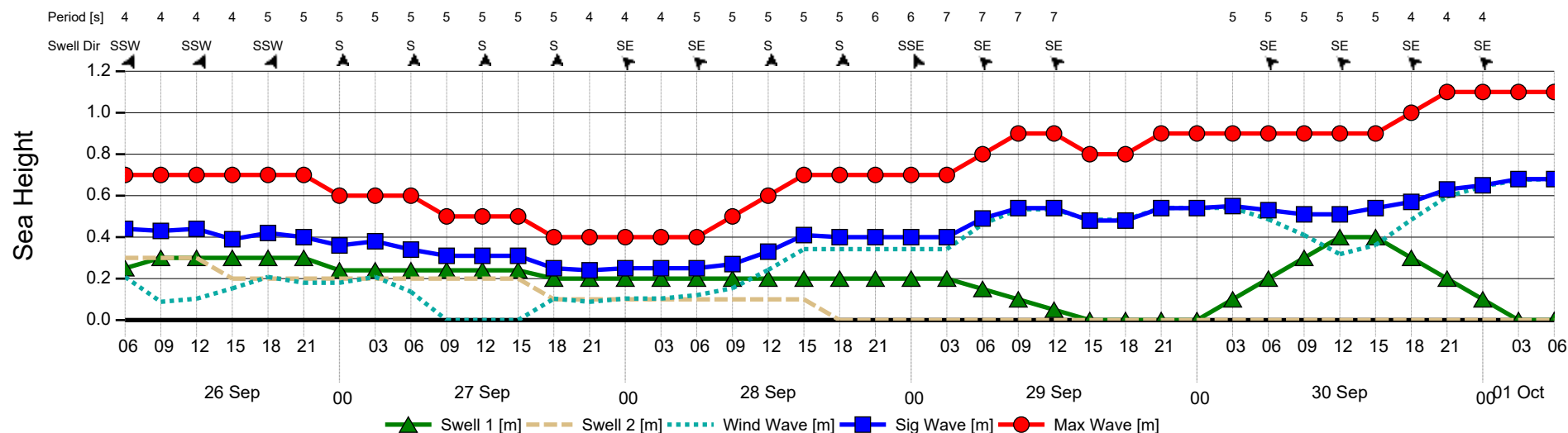
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



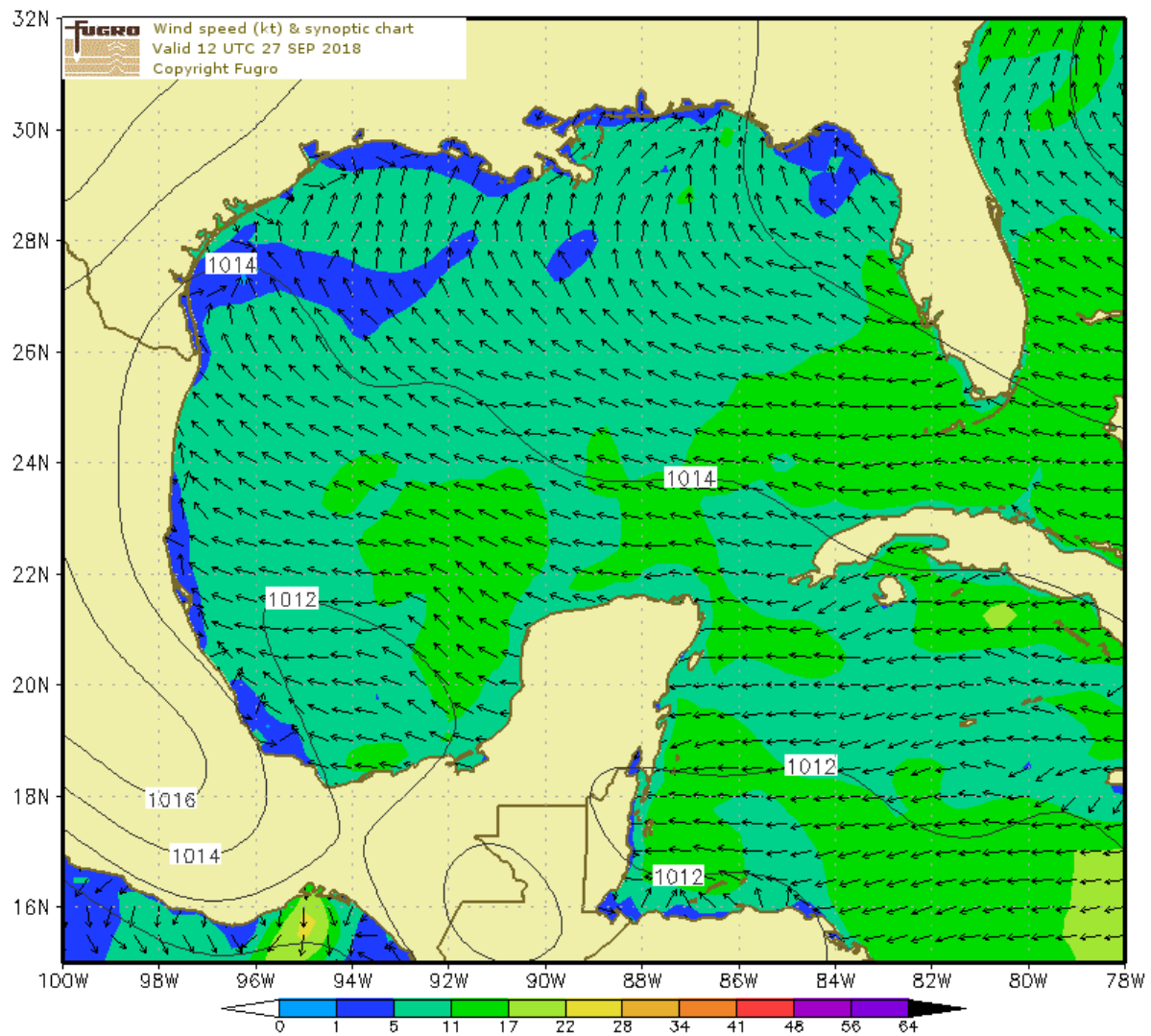
Wave Chart



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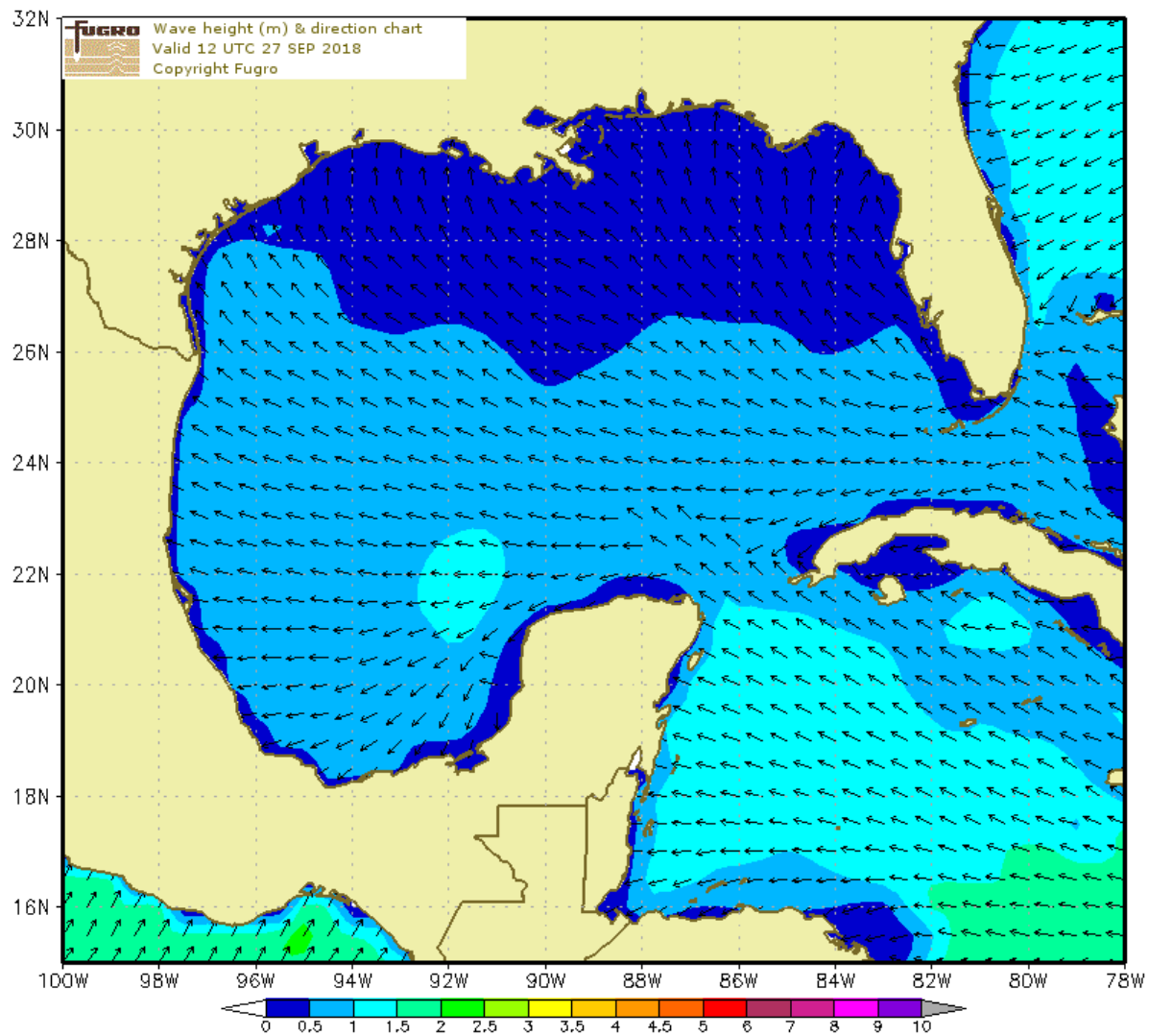
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To: Fugro USA Land Inc

Subject: Weather Forecast for Galveston at 29.32N 94.67W

Validity: Forecast valid 120 hours from 0600 (UTC-5) on 27 Sep 2018

Tropical NIL.

Advisory:

Met Situation: A frontal trough lying SW/NE moves ESE into the N GoM this morning. Through the afternoon this fragments and clears by tomorrow morning. Weak showery troughs then move WNW over the GoM from tomorrow afternoon, as a weak ridge becomes oriented S-SSW across the S States and into the N GoM by Saturday morning.

WARNINGS: THUNDERSTORMS. SQUALLS.

(Next 24 hours)

Weather: Showers or longer spells of rain likely today, which may contain embedded thunderstorms. Conditions will turn largely fair from this evening, as showers/thunderstorms become more isolated.

(Next 48 hours)

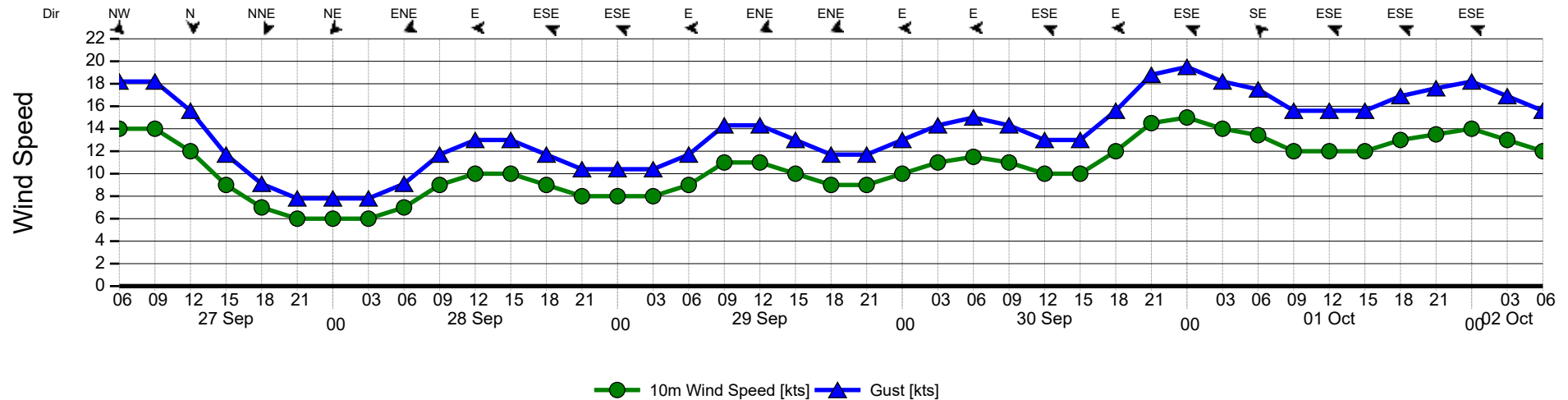
Confidence: Fairly high for trend, but moderate for peak wind/wave detail as a frontal trough moves over your location today. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
27/0600	NW	14	18	0.0	SE	0.4	4	S	0.2	5	0.5	0.8
27/0900	NNW	14	18	0.0	SE	0.4	4	S	0.2	5	0.5	0.8
27/1200	N	12	16	0.0	SE	0.4	4	S	0.2	5	0.4	0.7
27/1500	N	9	12	0.0	SE	0.3	4	S	0.2	5	0.4	0.6
27/1800	NNE	7	9	0.0	SE	0.3	4	S	0.1	5	0.3	0.5
27/2100	NNE	6	8	0.0	SE	0.2	5	S	0.1	5	0.2	0.4
28/0000	NE	6	8	0.0	SE	0.2	5	S	0.1	5	0.2	0.4
28/0300	NE	6	8	0.0	SE	0.2	5	SSW	0.1	4	0.2	0.4
28/0600	ENE	7	9	0.0	SE	0.3	5	SSW	0.1	4	0.3	0.5
28/0900	ENE	9	12	0.1	SE	0.3	5	SSW	0.1	4	0.3	0.5
28/1200	E	10	13	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
28/1500	E	10	13	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
28/1800	ESE	9	12	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
28/2100	ESE	8	10	0.2	SE	0.2	5	-	0.0	-	0.3	0.5
29/0000	ESE	8	10	0.2	SE	0.2	4	-	0.0	-	0.3	0.5
29/0300	ESE	8	10	0.2	SE	0.2	4	SSE	0.1	4	0.3	0.5
29/0600	E	9	12	0.2	SE	0.2	5	SSE	0.1	4	0.3	0.5
29/0900	ENE	11	14	0.0	SE	0.3	5	SSE	0.1	4	0.3	0.5
29/1200	ENE	11	14	0.0	SE	0.3	5	SSE	0.1	4	0.3	0.5
29/1500	ENE	10	13	0.0	SE	0.2	5	SSE	0.2	4	0.3	0.5
29/1800	ENE	9	12	0.0	SE	0.2	5	SSE	0.2	3	0.3	0.5
29/2100	ENE	9	12	0.3	SE	0.1	5	SSE	0.1	3	0.4	0.6
30/0000	E	10	13	0.4	SE	0.1	5	-	0.0	-	0.4	0.6
30/0300	E	11	14	0.4	SE	0.1	5	-	0.0	-	0.4	0.7
30/0600	E	12	15	0.5	SE	0.2	5	-	0.0	-	0.5	0.8
30/0900	E	11	14	0.4	SE	0.3	5	-	0.0	-	0.5	0.9
30/1200	ESE	10	13	0.4	SE	0.4	5	-	0.0	-	0.5	0.9
30/1500	E	10	13	0.4	SE	0.4	5	-	0.0	-	0.5	0.9
30/1800	E	12	16	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
30/2100	E	15	19	0.6	SE	0.2	5	-	0.0	-	0.6	1.0
01/0000	ESE	15	20	0.6	SE	0.1	5	-	0.0	-	0.6	1.0
01/0300	ESE	14	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/0600	SE	13	18	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/0900	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/1200	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/1500	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/1800	ESE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
01/2100	ESE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.2
02/0000	ESE	14	18	0.8	-	0.0	-	-	0.0	-	0.8	1.3
02/0300	SE	13	17	0.8	-	0.0	-	-	0.0	-	0.8	1.3
02/0600	ESE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.2

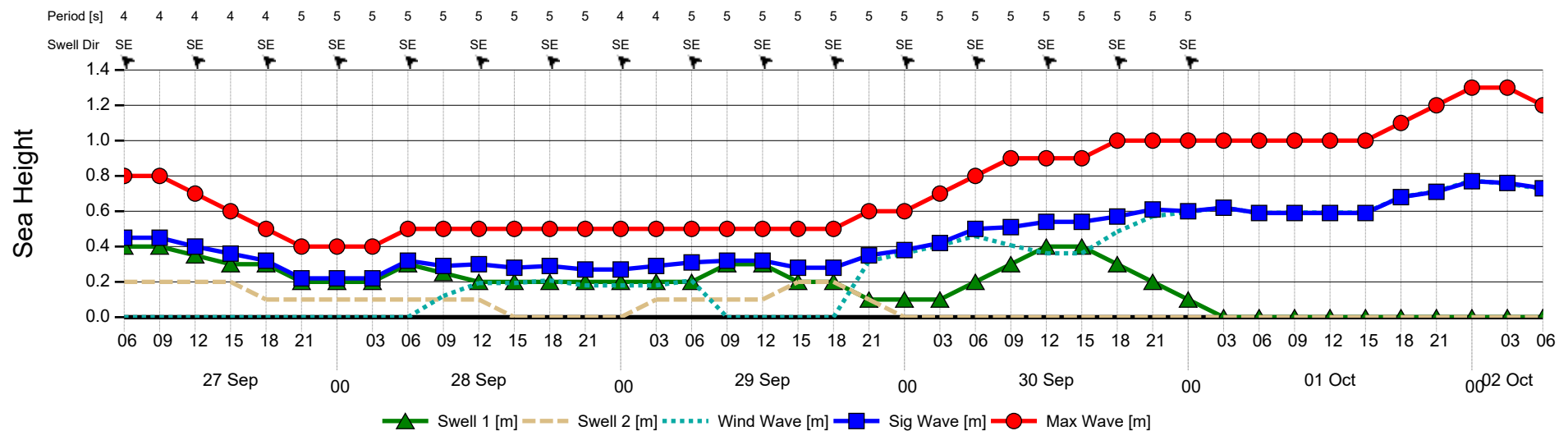
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



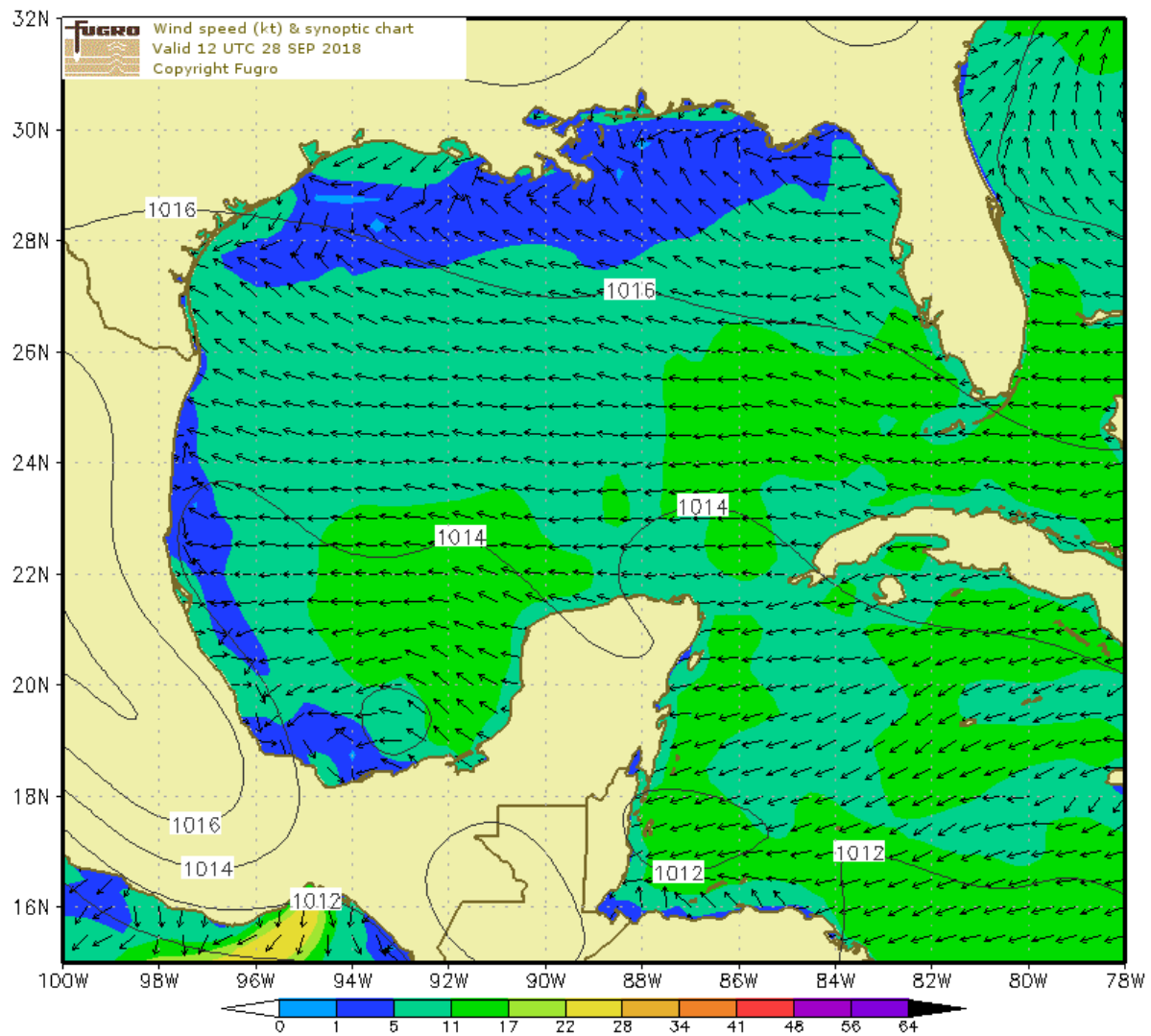
Wave Chart



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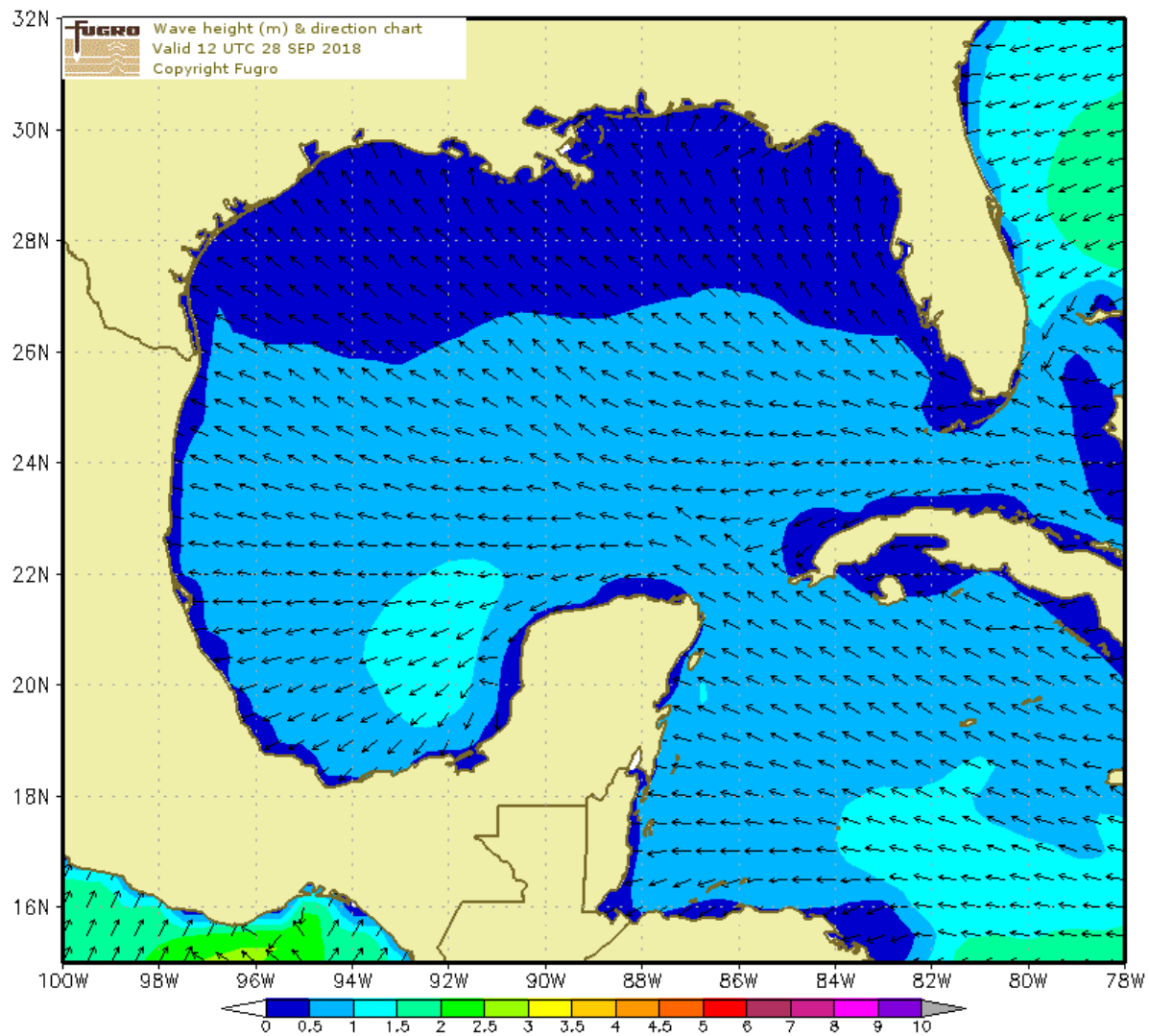
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Email : forecast@fugro.com



To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 28 Sep 2018
Tropical Advisory: NIL.

Met Situation: Weak showery troughs move WNW over the central GoM from this afternoon onwards, and deepen at times (Next 48 hours) over the NW GoM. Meanwhile a ridge extends SSW over the SE States towards the N GoM coastline.

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Heavy showers/thunderstorms during late mornings and the afternoons. Clearing fair during the evenings (Next 48 hours) and overnight.

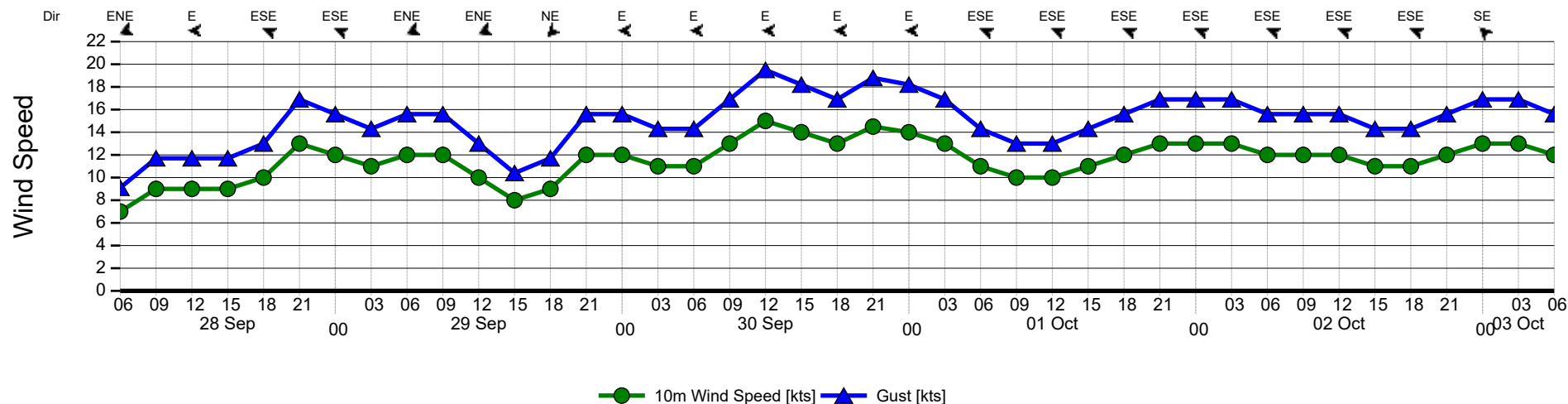
Confidence: Fairly high for trend, but moderate for peak wind/wave detail during the afternoons with troughs deepening nearby. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
28/0600	ENE	7	9	0.0	SE	0.3	5	SSW	0.1	4	0.3	0.5
28/0900	ENE	9	12	0.0	SE	0.3	5	SSW	0.1	4	0.3	0.5
28/1200	E	9	12	0.2	SE	0.2	5	SSW	0.1	4	0.3	0.5
28/1500	ESE	9	12	0.2	SE	0.2	5	-	0.0	-	0.3	0.4
28/1800	ESE	10	13	0.3	SE	0.2	5	-	0.0	-	0.3	0.6
28/2100	ESE	13	17	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
29/0000	ESE	12	16	0.3	SE	0.2	4	-	0.0	-	0.4	0.7
29/0300	E	11	14	0.3	SE	0.2	4	-	0.0	-	0.4	0.6
29/0600	ENE	12	16	0.0	SE	0.3	5	SSE	0.1	5	0.3	0.5
29/0900	ENE	12	16	0.0	SE	0.3	5	SSE	0.1	5	0.3	0.5
29/1200	ENE	10	13	0.0	SE	0.4	5	SSE	0.1	5	0.4	0.7
29/1500	ENE	8	10	0.0	SE	0.4	5	-	0.0	-	0.4	0.7
29/1800	NE	9	12	0.0	SE	0.4	5	-	0.0	-	0.4	0.7
29/2100	ENE	12	16	0.3	SE	0.3	5	-	0.0	-	0.5	0.8
30/0000	E	12	16	0.3	SE	0.2	5	-	0.0	-	0.4	0.7
30/0300	E	11	14	0.4	SE	0.2	5	-	0.0	-	0.5	0.8
30/0600	E	11	14	0.4	SE	0.4	5	-	0.0	-	0.6	1.0
30/0900	E	13	17	0.4	SE	0.4	5	-	0.0	-	0.6	0.9
30/1200	E	15	20	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
30/1500	E	14	18	0.5	SE	0.3	5	-	0.0	-	0.6	0.9
30/1800	E	13	17	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
30/2100	E	15	19	0.6	SE	0.2	5	-	0.0	-	0.7	1.1
01/0000	E	14	18	0.6	SE	0.1	5	-	0.0	-	0.6	1.1
01/0300	ESE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
01/0600	ESE	11	14	0.6	-	0.0	-	-	0.0	-	0.6	1.1
01/0900	ESE	10	13	0.5	-	0.0	-	-	0.0	-	0.6	0.9
01/1200	ESE	10	13	0.5	-	0.0	-	-	0.0	-	0.6	0.9
01/1500	ESE	11	14	0.6	-	0.0	-	-	0.0	-	0.6	1.1
01/1800	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/2100	ESE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
02/0000	ESE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
02/0300	ESE	13	17	0.8	-	0.0	-	-	0.0	-	0.8	1.3
02/0600	ESE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.2
02/0900	ESE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.2
02/1200	ESE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.2
02/1500	ESE	11	14	0.6	-	0.0	-	-	0.0	-	0.6	1.1
02/1800	ESE	11	14	0.6	-	0.0	-	-	0.0	-	0.6	1.1
02/2100	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
03/0000	SE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
03/0300	SE	13	17	0.7	-	0.0	-	-	0.0	-	0.7	1.1
03/0600	SE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0

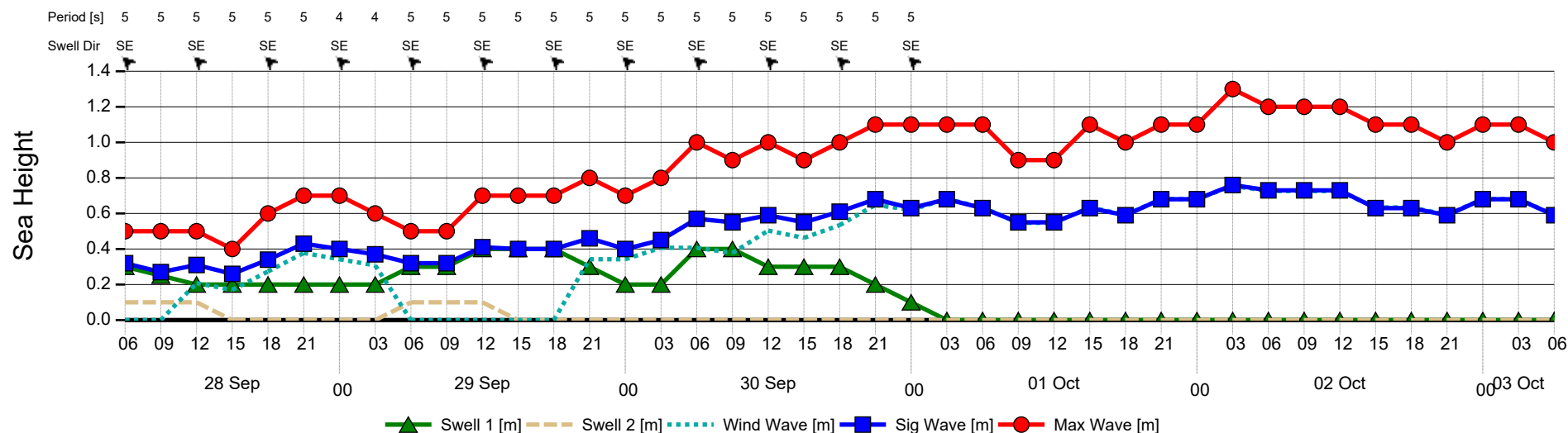
Forecaster: Hannah Mallinson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



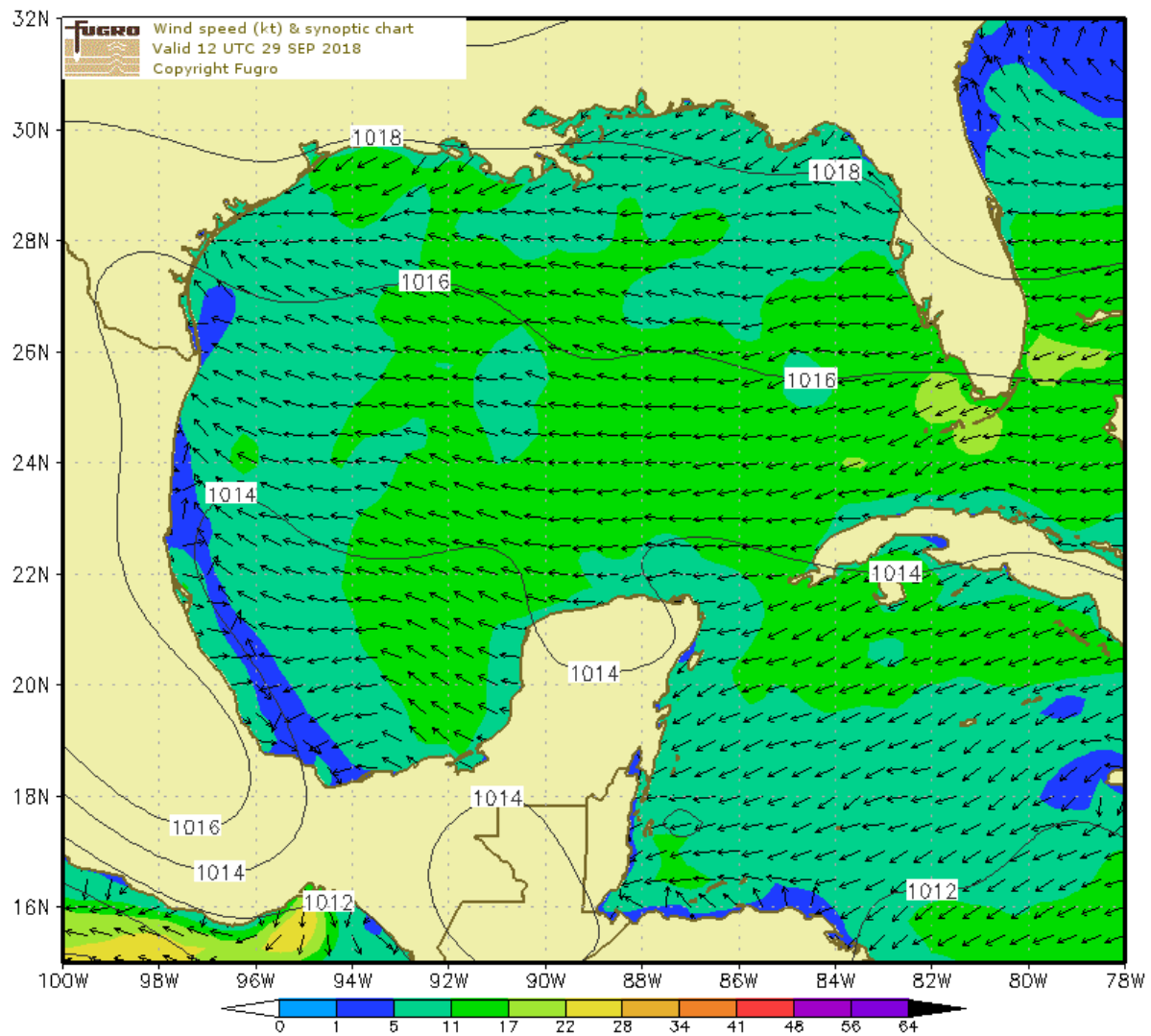
Wave Chart



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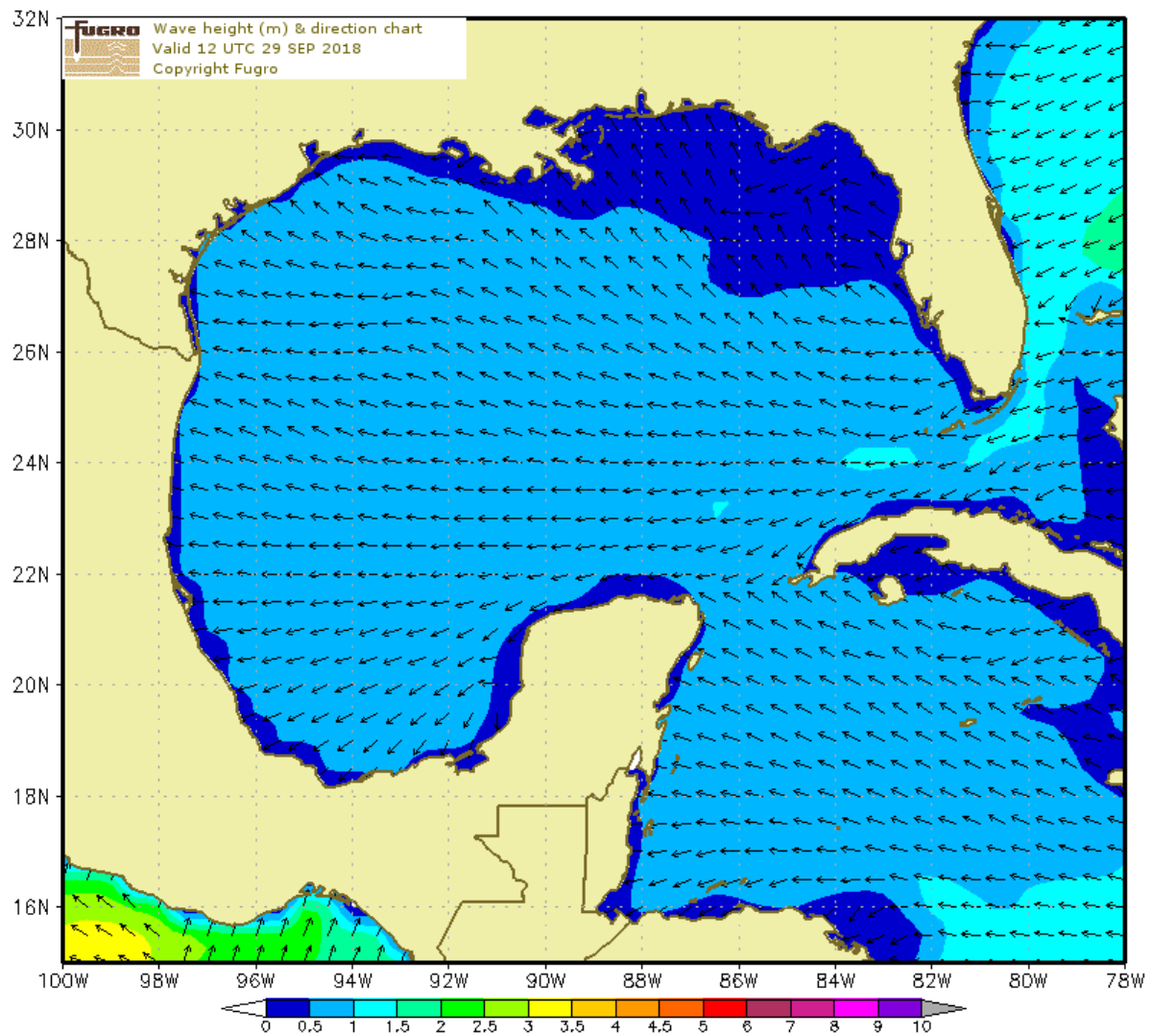
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 29 Sep 2018
Tropical Advisory: NIL.

Met Situation: Weak showery troughs move WNW over the central GoM and deepen at times over the NW GoM.
(Next 48 hours) Meanwhile a weak ridge extends SSW over the SE States towards the N GoM coastline. The ridge becomes orientated SW by tomorrow evening and into Monday morning.

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Heavy showers/thunderstorms during late mornings and the afternoons. Clearing mainly fair during the evenings and overnight as these become more isolated.
(Next 48 hours)

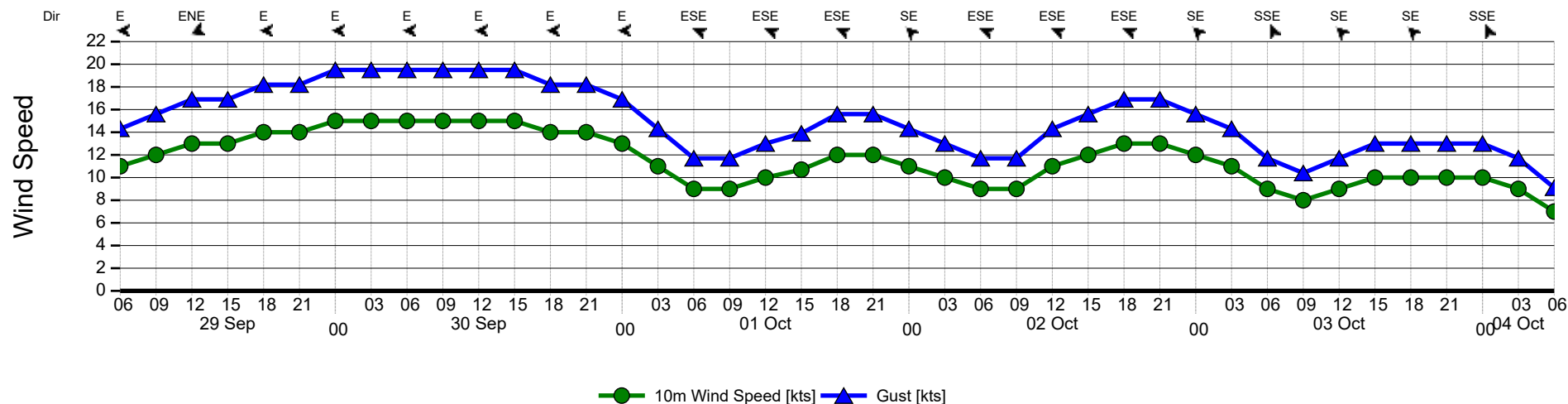
Confidence: Fairly high for trend, but moderate for peak wind/wave detail during the afternoons with troughs deepening nearby. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
29/0600	E	11	14	0.2	SE	0.5	7	-	0.0	-	0.5	0.9
29/0900	ENE	12	16	0.2	SE	0.5	7	-	0.0	-	0.5	0.9
29/1200	ENE	13	17	0.2	SE	0.5	7	-	0.0	-	0.5	0.9
29/1500	E	13	17	0.2	SE	0.5	7	-	0.0	-	0.5	0.9
29/1800	E	14	18	0.2	SE	0.5	6	-	0.0	-	0.5	0.9
29/2100	E	14	18	0.4	SE	0.5	6	-	0.0	-	0.6	1.0
30/0000	E	15	20	0.5	SE	0.4	6	-	0.0	-	0.6	1.1
30/0300	E	15	20	0.5	SE	0.4	6	-	0.0	-	0.6	1.1
30/0600	E	15	20	0.5	SE	0.4	6	-	0.0	-	0.6	1.1
30/0900	E	15	20	0.5	SE	0.4	6	-	0.0	-	0.6	1.1
30/1200	E	15	20	0.5	SE	0.3	6	-	0.0	-	0.6	1.0
30/1500	E	15	20	0.5	SE	0.3	6	-	0.0	-	0.6	1.0
30/1800	E	14	18	0.5	SE	0.3	6	-	0.0	-	0.6	1.0
30/2100	E	14	18	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
01/0000	E	13	17	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
01/0300	ESE	11	14	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
01/0600	ESE	9	12	0.5	SE	0.4	5	-	0.0	-	0.6	1.0
01/0900	ESE	9	12	0.5	SE	0.4	5	-	0.0	-	0.6	1.0
01/1200	ESE	10	13	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
01/1500	ESE	11	14	0.6	SE	0.1	5	-	0.0	-	0.6	1.0
01/1800	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
01/2100	ESE	12	16	0.6	SE	0.1	5	-	0.0	-	0.6	1.0
02/0000	SE	11	14	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
02/0300	SE	10	13	0.5	SE	0.4	5	-	0.0	-	0.6	1.0
02/0600	ESE	9	12	0.5	SE	0.4	5	-	0.0	-	0.6	1.0
02/0900	ESE	9	12	0.5	SE	0.2	5	-	0.0	-	0.5	0.9
02/1200	ESE	11	14	0.5	SE	0.1	5	-	0.0	-	0.5	0.9
02/1500	ESE	12	16	0.6	-	0.0	-	-	0.0	-	0.6	1.0
02/1800	ESE	13	17	0.6	-	0.0	-	-	0.0	-	0.6	1.1
02/2100	SE	13	17	0.6	SE	0.1	6	-	0.0	-	0.6	1.1
03/0000	SE	12	16	0.6	SE	0.2	6	-	0.0	-	0.6	1.1
03/0300	SE	11	14	0.5	SE	0.4	6	S	0.1	4	0.7	1.1
03/0600	SSE	9	12	0.4	SE	0.4	6	S	0.2	4	0.6	1.0
03/0900	SSE	8	10	0.3	SE	0.4	6	S	0.2	4	0.6	0.9
03/1200	SE	9	12	0.4	SE	0.3	6	S	0.1	4	0.5	0.8
03/1500	SE	10	13	0.5	SE	0.2	6	-	0.0	-	0.5	0.8
03/1800	SE	10	13	0.5	SE	0.2	6	-	0.0	-	0.5	0.8
03/2100	SE	10	13	0.5	SE	0.2	6	-	0.0	-	0.5	0.8
04/0000	SSE	10	13	0.4	SE	0.2	6	S	0.1	4	0.5	0.8
04/0300	SSE	9	12	0.3	SE	0.2	6	S	0.2	4	0.4	0.7
04/0600	SE	7	9	0.2	SE	0.3	6	S	0.2	4	0.4	0.7

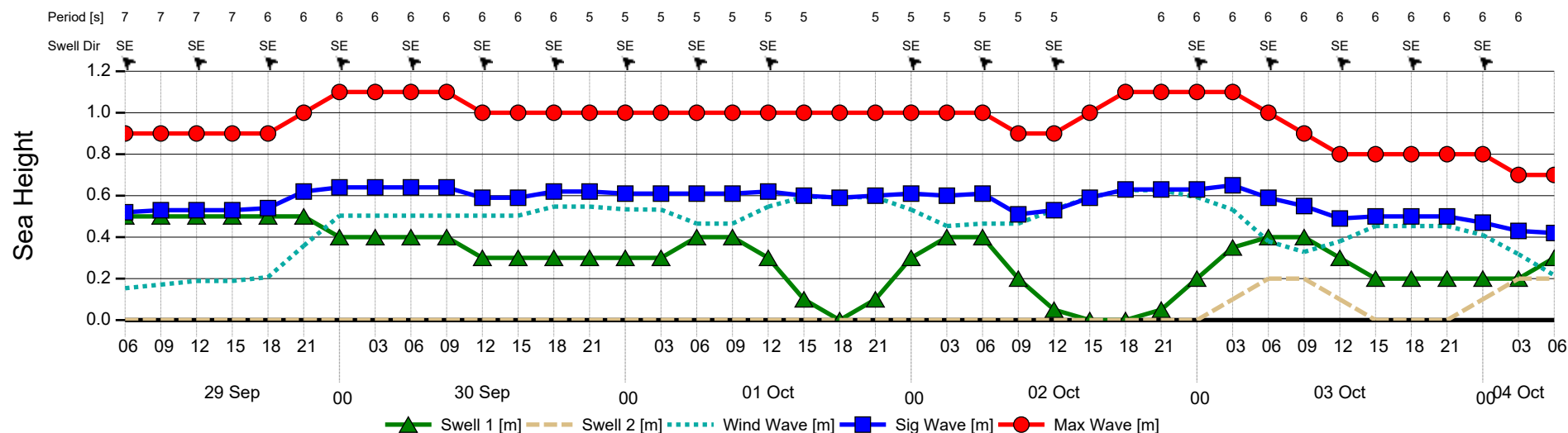
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



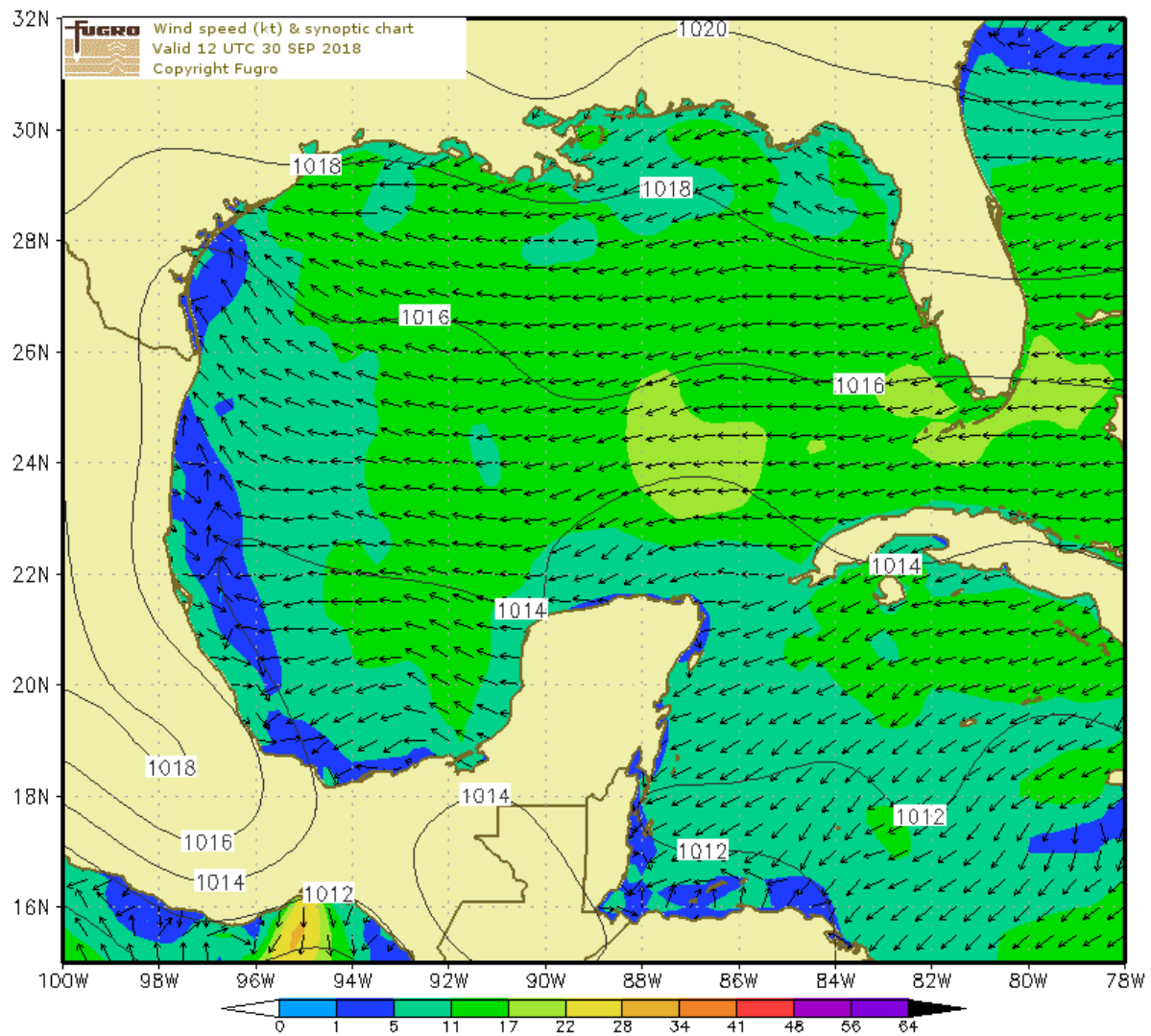
Wave Chart



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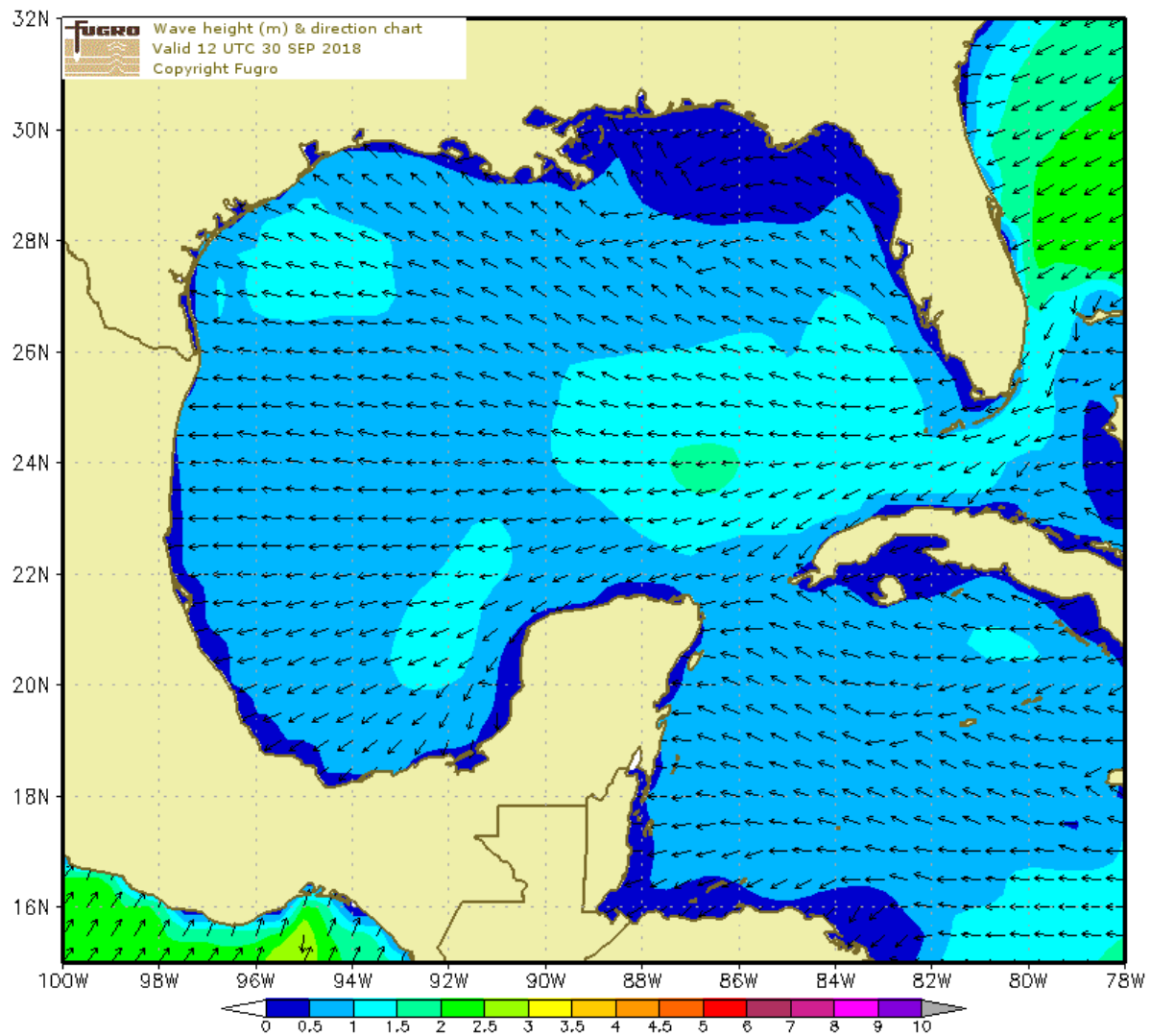
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To: Fugro USA Land Inc
Subject: Weather Forecast for Galveston at 29.32N 94.67W
Validity: Forecast valid 120 hours from 0600 (UTC-5) on 30 Sep 2018
Tropical Advisory: NIL.

Met Situation: Weak showery troughs move WNW over the central GoM and deepen at times over the NW GoM.
(Next 48 hours) Meanwhile a weak ridge extends SSW over the SE States towards the N GoM coastline. This becomes oriented SW by tomorrow afternoon and into Tuesday morning.

WARNINGS: THUNDERSTORMS. SQUALLS.
(Next 24 hours)

Weather: Heavy showers/thunderstorms during late mornings and afternoons. Clearing mainly fair during the evenings
(Next 48 hours) and overnight as these become more isolated.

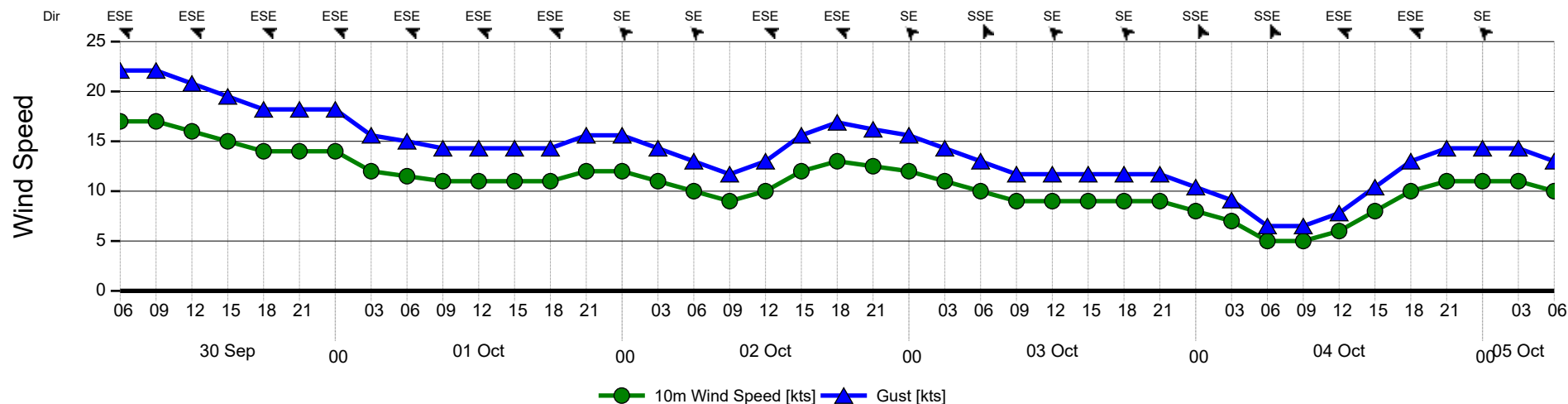
Confidence: Fairly high for trend, but moderate for peak wind/wave detail during the afternoons with troughs deepening nearby. Low overall by late period. Stronger gusts in/near showers.

Valid At	10m Wind Dir	10m Wind Speed	Gust	Wind Sea	Swell 1 Dir	Swell 1 Height	Swell 1 Period	Swell 2 Dir	Swell 2 Height	Swell 2 Period	Sig. Height	Max Wave
30/0600	ESE	17	22	0.6	SE	0.5	6	-	0.0	-	0.8	1.3
30/0900	ESE	17	22	0.6	SE	0.5	6	-	0.0	-	0.8	1.3
30/1200	ESE	16	21	0.6	SE	0.4	6	-	0.0	-	0.8	1.3
30/1500	ESE	15	20	0.7	SE	0.3	6	-	0.0	-	0.7	1.2
30/1800	ESE	14	18	0.7	SE	0.2	6	-	0.0	-	0.7	1.2
30/2100	ESE	14	18	0.7	SE	0.1	6	-	0.0	-	0.7	1.2
01/0000	ESE	14	18	0.7	-	0.0	-	-	0.0	-	0.7	1.2
01/0300	ESE	12	16	0.7	-	0.0	-	-	0.0	-	0.7	1.1
01/0600	ESE	12	15	0.6	SE	0.2	5	-	0.0	-	0.7	1.1
01/0900	ESE	11	14	0.5	SE	0.4	5	-	0.0	-	0.6	1.1
01/1200	ESE	11	14	0.5	SE	0.4	5	-	0.0	-	0.6	1.1
01/1500	ESE	11	14	0.5	SE	0.4	5	-	0.0	-	0.6	1.1
01/1800	ESE	11	14	0.5	SE	0.3	5	-	0.0	-	0.6	1.0
01/2100	ESE	12	16	0.5	SE	0.1	5	-	0.0	-	0.6	0.9
02/0000	SE	12	16	0.5	-	0.0	-	-	0.0	-	0.5	0.9
02/0300	SE	11	14	0.5	-	0.0	-	-	0.0	-	0.5	0.9
02/0600	SE	10	13	0.5	SE	0.2	6	-	0.0	-	0.5	0.8
02/0900	ESE	9	12	0.4	SE	0.3	6	-	0.0	-	0.5	0.8
02/1200	ESE	10	13	0.5	SE	0.2	6	-	0.0	-	0.5	0.8
02/1500	ESE	12	16	0.5	SE	0.1	6	-	0.0	-	0.5	0.8
02/1800	ESE	13	17	0.5	-	0.0	-	-	0.0	-	0.5	0.9
02/2100	SE	13	16	0.6	SE	0.1	5	-	0.0	-	0.6	1.0
03/0000	SE	12	16	0.6	SE	0.2	5	-	0.0	-	0.6	1.1
03/0300	SSE	11	14	0.5	SE	0.4	4	-	0.0	-	0.6	1.1
03/0600	SSE	10	13	0.5	SE	0.4	4	-	0.0	-	0.6	1.0
03/0900	SE	9	12	0.4	SE	0.4	4	-	0.0	-	0.6	0.9
03/1200	SE	9	12	0.4	SE	0.4	5	-	0.0	-	0.6	0.9
03/1500	SE	9	12	0.4	SE	0.3	5	-	0.0	-	0.5	0.8
03/1800	SE	9	12	0.4	SE	0.2	5	-	0.0	-	0.4	0.7
03/2100	SE	9	12	0.4	SE	0.2	6	-	0.0	-	0.4	0.7
04/0000	SSE	8	10	0.3	SE	0.3	6	-	0.0	-	0.4	0.7
04/0300	SSE	7	9	0.2	SE	0.3	6	-	0.0	-	0.4	0.6
04/0600	SSE	5	7	0.1	SE	0.3	6	-	0.0	-	0.3	0.5
04/0900	ESE	5	7	0.1	SE	0.3	6	-	0.0	-	0.3	0.5
04/1200	ESE	6	8	0.2	SE	0.3	6	-	0.0	-	0.3	0.5
04/1500	ESE	8	10	0.3	SE	0.2	6	-	0.0	-	0.3	0.5
04/1800	ESE	10	13	0.3	SE	0.1	6	-	0.0	-	0.3	0.5
04/2100	ESE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.6
05/0000	SE	11	14	0.4	-	0.0	-	-	0.0	-	0.4	0.7
05/0300	SSE	11	14	0.4	SE	0.2	6	-	0.0	-	0.5	0.8
05/0600	SSE	10	13	0.4	SE	0.4	6	-	0.0	-	0.5	0.9

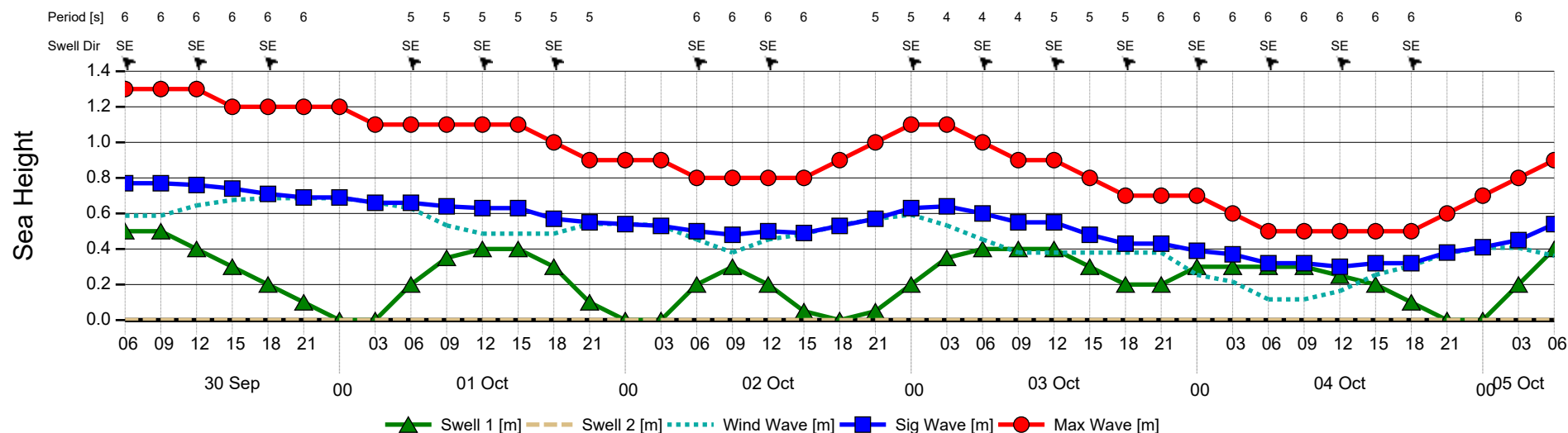
Forecaster: Megan Pearson

Notes: Wind speeds are in knots. Wave heights are in metres. The significant wave height is defined as the average of the highest 1/3rd of the waves. The maximum wave height is the average of the highest 1% of the waves.

Wind Chart



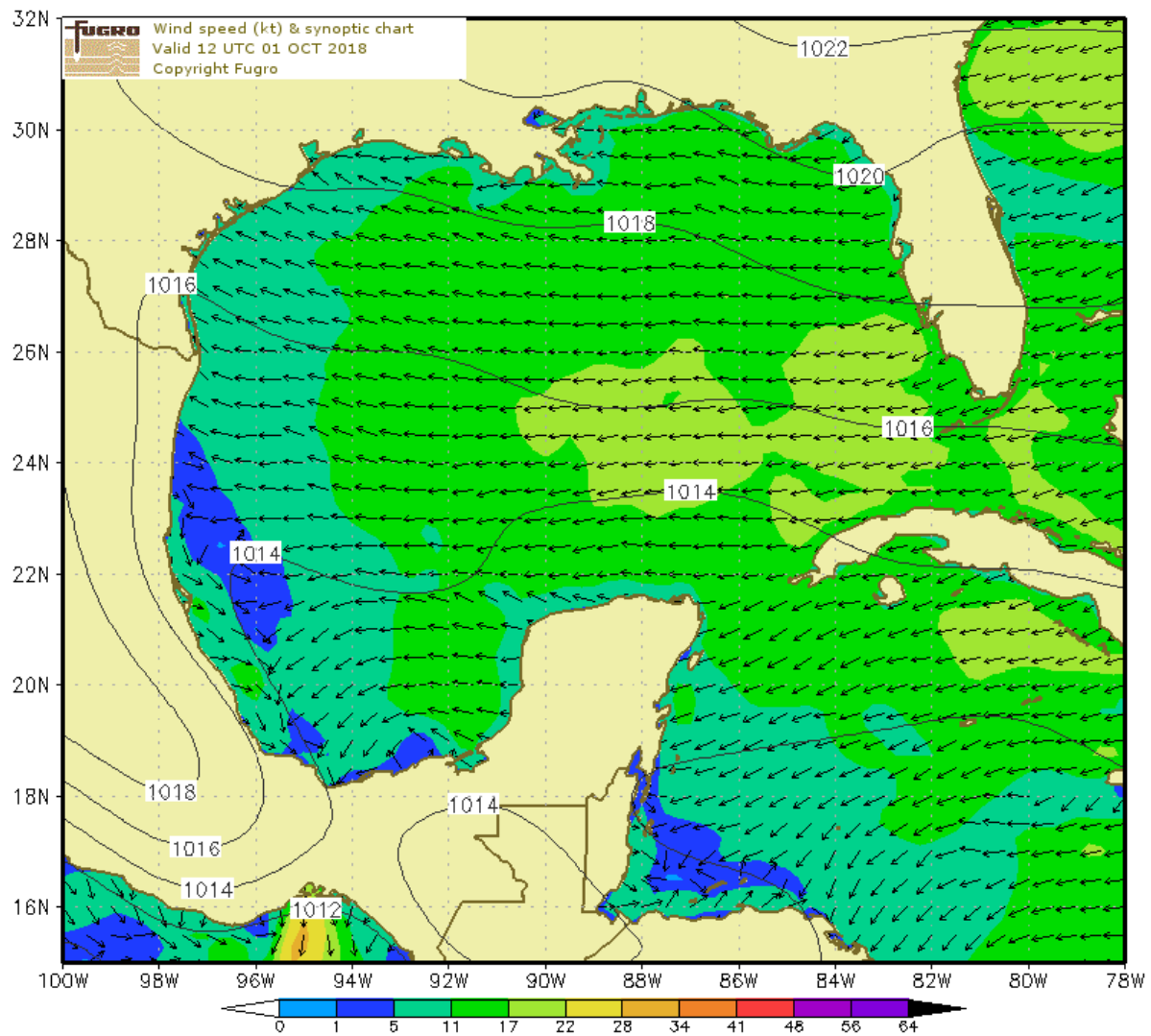
Wave Chart



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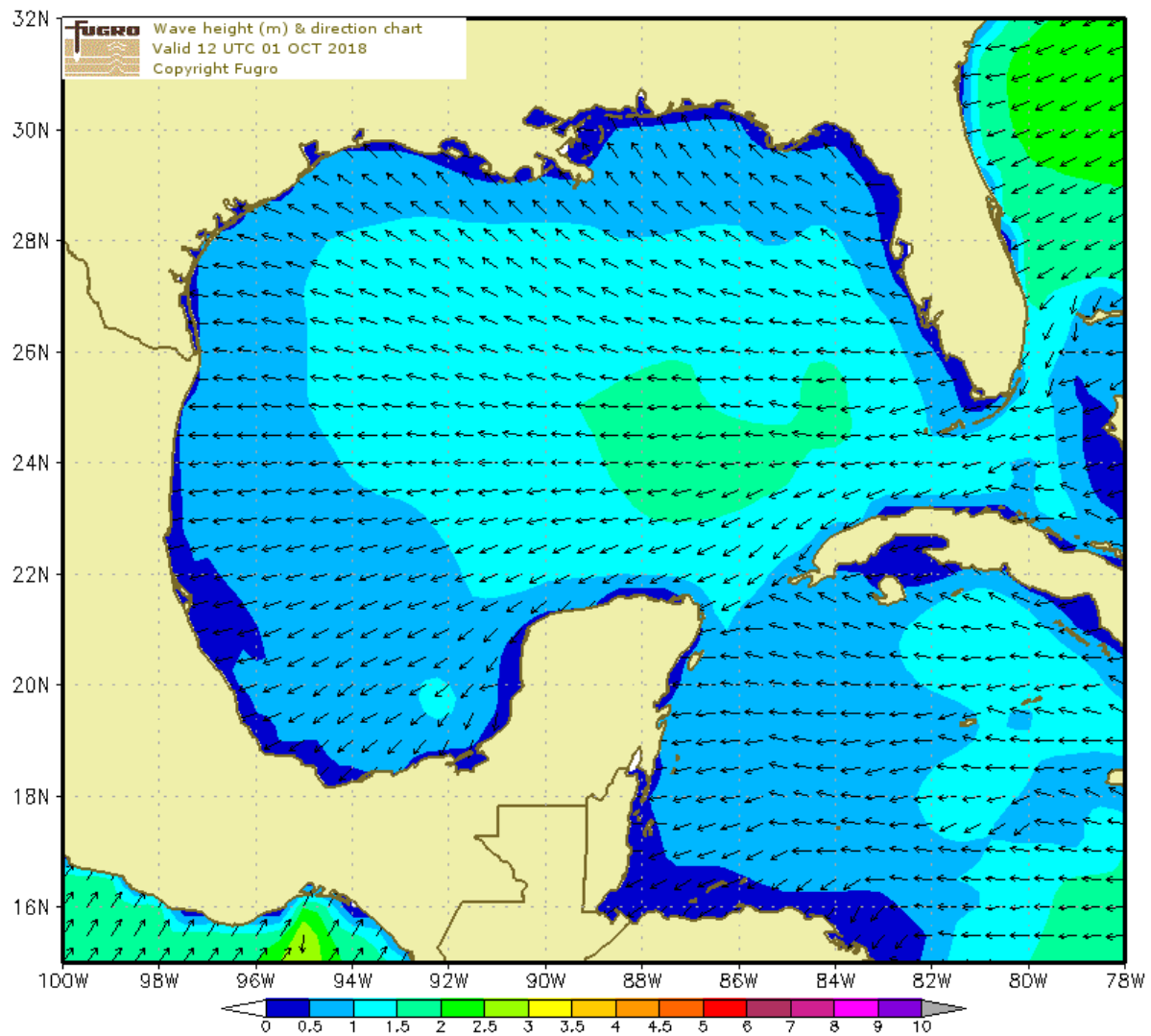
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Houston Weather History for October 1, 2018

Show weather for:

Scroll right to see more

Conditions			Comfort					
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Mon, Oct 1		76 °F	Mostly cloudy.	10 mph	↑	91%	30.08 "Hg	10 mi
1:53 am		76 °F	Overcast.	5 mph	↑	91%	30.09 "Hg	10 mi
2:53 am		76 °F	Mostly cloudy.	No wind	↑	88%	30.09 "Hg	10 mi
3:53 am		75 °F	Mostly cloudy.	5 mph	↑	90%	30.09 "Hg	10 mi
4:53 am		75 °F	Mostly cloudy.	3 mph	↑	90%	30.08 "Hg	9 mi
5:53 am		75 °F	Passing clouds.	6 mph	↑	94%	30.09 "Hg	8 mi
6:26 am		75 °F	Fog.	5 mph	↑	94%	30.08 "Hg	5 mi
6:53 am		76 °F	Passing clouds.	6 mph	↑	91%	30.10 "Hg	7 mi
7:53 am		76 °F	Fog.	6 mph	↑	91%	30.11 "Hg	6 mi
8:53 am		78 °F	Fog.	5 mph	↑	90%	30.13 "Hg	6 mi
9:32 am		78 °F	Thunderstorms. Cloudy.	5 mph	↑	90%	30.14 "Hg	7 mi
10:08 am		72 °F	Strong thunderstorms. Mostly cloudy.	10 mph	↑	84%	30.15 "Hg	1 mi
10:21 am		72 °F	Thunderstorms. Fog.	No wind	↑	87%	30.17 "Hg	3 mi
10:53 am		72 °F	Thunderstorms. Fog.	3 mph	↑	93%	30.18 "Hg	4 mi
11:53 am		74 °F	Thundershowers. Mostly cloudy.	3 mph	↑	91%	30.17 "Hg	9 mi















Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:36 pm		75 °F	Light rain. Partly sunny.	7 mph	↑	88%	30.15 "Hg	10 mi
12:53 pm		75 °F	Light rain. Partly sunny.	6 mph	↑	88%	30.16 "Hg	10 mi
1:53 pm		78 °F	Light rain. Broken clouds.	9 mph	↑	82%	30.13 "Hg	10 mi
2:53 pm		81 °F	Partly sunny.	6 mph	↑	74%	30.10 "Hg	10 mi
4:34 pm		80 °F	Partly sunny.	12 mph	↑	74%	30.08 "Hg	10 mi
4:53 pm		80 °F	Partly sunny.	12 mph	↑	74%	30.09 "Hg	10 mi
5:53 pm		79 °F	Broken clouds.	9 mph	↑	77%	30.07 "Hg	10 mi
6:53 pm		78 °F	Broken clouds.	3 mph	↑	79%	30.09 "Hg	10 mi
7:53 pm		77 °F	Passing clouds.	6 mph	↑	82%	30.10 "Hg	10 mi
8:53 pm		76 °F	Partly cloudy.	5 mph	↑	82%	30.11 "Hg	10 mi
9:53 pm		76 °F	Passing clouds.	5 mph	↑	82%	30.12 "Hg	10 mi
10:53 pm		75 °F	Passing clouds.	5 mph	↑	88%	30.13 "Hg	10 mi
11:53 pm		74 °F	Passing clouds.	3 mph	↑	91%	30.12 "Hg	10 mi














Show weather for:

October 2, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Tue, Oct 2		74 °F	Passing clouds.	5 mph	↑	91%	30.11 "Hg	10 mi
1:53 am		74 °F	Passing clouds.	No wind	↑	91%	30.11 "Hg	10 mi
2:53 am		73 °F	Passing clouds.	5 mph	↑	94%	30.09 "Hg	10 mi
3:53 am		73 °F	Passing clouds.	3 mph	↑	94%	30.09 "Hg	8 mi
4:23 am		73 °F	Passing clouds.	No wind	↑	94%	30.08 "Hg	7 mi
4:53 am		74 °F	Fog.	5 mph	↑	94%	30.09 "Hg	4 mi
5:53 am		74 °F	Fog.	5 mph	↑	97%	30.10 "Hg	3 mi
6:10 am		74 °F	Fog.	6 mph	↑	97%	30.09 "Hg	5 mi
6:53 am		74 °F	Fog.	6 mph	↑	94%	30.11 "Hg	6 mi
7:53 am		74 °F	Fog.	No wind	↑	97%	30.12 "Hg	4 mi
9:03 am		78 °F	Partly sunny.	5 mph	↑	90%	30.12 "Hg	8 mi
9:53 am		80 °F	Partly sunny.	7 mph	↑	87%	30.14 "Hg	8 mi
10:40 am		83 °F	Partly sunny.	6 mph	↑	82%	30.13 "Hg	10 mi
11:01 am		84 °F	Broken clouds.	7 mph	↑	77%	30.13 "Hg	10 mi
11:02 am		84 °F	Partly sunny.	8 mph	↑	77%	30.13 "Hg	10 mi
11:34 am		86 °F	Scattered clouds.	8 mph	↑	72%	30.13 "Hg	10 mi

















Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
11:53 am		86 °F	Scattered clouds.	9 mph	↑	70%	30.14 "Hg	10 mi
12:53 pm		87 °F	Scattered clouds.	10 mph	↑	67%	30.12 "Hg	10 mi
1:53 pm		86 °F	Scattered clouds.	8 mph	↑	67%	30.09 "Hg	10 mi
2:53 pm		86 °F	Scattered clouds.	9 mph	↑	70%	30.06 "Hg	10 mi
3:53 pm		86 °F	Broken clouds.	13 mph	↑	67%	30.05 "Hg	10 mi
4:53 pm		85 °F	Broken clouds.	9 mph	↑	72%	30.04 "Hg	10 mi
5:53 pm		83 °F	Broken clouds.	8 mph	↑	79%	30.05 "Hg	10 mi
6:53 pm		82 °F	Broken clouds.	7 mph	↑	82%	30.05 "Hg	10 mi
7:53 pm		81 °F	Passing clouds.	3 mph	↑	85%	30.06 "Hg	10 mi
8:53 pm		80 °F	Passing clouds.	3 mph	↑	87%	30.07 "Hg	9 mi
9:53 pm		79 °F	Passing clouds.	6 mph	↑	90%	30.08 "Hg	8 mi
10:53 pm		78 °F	Passing clouds.	No wind	↑	93%	30.08 "Hg	8 mi
11:53 pm		77 °F	Fog.	3 mph	↑	96%	30.07 "Hg	6 mi












Show weather for:

October 3, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Wed, Oct 3		76 °F	Fog.	No wind	↑	97%	30.06 "Hg	8 mi
1:53 am		75 °F	Fog.	No wind	↑	96%	30.06 "Hg	8 mi
2:53 am		75 °F	Fog.	No wind	↑	96%	30.04 "Hg	7 mi
3:17 am		75 °F	Fog.	No wind	↑	96%	30.02 "Hg	7 mi
3:53 am		76 °F	Fog.	No wind	↑	94%	30.03 "Hg	7 mi
4:53 am		75 °F	Fog.	3 mph	↑	96%	30.02 "Hg	6 mi
5:44 am		75 °F	Fog.	No wind	↑	96%	30.01 "Hg	2 mi
6:09 am		75 °F	Fog.	No wind	↑	96%	30.01 "Hg	5 mi
6:53 am		74 °F	Fog.	No wind	↑	97%	30.03 "Hg	6 mi
7:53 am		75 °F	Passing clouds.	No wind	↑	96%	30.03 "Hg	10 mi
8:53 am		81 °F	Passing clouds.	No wind	↑	88%	30.04 "Hg	10 mi
9:53 am		82 °F	Scattered clouds.	3 mph	↑	82%	30.05 "Hg	10 mi
10:53 am		86 °F	Scattered clouds.	5 mph	↑	70%	30.05 "Hg	10 mi
11:53 am		87 °F	Scattered clouds.	7 mph	↑	65%	30.04 "Hg	10 mi
1:02 pm		88 °F	Scattered clouds.	9 mph	↑	65%	30.01 "Hg	10 mi
1:53 pm		89 °F	Scattered clouds.	10 mph	↑	61%	30.00 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
2:53 pm		87 °F	Scattered clouds.	10 mph	↑	67%	29.97 "Hg	10 mi
3:53 pm		88 °F	Partly sunny.	10 mph	↑	63%	29.95 "Hg	10 mi
4:53 pm		89 °F	Broken clouds.	9 mph	↑	63%	29.95 "Hg	10 mi
5:53 pm		87 °F	Broken clouds.	9 mph	↑	63%	29.96 "Hg	10 mi
6:53 pm		84 °F	Scattered clouds.	9 mph	↑	70%	29.97 "Hg	10 mi
7:53 pm		82 °F	Passing clouds.	7 mph	↑	77%	29.98 "Hg	10 mi
8:53 pm		80 °F	Passing clouds.	3 mph	↑	85%	30.00 "Hg	10 mi
9:53 pm		79 °F	Passing clouds.	3 mph	↑	88%	30.01 "Hg	10 mi
10:53 pm		79 °F	Passing clouds.	No wind	↑	88%	30.01 "Hg	10 mi
11:53 pm		78 °F	Passing clouds.	No wind	↑	90%	30.01 "Hg	10 mi
















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Show weather for:

October 4, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Thu, Oct 4		78 °F	Passing clouds.	No wind	↑	90%	30.00 "Hg	10 mi
1:53 am		77 °F	Passing clouds.	3 mph	↑	94%	29.99 "Hg	10 mi
2:53 am		77 °F	Passing clouds.	3 mph	↑	94%	29.99 "Hg	10 mi
3:53 am		76 °F	Passing clouds.	3 mph	↑	97%	29.99 "Hg	10 mi
4:53 am		76 °F	Passing clouds.	No wind	↑	94%	29.99 "Hg	10 mi
5:53 am		76 °F	Passing clouds.	No wind	↑	94%	30.01 "Hg	10 mi
6:53 am		75 °F	Passing clouds.	No wind	↑	94%	30.02 "Hg	10 mi
7:53 am		76 °F	Passing clouds.	No wind	↑	94%	30.04 "Hg	10 mi
8:53 am		81 °F	Passing clouds.	No wind	↑	82%	30.06 "Hg	10 mi
9:53 am		83 °F	Scattered clouds.	3 mph	↑	77%	30.07 "Hg	10 mi
10:53 am		85 °F	Scattered clouds.	3 mph	↑	68%	30.07 "Hg	10 mi
11:53 am		88 °F	Scattered clouds.	No wind	↑	61%	30.06 "Hg	10 mi
12:53 pm		88 °F	Scattered clouds.	6 mph	↑	57%	30.03 "Hg	10 mi
1:53 pm		90 °F	Scattered clouds.	8 mph	↑	61%	30.01 "Hg	10 mi
2:53 pm		87 °F	Light rain. Broken clouds.	8 mph	↑	67%	29.99 "Hg	10 mi
3:53 pm		87 °F	Partly sunny.	7 mph	↑	65%	29.97 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
4:53 pm		87 °F	Broken clouds.	9 mph	↑	65%	29.96 "Hg	10 mi
5:53 pm		88 °F	Scattered clouds.	7 mph	↑	61%	29.97 "Hg	10 mi
6:53 pm		84 °F	Scattered clouds.	7 mph	↑	70%	29.98 "Hg	10 mi
7:53 pm		82 °F	Passing clouds.	6 mph	↑	72%	29.99 "Hg	10 mi
8:53 pm		80 °F	Passing clouds.	3 mph	↑	79%	30.01 "Hg	10 mi
9:53 pm		79 °F	Passing clouds.	3 mph	↑	82%	30.01 "Hg	10 mi
10:53 pm		78 °F	Passing clouds.	No wind	↑	87%	30.02 "Hg	10 mi
11:53 pm		78 °F	Passing clouds.	No wind	↑	87%	30.00 "Hg	10 mi

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Show weather for:

October 5, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Fri, Oct 5		77 °F	Passing clouds.	No wind	↑	94%	29.99 "Hg	10 mi
1:53 am		77 °F	Passing clouds.	No wind	↑	90%	29.99 "Hg	10 mi
2:53 am		77 °F	Passing clouds.	No wind	↑	90%	29.99 "Hg	10 mi
3:53 am		76 °F	Passing clouds.	3 mph	↑	94%	29.98 "Hg	9 mi
4:53 am		77 °F	Passing clouds.	No wind	↑	90%	29.98 "Hg	10 mi
5:53 am		76 °F	Passing clouds.	No wind	↑	94%	29.99 "Hg	10 mi
6:53 am		76 °F	Passing clouds.	3 mph	↑	94%	30.00 "Hg	10 mi
7:53 am		78 °F	Passing clouds.	5 mph	↑	90%	30.01 "Hg	10 mi
8:53 am		82 °F	Passing clouds.	8 mph	↑	82%	30.01 "Hg	10 mi
9:53 am		84 °F	Scattered clouds.	9 mph	↑	74%	30.03 "Hg	10 mi
10:53 am		86 °F	Scattered clouds.	7 mph	↑	67%	30.02 "Hg	10 mi
11:53 am		87 °F	Scattered clouds.	No wind	↑	63%	30.00 "Hg	10 mi
12:53 pm		89 °F	Scattered clouds.	8 mph	↑	63%	29.98 "Hg	10 mi
1:53 pm		87 °F	Scattered clouds.	13 mph	↑	67%	29.97 "Hg	10 mi
2:53 pm		87 °F	Scattered clouds.	13 mph	↑	65%	29.94 "Hg	10 mi
3:53 pm		86 °F	Light rain. Broken clouds.	14 mph	↑	65%	29.94 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
4:53 pm		87 °F	Scattered clouds.	12 mph	↑	61%	29.93 "Hg	10 mi
5:53 pm		86 °F	Scattered clouds.	9 mph	↑	59%	29.93 "Hg	10 mi
6:53 pm		83 °F	Scattered clouds.	7 mph	↑	70%	29.93 "Hg	10 mi
7:53 pm		82 °F	Passing clouds.	6 mph	↑	74%	29.95 "Hg	10 mi
8:53 pm		80 °F	Passing clouds.	7 mph	↑	81%	29.96 "Hg	10 mi
9:53 pm		80 °F	Passing clouds.	6 mph	↑	81%	29.96 "Hg	10 mi
10:53 pm		79 °F	Passing clouds.	6 mph	↑	84%	29.95 "Hg	10 mi
11:53 pm		79 °F	Passing clouds.	3 mph	↑	82%	29.94 "Hg	10 mi

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Show weather for:

October 6, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Sat, Oct 6		78 °F	Passing clouds.	3 mph	↑	84%	29.94 "Hg	10 mi
1:53 am		77 °F	Passing clouds.	5 mph	↑	88%	29.94 "Hg	10 mi
2:53 am		77 °F	Passing clouds.	5 mph	↑	88%	29.94 "Hg	10 mi
3:53 am		77 °F	Passing clouds.	No wind	↑	88%	29.94 "Hg	10 mi
4:53 am		76 °F	Passing clouds.	No wind	↑	88%	29.94 "Hg	10 mi
5:53 am		75 °F	Passing clouds.	No wind	↑	94%	29.95 "Hg	10 mi
6:53 am		76 °F	Passing clouds.	6 mph	↑	91%	29.95 "Hg	10 mi
7:53 am		76 °F	Scattered clouds.	3 mph	↑	88%	29.96 "Hg	10 mi
8:53 am		81 °F	Scattered clouds.	5 mph	↑	77%	29.97 "Hg	10 mi
9:53 am		84 °F	Scattered clouds.	10 mph	↑	67%	29.98 "Hg	10 mi
10:53 am		86 °F	Broken clouds.	8 mph	↑	59%	29.98 "Hg	10 mi
11:53 am		88 °F	Scattered clouds.	3 mph	↑	55%	29.98 "Hg	10 mi
12:53 pm		88 °F	Broken clouds.	7 mph	↑	59%	29.96 "Hg	10 mi
1:53 pm		91 °F	Broken clouds.	8 mph	↑	54%	29.94 "Hg	10 mi
2:53 pm		91 °F	Broken clouds.	6 mph	↑	54%	29.92 "Hg	10 mi
3:53 pm		89 °F	Broken clouds.	9 mph	↑	59%	29.91 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
4:53 pm		89 °F	Broken clouds.	12 mph	↑	61%	29.90 "Hg	10 mi
6:00 pm		82 °F	Heavy rain. Partly sunny.	3 mph	↑	79%	29.90 "Hg	7 mi
6:53 pm		82 °F	Partly sunny.	5 mph	↑	77%	29.92 "Hg	10 mi
7:53 pm		81 °F	Passing clouds.	5 mph	↑	79%	29.93 "Hg	10 mi
8:53 pm		81 °F	Passing clouds.	6 mph	↑	82%	29.93 "Hg	10 mi
9:53 pm		81 °F	Passing clouds.	7 mph	↑	82%	29.93 "Hg	10 mi
10:53 pm		80 °F	Passing clouds.	3 mph	↑	85%	29.94 "Hg	10 mi
11:53 pm		80 °F	Passing clouds.	6 mph	↑	87%	29.93 "Hg	10 mi

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Show weather for:

October 7, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Sun, Oct 7		80 °F	Passing clouds.	7 mph	↑	87%	29.93 "Hg	10 mi
1:53 am		79 °F	Passing clouds.	5 mph	↑	88%	29.94 "Hg	10 mi
2:53 am		79 °F	Passing clouds.	7 mph	↑	88%	29.93 "Hg	10 mi
3:53 am		79 °F	Passing clouds.	8 mph	↑	82%	29.93 "Hg	10 mi
4:53 am		77 °F	Passing clouds.	3 mph	↑	82%	29.93 "Hg	10 mi
5:53 am		76 °F	Passing clouds.	3 mph	↑	88%	29.93 "Hg	10 mi
6:53 am		77 °F	Passing clouds.	No wind	↑	88%	29.95 "Hg	10 mi
7:53 am		77 °F	Broken clouds.	5 mph	↑	90%	29.95 "Hg	9 mi
8:53 am		82 °F	Broken clouds.	8 mph	↑	82%	29.96 "Hg	10 mi
9:53 am		85 °F	Partly sunny.	10 mph	↑	72%	29.97 "Hg	10 mi
10:53 am		86 °F	Partly sunny.	10 mph	↑	63%	29.98 "Hg	10 mi
11:53 am		89 °F	Broken clouds.	16 mph	↑	57%	29.97 "Hg	10 mi
12:23 pm		86 °F	Thunderstorms. Broken clouds.	13 mph	↑	63%	29.96 "Hg	10 mi
12:32 pm		86 °F	Thunderstorms. Broken clouds.	12 mph	↑	63%	29.95 "Hg	10 mi
1:05 pm		90 °F	Broken clouds.	13 mph	↑	56%	29.93 "Hg	10 mi
1:53 pm		89 °F	Broken clouds.	17 mph	↑	55%	29.91 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
2:53 pm		90 °F	Broken clouds.	13 mph	↑	54%	29.90 "Hg	10 mi
3:53 pm		84 °F	Thunderstorms. Broken clouds.	8 mph	↑	59%	29.91 "Hg	10 mi
4:24 pm		86 °F	Broken clouds.	10 mph	↑	65%	29.89 "Hg	10 mi
4:53 pm		86 °F	Broken clouds.	13 mph	↑	65%	29.90 "Hg	10 mi
5:53 pm		84 °F	Broken clouds.	12 mph	↑	61%	29.89 "Hg	10 mi
6:53 pm		82 °F	Broken clouds.	8 mph	↑	72%	29.90 "Hg	10 mi
7:53 pm		77 °F	Passing clouds.	5 mph	↑	85%	29.90 "Hg	10 mi
8:53 pm		78 °F	Passing clouds.	5 mph	↑	87%	29.90 "Hg	10 mi
9:53 pm		79 °F	Passing clouds.	6 mph	↑	84%	29.91 "Hg	10 mi
10:53 pm		78 °F	Passing clouds.	6 mph	↑	84%	29.91 "Hg	10 mi
11:53 pm		79 °F	Passing clouds.	6 mph	↑	82%	29.90 "Hg	10 mi











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Show weather for:

October 8, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Mon, Oct 8		79 °F	Passing clouds.	6 mph	↑	84%	29.90 "Hg	10 mi
1:53 am		78 °F	Passing clouds.	5 mph	↑	84%	29.90 "Hg	10 mi
2:53 am		77 °F	Passing clouds.	6 mph	↑	85%	29.89 "Hg	10 mi
3:53 am		76 °F	Passing clouds.	No wind	↑	88%	29.88 "Hg	10 mi
4:53 am		75 °F	Passing clouds.	No wind	↑	90%	29.86 "Hg	10 mi
5:53 am		76 °F	Passing clouds.	5 mph	↑	88%	29.87 "Hg	10 mi
6:53 am		76 °F	Passing clouds.	3 mph	↑	88%	29.87 "Hg	10 mi
7:53 am		77 °F	Passing clouds.	5 mph	↑	85%	29.88 "Hg	10 mi
8:53 am		81 °F	Passing clouds.	8 mph	↑	79%	29.88 "Hg	10 mi
9:53 am		85 °F	Scattered clouds.	10 mph	↑	68%	29.89 "Hg	10 mi
10:53 am		86 °F	Scattered clouds.	12 mph	↑	63%	29.89 "Hg	10 mi
11:53 am		86 °F	Partly sunny.	14 mph	↑	63%	29.88 "Hg	10 mi
12:53 pm		81 °F	Scattered clouds.	9 mph	↑	79%	29.87 "Hg	10 mi
1:29 pm		78 °F	Light rain. Broken clouds.	10 mph	↑	82%	29.84 "Hg	5 mi
1:53 pm		85 °F	Scattered clouds.	13 mph	↑	72%	29.83 "Hg	10 mi
2:53 pm		86 °F	Scattered clouds.	10 mph	↑	63%	29.81 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
3:53 pm		86 °F	Broken clouds.	13 mph	↑	65%	29.81 "Hg	10 mi
4:53 pm		84 °F	Broken clouds.	13 mph	↑	70%	29.80 "Hg	10 mi
5:53 pm		84 °F	Broken clouds.	13 mph	↑	67%	29.79 "Hg	10 mi
6:53 pm		82 °F	Scattered clouds.	9 mph	↑	74%	29.79 "Hg	10 mi
7:53 pm		80 °F	Passing clouds.	7 mph	↑	79%	29.80 "Hg	10 mi
8:53 pm		80 °F	Passing clouds.	6 mph	↑	79%	29.81 "Hg	10 mi
9:53 pm		79 °F	Passing clouds.	5 mph	↑	82%	29.83 "Hg	10 mi
10:53 pm		78 °F	Passing clouds.	5 mph	↑	84%	29.82 "Hg	10 mi
11:53 pm		79 °F	Passing clouds.	5 mph	↑	84%	29.81 "Hg	10 mi

















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Show weather for:

October 22, 2018



Scroll right to see more

Conditions				Comfort				
Time		Temp	Weather	Wind		Humidity	Barometer	Visibility
12:53 am Mon, Oct 22		61 °F	Passing clouds.	8 mph	↑	62%	30.19 "Hg	10 mi
1:53 am		60 °F	Passing clouds.	6 mph	↑	65%	30.18 "Hg	10 mi
2:53 am		59 °F	Passing clouds.	6 mph	↑	67%	30.16 "Hg	10 mi
3:53 am		59 °F	Partly cloudy.	7 mph	↑	67%	30.16 "Hg	10 mi
4:53 am		57 °F	Passing clouds.	8 mph	↑	69%	30.16 "Hg	10 mi
5:53 am		56 °F	Passing clouds.	7 mph	↑	72%	30.16 "Hg	10 mi
6:53 am		55 °F	Partly cloudy.	8 mph	↑	72%	30.16 "Hg	10 mi
7:53 am		55 °F	Overcast.	8 mph	↑	72%	30.17 "Hg	8 mi
8:53 am		56 °F	Overcast.	7 mph	↑	70%	30.19 "Hg	10 mi
9:53 am		58 °F	Overcast.	7 mph	↑	67%	30.20 "Hg	10 mi
10:53 am		60 °F	Cloudy.	7 mph	↑	65%	30.20 "Hg	10 mi
11:53 am		64 °F	Overcast.	8 mph	↑	61%	30.19 "Hg	10 mi
12:53 pm		66 °F	Mostly cloudy.	6 mph	↑	59%	30.17 "Hg	10 mi
1:53 pm		67 °F	Mostly cloudy.	8 mph	↑	59%	30.14 "Hg	10 mi
2:53 pm		69 °F	Mostly cloudy.	6 mph	↑	53%	30.13 "Hg	10 mi
3:53 pm		69 °F	Overcast.	8 mph	↑	53%	30.12 "Hg	10 mi

Time	Conditions		Comfort					
		Temp	Weather	Wind		Humidity	Barometer	Visibility
4:53 pm		67 °F	More clouds than sun.	10 mph	↑	59%	30.12 "Hg	10 mi
5:53 pm		65 °F	More clouds than sun.	10 mph	↑	61%	30.11 "Hg	10 mi
6:53 pm		64 °F	Mostly cloudy.	14 mph	↑	58%	30.13 "Hg	10 mi
7:53 pm		63 °F	Mostly cloudy.	10 mph	↑	65%	30.14 "Hg	10 mi
8:53 pm		63 °F	Mostly cloudy.	12 mph	↑	65%	30.15 "Hg	10 mi
9:53 pm		62 °F	Mostly cloudy.	12 mph	↑	65%	30.16 "Hg	10 mi
10:53 pm		62 °F	Mostly cloudy.	9 mph	↑	65%	30.16 "Hg	10 mi
11:53 pm		62 °F	Mostly cloudy.	10 mph	↑	65%	30.15 "Hg	10 mi

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APPENDIX D

BENCHMARK SAMPLE DESCRIPTIONS

APPENDIX D - STRATIGRAPHY HSCNew-NMP-01
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-01AH3-1	10/06/19	-33.0	5.0	5.0	1	0-5 ft. Dark gray silt	Hydrocarbon	3,209,399	13,844,992
HSCNew-NMP-01AH3-2	10/06/19	-36.1	5.5	5.5	1	0-4 ft. Dark gray silt	none	3,209,391	13,845,001
						4-5.5 ft. Tan and gray silty sand			
HSCNew-NMP-01AH3-3	10/06/19	-36.1	5.5	5.5	1	0-4.5 ft. Dark gray silt	Hydrocarbon	3,306,062	13,706,660
						4.5-5.5 ft. Dark gray sandy silt			
HSCNew-NMP-01AH3-4	10/06/19	-35.1	5.0	5.0	1	0-4 ft. Dark gray silt	none	3,209,370	13,844,967
						4-5.5 ft. Dark gray sandy silt			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-02
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-02-A-1	10/06/19	-34.7	-	-	-	0-10.5 ft Not sampled	-	3,190,670	13,835,075
		-44.7	5.0	5.0	1	10.5-15.5 ft. Dark gray silt	Hydrocarbon		
HSCNew-NMP-02-A-2	10/06/19	-34.2	-	-	-	0-10 ft. Not sampled	-	3,190,674	13,835,065
		-44.2	5.0	5.0	1	10-15 ft. Dark gray silt	Hydrocarbon		
HSCNew-NMP-02-C-1	10/06/19	-16.1	-	-	-	0-11 ft Not sampled	-	3190740	13835560
		-27.1	4.0	4.0	1	11-16 ft. Tan sandy clay with shell hash and shell fragments	none		
		-32.1	5.0	5.0	2	16-20 ft. Tan sandy clay with some shell hash	none		
						20-21 ft. Tan/orange firm clay			
		-37.1	5.0	5.0	3	21--25 ft. Tan/orange firm clay	none		
						25-26 ft. Tan/orange sandy clay			
		-42.1	5.0	5.0	5	26-31 ft. Green and orange sandy clay with calcite nodules	none		
-47.1	2.5	2.5	6	31-33.5 ft. Firm orange clay with firm green clay					

APPENDIX D - STRATIGRAPHY HSCNew-NMP-03
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)

APPENDIX D - STRATIGRAPHY HSCNew-NMP-03
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-03-A-1	10/05/18	-31.2	5.0	3.0	1	0-3 ft. Clayey sand, light gray with trash (debris) with brown sand at timp of core head	none	3,185,272	13,837,839
						3-5 ft. Not sampled (no retrieval)			
		-36.2	5.0	5.0	2	5-10 ft. Hard gray green clay	none		
		-41.2	5.0	3.0	3	10-12 ft. Not sampled (not retrieval)			
		-46.2	5.0	2.9	4	12-14 ft. Gray green orange tan clay mix	none		
						14-14.25 light brown sand			
						14.25-15 ft. Gray green orange tan clay mix			
-51.2	3.0	3.0	5	15-18 ft. Orange clay	none				
HSCNew-NMP-03-A-1 (Dup)	10/05/18	-30.6	5.0	3.0	1	0-3 ft. Not sampled (no retrieval)	none	3,185,291	13,837,849
						3-5 ft. Dark gray silty sand			
		-35.6	5.0	5.0	2	5-7 ft. Dark gray silty sand	none		
						7-9 ft. Tan firm clay			
						9-10 ft. Green firm clay			
		-40.6	5.0	3.0	3	10-12.5 ft. Not sampled (no retrieval)	none		
						12.5-13.5 ft. Light tan sand			
						13.5-15 ft. Tan orange sandy clay			
		-45.6				14.25-15 ft. Gray green orange tan clay mix			
		-50.6	4.0	4.0	4	15-16 ft. Tan firm clay	none		
						16-19 ft. Green firm clay mised with sandy clay			
HSCNew-NMP-03-C-1	10/05/18	-22.0	2.0	1.0	1	0-1 ft. Brpwn sand and gray silt mix	none	3,185,164	13,838,758
						1-2 ft. Not sampled (no retrieval)			
		-24.0	5.0	5.0	2	2-6 ft. Not sampled (no retrieval)	none		
						6-7 ft. Brown sand			
		-29.0	5.0	3.0	3	7-9 ft. Brown sand with shell pieces	none		
						9-12 ft. Not sampled (not retrieval)			
		-34.0	5.0	3.0	4	12-15 ft. Brown sand	none		
						15-17 ft. Not sampled (no retrieval)			
		-39.0	5.0	5.0	5	17-22 ft. Orange clay	none		
		-44.0	5.0	5.0	6	22-26 ft. Orange clay with brown sand pockets	none		
26-27 ft. Brown sand with clay nodules									
HSCNew-NMP-03-C-1 (Dup)	10/05/18	-19.7	4.0	2.0	1	0-2 ft. Brown sand with black silt	none	3,185,164	13,838,762
						2-4 ft. Not sampled (no retrieval)			
		-23.7	5.0	5.0	3	4-6 ft. Gray sand	none		
						6-7.5 ft. Gray black silt			
						7.5-8.5 ft. Gray sandy clay			
						8.5-9 ft. Gray sand			
						9-12 ft. Not sampled (no retrieval)			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-03
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
		-28.7	5.0	2.0	4	12-13 ft.Brown gray sand	none		
						13-14 ft. Light brown sand			
		-33.7	5.0	5.0	5	14-19 ft. Gray sand with clay pug in core head	none		
		-38.7	5.0	3.0	6	19-21 ft. Not sampled (no retrieval)	none		
						21-24 ft. Gray sand			
		-43.7	4.0	4.0	7	24-28 ft. Gray sand	none		

APPENDIX D - STRATIGRAPHY HSCNew-NMP-04
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-04A-1	10/05/18	-30.5	-	-	-	0-14 ft. Not sampled	none	3,177,578	13,837,883
		-44.5	5.0	5.0	1	14-16.25 ft. Black silt			
						16.25-16.5 ft. Gray sand			
						16.5-19 ft. Orange clay			
HSCNew-NMP-04A-2	10/05/18	-37.7	-	-	-	0-7 ft. Not sampled	none	3,177,560	13,837,887
		-44.7	5.0	5.0	1	7-10.5 ft. Black silt			
						10.5-10.75 ft. Gray brown sand layer			
						10.75-12 ft. Orange clay			
HSCNew-NMP-04C-1	10/05/18	-43.3	-	-	-	0-1.5 ft. Not sampled	-	3,177,446	13,838,353
		-44.8	4.5	1.5	1	1.5-4 ft. Gray and black silt	none		
						4-6 ft. Not sampled (No retrieval)			
HSCNew-NMP-04C-2	10/05/18	-43.4	-	-	-	0-1.5 ft. Not sampled	-	3,177,448	13,838,374
		-44.9	4.0	4.0	1	1-5 ft. Black silt with shell hash and gravel	none		
HSCNew-NMP-04C-3	10/05/18	-43.0	-	-	-	0-1.5 ft. Not sampled	-	3,177,473	13,838,383
		-44.5	5.0	5.0	1	1.5-3 ft. Gray and black silt	none		
						3-6.5 ft. Not sampled (gravel)			
HSCNew-NMP-04C-4	10/05/18	-43.0	-	-	-	0-1.7 ft. Not sampled	-	3,177,493	13,838,377
		-44.7	5.0	5.0	1	1-5 ft. Black silt	none		
						5-6 ft. Orange clay			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-05
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-05A-1	10/05/18	-37.7	-	-	-	0-8 ft. Not sampled	-	3,171,789	13,832,332
		-45.7	5.0	5.0	1	8-12 ft. Gray and black silt with clay at the bottom 3 inches	none		
HSCNew-NMP-05A-2	10/05/18	-39.5	-	-	-	0-8 ft. Not sampled	-	3,171,785	13,832,337
		-47.5	4.0	4.0	1	8-11.5 ft. Black silt	none		
						11.5-12 ft. Orange sandstone clay			
HSCNew-NMP-05A-3	10/04/18	-40.5	-	-	-	0-5 ft. Not sampled	-	3,171,778	13,832,329
		-45.5	5.0	5.0	1	5-9 ft. Black silt	none		
HSCNew-NMP-05C-1	10/04/18	-11.5	-	-	-	0-33 ft. Not sampled	-	3,171,351	13,832,522
		-44.5	5.0	5.0	1	33-36 ft. Orange and white clay, sampler hit hard sandstone and could not drill down to -49.5	none		
HSCNew-NMP-05C-2	10/04/19	-14.1	-	-	-	0-30.5 ft. Not sampled	-	3,171,367	13,832,517
		-44.6	5.5	5.5	1	30.5-33 ft. Red brown orange sand with clay pockets	none		
						33-35.5 ft. Orange and light gray clay			
HSCNew-NMP-05C-3	10/04/19	-19.5	-	-	-	0-25 ft. Not sampled	-	3,171,393	13,832,512
		-44.5	5.0	5.0	1	25-26 ft. Light gray and orange clay	none		
						26-28 ft. Light brown gray and orange sand			
						28-30 ft. Not sampled (no retrieval)			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-06
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-06A-1	10/04/19	-27.4	-	-	-	0-14 ft. Not sampled	-	3,157,010	13,830,360
		-41.4	3.0	3.0	1	14-17 ft. Light and dark gray silt	Hydrocarbon		
HSCNew-NMP-06A-2	10/04/19	-34.5	-	-	-	0-7 ft. Not sampled	-	3,156,997	13,830,374
		-41.5	3.0	3.0	1	7-10 ft. Black clayey silt	none		
HSCNew-NMP-06A-3	10/04/19	-36.7	-	-	-	0-5 ft. Not sampled	-	3,156,993	13,830,383
		-41.7	3.0	3.0	1	5-8 ft. Black clayey silt with debis (trash)	none		
						30.5-33 ft. Orange clay			
HSCNew-NMP-06C-1	10/04/19	-11.6	-	-	-	0-29 ft. Not sampled	-	3,157,267	13,830,791
		-40.6	3.0	3.0	1	29-31.25 ft. Orange clayey sand	none		
						31.25-33 ft. Orange clay			
HSCNew-NMP-06C-2	10/04/19	-12.0	-	-	-	0-29 ft. Not sampled	-	3,157,252	13,830,786
		-41.0	4.0	4.0	1	29-30.5 ft. Orange sandy clay	none		
						30.5-33 ft. Orange clay			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-07
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-07(ALT1-1)	10/03/19	-19.4	-	-	-	0-21.5 ft. Not sampled	-	3,151,936	13,829,813
		-40.9	4.0	4.0	1	21.5 - 24.5 ft. Soft black silt with clay	none		
						24.5-25.5 Gray black brown silty sandy clay			
HSCNew-NMP-07(ALT1-2)	10/03/19	-20.2	-	-	-	0-21.5 ft. Not sampled	-	3,151,936	13,829,809
		-40.7	4.0	4.0	1	21.5 - 24.5 ft. Soft black silt with clay	none		
						24.5-25.5 ft. Gray black silty sandy clay			
HSCNew-NMP-07(ALT1-3)	10/03/19	-19.8	-	-	-	0-21 ft. Not sampled	-	3,151,924	13,829,798
		-40.8	4.0	4.0	1	21 - 23 ft. Soft black/dark gray silt with clay	none		
						23-25 ft. Gray and brown soft silty sand			
HSCNew-NMP-07(ALT1-4)	10/03/19	-19.7	-	-	-	0-21 ft. Not sampled	-	3,151,916	13,829,792
		-40.7	4.0	4.0	1	21-22 ft. Soft black silt with vegetation	none		
						22-25 ft. Gray and black silty sand with vegetation			
HSCNew-NMP-07(ALT1-5)	10/03/19	-19.4	-	-	-	0-21 ft. Not sampled	-	3,151,921	13,829,775
		-40.4	4.0	4.0	1	21-24 ft. Black sandy silt with vegetation	none		
						24-25 ft. Gray sand			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-08
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-08-A-1	10/03/19	-14.7	-	-	-	0-26 ft. Not sampled	-	3,149,974	13,831,274
		-40.7	4.0	4.0	1	26-30 ft. Orange clay	none		
HSCNew-NMP-08-A-2	10/03/19	-22.1	-	-	-	0-19 ft. Not sampled	-	3,150,021	13,831,253
		-41.1	4.0	4.0	1	19-23 ft. Black silt with pieces of coke	Hydrocarbon		
HSCNew-NMP-08-C-1	10/03/19	-37.7	-	-	-	0-3 ft. Not sampled	-	3,150,638	13,831,379
		-40.7	4.0	3.0	1	3-4.5 ft. Not sampled (no retrieval)	-		
						4-5.5 ft. Dark gray silt with vegetation	none		
						5.5-6 ft. Black silt			
						6-7 ft. Orange clay with brown sand pockets			
HSCNew-NMP-08-C-2	10/03/19	-38.0	-	-	-	0-2.5 ft. Not sampled	-	3,150,649	13,831,382
		-40.5	4.0	3.0	1	3-4.5 ft. Not sampled (no retrieval)	-		
						4.5-5.5 ft. Dark gray silt with vegetation	none		
						5.5-7 ft. Orange clay with wood chunks			
HSCNew-NMP-08-C-3	10/03/19	-37.6	-	-	-	0-3 ft. Not sampled	-	3,150,637	13,831,389
		-40.6	4.0	3.0	1	3-4 ft. Not sampled (no retrieval)	-		
						4-5 ft. Black gray silt with vegetation	none		
						5-5.5 ft. Orange clay			
						5.5-6.5 ft. Dark gray brown sand layers			
6.5-7 ft. Orange clay									
HSCNew-NMP-08-C-4	10/03/19	-37.7	-	-	-	0-3 ft. Not sampled	-	3,150,629	13,831,393
		-40.7	4.0	2.0	1	3-5 ft. Not sampled (no retrieval)	-		
						5-6 ft. Black silt with vegetation	none		
						6-7 ft. Orange clay			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-09
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-09-A-1	10/02/19	-38.2	-	-	-	0-2 ft. Not sampled	-	3,149,149	13,833,987
		-40.2	4.0	4.0	1	2-5 ft. Dark gray silt with ligh gray streak in the middle	none		
						5-6 ft. Orange clay			
HSCNew-NMP-09-A-2	10/02/19	-37.7	-	-	-	0-3 ft. Not sampled	-	3,149,153	13,833,975
		-40.7	4.0	4.0	1	3-3.5 ft. Black silt with orange clay globules	none		
						3.5-7 ft. Orange clay			
HSCNew-NMP-09-A-3	10/02/19	-37.8	-	-	-	0-3 ft. Not sampled	-	3,149,159	13,833,976
		-40.3	4.0	4.0	1	3-4 ft. Black silt with orange clay globules	none		
						4-6 ft. Orange clay			
						6-7 ft. Not sampled (no retrieval)			
HSCNew-NMP-09-C-1	10/03/19	-38.0	-	-	-	0-3 ft. Not sampled	-	3,149,514	13,834,136
		-41.0	4.0	3.0	1	3-4 ft. Not sampled (no retrieval)	none		
						4-5.5 ft. Dark brown silt			
						5.5-7 ft. Orange clay			
HSCNew-NMP-09-C-2	10/03/19	-38.6	-	-	-	0-2 ft. Not sampled	-	3,149,510	13,834,140
		-40.6	4.0	2.5	1	2-3.5 ft. Not sampled (no retrieval)	none		
						3.5-4.5 ft. Dark gray and black silt			
						4.5-5 ft. Brown silty sand			
HSCNew-NMP-09-C-3	10/03/19	-38.5	-	-	-	0-2 ft. Not sampled	-	3,149,513	13,834,137
		-40.5	4.0	2.5	1	2-4.5 ft. Not sampled (no retrieval)	none		
						4.5-5 ft. Dark gray silt with brown sand pockets			
						5-6 ft. Orange clay			
HSCNew-NMP-09-C-4	10/03/19	-38.4	-	-	-	0-2 ft. Not sampled	-	3,149,511	13,834,149
		-40.9	4.0	4.0	1	2-3 ft. Dark gray silt	none		
						3-3.5 ft. Brown sandy silt			
						3.5-6 ft. Orange clay			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-10
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-10A-1	10/02/19	-37.4	-	-	-	0-3 ft. Not sampled	-	3,147,880	13,836,082
		-40.4	4.0	4.0	1	3-7 ft. Dark brown silty clay	none		
HSCNew-NMP-10A-2	10/02/19	-36.9	-	-	-	0-3.5 ft. Not sampled	-	3,148,882	13,836,063
		-40.4	4.0	3.0	1	3.5-4.5 ft. Not sampled (no retrieval)	none		
						4.5-7.5 ft. Dark gray, brown, and black modules of silt			
HSCNew-NMP-10A-3	10/02/19	-36.4	-	-	-	0-4 ft. Not sampled	-	3,147,894	13,836,050
		-40.4	4.0	3.0	1	4.0-4.5 ft. Not sampled (no retrieval)	Hydrocarbon		
						4.5-7.5 ft. Dark gray silt with sheen and 2 inch orange clay plug			
HSCNew-NMP-10A-4	10/02/19	-36.4	-	-	-	0-4 ft. Not sampled	-	3,147,894	13,836,063
		-40.4	4.0	2.0	1	4.0-5.5 ft. Not sampled (no retrieval)	none		
						5.5-7.5 ft. Dark gray and black silt			
HSCNew-NMP-10C-1	10/02/19	-33.6	-	-	-	0-7 ft. Not sampled	-	3,147,863	13,836,670
		-40.6	4.0	4.0	1	7-9 ft. Dark brown silt	none		
						9-11 ft. Orange clay			
HSCNew-NMP-10C-2	10/02/19	-34.2	-	-	-	0-6.5 ft. Not sampled	-	3,147,862	13,836,675
		-40.7	4.0	4.0	1	6.5-7 ft. Black silt	none		
						7-10.5 ft. Orange clay			

APPENDIX D - STRATIGRAPHY HSCNew-NMP-11
SUMMARY OF BENCHMARK SEDIMENT LOGS - HSC NMP
Fugro Project No. 04.18180008 - NMP

Location Identification	Date	Top of Sediment Elevation MLLW (ft.)	Core Length (ft.)	Recovery (ft.)	Core Segment	Typical Description	Odor	GPS Coordinates (Actual) NAD83	
								X (ft)	Y (ft)
HSCNew-NMP-11A-1	10/02/19	-31.3	-	-	-	0-4 ft. Not sampled	-	3,145,331	13,838,513
		-35.3	5.0	5.0	1	4-5 ft. Black watery silty sand	none		
						5-6.5 ft. Gray silty sand			
						6.5-9-ft. Brown sand			
		-40.3	4.0	4.0	2	9-11 ft. Brown sand	none		
						11-12 ft. Dark brown sandy clay			
						12-13 ft. Orange clay			
HSCNew-NMP-11A-2	10/02/19	-31.3	-	-	-	0-0-4 ft. Not sampled	-	3,145,340	13,838,513
		-35.3	5.0	5.0	1	4-7 ft. Gray silty sand	none		
						7-9 ft. Brown sand			
		-40.3	5.0	1.0	2	9-13-ft. Not sampled (no retrieval)	none		
						13-14 ft. Brown sand			
HSCNew-NMP-11C-1	10/02/19	-33.1	-	-	-	0-0-7.5 ft. Not sampled	-	3,145,773	13,839,568
		-40.6	4.0	4.0	1	7.5-10.5 ft. Brown silty clay with sand pockets	none		
						10.5-11 ft. Black silty clay			
						11-11.5-ft. Orange clay			
HSCNew-NMP-11C-2	10/02/19	-33.2	-	-	-	0-0-7.5 ft. Not sampled	-	3,145,774	13,839,559
		-40.7	4.0	4.0	1	7.5-9 ft. Brown silty sand	none		
						9-9.25 ft. Black silt			
						9.25-11.5-ft. Orange clay			
HSCNew-NMP-11C-3	10/02/19	-33.2	-	-	-	0-0-7.5 ft. Not sampled	-	3,145,774	13,839,567
		-40.7	4.0	4.0	1	7.5-9 ft. Brown silty sand	none		
						9-9.25 ft. Black silt			
						9.25-11.5-ft. Orange clay			

APPENDIX E

PROJECT HSSE MANAGEMENT PLAN



SEDIMENT AND WATER SAMPLING FOR HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT

MARINE GEOTECHNICAL SITE INVESTIGATION

PROJECT HSSE MANAGEMENT PLAN

Houston Ship Channel, Houston, Texas

Fugro Project No: 04.18180008

Revision: 0

Date: 4 September 2018

Client: **AECOM**

Document Status: Final



REVISIONS

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Rev	Description	Prepared	Checked	Approved	Date

AMENDMENTS

	Revision Details
00	Draft Submitted for review
01	Final Submitted
02	
03	
04	

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APPENDICES

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- B. TASK RISK ASSESSMENT REGISTRY**
- C. OVERWATER EMERGENTY RESPONSE PLAN**
- D. HSSE BRIDGING DOCUMENT**

ABBREVIATIONS

ALARP	As Low As Reasonably Practical
ANSI	American National Standards Institute
CI	Client Company Initials
CR	Client Representative
CPR	Cardio Pulmonary Resuscitation
D&A	Drugs and Alcohol
DOT	Department of Transportation
ERP	Emergency Response Plan
FRC	Fire Resistant Clothing
FUGRO	Fugro USA Land, Inc.
HAZID	Hazard Identification
HIPO	High Potential Incidents
HOC	Hazard Observation Card
HSSE	Health, Safety, Security, and Environment
IDLH	Immediately Dangerous to Life or Health
JHA	Job Hazard Analysis
MOC	Management of Change
SDS	Safety Data Sheet
MUTCD	Manual of Uniform Traffic Control Devices
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
PTW	Permit to Work
RAM	Risk Assessment Matrix
SIMOPS	Simultaneous Operations
SLAM	Stop, Look, Assess, Manage
SOM	Safe Operations Manual
SSW	Short Service Worker
TRA	Task Risk Assessment
PROJECT HSSE PLAN	Project Health, Safety, Security, Environment Management Plan

1 INTRODUCTION AND INTERFACE STATEMENT

This document is to act as a Bridging Document between Fugro USA Land, Inc.(Fugro), AECOM JV (AECOM), and Fugro's Sub-Contractors Management System or HSSE program to form a document that addresses the site-specific work activities.

Our Vision is that Fugro companies will be the safest places to work in the worldwide geotechnical, survey and geosciences service industry, through working together and taking personal responsibility for the safety of ourselves and others.

To achieve this, we ALL must:

- **Always act in a safe and responsible manner**
- **Lead by example and promote trust**
- **Intervene and welcome intervention from others**
- **Stop any activity we feel is unsafe or where control is being lost**
- **Accept responsibility for our actions**
- **Contribute to continual improvement**

To supplement this vision Fugro has implemented **GOLDEN RULES OF HSSE**, which reinforces, but does not replace the HSSE Management System, Risk Assessments, Statutory Requirements or specific training in Safety. Their purpose is to instill a culture of personal safety awareness throughout the company and to ensure that all staff work as a team to avoid incidents. **Fugro is totally committed** to uphold and enforce the policies and principles that form the core values of our company-wide HSSE Management System. Likewise, Fugro expects that everyone gives their own personal commitment in their work and as they go about their day-to-day activities.

1.1 PURPOSE

The purpose of this Project HSSE PLAN is to:

- Provide the client with a clear statement of the methods by which Fugro shall conduct the contracted services in a safe manner and in accordance with our own policies and procedures, local and international regulations and client requirements.
- Define the safety responsibilities, reporting systems and operational procedures that are to be used by the Fugro staff and subcontractors throughout the geotechnical component of the project.
- Identify and define the applicable Task Risk Assessment (TRA). (TRA Registry is included in APPENDIX B and applicable TRA's will be available on-site.)
- Act as a bridging document between the Client and Sub-Contractor Management Systems.

1.2 MANAGEMENT HSSE COMMITMENT

Fugro has a core value of maintaining and improving the health, safety, protection of the environment and security of all personnel and contractors under its work control. Visible leadership and commitment are key elements towards achieving the HSSE best practice performance and ensuring the effective implementation of this Project HSSE Plan.

The Management of Fugro is committed to providing a safe and efficient place of work for its employees, sub-contractors and clients. This is achieved by adhering to standards and controls that continually strive to improve the performance of its operations and management systems.

Fugro's senior management for the contract shall take an active and visible role in HSSE engagement activities which shall include, but not be limited to, the following:

- Ensuring that all decisions and practices are in line with the principles of Fugro's Health, Safety, Security, and Environment Policy;
- Providing adequate resources for HSSE matters;
- Participating in the HSSE audit program and hazard identification systems;
- Dealing appropriately and immediately with any non-compliance with HSSE deficiencies or departure from approved procedures;
- Demonstrating personal commitment to HSSE;
- Participating in safety walk-rounds, safety inspections, audits, observations, incident investigation, risk assessments, training, and other management input as required to maintain required HSSE standards;
- Participating in accident investigations and reviews of accident reports, determination, and implementation of remedial actions;
- Provide an appropriate climate for participation in HSSE management at all levels and work groups within the project's organization;
- Ensure that all subcontractors and suppliers are aware of and comply with the client's and Fugro's HSSE policies and their objectives;
- Implement a safety awareness program (HOC - Hazard Observation Card);
- Manage all produced wastes in line with government regulations;
- Comply with all applicable HSSE government regulations;
- Monitor and strive to continually improve the HSSE performance;

- Promote and communicate lessons learned to the Contractor's Personnel;
- Reinforcing positive behavior and recognition of excellence in HSSE performance.

1.3 PROJECT SPECIFIC GOALS

Our goals are simply stated - no accidents, no harm to people, and no damage to property or the environment.

Our objective is to maintain a prevention based program for HSSE Loss Prevention that results in this project being recognized as exemplary - and each participating company as a leader - in the engineering and geotechnical field work for the project. The foundation for this program is based upon establishing an HSSE culture using not only the normal compliance programs, but a behavioral process, an observation process, tracking leading and lagging indicators, and recognizing those contributing to positive HSSE performance with the expectations of "no accidents", "no harm to people" and "no damage to property or the environment". Our HSSE program is a continuous improvement process, defining compliance with governmental rules and regulations as a minimum requirement. The implementation of contractor systems that incorporate Client, Fugro, subcontractor and employee participation results in growth and achievement of our goals as well as providing a safe workplace in which all project employees can excel.

The following principles will guide the collective project Team in all project activities:

- People are our most important asset.
- All incidents and injuries are preventable.
- Safety is everyone's responsibility.
- Management has the responsibility to train employees to work safely and to develop a "work-safe" culture.
- Working safely is a condition of employment.
- All tasks must be planned and performed with a concern for safety.
- Working safely makes financial sense.
- The project team will commit to implement a behavior based safety process.

It is the objective and target of Fugro to provide a safe and healthy place of work as well as promote health, safety, security, and environmental protection for all personnel during this project. It is Fugro's belief that all accidents are preventable. For this project, the objectives and targets are:

- Zero (0) Recordable Incidents
- Zero (0) Environmental Incidents
- Zero (0) Nuisance Reports (e.g., noise, light, traffic, smells) from the surrounding community potentially caused by investigation or field activities
- Zero (0) Auto Incidents
- Zero (0) Property Damage Incidents
- Zero (0) Security Related Incidents

1.4 MONITORING

Monitoring involves the measurement and control of the targets as set out above. All personnel and sub-contractors will have access to this plan and all attachments. Monitoring will include verification that:

- TRA sheets have been prepared for each task
- TRA sheets reviewed prior to commencement of the activities.
- Fugro and its sub-contractor personnel have attended project inductions.
- Fugro and its sub-contractors personnel have attended the project start-up meeting.
- Fugro and its sub-contractor personnel have received site orientation.
- Toolbox Meetings / JHA held and documented daily.
- Daily Equipment inspection completed
- Proper shift change hand-over completed

The summary of objectives and targets set down in this plan are compiled into a HSSE Commitment Register, which is to be found as an attachment in APPENDIX A.

2 SCOPE OF WORK

The scope of work and how Fugro will undertake to complete is has been described in detail in the Project Work Plan. However, in order that this HSSE Plan can be read as a standalone document, a short summary of the work to be performed on this project is summarized below:

The marine field operations will be conducted for future dredging of the Houston Ship Channel. The work will be conducted from two vessels, the Lift Boat Shallow Draft 17 a Class 70 Lift Boat and a 32-ft support boat contracted through Shallow Draft Elevating Boats, Inc. and for environmental sampling a 24-ft vessel contracted through Benchmark Ecological Services, Inc (Benchmark). Field operations will be on a 10 to 12-hour operation bases, until the geotechnical drill program is completed. The planned activities will be 20 sampling locations throughout the Houston Ship Channel specifically

- 9 stations South of Morgan's Point
- 11 station North of Morgan's Point

The field program will be tailored to adequately drill, sample, and recover soil and waters samples in water depths that range from 7 to 50ft and to depth up to 50.5ft below Mean Low Lower Water (MLLW). The Site Manager and Captains of the L/B will ensure the safety of all onboard and the Captain will have ultimate authority and responsibility for the safety of personnel.

2.1 SITE FACILITIES

2.1.1 Shallow Draft 17

The Lift Barge (LB) is a 70ft Jack Up type vessel, with a twin 671 diesel engine, length 64ft, beam 24ft and draft of 4.4ft. The LB has a 10-ton crane. Facilities aboard the Lift Boat (LB) Shallow Draft #17 consist of a work deck, small tea/mess room, portable potty, and drilling and ancillary equipment. Accommodations



onboard the LB is mainly for captain and one crew member. The maximum working depth is 45 to 50ft which will allow for a 5 to 10ft air gap.

2.1.2 Benchmark 24 Foot Sediment Water Sample Vessel

Sediment grab samples will be collected and processed using the Benchmark 24-foot sample vessel. Samples from the offshore Reference sample station will be collected using this boat. When collecting sediment grab samples, the sample vessel will be equipped with an A-frame and winch to raise and lower the Van Veen grab sampler. Water samples from all sample stations will also be collected using Benchmark's sample vessel. For all sampling events, the sample vessel will be equipped (at a minimum) with a sub-meter Trimble Geo XH 6000 GPS unit, appropriate sample containers, coolers with ice to store processed samples, field data sheets, and drink cooler.

2.1.3 Shallow Draft 32 Foot Support Vessel

Shallow Draft will operate a 32-foot support vessel powered by dependable Yamaha outboards with 7,000 lb deck payload capacity. The boat will be used to transport personnel from/to the land points and the sampling vessel. The vessel will standby during operations tide all times to the LB. The support vessel will include all safety features to accommodate crew transfers and will be in constant contact with the LB captain. Samples will also be transported to shore via this vessel.

2.1.4 Duration

The anticipated start date is approximately mid-September and completion the by the first week of October. The anticipated schedule is 12-hour operations for approximately 20 days, subject to weather and drilling performance, etc.

3 HSSE POLICES AND PROCEDURES

Fugro has developed a set of safety policies and procedures that ensure employees and subcontractors can work safely. The following sections cross-reference all safety documentation that will be used during the project. All documents containing the job number are project specific. Any changes or additions to standard company documents for this project will appear in the project specific documents.

The Fugro Safety Management System has been configured to meet the requirements of OHSAS18001 and maintains accreditation by an external agency.

3.1 UPDATING THE PROJECT HSSE PLAN

The Project HSSE Advisor shall review the safety plan with the Project Manager, Project Engineer, and Field Supervisor at regular intervals and revise the safety plan if necessary during the project life cycle. This review shall be conducted during the pre-mobilization planning. Any updates of the Project HSSE Plan will be issued through the Project Manager for all holders of controlled copies. Changes to this Project HSSE Plan will be communicated to affected project personnel.

3.2 CONFIDENTIALITY

This document is confidential. Neither the whole nor any part may be disclosed to any third party, nor reproduced, stored in any retrieval system, or transmitted in any form, nor by any means (electronic, mechanical, reprographic, recording or otherwise) without the prior written consent of Fugro.

4 PROJECT ROLES AND RESPONSIBILITIES

Details of project contractual, organizational arrangements and interfaces can be found in the Project Work Plan. A summary of the project safety responsibilities is outlined in the following sub-sections.

4.1 FUGRO PROJECT MANAGER

- Has the ultimate responsibility of ensuring the directives of this document (Project HSSE Plan) Must provide the necessary resources and trained personnel and provide the authority for those persons to carry out the plan in a safe and proper manner in compliance with all relevant legislation.
- Empowering all project management with STOP WORK AUTHORITY, and; ensuring management reinforces that all project personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy
- Have an appreciation of health and safety standards / legislation affecting site operations and an understanding of their role in the management of health and safety.
- Ensure that health and safety documentation is suitable and sufficient and meets contract HSSE requirements.
- Ensure that all management staff are formally assigned appropriate duties and responsibilities to assist with the implementation of the project safety
- Has responsibility for the health and safety of project staff.
- Has responsibility for project compliance in regard to environmental protection and security management.

4.2 FUGRO PROJECT ENGINEER

- The Fugro Project Manager is the primary point of contact with the Client Project Manager.
- It is their responsibility to monitor and address project risks and ensure implementation of this plan.
- Liaise with the Fugro QHSSE Managers and with site Project Managers on all matters related to QHSSE.
- Empowering all project personnel with STOP WORK AUTHORITY, and will ensure all personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy
- Have an appreciation of health and safety standards / legislation affecting site operations and an understanding of their role in the management of health and safety.
- Ensure that health and safety documentation is suitable and sufficient and meets project HSSE requirements.
- Ensure that site project management are formally assigned appropriate duties and responsibilities to assist with the implementation of the project safety

- Work with Project HSSE Manager to prepare project-specific health and safety documentation and disseminate this information to all parties involved in the project.
- Organize appropriate welfare arrangements.
- Arrange for the mobilization of appropriate equipment and tools for the job including safety equipment and protective clothing.
- Ensure that equipment is properly selected and that procedures are in place to ensure that equipment is maintained in good working order
- Ensure only trained and competent personnel are allocated to operate equipment and tools on site.
- Ensure that the subcontractor's managers are aware of the safety requirements of the work involved to undertake this task.
- Monitor the health and safety aspects of the project and operations for which they are responsible.
- Ensure that security measures are in place and utilized.

4.3 THE FIELD SUPERVISOR(S)

- Oversee the implementation of work of this plan in the field.
- Approve the appropriate trained personnel to perform the field functions of the plan.
- All incident and accident reporting shall be reviewed and where necessary, investigated by the Project Manager to FUGRO's satisfaction.
- Liaise with the FUGRO QHSSE Manager, Project HSSE Advisor, and with Fugro's Project Manager on all matters related to QHSSE.
- Empowering all project personnel with STOP WORK AUTHORITY, and will ensure all personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy
- Have an appreciation of health and safety standards / legislation affecting site operations and an understanding of their role in the management of health and safety.
- Ensure that health and safety documentation is suitable and sufficient and meets contract HSSE requirements.
- Ensure field supervisors are formally assigned appropriate duties and responsibilities to assist with the implementation of the project safety
- Ensure that no person affected by alcohol or drug abuse is allowed on site
- Organize appropriate fire precautions, spill response and first aid measures.
- Ensure that plant and equipment is properly maintained in good working order
- Ensure only trained and competent personnel are allocated to operate equipment and tools on site.
- Ensure that the subcontractor's managers are aware of the safety requirements of the work involved to undertake this task.
- Monitor the health and safety aspects of the project and operations.
- Ensure that security measures are in place and utilized.
- Ensure that all incidents are immediately communicated with the client.

4.4 THE QHSSE MANAGER

- The QHSSE Manager is the designated management representative on occupational health, safety, security, and environment for the project.
- Ensure that the company complies with the QHSSE Management policy and standards, strategic QHSSE objectives, client QHSSE policies, and relevant state and local HSSE laws, regulations and codes of practice.
- Provides specialist support and advice to project team in driving the QHSSE management process.
- Represents the company in QHSSE matters when dealing with the client, external parties, professional and statutory bodies.

4.5 THE PROJECT HSSE ADVISOR

- The Project HSSE Manager is the designated management representative on occupational health, safety, security, and environment for Fugro and subcontractor's operations.
- Provides specialist support and advice to project team in driving the QHSSE management process.
- Participate in HSSE Induction of project staff.
- Provides support as required to the Fugro QHSSE Manager in representing the company in QHSSE matters when dealing with clients, external parties, professional and statutory bodies.
- In the event of an incident will promptly investigate and perform root cause analysis if required.
- Perform (or coordinate) project HSSE compliance site audits.
- Work with the project team to continually improve or grow the HSSE program throughout the project duration
- Empowering all project personnel with STOP WORK AUTHORITY, and ensure all personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy
- Responsible for health, safety, security environmental awareness from a project level.

4.6 FIELD CREW LEADERS / MENTORS

- The Field Crew Leader / Mentor in conjunction with the Drilling Supervisor, will be responsible for ensuring that the geotechnical operations are conducted in a safe and efficient manner for the duration of the project.
- Report all incidents immediately to the Field Supervisor and the Project HSSE Manager.
- Be aware of the limits of access to project sites. Stop work and seek clarification if unsure of access.
- The Field Crew Leader / Mentor will ensure that safe work practices and procedures are defined, documented and that geotechnical personnel are appropriately trained for their assigned tasks.
- Onsite environmental monitor. They must ensure that all personnel are aware of their environmental responsibilities and that all specific environmental procedures are adhered to.
- Empowering all project personnel with STOP WORK AUTHORITY, and; ensuring all personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy.

4.7 SUBCONTRACTOR MANAGEMENT

Subcontractor management is expected to meet or exceed the following:

- Communicate the requirements of “Subcontractor Employees Safety Expectations”, as described in this section.
- Have written safety and environmental policies and procedures that are effectively communicated to all employees.
- Require employees to report all occupational injuries, illnesses and incidents immediately to their supervisor.
- Cooperate fully in any incident investigations conducted by Fugro or client.
- Provide employees who are physically fit, adequately trained, and qualified to perform their jobs.
- Provide employees with proper and safe tools and equipment and ensure that they are used appropriately. This includes personal protective equipment.
- Provide a training program that meets or exceeds the minimum requirements of Fugro.
- As evidence that personnel have been trained to perform their assigned duties, management should be capable of providing documentation of its employees’ training.
- Have a substance abuse policy, which meets or exceeds Fugro and Client requirements.
- Meet appropriate government regulations and Fugro policies and procedures.

4.8 VESSEL / LIFT BOAT MASTER

The Vessel Master shall implement the company’s QHSSE policies and procedures and motivate employees in support of the company’s QHSSE policies and procedures. The Vessel Master will ensure compliance to all requirements of maritime law and the rules and regulations as defined by state and federal authorities.

The Vessel / Lift Boat Master:

- Has the overriding responsibility to ensure that the operations onboard his/her vessel are performed in a safe manner in respect of the vessel, crew, equipment, and environmental aspects.
- Is responsible for the welfare and security of all onboard. She/he ensures that all personnel onboard maintain high standards of hygiene and personal care.
- Implements regular inspections by relevant personnel of work and accommodation areas to maintain a safe and healthy environment.
- Has total authority concerning the safe navigation of the vessel and all associated operations. The Master’s decisions, with regards to the, shall be acted upon, respected and supported by all parties concerned with operations.

4.9 SUBCONTRACTOR EMPLOYEES

Employees of all subcontractors are expected to meet or exceed the following:

- Participate in Fugro on-site safety programs, meetings, etc.
- Report all incidents that result in injuries, illness, equipment damage/loss, fires, a near miss, or cause environmental damage.

- Use personal protective equipment (PPE) appropriate to the job being done.
- Correct or shut down and report unsafe conditions, unsafe acts, and near misses.
- Adhere to instructions given in Fugro site specific orientations and all posted warnings.
- Arrive at the work site free of drugs, alcohol, and firearms.
- Understand their right and responsibility to use STOP Work Authority if they see an unsafe act or conditions that could put themselves or others in danger.

4.10 FIRST AID RESPONDER

- In addition to the roles and responsibilities above, the role of the First Aid Responder will be fulfilled by field staff that will be identified prior to mobilization. The First Aid responder is responsible for providing first aid (within their level of training as a Good Samaritan) as necessary for any personnel. In order to fulfill this role of First Aid Responder will possess the required qualifications.

4.11 CLIENT REPRESENTATIVE

- The Client Representatives are to represent the client in all matters, which effect the client's commitment to health, safety and environmental performance and ensure that the QHSSE and technical expectations are met.
- The Client Representatives will be invited to participate in safety meetings and may be a member of the investigation team activated as the result of an accident or incident. The Client Representative is also responsible for advising the client management of any incidents.
- The Client representatives are required to comply with all site rules, regulations, policies and procedures as defined within the HSSE manual and this document.

Additional information can be found in the individual crew member's job description which can be provided upon request. In addition to the responsibilities described above, other assigned duties may be assigned in other section of this Project HSSE Plan.

5 HSSE REFERENCE DOCUMENTATION

The geotechnical drilling sampling will adopt the project governance of policies and procedure described in the Work Plan

5.1 HSE INTERFACE – BRIDGING

This section aims to demonstrate that the management systems covering the fieldwork activities have been reviewed and are clearly stated, resulting in safe operation to agreed procedures and compliance with all regulatory requirements. The management systems interface between AECOM and Fugro business lines and any relevant third-party contractor are defined here in order to highlight differences and define how these will be managed.

5.2 CLIENT

A project bridging document has been created to bridge HSE requirements / specifications of the Master Service Agreement between AECOM and Fugro and project requirements for the Houston Ship Channel Expansion Improvement Project in Appendix C.

5.3 SUB-CONTRACTORS

A project bridging document has been created all relevant sub-contractors listed below and Fugro company HSE policies and procedures. These procedures have been aligned in accordance with industry best practice.

A project bridging document has been created for the follow sub-contractors:

- Shallow Draft Elevating Boats
- Benchmark Ecological Services Inc.

5.4 POLICIES

Fugro acknowledges Client's commitment to health, safety and the environment and wish to confirm that the published Fugro policies on Occupational Health & Safety and the Environment and all project specific policies or procedures are widely disseminated and understood among our employees and sub-contractors. The following policies have been drawn up and published by Fugro management:

Integrated Management System Document (QHSSE)	QHSSE-IMS-002
Integrated Management System QHSSE Policy (QHSSE)	QHSSE-IMS-001
Company Project Organizational Chart	SM-R20
Drug, Alcohol Weapon Free Policy	HR-R50
Whistleblower Policy	HR-R47
General Business Principles	HR-46
Productive Work Environment and Anti-Harassment Policy	HR-R52
Information Technology Policy	HR-R53
Use of New Media Policy	HR-R55
Driving Policy	HR-R56
DOT Cell Phone Policy	DOT-F08
DOT Policy	DOT-PO1
Injury Illness Prevention-Code of Safe Practice / Disciplinary	HS-R38
Hazard Identification and Risk Assessment	HS-P10
Management of Change	HS-P15
Subcontractor Management	HS-P58
Incident Investigation and Reporting	QHSSE-IMS-P002
QHSSE Incentive Program	HS-R30
Code of Safe Practices	HS-R39
Lifting Guidelines	HS-R41



Confined Space	HS-R44
Hand and Power Tools	HS-R47
Ladders	HS-R48
Energy Isolation Lockout/Tagout	HS-R49
Crane Safety	HS-R54
Excavation and Trenching	HS-R59
Stretching Guidelines	HS-R68
Permit to Work	HS-R72
Slings & Rigging Material Handling	HS R73
Waste Management	HS-R74
Personal Protective Equipment	HS-R66
Behavior Based Safety	HS-R77

The policies are reviewed at regular intervals by the project team and revised as necessary to be brought into line with current requirements and new legislation. If there are differences between Fugro and client procedures, the more stringent shall apply. The policies will be available at the Fugro Project Offices. All new employees and contractors are introduced to these policies at the initial Fugro Safety Induction.

5.5 PLANS & REGISTERS

HSSE Commitment Register	APPENDIX A
TRA Register	APPENDIX B
Over Water Emergency Response Plan (OERP)	APPENDIX C
HSSE Bridging Document	APPENDIX D

5.6 QHSSE RECORDS

The following forms may be used during the project. Completed document will be collected by the Field Manager. Upon completion of the project these records will be passed to the Project Manager for archiving.

Record of HSSE Meeting	HS-F05
Daily Meeting Form	HS-F06
Job Hazard Analysis Form	HS-F08
Incident Report	GD-HSSE-F01
Incident Investigation Form	GD-HSSE-F02
Lift Plan Form	HS-F20
Management of Change Request Form	HS-F80
Permit to Work Form	HS-F15
Journey Management Form	HS-F81
Jobsite Audit/Field Inspection Form	HS-F95
Management Visit Form	GD-HSSE-F03
TRA Review Form	HS-F09
Facility Inspection Form	HS-F125
Visitor Sign-In / Sign-Out Form	HS-F14
Emergency Drill Record	HS-F90

Vehicle Inspection Checklist

HS-F88

Personnel must have read and understood their own company documents and any other relevant document that impacts their assigned tasks. Documents that will be used by subcontractors on this project shall be submitted for inclusion.

6 COMMUNICATIONS

6.1 “KICK OFF” HSSE MEETING

A “kick off” project HSSE meeting will be held prior to the commencement of field activities and may be part of the initial induction. The “kick off” may also be held when deemed necessary or prior to a new phase of work if applicable. All members of the project team will attend. The meeting will be part of the Project Specific Safety Induction process.

A list of all attendees as well as points raised, and decisions made during the meeting shall be documented and addressed by the Field Supervisor or Project HSSE Advisor.

6.2 WEEKLY HSE MEETINGS

Weekly HSE safety meetings are held onboard during the project. Points discussed at the meeting include:

- i. Review of any HSE issues that have arisen since the last meeting;
- ii. Review of HOCs raised that week;
- iii. Reports on any incidents or near misses;
- iv. Reports/lessons learned following any incident investigations;
- v. Any HSE Alerts received from onshore;
- vi. Review of the proposed scope of work and the need for risk assessment reviews.

6.3 HSE BRIEFINGS

A toolbox talk is held as part of the shift changeover briefing at the start of each shift. In addition, toolbox talks are held for any significant or abnormal task or change in operations. These meetings address the exact nature of the task and HSE issues specific to the task performed during a shift or task change. A list of attendees is recorded at each toolbox meeting.

6.4 VESSEL INDUCTION AND DRILLS

The purpose of the induction is to explain the vessel's emergency procedures and the operation of safety equipment. The induction includes a tour of the vessel with the Vessel Master or First Officer who points out the muster stations, escape routes, personnel transfer procedure-primary and secondary, emergency evacuation, and safety equipment locations.

Vessel induction is conducted within 24 hours of anyone joining the vessel for the first time and is recorded on the ships log or appropriate form. The Vessel Master holds the completed log or forms.

Emergency drills are conducted at not more than weekly intervals. The first drill is conducted once personnel arrive on the L/B. All personnel onboard are required to attend and take an active part as directed by the marine crew. The drills are recorded in the vessel log and in the DPR/DOR.

Persons temporarily on board the vessel in port (e.g. service engineers, or Client/Fugro staff attending kick-off meetings) receive a short briefing about emergency exits, muster areas and alarms.

All Marine and Project crew who will be working offshore will be inducted in the kick-off briefings, communicating project plans and any specific procedure as well as combined AECOM and Fugro project objectives.

Any on signing personnel who have not worked on the vessel will be given a thorough vessel familiarization within 24 hours of departure from the mobilization port. This familiarization shall cover; safety, rescue equipment and procedures, also give the individual a good understanding of areas and equipment on board to be given specific attention. New personnel are also to be informed about what and to whom to report, and who is the Vessel's Safety Officer.

Prior to fieldwork commencement all key members of the project team will be provided with access to copies of the Execution / Operations Plan either electronically or in hard-copy. These documents are considered 'live' documents and are therefore updated and re-distributed to the project team throughout the duration of the project as required.

6.5 AUDIT

The objectives and frequency of the audit or inspection will be determined by the level of perceived risk and type of activity at a particular department, location or site. Auditing is a useful tool in quality assurance which in itself is a mitigation of the risk of not following procedure.

If a review of audit or performance feedback findings highlights areas where HSE performance does not meet agreed standards, Fugro and its subcontractor management will cooperate with AECOM to produce and implement an appropriate improvement plan. Any actions arising from the HSE continual improvement process will be entered into Fugro IMPACT and assigned to a responsible person; the Project Manager will monitor the actions and ensure they are closed out.

6.6 LESSONS LEARNT

Actions from the lessons learnt sessions are captured in Fugro's IMPACT system and assigned to a responsible person, with estimated completion dates. Revisions to HAZID worksheets, project plan templates and procedures include the approved recommendations from the lessons learnt sessions. Lessons learnt are captured throughout the project life cycle.

7 EMERGENCY

7.1 FIELD EMERGENCY

Fugro is well prepared to handle any situation that may arise that requires emergency response. The Overwater Emergency Response Plan (OERP) is attached in APPENDIX C of this Plan.

8 TRAINING AND EXPERIENCE

8.1 COMPETENCE OF EACH EMPLOYEE

Training is a key component in the enhancement of safety awareness, skills, knowledge, and attitudes of each project team member and in developing their competency to deal with risks and take appropriate bodily injury or loss prevention measures. It is mandatory for all, Fugro personnel, sub-contractors and client representatives to have a current safety and environmental training required for the task(s) that will be performed. All Fugro and subcontract personnel shall be suitably qualified and experienced and shall be physically capable of performing the services to be provided. The Project Manager shall verify the suitability of all personnel proposed. Auditable records of all induction and safety courses will be maintained for each employee.

8.1.1 Project Induction

A Project Induction will be the mechanism that Fugro uses to introduce the HSSE requirements of the project to all crew. Project Induction shall be documented using a Project Induction Checklist. Items that will be included are described in the remainder of this section.

Title	Content
Project Overview / Management Commitment	Client Presentation on project expectations
Roles / Responsibilities / Accountability	Review Project Staff Roles and Responsibilities SSW (Mentor) / Direct Supervisor / 2 Way Communication / Stop Work Authority
Behaviour Based Safety	iPOWER Introduction
Pre-Task Planning	Fugro SLAM (Stop, Look, Assess, Manage)
Health	Review of the Health Section of the Project HSSE Plan: Sanitation, Fatigue Management, Smoking Policy, Substance Abuse Program,
Safety	Review of the Safety Section of the Project HSSE Plan: Task Risk Assessments, Hazard Observation Card (HOC), Jobsite Hazard Analysis (JHA), Golden Rules of HSE, Permit to Work, Housekeeping, Equipment Inspections, Vehicle Inspections, Right Tool for the Job, Weather
Environmental Management	Introduction to project environmental policies
Incident / Near Miss Reporting	Review of Project Incident Reporting procedure



Disciplinary Program	Review of Project Disciplinary Actions (EX: D&A violation, smoking, unsafe driving, cell phone while driving, violating safety rules, violating golden rules)
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8.2 SHORT SERVICE WORKERS (SSW)

Fugro utilizes a mentoring system to address the issues associated with the safety and health of temporary or Short Service Workers (SSW). The purpose of the mentoring system is to ensure that employees new to the project are adequately supervised, trained, and managed so as to prevent injury to themselves or others, property damage, or environmental harm.

An SSW works with a qualified Crew Leader / Mentor (a project employee that has sufficient experience and leadership qualities and has undergone project HSSE Supervisor training), who will ensure that the SSW is only performing tasks for which they have received the proper training and are following regulations as well as policies and procedures set forth by this Project HSSE Plan. SSW employees and Crew Leaders / Mentors will be identified with a hard hat sticker.

9 WORKING WITH SUPPLIERS, CONTRACTORS AND OTHERS

Fugro is committed to using only contractors who demonstrate that they are committed to preventing accidents and protecting the environment. If there is a conflict concerning HSSE requirements with a contractor, the more stringent requirements will be followed. The Fugro Project Manager, in consultation with the Fugro HSSE Department, will handle HSSE conflict resolution.

10 HEALTH MANAGEMENT

10.1 WELFARE FACILITIES

Proper welfare facilities will be available near each site, including but not limited to: a rest area, shade and protection from the sun, and access to toilets / lavatories. The Field Supervisor is responsible for ensuring that welfare facilities are kept clean and tidy, however, all those who use the facilities are required to leave facilities clean and tidy after use.

10.2 SANITATION

- Trash is not permitted to accumulate in work areas.
- Meal trash is to be placed in garbage containers only.
- Personal hygiene is to be maintained by all employees working on site.
- Project personnel shall use only toilet facilities, hand wash facilities, and drinking water facilities designated for employees.

10.3 FATIGUE MANAGEMENT

Fatigue will be carefully monitored throughout the program and will take into consideration the season changes in temperature and ambient light. Operations are anticipated relatively short duration and are to be conducted at a maximum of 12 hours shifts per day. Following is the tentative plan for fatigue management:

- Employees must be in a fit state to undertake work. See Fugro HS-R79 Fatigue Management.
- Employees must be fit to complete work.
- Employees must take at least minimum periods of rest to safely perform their work.
- Daily work will typically be conducted on a fixed shift schedule to be agreed upon at commencement of the project. These times may be updated based on expected sunrise and sunset times.
- No personnel will be allowed to work more than 14 hours including travel to and from site and will be required to have a rest period of at least 8 hours between shifts.
- No field personnel will be allowed to work more than 14 continuous days.
- Operations will be carried out in shifts that comply with the above.
- During working hours regular rest breaks will be taken to allow staff to stay alert hydrated and adjust to environmental conditions on site.

10.4 JEWELRY SAFETY

Jewelry can be dangerous and shall not be worn during field activities. Large earrings, long necklaces, loose-fitting bracelets, rings, watches, etc. can become entangled in machinery with the potential of serious injury / fatality, as well as be conductive of electricity.

10.5 SMOKING POLICY

Fugro is strongly committed to providing a safe working environment for all staff and contractors. This includes the control of smoking, so it does not impact people who do not smoke. Each location shall designate a smoking area. The Captain will ensure that smoking areas are clearly understood. Under no circumstance will smoking be permitted inside the cabin area of any vessel. The smoking area is required to have all of the following:

- Cigarette Butt Can (constructed of metal and earthen material) ensuring that they are project from being blown or washed overboard.
- Fire Extinguisher in the immediate area (Fire extinguisher shall have an A rating (or other applicable rating) based on flammable materials present in the smoking area.
- Select smoking area away from flammable materials, fuel vents and fresh air intakes.

Before leaving the smoking area, the individual shall verify that all smoking materials have been extinguished. Cigarettes are not permitted to be discarded overboard or anywhere but in the cigarette butt container in the designated smoking area.

The use of "strike anywhere" matches is prohibited: only "safety matches" shall be allowed. During high fire risk conditions additional hazard controls are required.



Smoking is prohibited while driving. Smoking while driving can distract the driver and potentially cause an incident. Violation of the site smoking rules will result in disciplinary action and may include dismissal from the project.

10.6 SUBSTANCE ABUSE PROGRAM

The consumption of alcohol and the use of un-prescribed drugs have been identified as a serious safety hazard on work sites. The project strictly prohibits the use, manufacture, possession, purchase, sale, distribution, taking, carrying, transfer, handling, or other involvement with controlled substances, illegal drugs, legal drugs illegally used (not taken as directed by employee's physician), alcohol, alcoholic beverages, or any other intoxicants (such as inhalants) by any project employee.

All personnel using prescription and/or non-prescription drugs must advise the Field Supervisor prior to joining a work crew. The Field Supervisor may ask for the drugs to be left in their care for the duration of the work cycle. Additionally, since the Captain of the L/B SD#17 and the Benchmark work vessel have overall responsibility for the safety of all onboard he/she will need to be informed of medication onboard as well as medical conditions such as allergies, heart condition, etc. of the passengers.

The project substance abuse policy includes substance testing of all project employees and may include, pre-access testing, random testing, reasonable suspicion testing, and post-accident testing.

Project management staff reserves the right to search an employee's work area and company equipment / vehicles for prohibited drugs and paraphernalia, alcoholic beverages, and/or unauthorized property or equipment. Violation of this substance abuse policy may result in immediate discharge from the project.

If an incident occurs, project staff involved in the incident shall be taken for post-accident drug (10-Panel Non-DOT) and alcohol testing immediately after any incidents has been evaluated. Employees will be restricted from working or driving on the project until the results have been confirmed.

For post-accident and random drug tests, if the preliminary drug tests results show a positive result, the employee will be removed from the jobsite immediately (pending MRO (Medical Review Officer) review).

- If the MRO confirms a positive drug test, the employee will be banned from the site indefinitely.
- If the MRO confirms a negative drug test, the employee will be allowed to return to the site.

11 JOURNEY MANAGEMENT

Journey Management Planning is essential to ensure adequate safety and security protocols are in place and reduce the risk of affected personnel while traveling by land, air, or sea. Fugro utilizes two protocols to manage journey planning, 'Journey Management Plan' for driving and 'Passage Planning Procedures' for sea travel.

11.1 DRIVING

It is the responsibility of every employee who drives a Company vehicle to do so safely. All employees must adhere to all local, state, and federal laws related to transportation on our highway or road systems. Employees are responsible for the proper use and care of company vehicles. Employees are also responsible for following Journey Management Procedures.

11.2 TRAVEL BY SEA PLAN

Marine vessels will plot courses for passage and Expected Time of Arrival (ETA) and location should be recorded. Onboard crew list shall be recorded in the Vessel logbook.

12 SAFETY MANAGEMENT

Risk Management and hazard evaluation is the key to effective implementation of any safety management system. The principles of 'identify, assess, control and recover' form the basis of hazard management.

Hazards are initially identified by a risk assessment process whereby the project team compiles a Hazard Register based on their experience of carrying out similar operations. In addition, hazards that are specific to this project will be identified.

Tools used for the management of hazards include, Hazard Identification Meeting (HAZID), Task Risk Assessment, Job Hazard Analysis (JHA), Toolbox Meetings, Management of Change, the Hazard Observation Card Program (HOC), and Permit to Work systems as discussed in this document.

Offsite and onsite training will be provided to ensure that all project personnel understand and can use these tools effectively.

12.1 HAZARD IDENTIFICATION AND RISK MANAGEMENT

Activities that pose a risk to health and safety are identified during the project preparation stage. The principle of "identify, evaluate, eliminate and / or control forms the basis of hazard management. The aim is to reduce the risk to a level that is acceptable and as low as reasonably practicable (ALARP).

A formal hazard and risk identification workshop has been undertaken and the outcome used to develop this plan and associated project procedures and method statements.

Risk are assessed and used to establish suitable procedures that reduce the risk to acceptable levels. The project standard operating procedures and method statement taking into account the outcome of the risk assessments. Should an activity be performed that was not initially considered during the risk assessment process, additional risk assessments and method statements will be created by the project Team.

12.2 BEHAVIOR BASED SAFETY

12.2.1 Golden Rules of Safety

Our organization is diverse with many HSSE risks which need to be managed. These Golden Rules of HSSE provide basic guidance which is based on our experience and lessons learned. Compliance with the rules is essential to preventing personal injury and ill health. Each crew on this project is required to have a copy of the Golden Rules of HSSE and should review aspects of the Golden Rules of HSSE during the project.

The safety of everyone requires commitment, leadership, and the willingness to intervene when you see someone working unsafely or when a situation deteriorates. Some of the key principles of the Golden Rules of HSSE include:

- Everyone has a responsibility to themselves and others to act and work safely.
- Carefully planned work will prevent unsafe situations.
- Learning from our experience will improve our HSSE performance.
- Support of our principles by suppliers and subcontractors will assist us in improving our standards
- Empowering all employees and contractors to stop unsafe acts will reduce incidents and personal injury.



6	Confined Spaces
8	Driving
10	Equipment/ System Isolation
12	Fitness for Work
14	Ground Disturbance
16	Hazardous Substances
18	Lifting Operations
20	Loading and Unloading of Vehicles
22	Personnel Transfer
24	Simultaneous Operations
26	Working at Height
28	Working with Equipment

12.2.2 iPOWER

It is recognized that high levels of technology and HSSE management systems are not sufficient for achieving zero incidents. Motivating people to want to work safely requires a culture where behaviors and attitudes are safety focused. Accordingly, an iPower initiative intended to strengthen the health and safety culture within Fugro and its subcontractors.



The iPower icon consists of an "I" with an "Eye" above it. The "I" stands for the Individual and the "Eye" is the watchful eye that keeps a lookout for not only the individual's safety, but the safety of others. Individual commitment will be required from all crew members and shall be discussed in the daily safety meeting.

12.2.3 Stop Work Authority

The main objective of the stop work authority is to intervene or correct any unsafe action. Intervention can consist of speaking with employee(s), interrupting or stopping an act or action, or protecting someone from an immediately dangerous to life or health (IDLH) situation. All Fugro employees have the RESPONSIBILITY to stop the job if they believe that the work environment or procedures could jeopardize their personal health or safety, the health and safety of other personnel, or the environment.

Employees shall stop any activity:

- Where there is good reason to believe that the circumstances involved could jeopardize their health and safety or those of any other individual or have an adverse effect on the environment.
- When the control methods for reducing the HSSE risk are not clearly defined.

Management shall:

- Provide the fullest possible support to any employee who finds him or herself in such a situation.
- Not reprimand any employee for using Stop Work Authority in an attempt to prevent injury/illness/damage from an identified hazard.
- Review all reports of Stop Work Authority being used.
- Ensure that Stop Work Interventions are documented using a Hazard Observation Card.
- Follow-up on all Stop Work Interventions that have been initiated and/or closed.

It is important that:

- 1) All employees must be trained on Stop Work Authority before their initial assignment. This includes knowing the steps of Stop Work Authority which are: Stop, Notify, Correct, and Resume.
- 2) No work resumes until all issues and concerns have been addressed.
- 3) Every employee understands their responsibility and obligation to stop any work that they consider compromising health, safety or the environment.
- 4) All Fugro personnel are trained to intervene whenever unsafe work is witnessed and report incidents and near misses to their immediate supervisor.

12.2.3.1 Hazard Observation Card (HOC)

The Fugro “Hazard Observation Card (HOC)” program will be utilized throughout the project. The HOC program should be used by Fugro employees, Fugro subcontractors, clients or visitors to report the following:

Safe Act or Suggestion

- any exceptional safe act or suggestion that promotes safe working practice and demonstrates good safety awareness;

Unsafe Act or Condition

- an unsafe act is a specific action or lack of action by an individual, e.g. removal of safety guards, standing under a suspended load, not following a procedure, or
- an unsafe condition is a situation or event which may result in an accident, e.g. poor housekeeping, blocked escape routes, unguarded or defective machinery, lack of edge protection, etc.

All completed cards should be reviewed by the Project HSSE Manager and Field Supervisor, and where appropriate the necessary remedial action(s) taken. If a hazard cannot be addressed and remedied immediately it should be reported through the HSSE reporting structure.

HOCs will be reviewed during the daily toolbox meetings, as necessary.

12.3 SUB-SURFACE AND OVERHEAD HAZARDS

A hazard survey will be conducted by Fugro using a magnetometer to detect metallic debris or utility's through the proposed work area.

Additionally the L/B SD # 17 legs are 70' in length. Along the route from the mobilization berth the Houston Ship Channel through to the worksite (boring locations) the area has been reviewed and there are no low bridges, obstacles.

12.4 TASK RISK ASSESSMENT

Task Risk Assessment (TRA) sheets will be completed by Fugro and any sub-contractors for all tasks where there is a potential for personal injury (serious or minor), damage to property and equipment or loss, or harm to the environment. TRAs identify and assess the hazards for each step of the task and define the appropriate controls and recovery measures. Changes to equipment, personnel or the equipment will require a review and possible revision of existing TRAs to capture all associated hazards. If a TRA does not exist for a certain task one must be created. Revised and new TRAs will be covered during the Toolbox meeting prior to undertaking the task. A risk assessment is also required for a new or revised TRA. A management of change may also be required in such cases.

Where specific activities or tasks have a potential for introducing new and unidentified hazards, these hazards will be discussed as part of the daily Toolbox Meeting and incorporated into the JHA. If additional planning is needed, work will be stopped to address the issues. If the activities require a work permit, then Fugro's Permit to Work system will identify and manage interfacing hazards. For more details regarding the Task Risk Assessment for project specific risks, refer to the register in APPENDIX B.

12.4.1 Risk Factor

TRAs have two indices, which form the components of risk. The risk is computed based on the indices following the identification and subsequent mitigation of a task's hazard(s). The risk factor is initially determined by identifying the corresponding highest severity score and likelihood score that could reasonably be expected without control measures in place. The severity and likelihood score scales presented in Tables 11-1 and 11-2 below are used for this project.

Table 11-1: Severity Score

Severity	Reputation	Assets	Environment	People
1 – Slight	Slight impact	Slight damage, less than € 25,000	Little or no actual impact or potential for damage	Slight health effect/injury (First Aid)
2 – Minor	Limited impact	Minor damage € 25,000 – 100,000	Within site boundary, short term impact recoverable by the work site	Minor health effect/injury (RWC MTO)
3 – Major	Considerable impact	Major damage € 100,000 – 500,000	Impact beyond the site boundary unlikely to last beyond 1 month. Recovery may require external aid	Major health effect/injury (DAWC)

Severity	Reputation	Assets	Environment	People
4 – Severe	National impact	Severe damage € 500,000 – 1,000,000	Impact beyond the site boundary unlikely to last beyond 12 months. Recovery requires external aid	Permanent total disability or single fatality
5 – Catastrophic	International impact	Extensive damage, greater than € 1,000,000	Massive uncontrolled release with significant impact extending well beyond the site boundary	Multiple serious injuries or fatalities

Table 11-2: Likelihood Score

Likelihood	Description
A – Very unlikely	A freak combination of factors required for incident to result
B – Unlikely	A rare combination of factors would be required for an incident to result
C – Possible	Could happen when additional factors are present but otherwise unlikely to result
D – Likely	Not certain to happen but an additional factor may result in an incident
E – Very Likely	Almost inevitable that an incident would result

12.4.2 Residual Risk Factor

The residual risk is the risk factor after control measures have been recommended or implemented. The recommended or implemented control measures should reduce or have been proven to reduce either one or both severity and likelihood scores respectively. The hierarchy of control measures is as follows:

- Elimination;
- Substitution;
- Barrier / Enclosure e.g. machine guarding;
- Administrative control e.g. procedure;
- Use of Personal Protective Equipment.

The following risk factor tables (Table 11-3 and 1-4) serve as guidance on the tolerance level of risk. Activities with intolerable risk (risk ratings in red) shall have an action plan / control measures to reduce its severity and / or likelihood to a tolerable or as low as reasonably practicable level of residual risk.

Table 11-3: Risk Rating

	Likelihood				
Hazard Severity	A – Very unlikely	B – Unlikely	C – Possible	D – Likely	E – Very Likely
1 – Slight	A1	B1	C1	D1	E1
2 – Minor	A2	B2	C2	D2	E2
3 – Major	A3	B3	C3	D3	E3
4 – Severe	A4	B4	C4	D4	E4
5 – Catastrophic	A5	B5	C5	D5	E5

Table 11-4: Risk Rating Description

Green (Low)	Manage for continuous improvement. May be acceptable; however, review task to see if risk can be reduced further.
Yellow (Medium)	Incorporate Risk Reduction measures. Task should only proceed with appropriate management authorisation after consultation with specialist personnel and assessment team. Where possible, the task should be redefined to take into account the hazards involved, or the risk should be reduced further prior to task commencement.
Red (High)	Intolerable. Task must not proceed. It should be redefined, or further control measures put in place to reduce risk. The controls should be re-assessed for adequacy prior to task commencement.

12.5 JOB HAZARD ANALYSIS (JHA)

A JHA will be prepared prior to the start of any activity requiring hazard management to address any hazards that are present on the jobsite that are not directly related to the task being performed. A JHA shall be completed and reviewed for any task that does not have a Task Risk Assessment. These documents will be reviewed with all applicable personnel prior to start of activity.

12.6 HSSE MEETINGS

HSSE meetings will be held in one of two manners: Daily Toolbox meetings and when Project Management deems an impromptu HSSE meeting is needed. However, project staff may go above and beyond the requirement to hold additional meetings as necessary and as often as deemed appropriate.

Minimum points to be reviewed for the Daily Toolbox Meetings shall include:

- Environmental Conditions (weather conditions, wind strength, and direction)
- Environmental Concerns and/or Hazards (i.e. protected habitat, spill potential)
- Progress and Technical Problems on the Previous Day or Shift
- Expected Activities for the Upcoming Day or Shift
- Completion of JHA
- Accidents, Near Misses or Hazard Observations from the Previous Day or Shift
- Emergency Muster Locations that will be used
- Location of Spill / First Aid / Fire Fighting Equipment

12.7 PERMIT TO WORK

A Permit to Work (PTW) system will be used for all operations. The Field Supervisor is responsible for ensuring that the requirements of the permit system are used. A permit will be raised for:

- Entry into confined spaces
- Working Near Power lines
- Working aloft
- Hot work
- Energy Isolation
- Locate Permits
- Other work considered dangerous

All personnel involved in requesting, preparing and approving permits will be made aware of and understand the PTW system and understand its requirements. Before work can be initiated, two signatures are required. These signatures should come from the Crew Leader / Mentor and the Project HSSE Manager at the time the work is being performed. This step is taken to reduce possibility of conflicts in work processes. Copies of open permits must be kept onsite for review.

* All work within 33 feet (10.1 meters) of overhead power lines (or their components e.g. guy wires, poles, etc.) must be performed under and approved Working Near Overhead Power Lines Permit. No work will be allowed within 10 feet of energized line. All lines must be considered energized unless the authority or utility company owning the lines indicates in writing that they are not energized, and the lines are grounded at the point of operation. Driving a vehicle that does not have the capability of any part of it rising under and overhead power line does not require a permit. A vehicle that does have the capability of any part of it rising under an overhead power line (such as a truck crane or dump truck) "may" require a permit, depending on the driving conditions. This permit shall be signed off on by the client before operations begin.

12.8 SIMULTANEOUS OPERATIONS (SIMOPS)

It is unlikely that several or all activities occur at the same time. If more than one unrelated task is to occur, management of those SIMOPS to avoid any conflict will be achieved by implementing the following:

- Every activity has a dedicated Crew Leader / Mentor for the entire operation;
- The Crew Leader / Mentor report and coordinate their operations daily with the Field Supervisor that is responsible for that scope of work;
- The Fugro Field Supervisor will have overall responsibility for coordinating the various activities on site and for communicating daily with the Field Supervisors in toolbox talks and other associated planning sessions.

The above actions ensure safe operations with minimum delay and disturbance to the different operations.

12.9 MANAGEMENT OF CHANGE (MOC)

All temporary and permanent changes to organization, personnel, systems, procedures, equipment, products, materials or substances will be assessed and managed to ensure that:

- The impact of the change upon the health and safety of personnel, the local community and the environment remain at an acceptable level.
- The health, safety, security, environmental, technical and other impacts of temporary and permanent changes are formally documented and approved and that any necessary revisions are made to project documents.
- All affected project persons are aware of and understand any project changes.
- The effects of change on the workforce/organization, including training requirements, are assessed and managed.
- The original scope and duration of temporary changes are not exceeded without review and approval.

Fugro shall complete and submit a MOC for all operations affecting the project as applicable and as per HS-P15 Management of Change Procedure and HS-F80 Change Management Request Form.

12.9.1 Responsibilities

The on-site Client and Fugro Site Supervisor will have the responsibility for assuring that any changes to the agreed project follow this MOC process. Any company or contract employee has the responsibility of reporting any changes to the project to the on-site Client and Fugro Field Supervisor for their implementation of the MOC process. The Field Supervisor has the responsibility for facilitating the MOC and completing any follow-up according to this procedure.

12.9.2 Documentation

All applicable changes should have a corresponding MOC Change Request and Authorization form. This form can be used for communicating the change and follow the process below.

- All signed original forms and any attachments must be collected and sent to the Fugro Project Manager for the project files upon completion of the project
- Copies of any signed forms and all attachments shall be sent to the QHSSE Department to be included for tracking purposes on the MOC Register.
- When sending in a MOC request all supporting documentation shall be faxed or e-mailed to the appropriate people for review.
- Supporting documentation shall include at a minimum a Task Risk Assessment.

Any changes to the contract, to any procedures or policies, the HSSE Risk Assessments, the HSSE & Operating Plan and/or the HSSE Interface document shall be made by the appropriate document custodian and then re-distributed or made available accordingly. At a minimum, these documents should indicate Revision Number, Latest Revision Date, Print Date, and have a distribution list.



12.9.3 Awareness

All client, Fugro, and other subcontractor supervisory and management affiliated with this project are to be made aware of this procedure, what constitutes a “change” and what project documents could be affected.

12.10 HAZARD COMMUNICATIONS

Fugro and subcontractor will ensure that chemicals that are brought onsite and will have a proper Safety Data Sheet (SDS) available for use in all locations where the chemical will be utilized. The SDS shall be reviewed to determine if any special personal protective equipment is required prior to mobilization to the project site.

12.11 FIRE PREVENTION

To understand fire safety, you must first understand fire chemistry. These four basic elements are needed to produce a fire:

- Fuel - Paper, wood, rags, oil, or grease.
- Oxygen - Air, ventilation, stored oxygen.
- Heat - Ignition sources, hot surfaces, sparks, open flames, electrical arcs.
- Chemical Reaction - A sustained chemical reaction

To eliminate the potential for a fire or to extinguish a fire, you must remove 1 or more of the 4 components of the Fire Tetrahedron.

12.11.1 Four General Classes of Fire

The four general classes of fire are as follows:

- **Class A** fires are those that have paper, wood, trash, and other solid material for fuel.
- **Class B** has a flammable liquid or gas as a fuel; an example of a Class B fire would be gasoline that has ignited
- **Class C** fires are electrical in nature.
- **Class D** fires result from a combustible metal such as magnesium.

12.11.2 FIRE PREVENTION GUIDELINES

The following fire prevention guidelines should be adhered to mitigate the hazards of fire, explosions, and the dangers associated with flammable materials.

- A minimum of one (1) 20-pound ABC rated fire extinguisher must be at each borehole worksites.
- A minimum of one (1) 2.5-pound ABC (1A:10BC) rated fire extinguisher must be available on all non-borehole worksites.
- A fire extinguisher, rated not less than 10B shall be present within 50 feet when 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the jobsite.



- The travel distance from any point on the work area to a fire extinguisher shall not exceed 100 feet.
- All fire extinguishers shall have a current annual inspection (tag present).
- All fire extinguishers shall be inspected monthly (tag present and marked for the current month).
- Work locations, vehicles, and the inside and outside of buildings shall always be kept clean and orderly.
- Discarded packing material or scrap should not be accumulated.
- Portable electric heaters must be used with caution, away from ignition sources, furniture and other flammable materials.
- Combustible materials, such as oil-soaked rags, waste, and shavings shall be kept in approved metal containers with metal lids. Containers should be emptied as soon as possible.
- When pouring or pumping gasoline or other flammable liquids from one container to another, metallic contact shall be maintained between the pouring and receiving containers.
- Strict adherence shall be paid to the "No Smoking" and "Stop Your Motor" signs at fuel dispensing locations.
- Change oil-soaked or contaminated clothing. It may cause skin irritation and is a fire hazard. Do NOT place in a dryer!
- Smoking or open flame shall not be permitted in areas where dangerous gases might be present, for example, oil rooms, hydrogen areas, acetylene storage, or similar areas. Neither shall smoking be permitted in storerooms, battery rooms, flammable liquid storage and use locations, or in other areas where quantities of combustible materials are kept. Absence of "No Smoking" signs shall not excuse smoking in dangerous places.
- All containers shall be labelled as to their contents. The SDS for each hazard will be readily available.
- A hot work permit shall be in place for any activity that produces an open flame, welding operations, grinding operations, and other spark producing activities.
- Smoking shall not be permitted in cabin areas
- Personal item such as cell phones and computers shall not be charged within the bunk area or on bedding.
- Battery charging must follow the manufactures recommendations. Battery chargers such a cell phone charger and remote chargers must be compatible with the items specification. Damaged cords must be replaced including cell phone charge cords.

12.12 HOUSEKEEPING

The maintenance of good housekeeping at the worksite is the simplest way to reduce HSSE incidents. The following actions shall be taken to ensure a high standard of housekeeping is maintained:

- Material shall be stored in an orderly and stable fashion and kept clear of work areas and traffic aisles.
- Spills shall be cleaned up immediately.



- Nails/staples shall not be left protruding from boards or boxes.
- Vehicles, offices and other facilities shall be kept neat, clean, and orderly.
- All trash shall be placed in trash containers.
- Tools shall be kept clean and in proper storage areas.
- Pipe and similar materials shall be stacked and choked to prevent spreading.
- Working areas will as far as practical be maintained level and dry
- Hazardous areas shall be barricaded and signed.
- Sufficient access shall be available for the safe passage of vehicles and pedestrians
- Sufficient lighting shall be available where required to maintain safe working conditions
- Flammable and combustible materials shall be stored at least 50 feet from hot work or other sources of ignition.
- Fire extinguishers shall be provided at least 25 feet from, but not more than 75 feet from flammable liquid storage areas.
- Flammable liquids shall be stored in clearly marked containers and labelled as to contents.
- Maintain the smallest possible inventory of chemicals to meet the immediate needs.
- Hazard Observation Cards should be used to identify and correct housekeeping issues.

12.13 MUSCULAOSKELTAL AWARENESS / ERGONOMICS

- Employees should avoid being in a prolonged position for extended periods of time.
- Limit the use of vibrating tools
- Avoid reaching to access work / avoid awkward positions
- Avoid repetitive tasks. Rotate tasks or take rest breaks to break up repetitive tasks.
- Limit as much as practicable working on your knees and twisting your hands and wrists
- Limit lifts to 50 lbs or less
- When you pick up or set down a load, don't reach more than 10" from your body
- Don't twist your body
- Lift with your legs, not your back. Keep your back as straight as possible
- Lift the load using a solid two-handed grip.

12.14 WORKPLACE VIOLENCE

The project has a zero-tolerance policy for workplace violence. Consistent with this policy, acts or threats of physical violence, including intimidation, harassment, and/or coercion, which involve or affect the project, or which occur on project property will not be tolerated.

Acts or threats of violence include conduct, which is sufficiently severe, offensive, or intimidating to alter the employment conditions on the project or to create a hostile, abusive, or intimidating work environment for one or several project employees.

12.15 FIREARMS AND EXPLOSIVES

Firearms and explosives will not be permitted on project property. The project reserves the right to search any person and/or property of employees, suppliers, and site visitors for the presence of firearms and explosives.

12.16 TEMPERATURE EXTREME

12.16.1 Hot Environments

Heat-related illnesses are avoidable if training is in place and the right actions are taken before, during, and after working in hot conditions. High temperatures and humidity can stress the body's ability to cool itself, making heat illness a concern during hot weather months. Working outdoors, especially during summer months, exposes personnel to elevated heat conditions, creating the potential for heat illness. The three primary forms of heat illness are heat cramps, heat exhaustion, and heat stroke. Heat stroke can be a life-threatening condition. The Fugro Management Team will evaluate the temperature using the wet bulb globe temperature as shown in OSHA

https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_4.html

12.16.1.1 Employee Responsibilities

Learn the signs and symptoms of heat-induced illness and how to respond.

Employee training topics will include:

- The environmental and personal risk factors for heat illness
- Review of this section of the Project HSSE Plan
- The importance of staying hydrated, drinking water frequently throughout the day, at least 4 cups per hour
- Importance of acclimatization (allowing the body to adjust gradually to the work in high heat)
- Types of heat illness and the signs and symptoms
- Necessity of immediately reporting to Fugro, directly or through the Crew Leader / Mentor any signs or symptoms of heat illness
- Procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided if they become necessary
- Procedures for emergency communications. This includes the emergency response procedures such as locating local medical services and communication alternatives
- Procedures for ensuring that, in the event of an emergency, clear and precise directions to the work site can and will be provided, as needed, to emergency responders

12.16.1.2 Crew Leader / Mentor Responsibilities

Prior to assignment to supervision of employees working in the heat, training on the following topics shall be provided:

- The information required for employee training listed above
- The importance of preventing heat illness and how to recognize the symptoms
- The procedures the Crew Leader / Mentor is to follow when an employee exhibits symptom consistent with possible heat illness, including emergency response procedures
- Procedures for acclimatization
- Modifying working hours where necessary/possible to work during cooler hours of the day
- Providing a "buddy system" to allow employees to watch each other closely for signs of heat illness



12.16.1.3 Water

There will be an adequate supply of clean cool potable water available at all job sites. The Crew Leader / Mentor will ensure that an adequate supply of drinking water is available at each location and that employees are encouraged to consume an adequate amount of water. It is recommended that each employee drink 4 8-ounce glasses of water per hour, including at the start of shift.

12.16.1.4 Shade

Shade for recovery periods will be provided when employees need relief from the heat. The direct heat of the sun can add as much as 15 degrees to the heat index. Rest breaks are important to provide time for cooling and provide an opportunity to drink water. Breaks should be taken in cooler, shaded areas. The Field Supervisor will be responsible for ensuring that adequate shade is available at work sites where the temperature is expected to exceed 85 degrees. The location of shade areas and the need to rest and get into the shade if any heat illness symptoms are present will be discussed daily at the tailgate meeting.

12.16.1.5 Acclimatization

People need time for their bodies to adjust to work in the heat. Acclimatization is particularly important for employees returning to work after a prolonged absence or recent illness, recently moving from a cool climate to a hot climate or working during the beginning stages of a heat wave. Monitor employees closely for signs and symptoms of heat illness, particularly when they have not been working in the heat for the last few days or when a heat wave occurs.

12.16.1.6 Work / Rest Regimens

Heat stress is dependent on the activity level and the environment around the employee. Specialized help to assess the risk must be consulted when radiant heat is a major contributor. When no radiant heat is present, the following can be used as guidance for the maximum exposure time to high temperature.

Estimate the activity level with the aid of Table 11.19-1. Read the maximum exposure temperature (wet temperature) in 11.19-2 — this is the maximum exposure temperature at 100 percent humidity. Usually the humidity is lower, more heat can be removed by sweating, and a higher dry temperature is allowed. This dry temperature is the temperature normally referenced and can be derived from the wet temperature and the relative humidity with the aid of 11.19-3. Table 11.19-4 provides the “apparent temperature” for temperatures 64 degrees F (18 degrees C) to 108 degrees F (42 degrees C) — the apparent temperature is the general term for (human) perceived outdoor temperature caused by the combined effects of air temperature, relative humidity, and wind speed.

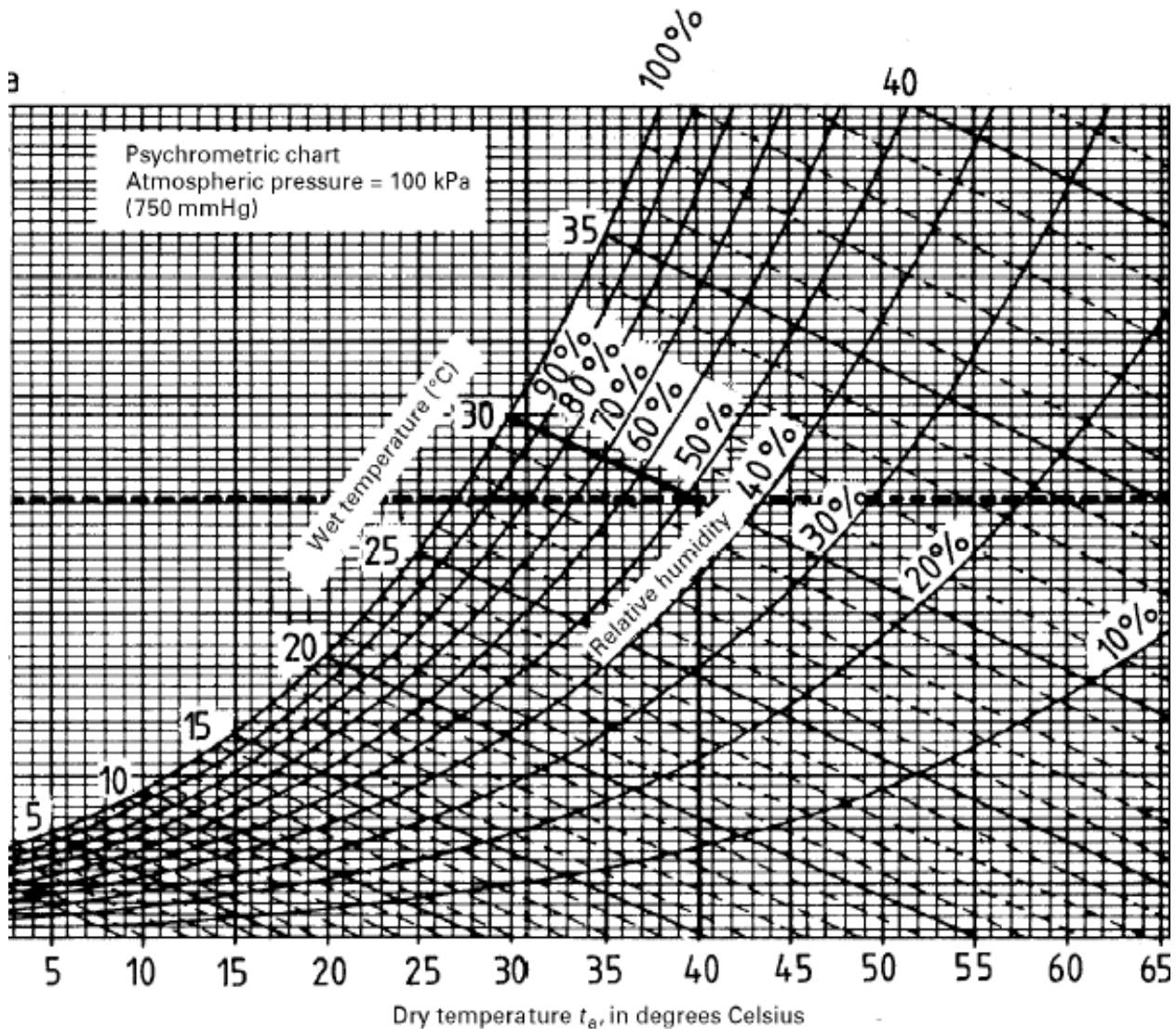
Table 11.19-1 - Activity Level

#	Class Description	Example
0	Resting	Resting
1	Low activity rate	<p>Sitting at ease: light manual work (writing, typing, drawing, sewing, book-keeping); hand and arm work (small bench tools, inspection, assembly or sorting of light materials; arm and leg work (driving vehicle in normal conditions, operating foot switch or pedal).</p> <p>Standing: drill (small parts); milling machine (small parts); coil winding; small armature winding; machining with low power tools; casual walking (speed up to 2.2 mph [3.5 km/h])</p>
2	Moderate activity rate	Sustained hand and arm work (hammering in nails, filing); arm and leg work (off-road operation of lorries, tractors ,or field execution equipment); arm and trunk work (work with pneumatic hammer, tractor assembly, plastering, intermittent handling of moderately heavy material, weeding, hoeing, picking fruit or vegetables); pushing or pulling light weight carts or wheelbarrows; walking at a speed of 2.2 to 3.4 mph (3.5 to 5.5 km/h) forging
3	High activity rate	<p>Intense arm and trunk work; carrying heavy material; shovelling; sledge hammer work; sawing, planning, or chiselling hard wood; hand mowing; digging; walking at a speed of 3.4 to 4.3 mph (5.5 to 7 km/h)</p> <p>Pushing or pulling heavily loaded handcarts or wheelbarrows; chipping castings; concrete block laying</p>
4	Very high activity rate	Very intense activity at fast to maximum pace; working with an axe; intense shovelling or digging; climbing stairs, running, walking at a speed greater than 4.3 mph (7 km/h)

Table 11.19-2 - Maximum Exposure Temperatures (wet temperature at 100% humidity)

#	Class description	Maximum exposure temperature (°F / °C, wet at 100% humidity)			
		Person acclimatized to heat		Person not acclimatized to heat	
0	Resting	91 °F/33 °C		90 °F/32 °C	
1	Low activity rate	86 °F/30 °C		84 °F/29 °C	
2	Moderate activity rate	82 °F/28 °C		79 °F/26 °C	
3	High activity rate	No sensible air movement 77 °F/25 °C	Sensible air movement 79 °F/26 °C	No sensible air movement 72 °F/22 °C	Sensible air movement 73 °F/23 °C
4	Very high activity rate	73 °F/23 °C	77 °F/25 °C	64 °F/18 °C	68 °F/20 °C

Table 11.19- 3 - Conversion Wet Temperature to Dry Temperature



Example: What is the corresponding dry temperature for 30 °C (wet) when humidity is at 60 percent?
Look up the top curved line with the indication 100 percent.
Find 30 °C.
Follow the straight line towards the right-hand bottom corner till curved line indicating 60 percent is met.
Follow the vertical line to the bottom of the table.
Read the temperature (= 37 °C).
 $^{\circ}\text{C} = (^{\circ}\text{F} \times 5/9) - 32$
 $^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32$

Table 11.19-4 - Apparent Temperature Index

Relative Humidity	Apparent temperature(°F/°C)										
0%	64/18	70/21	73/23	79/26	82/28	88/31	91.4/33	95/35	99/37	102/39	108/42
10%	64/18	70/21	75/24	81/27	84/29	90/32	95/35	100/38	106/41	111/44	117/47
20%	66/19	77/22	77/25	82/28	88/31	93/34	99/37	106/41	111/44	120/49	129/54
30%	66/19	73/23	79/26	84/29	90/32	97/36	104/40	113/45	124/51	135/57	148/64
40%	68/20	73/23	79/26	86/30	93/34	100/38	109/43	122/50	137/58	151/66	
50%	70/21	75/24	79/27	88/31	97/36	108/42	120/49	135/57	151/66		
60%	70/21	75/24	82/28	90/32	100/38	115/46	133/56	149/65			
70%	70/21	77/25	84/29	93/34	106/41	124/51	144/62				
80%	72/22	79/26	86/30	97/36	113/45	137/58	156/69				
90%	72/22	79/26	88/31	102/39	122/50	151/66	171/77				
100%	72/22	81/27	91/33	108/42	133/56	165/74					

12.16.1.7 Prompt Medical Attention

Recognizing the symptoms of heat illness and providing an effective response requires promptly acting on early warning signs. Symptoms of related illnesses include, headaches, dizziness, light headedness, weakness, mood change, irritability, confusion, upset stomach, vomiting, decreased or dark colored urine, fainting, passing out and pale clammy skin. Any of these symptoms require immediate attention.

All Fugro field personnel are first-aid/CPR trained. However, if workers show any abnormal response to the heat and first-aid trained personnel are not immediately available onsite, call 911 immediately.

12.16.1.7.1 HEAT STRESS DANGERS POSED BY APPARENT TEMPERATURES

90-100 Degrees F (32-39 Degrees C):

Sunstroke, heat cramps, and heat exhaustion are possible with prolonged exposure and physical activities.

105-129 Degrees F (41-54 Degrees C):

Sunstroke, heat cramps, and heat exhaustion likely. Heat stroke is possible with prolonged exposure and physical activities.

129 Degrees F (54 Degrees C) or Higher:

Heat stroke or sunstroke is imminent.



12.17 PERSONAL PROTECTIVE EQUIPMENT (PPE)

All Fugro and subcontractor personnel shall wear appropriate personal protective equipment (PPE). It is the responsibility of everyone to bring and to wear all PPE as required by the specific task being performed, the potential hazards that person will be exposed to, and the specifics of the project. Personnel must adhere to the PPE requirements recommended on the SDSs for materials handled and required on the TRAs produced to assess the risk of that task.

The use of PPE shall comply with federal, state, and local regulations and shall be routinely inspected for any defects that would compromise the intended use. All PPE shall meet ANSI or equivalent international standard.

Personal Floatation Devices (PFD) shall be properly inspected prior to use and meet USCG recommendation for size, use and fitness and must be properly worn.

12.17.1 Project PPE requirements

Minimum PPE requirements for this project include:

- Hard Hat
- Safety Glasses
- Long Pants and a suitable shirt, with no less than 4" or 10cm sleeves
- Long sleeved shirts are recommended but not required
- High Visibility Work Vest (unless hazardous to wear as defined in the applicable TRA)
- Appropriate Gloves. All material handling requires use of gloves
- Protective Work Boots (safety toed)
- Personal Flotation Devices (PFD) during overwater, work or outside of hand railing or in areas captain has designated as requiring PFD's.

Hard Hat:

This job requires that approved hard hats always be worn in the construction zones.

- Hard hats shall only be allowed to be worn backwards when welding operations are being conducted.
- Company logo or Subcontractor logo shall be displayed on all hard hats.
- Hard hats will only be used in accordance with manufacturer's recommendation and client requirements

Work Boot:

Safety-toed boots are required (conforming to ANSI Z41-1991). They must be constructed of leather or rubber and be at least 5" high and have a defined heel. Tennis shoes, athletic shoes (including leather), canvas shoes, loafers, sandals or open-toe shoes are not allowed during field operations.

Hand Protection:

Employees are required to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; sever cuts or lacerations; severe abrasions;



punctures; chemical burns; thermal burns; and harmful temperature extremes. The selection of glove will be based on the risk assessment performed for the applicable task. Gloves are required for all manual handling activities and when hands/fingers could be in the line of fire.

Eye Protection:

Proper eye protection is mandatory on the Project. Safety Glasses and/or prescription eyeglasses must conform to ANSI standard Z87.1.

- Safety glasses with project approved side-shields are required for all employees.
 - Clear lenses for low light work areas
 - Shaded lenses in outside, natural light work areas
- Prescription glasses must meet ANSI standard Z87.1
- Prescription glasses NOT meeting ANSI standard Z87.1 must be covered with "over glasses"
- The minimum eye protection for the project is the company issued safety glasses which will be worn at all times upon entering the site.

Hearing Protection (as needed):

- When noise levels are above 80 dBa where tools and equipment are in use such as drilling operations or employees are standing within few feet of these type operations employees shall wear hearing protection.
- When noise levels are above 90 dBa double hearing protection will be used.
- All employees will have ear plugs available for use at all times.
- Noise levels will be evaluated and will be available at each rig. Mentor shall not allow unprotected employees to enter the work area (defined as safe based on noise level monitoring) without proper hearing protection.

Respiratory Protection (as needed):

Facial hair, which would make it difficult to achieve a good seal with a respirator, will not be allowed on the project if respiratory protection is required. This includes beards, large sideburns and/or mustaches which could interfere with respirator face seal.

Employees exposed to airborne particulates, toxic fumes, gases, vapors or potential oxygen deficient atmospheres shall wear a respirator applicable for the particulates hazard encountered or expected.

Employees shall be trained (by the Project HSSE Manager), medically evaluated, and fit tested in the use, care and limitations of the respirator they are required to use per OSHA regulations.

Fall Protection (as needed):

Falls are one of the leading causes of construction injuries. Since these injuries are often severe and sometimes fatal, it is critical that all precautions are taken seriously. Failure to take appropriate fall protection precautions could result in termination. 100% Fall Protection is defined as: whenever an employee is exposed to a potential fall, they shall be secured in such a manner to arrest the fall before injury is occurred. Fall protection shall be worn when work requires the employee to be exposed to a fall to the next level of 6 feet. Full body harnesses and lanyards shall be used as follows:



- Shall be inspected daily by the user.
- Shall be secured to an object, structure or lifeline capable of supporting 5,000 pounds.
- Shall be secured as far above the waist level as possible, and the potential fall distance shall never be allowed to exceed 6 feet.
- Shall always be secured in such a manner as to minimize the potential fall distance (such as looping the lanyard around the lifeline and securing the lanyard back to the "D" ring on the belt).
- Shall be used in a manner as to be connected to an anchor point at all times (100% tie-off)
- Shall be used in accordance with the Permit to Work procedure contained in this document.

Clothing:

- High visibility work vest, unless vest creates a hazard.
- No loose clothing allowed.

Personal Flotation Devices (PFDs):

- Employees working over water will wear U.S. Coast Guard approved life jackets

13 ADVERSE WEATHER

Adverse weather is any prevailing weather conditions that can make routine operations more hazardous to perform and where additional safety requirements may be necessary if work is to be continued. The points listed in this section are ONLY GUIDELINES and are designed to be trigger points at which action may be instigated. The vessel Master, in consultation with the Site Manager, has total discretion regarding the safe operations and weather conditions.

13.1 WEATHER MONITORING

The Captains and the Site Supervisor will continually monitor weather forecasts through local VHF marine forecast and local weather broadcasts. Additionally, Fugro weather service will be used for the South Miller Point work. Geotechnical and Vessel/LB operations will be terminated well in advance of the approach of a major change in weather conditions to allow adequate time to jack up legs, safely transfer personnel to crew vessel if required to transit to safe haven before sea conditions become too severe for safe transit.

It is the responsibility of the Master of the vessel to keep abreast of the weather in the general work area, and to know if any impending squalls / storms are headed his way.

The Following forecast and information sources are available onboard the vessel:	
National Marine Weather Services	VHF Radio Weather Band – 24 hour/day Marine Weather Forecast.
National Hurricane Center	Available, as needed, to monitor tropical development.
Fugro Weather Service	Weather reports will be emailed twice daily for the South of Miller Point Locations

13.2 LIMITING CONDITIONS

There are several operations where adverse weather can have a major influence over the ability to safely perform these operations. Listed below are these tasks and the criteria which guide the Master, Party Manager, and those involved in decision-making.

Limiting Perimeters	
Maximum wave height	Five foot
Maximum wind velocity	Wind for of 5 or 20 knot winds
Marine moves	Maximum wave / swell height 3 feet. Other factors such as visibility, swell and wave shape, swell and wave period, exiting structures, seabed contours, vessel movements also require to be considered.

Personnel Transfer	
Maximum Personnel	Subject to crew vessels carrying capacity, on-site conditions and transfer method.
Maximum wave height	Maximum 3'. Factors to consider - swell and wave direction in relation to the Lift Boat and vessel, shape, swell period and wave crest.
Maximum wind velocity	BF 4 (13-18mph)

**** NO ONE IS ALLOWED ON DECK WHEN CLOUD TO GROUND LIGHTNING IS OBSERVED AND UNTIL 30 MINUTES HAS PASSED AFTER THE LAST OBSERVED STRIKE.**

**** ALL ACTIONS WILL BE TAKEN ON A CASE BY CASE BASIS WHEREBY THE PRECEEDING GUIDELINES MAY NOT BE APPLICABLE TO THE SITUATION AT HAND.**

13.3 HURRICANE AND TROPICAL CYCLONE PREPARATION

All personnel in a storm impact area should be evacuated to safe locations sufficiently in advance of the storm to ensure safe evacuation. The evacuation order is the responsibility of the operations managers in each operating division. Typically, this order will coincide with evacuation orders issued by our clients.

When operating in a known storm area, there should be enough fuel, food and provisions onboard for contingency. Once a Hurricane or Tropical cyclone is known to be active within the work area, the threat posed to the marine vessels must be evaluated and updated as the storm advance carries it either towards or away from the vessel's location.

14 SECURITY MANAGEMENT

Fugro is firmly committed to the protection the security of employees and property. The policy of the Company is to operate within the Geotechnical Investigation Industry in a sensible and conscientious manner, taking due regard of all security issues. Fugro will comply with all applicable regulations in the proposed area of work including IMCA regulation with project taking place in a low-risk area. Provisions will include on-signing procedures and gangway watch to control access to the vessel by the permitted personnel who are chaperoned, as required. While the vessel is in port, a 24-hour gangway watch will be in place. Further security provisions are as follows:

- Control of access to the L/B and support vessels
- Control embarkation of persons and their effects
- Monitoring restricted access areas
- Monitoring deck area & areas surrounding the L/B
- Supervision handling of cargo & stores
- Ensuring communication equipment is always readily available

Additionally, all Fugro team members traveling by air or road will be under the Fugro journey management during travel to and from the project area. Additionally, to reduce risk during ground transportation, every effort will be made to travel during hours of daylight.

To further endorse the Company's commitment to security management Fugro strives to achieve the following:

- Create awareness among all employees and contractors to the security issues that have been identified by the project team.

- Ensure that procedures are implemented to minimize the disturbance and impact of security issues on employees and property.
- To provide the Client with documentary evidence that the Fugro management takes security issues seriously and will take the appropriate measures to protect its employees and property.
- Monitor all field operations and ensure that the project complies with the security standards expected by both the local community and government.

14.1 KEY SECURITY ISSUES

- Project Site Equipment
- Project Facility Security
- Project Vessel Security
- Data / Project Information Security
- Travel Security

14.2 SECURITY MANAGEMENT RESPONSIBILITIES

The Fugro Project Manager has the ultimate responsibility for implementing and maintaining the Fugro Security Policy. This person must provide the necessary resources and training and delegate authority to those persons implementing the policy.

The Field Supervisor is responsible for ensuring that the policy is implemented on each project under his control.

The Crew Leader / Mentor is considered the onsite security monitor. They must ensure that all personnel are aware of their security responsibilities and that all security procedures are adhered to.

14.2.1 Project Data / Information

Project data and information shall be secured to prevent release to non-project personnel. When possible, project information shall not be printed. Project documents that are disseminated to the field shall be retrieved and disposed of at a project facility. Project information that is printed shall be shredded when no longer required.

Electronic media shall be secured with a password and/or access code at all times when not in control / use of project personnel. Data storage devices shall have project data removed prior to allowing non-project personnel use of such devices or disposal.

14.3 SECURITY MONITORING AND REPORTING

Fugro shall monitor the success of the security objectives and targets through:

- Site Inspections
- Incident Reports
- Hazard Observation Cards
- Non-conformance reporting

All security incidents shall be reported in accordance with the Fugro's Incident Reporting Procedure. Specific control and measurement requirements for the project include:

- All Project Personnel to attend Project Induction (which includes security review)
- Toolbox meetings to include security issues during shift change

14.4 TRAVEL SECURITY

As this project is in the United States of America, no project specific travel security issues have been identified. All personnel that travel to the project are to follow the journey management plan as set forth in this Project HSSE Plan.

15 ENVIRONMENTAL PROTECTION MANAGEMENT

Fugro is firmly committed to the protection of the natural environment. The policy of the Company is to operate within the Geotechnical Investigation / Geophysical Survey Industry in a sensible and conscientious manner, taking due regard of all sensitive environmental issues. Fugro will comply with all applicable regulations in the proposed area of work.

To further endorse the Company's commitment to environmental protection Fugro strives to achieve the following:

- Create awareness among all employees and contractors to the sensitive environmental conditions among which we work are that it is highly important and must be maintained.
- Ensure that procedures are implemented to minimize the disturbance and impact on the environment.
- Cultural reviews to be conducted prior to ground disturbance
- To provide the Client with documentary evidence that the Fugro Management does take due regard of its environmental responsibilities and is committed to conducting all work in an environmentally responsible manner.
- Monitor all field operations and ensure that the project complies with the environmental protection standards expected by both the local community and government.

The Environmental Goal for this project is:

- Zero Environmental Incidents

15.1 KEY ENVIRONMENTAL ISSUES

- Damage to the environment, through discharge of waste or oil spill
- Impact to wildlife
- Other impacts on the environment (routine waste)

15.2 ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

The Fugro Project Manager has the ultimate responsibility for implementing and maintaining the Fugro Environmental Policy. This person must provide the necessary resources and training and delegate authority to those persons implementing the policy.

The Project Manager is responsible for ensuring that the policy is implemented on each project under his control.

The Crew Leader / Mentor is considered the onsite environmental monitor. They must ensure that all personnel are aware of their environmental responsibilities and that all specific environmental procedures are adhered to.

Individual members of the geotechnical team are responsible for carrying out their duties in an environmentally conscious manner and for quickly reporting all environmental incidences including, but not limited to, unauthorized spills and discharges.

15.3 ENVIRONMENTAL MONITORING AND REPORTING

Fugro shall monitor the success of the environmental objectives and targets through:

- Site Inspections
- Incident Reports
- Hazard Observation Cards
- JHA Review
- Non-conformance reporting
- Audits and Inspections

All environmental incidents shall be reported in accordance with the Fugro's Incident Reporting Procedure. Specific control and measurement requirements for the project include:

- All Project Personnel to attend Project Induction (which includes environmental review)
- Toolbox meetings to include environmental issues during shift change
- Safety Meetings conducted on a weekly basis to include discussion of Environmental Issues.

15.4 SPILL PREVENTION AND RESPONSE

Fugro will set forth all necessary precautions to prevent and contain any spills due to leaks, breaks. Regular inspection of all equipment will be instituted as part of the preventative maintenance program, and to minimize the potential of a spill.

The risk of an environmental incident(s) has been closely evaluated by the team and control measures have been put in place that include daily equipment inspections, a fueling plan and proper material handling and storage.

In the case of a spill, and if conditions safely permit, Fugro and subcontractors will attempt to isolate and stop the source. Fugro will then immediately use available measures to contain the spill and prevent further environmental impact. All spills will be reported to the client immediately, once spill control measures are put in place. For larger spills client will be immediately notified.

15.4.1 Project Site Equipment

Site equipment shall be inspected daily for existing leaks and areas where potential leaks may occur (hoses, fitting, and engine blocks). Secondary containment shall be placed below areas where leaks are likely to occur, when possible.

15.5 ROUTINE WASTE

Efforts will be made to reduce the amount of materials that will be used on this project.

15.5.1 Disposal

Domestic garbage will be enclosed in a refuse container and disposed of to the appropriate collection point / disposal facility. Used hydraulic fluids, oil other or other equipment maintenance wastes will be properly stored in closed, labelled containers in a designated area that is properly labelled until sent to the appropriate disposal facility.

15.6 DRILLING WASTE

The borehole will be formed by rotary drilling. A casing will be used to support the borehole walls and to advance the borehole through common ground by wash boring method. The casing sizes to be used will depend on the samples to be taken and the target to be reached. Generally, it is envisaged that an outer casing will be used that acts as a conductor leading the drill cuttings back to the seafloor and preventing the spread of sediment with current flow.

Sea water will be used as the flushing medium in the borehole for the removal of cutting to the surface. Drilling additive (DUOVIZ) may be introduced to enhance viscosity or stabilise the borehole if necessary. The additive will be mixed aboard the L/B in the fully agitated mud batching system.

16 INCIDENT REPORTING

Incident reporting and investigation will be conducted in accordance with Fugro QHSSE-IMS-P002. Incidents involving Fugro employees and subcontractors will be reported to the Field Supervisor, and the QHSSE Representative. Fugro's reporting system will be used to record these events.

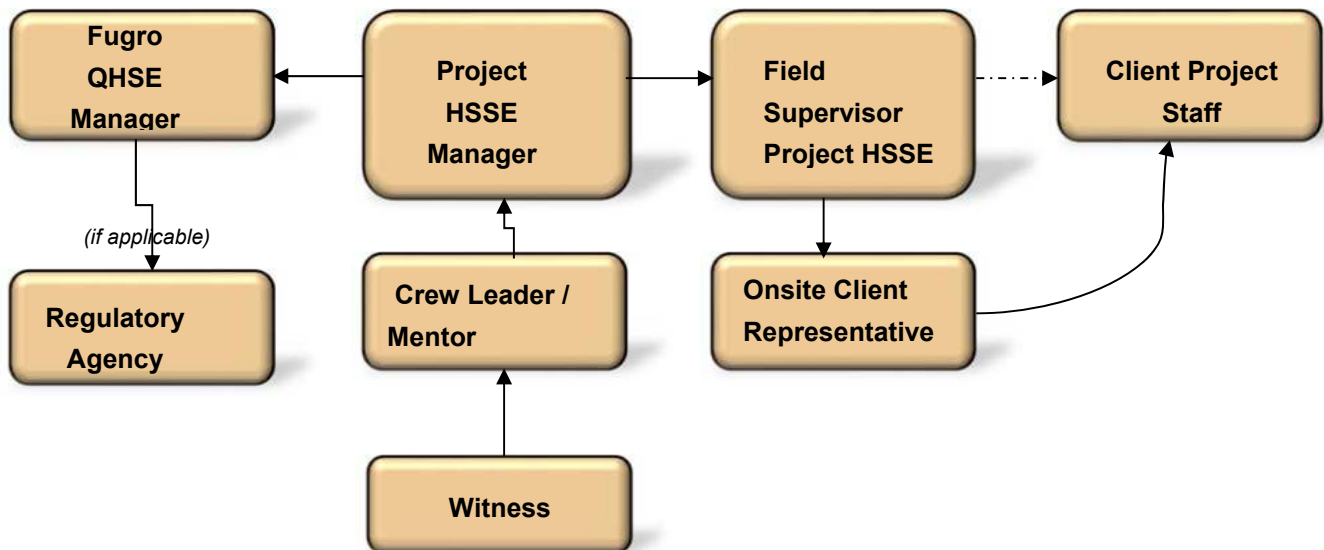
Reporting is divided into the following categories:

- Injury
- Illness
- Property Damage
- Fire / Explosion
- Environmental
- Near Miss
- Transportation

Fugro will assemble an appropriate investigation team and the appropriate subcontractor HSSE team shall promptly investigate and accurately report in writing all on-the-job accidents, all property damage, fires,

injuries, spills, and report them to the proper governmental authorities consistent with local and Country governing laws and regulations applicable to the Contract Area. Fugro will handle reporting in the following manner:

- Report the incident to the Client Project / HSSE Manager immediately once control measure are put in place.
- Secure the scene until released by the client
- Submit the initial Incident Investigation Report to the Client HSSE Manager within 24 hours.
- Submit the final Incident Investigation Report to the Client HSSE Manager within 72 hours.
- All corrective / preventative actions noted on the final Incident Investigation Report will be assigned to a responsible person, given a completion date, and tracked to closure using Fugro's IMPACT database.
- Develop and communicate lessons learned with project staff via Fugro Safety Alert.



16.1 INVESTIGATION AND CLOSE OUT

The following incidents will be investigated:

- High Potential Incidents (HIPO)
- Lost Time Incidents
- Restricted Work Cases
- Medical Treatment Cases
- First Aid Incidents
- Significant Near Misses
- Significant Environmental Events
- Fires and Explosions

Corrective and preventive actions will be documented and assigned close out dates. All actions shall be assigned a standard close out date of thirty (30) days or less in most instances. However longer dates may be assigned if deemed necessary in cases where there is a need to order and receive long lead material,

scheduling contractors, etc.

17 QHSSE MONITORING, AUDIT AND STATISTICS

On completion of the mobilization, the Field Supervisor shall ensure that regular safety audits are conducted. The review is not intended to be a full audit of the crews but rather a confirmation that the safety practices have been followed and that all checks have been made.

The continuous monitoring of the Project and QHSSE Systems is the responsibility of all members of the project team.

The Project Manager is to monitor the daily operations of the work crews via the daily reports and to ensure that all incidents, no matter how minor are properly investigated and corrective action implemented.

Fugro will compile HSSE statistics by collecting information on a daily basis and including them on the Daily Progress Report. Statistics will include (but not limited to) hours worked or exposure hours, leading indicators such as safety meetings, safety drills, near misses, tool box talks, Management of Change and Observations and lagging indicators will include environmental incidents, lost or damage equipment, first aid or medical incidents, non-conformances reports.

APPENDIX A
(HSSE Commitment Registry)

NO	HEALTH & SAFETY COMMITMENT	RESPONSIBILITY	REQUIRED
1	Consultation with Client on health, safety and environment expectations.	Fugro Project Manager	Post Contract Award
2	Drafting and submission of Project Safety Management Plan and Commitment Register.	Fugro Project Manager & HSSE Advisor	Pre- mobilization
3	Preparation of TRAs specific to the scope of work.	Fugro Project Manager & HSSE Advisor	Pre- mobilization
4	Issue of Fugro Project Safety Management Plan and attachments.	Fugro Project Manager	Pre- mobilization
5	Project Induction attended by Fugro personnel, Client Representatives and Sub-Contractor.	Fugro Project Manager & HSSE Advisor	Prior to commencement of mobilization
6	Supervision and monitoring mobilization activities including welding, cutting and working aloft, equipment offload, crane lifts, backing truck/trailers.	Fugro Field Supervisor/Crew Leader / Mentor Senior Drillers	During mobilization
7	Operation of Permit to Work System during welding, cutting, confined space entry and working aloft or outside of hand railing.	Field Supervisor	Throughout project
8	Revise and publish any changes to TRAs resulting from discussions at project meeting and toolbox meeting.	Fugro Field Supervisor/ Crew Leader / Mentor Fugro HSSE Manager	Throughout project
9	Toolbox meetings to be held at the start of each new shift.	Crew Leader / Mentor	Throughout project
10	Monitoring of all Fugro procedures and activities and advice the Project Manager on methods of improvement.	Fugro Field Supervisor/ Crew Leader / Mentor Onsite Fugro Safety Representative	Throughout project
11	Recording of all incidents relevant to Fugro operations.	Fugro Field Supervisors	Throughout project
12	All recorded incidents and near misses to be reported to Client Representative.	Fugro Field Supervisor/ Crew Leader / Mentor	Throughout project
13	Investigation of all reported incidents and near misses.	Fugro Field Supervisor/ Crew Leader / Mentor Fugro Onsite Safety Representative	Throughout project
14	Copies of all HSSE documentation including incident reports, investigation reports, published corrective and preventive actions, minutes of meetings etc. to be sent to Fugro QHSSE Manager and entered into IMPACT.	Field Supervisor/ Crew Leader / Mentor/Onsite Safety Representative	During Demobilization

ENVIRONMENTAL COMMITMENT REGISTER

NO	ENVIRONMENTAL COMMITMENT	RESPONSIBILITY	REQUIRED
1.	Sufficient spill response equipment must be available with equipment.	Field Supervisor	Prior to commencement of work
2.	Strict spill prevention measures will be put in place for over water work	Fugro Project Manager/ HSSE Advisor/ Subconsultant	Prior to commencement of this scope of work
3.	Environmental management, including waste management and disposal, must conform to Client and government requirements.	Field Supervisor	Throughout project
4.	Client must be informed immediately of any incidents involving fuel/oil spill.	Fugro Field Supervisor/ Crew Leader / Mentor /Client Representative	Within 24 hours
5.	All environmental incidents, near misses and hazards must be reported to Client using the incident & hazard report forms.	Fugro Field Supervisor/ Crew Leader / Mentor /Client Representative	Within 24 hours



APPENDIX B
(Task Risk Assessment Registry)

NO	Task
1.	GP-303 Thunder Lightning Storm
2.	GP-310 Vehicle Usage
3.	GP-311 Material Handling/Moving/Stacking Materials
4.	GP- 341 Drill Rig Maintenance
5.	GP-318 Welding
6.	GP-339 Powered Hand Tools
7.	EXPL-201 Hand Sampling
8.	EXPL-203 Retrieval/Transporting Field Samples
9.	EXPL-211 Grouting
10.	EXPL-217 Drilling Operations
11.	NEARSH-203 Small Boat Operations
12.	NEARSH-205 Working Over Water
13.	Fueling of Deck Equipment
14.	Personnel Transfer



APPENDIX C
(Overwater Emergency Response Plan)



APPENDIX D
(HSSE Bridging Document)

1. PURPOSE

The purpose of this plan is to interface plans, with particular emphasis on health, safety and environmental (HSE) focus, among operating companies jointly participating under a common Project HSE Management System.

2. SCOPE

This HSE Interface document applies to all personnel participating in the 2018 AECOM Houston Ship Channel Expansion Improvement project. This HSE Interface document will encompass all planning and operational activities undertaken by operations onboard the Lift Boat Shallow Draft # 17 for the duration of the 2018 Channel Deeping project.

Management System Standards

- **Fugro**
- **Shallow Draft Elevating Boats**
- **Benchmark Ecological Services Inc.**

3. BRIDGING MATRIX

Matrix Legend

X	Indicates Utilized plan
S	Indicates Common/Shared plan
P	Project-Specific Plan Utilized

FUGRO	SHALLOW DRAFT	BENCHMARK	HSE ELEMENT REFERENCE DOCUMENT
X	X	X	CHEMICAL SAFETY
	X		CONFINED SPACE PLAN
P	P	P	CONTACTS LIST
P	P	P	DRUG, ALCOHOL AND WEAPON FREE WORKPLACE PLAN <i>FUGRO ALCOHOL, DRUG & CONTRABAND POLICY</i>
	X		ELECTRICAL SAFETY PLAN
P	P	P	EMERGENCY RESPONSE PLAN
X	X	X	ENERGY ISOLATION PLAN
X	X		ENVIRONMENTAL PROTECTION PLAN
X	X	X	FALL PROTECTION PLAN
	X	X	FIRE PREVENTION AND PROTECTION PLAN
P	P	P	FIRST AID PLAN
X	X	X	FIT FOR DUTY PLAN (MEDICAL CERTIFICATES)
P	X		FUEL PROCEDURES

FUGRO	SHALLOW DRAFT	BENCHMARK	HSE ELEMENT REFERENCE DOCUMENT
X	X	X	HEARING CONSERVATION PLAN
X	X	X	HOT WORK PLAN
P	P	P	INCIDENT REPORTING AND INVESTIGATION PLAN
X	X	X	TRA / JSA PLAN
X	X	X	LIFTING OPERATIONS PLAN
P	P	P	MANAGEMENT OF CHANGE PLAN
X	X	X	MANUAL LIFTING PLAN
P	P	P	MEDICAL EVACUATION PLAN
X	X	X	PERSONAL PROTECTIVE EQUIPMENT PLAN
X	X	X	PREVENTATIVE MAINTENANCE PLAN
P	P	P	PROJECT EXECUTION PLAN (PEP)
X	X	X	SMOKING POLICY
X			SUB-CONTRACTOR HSE MANAGEMENT PLAN
X	X	X	VESSEL EMERGENCY RESPONSE MANUAL
	X	X	VESSEL GARBAGE MANAGEMENT PLAN
	X	X	VESSEL ORIENTATION PLAN
	X		VESSEL SECURITY PLAN
X	X	X	WORK PERMIT PLAN

APPENDIX F

QA DOCUMENTATION

Houston Ship Channel Expansion Channel Improvement Project

Refrigerated Trailer Temperature Log

Trailer Description 8' x 10' Refrigerated Trailer

Date	Time	Temperature (F)	Initials	Comments
10/2/2018	7:02	39°	RC	
10/2/2018	15:51	35°	RC	
10/3/2018	7:00	37°	RC	
10/4/2018	6:53	35°	RC	
10/4/2018	15:01	36°	RC	
10/5/2018	7:02	34°	RC	
10/5/2018	14:15	39°	RC	
10/6/2018	7:40	37°	PW	Arrival
10/6/2018	14:28	43°	PW	

APPENDIX G

PROJECT EXECUTION PLAN



AECOM JV

Project Execution Plan

**SEDIMENT AND WATER SAMPLING
FOR HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENT
PROJECT**

Fugro Document No.: 04.18180008

Document Issue Date: 10 September 2018

Houston Ship Channel, Houston, Texas

Fugro Project No. 04.18180008

1	Issued as Adv draft	J. Aramburu			7 September 2018
0	Issued as Draft	J. Aramburu			10 August 2018
Rev	Description	Prepared	Checked	Approved	Date

PROJECT EXECUTION PLAN

Sediment and Water Sampling for Houston Ship Channel Expansion



AMENDMENTS

Document Issue	Revision Details
Rev0	Issued to Client as draft
Rev1	Issued to Client as Advanced Draft

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1.0 INTRODUCTION

1.1 PROJECT WORK PLAN

This Project Execution Plan (PEP) communicates to the project team, project-specific information on the Nearshore Scope of Work, based on the contractually agreed objectives between Client here called AECOM JV (JV of Turner Collie and Braden, Inc. (dba AECOM) and Gahagan & Bryant Associate, Inc.) and Fugro USA Land, Inc. (Fugro).

This Project Execution Plan should be read in conjunction with the other three (3) documents that complement this text including:

- Emergency Response Plan;
- Health Safety and Environmental Management Plan; and
- Bridging Document.

All persons identified on the distribution list must ensure that this document is accessible both electronically and in hard copy where required.

1.2 PROJECT DESCRIPTION

AECOM JV awarded Fugro the contract for the Sediment and Water sampling for the Houston Ship Channel Expansion Channel Improvement Project. The scope of work consists on obtaining sediment and water samples for laboratory testing at 20 sampling stations throughout the Houston Ship Channel; specifically:

- 9 stations South of Morgan's Point
- 11 stations North of Morgan's Point

AECOM JV has contracted Fugro to collect sediment and water samples, storage and deliver of samples to the designated analytical USACE ERDC laboratory. Sampling Analysis Plans (SAPs) levelled *Draft Final* and dated May 16, 2018 were provided to Fugro to prepare our cost estimation. SAPs were prepared by USACE ERDC and used to design the field program. The field program will be tailored to adequately drill, sample, and recover soil and water samples in water depths that range from 7 to 50ft and to depths up to 50.5ft below Mean Low Lower Water (MLLW).

1.3 PROJECT OBJECTIVES

The purpose of this investigation is to acquire soil and water samples for environmental testing for the dredging of the Houston Ship Channel.

Fugro has subcontracted Benchmark Ecological Services, Inc. (Benchmark) for the environmental subsampling, handling and shipment of samples and water sampling.

Fugro also subcontracted Shallow Draft Elevating Boats, Inc of Louisiana for lift boat services. The Lift Boat (LB) Shallow Draft #17 and a 32-ft support boat, both owned and operated by Shallow Draft Inc will be used for this work.

Shallow Draft and Benchmark support vessels will be used for this program in conjunction with the L/B to support our daily operations.

Fugro's goal is to provide AECOM JV with the volume of samples required with quality and in a safe and efficient manner. This Project Execution Plan is specific for this overwater sampling program and serves to document the required scope of services and the procedures to be followed to safely conduct the investigation, as related to health, safety and environmental matters.

Following are the key items that Fugro will provide to achieve this objective:



- Provision of project specific documentation and plans related to the overwater work scope.
- Equipment mobilization to site for the overwater field program.
- Supervision and management of field operations.
- Magnetometer on the proposed overwater exploration locations.
- Provision of daily progress reports (DPRs) and relevant communication.
- Preparation of samples, storage and shipment to USACD ERDC laboratory.
- Equipment demobilization from site at the completion of the respective field program.
- Data report documenting our field operations.

1.4 MILESTONES

The following table presents the key milestones as identified by Fugro and informed to AECOM JV. Operations duration in this table are best estimate only and is provided based on the Scope of Work. It does not include any standby time or vessel delays.

Table 1: Project Milestones

Item	Start	Finish	Duration
1. Pre Mobilization	Authorization date	Sep 3, 2018	Finalized
2. Mobilization*	Sep 3, 2018	Sep 10, 2018	8 days
3. Operation**	Sep 11, 2018	Sept 30, 2018	20 days
4. Demobilization	Oct 1, 2018	Oct 8, 2018	7 days
5. Reporting	Oct 1, 2018	TBD	2 Weeks

* & ** These schedules are subject to favorable weather and working conditions.

1.5 HEALTH, SAFETY, AND ENVIRONMENT COMMUNICATIONS AND MEETINGS

The implementation of Fugro's Health, Safety, and Environmental (HSE) program is our highest priority, and the company is firmly committed to full compliance with federal, provincial, and local laws and ordinances. All decisions on policies and procedures are made within the framework of the applicable laws.

It is recognized that the policy of a safe-work culture is essential knowledge for all participants and that review of the project HSE and pre-project orientation alone may be insufficient. To bolster the safe-work culture and project documentation, Hazard Identification (HAZID) meeting was conducted on Sep 7 before operations start. Additionally, daily safety meetings will be conducted prior to the start of operations and at other necessary intervals when working conditions change or simultaneous operations are anticipated. This will be achieved by:

- JSA documents prepared for each activity of the project a required and reviewed by involved personnel prior to commencement of work;
- Daily toolbox/safety meetings held prior to commencement of daily activities;
- Conducting equipment pre-start inspections;
- Submission of Daily Progress Reports (DPRs), which will include HSE and incident documentation; and
- Conducting emergency drills.

1.5.1 Hazard Identification

In order to identify potential hazards and subsequent controls for the scope of work detailed herein, HAZID workshop was held before operations starts and attended by subcontractor supervisors, field crews and the Site Manager, Fugro and other contractors associated with the project. The information obtained during the HAZID is used to reinforce the JSAs prepared for the project and apply, and document, any additional engineering controls and mitigation measures.

1.5.2 Daily Safety Meetings

In an effort to disseminate and reiterate safe-work policies, a toolbox/safety meeting will be held at the beginning of each day of operations; when a new procedure or piece of equipment is introduced; or in the case of a near-miss, incident, or injury. The majority of the toolbox meetings are anticipated to be held at pier, LB, sampling vessel or in the yard while mobilizing/demobilizing equipment.

All toolbox meetings will be documented and will include, at a minimum, the following information:

- Environmental conditions, concerns, and/or hazards;
- Progress and technical problems from the previous day or shift;
- Expected activities and coordination between various subcontractors and Fugro employees for the upcoming day or shift;
- Coordination of work scopes by various subcontractors;
- Review of applicable TRAs; and
- Accidents, near misses, or hazard observations from the previous day.

All toolbox meeting records shall be kept in the Project HSE binder. The Project HSE binder shall be provided to the Project Manager at the completion of operations. In addition to the daily toolbox documentation, the following records and reporting will be required for the project:

- Daily Progress Reports (DPRs)
- HOCs (per occurrence)
- Near Miss Reports (per occurrence)
- Accident Report (per occurrence)
- Injury/Illness Report (per occurrence)

1.5.3 HSE Reporting Requirements

Serious incidents such as those listed below shall be verbally reported immediately to the Project Manager and QHSSE Manager and confirmed in writing within twenty-four (24) hours of occurrence:

- Incidents resulting in fatalities or serious injuries to Fugro employees, third party personnel, or members of the public that require evacuation/hospitalization (for purposes other than observation);
- Incidents resulting in property damage exceeding the equivalent of two thousand U.S. dollars (USD \$2,000);
- Spills or accidental releases of oil, refined products, chemicals, or other hazardous substances; and
- Near-miss incidents with high injury or property damage consequences.

In addition, Fugro shall evaluate and accurately report in writing all on-the-job accidents, property damage, fires, injuries, spills, and accidental releases to authorities consistent with local and country governing laws and regulations applicable to the area of operations. The reports on such incidents shall include information on the course of action taken or planned to mitigate or clean up the incident site, if applicable, and to prevent recurrence.

Fugro shall maintain and make available incident/accident records required by, or in general accordance with, local and federal governing laws and regulations applicable to the area of operations. These records shall include, as a minimum, a register of all first-aid treatments and a record of occupational injuries and days lost due to injuries.

The Site Manager will report the status of HSE on the project via the project DPR which is submitted to the Project Manager.

2.0 PROJECT REFERENCES

2.1 PROJECT ORGANISATION AND MANAGEMENT

Led by the Fugro Project Manager, the project team is responsible for execution of the project according to the scope of work described; this includes execution of the agreed changes to the scope of work.

2.2 PROJECT TEAM ORGANISATION

Figure 1 details the project team organisation.

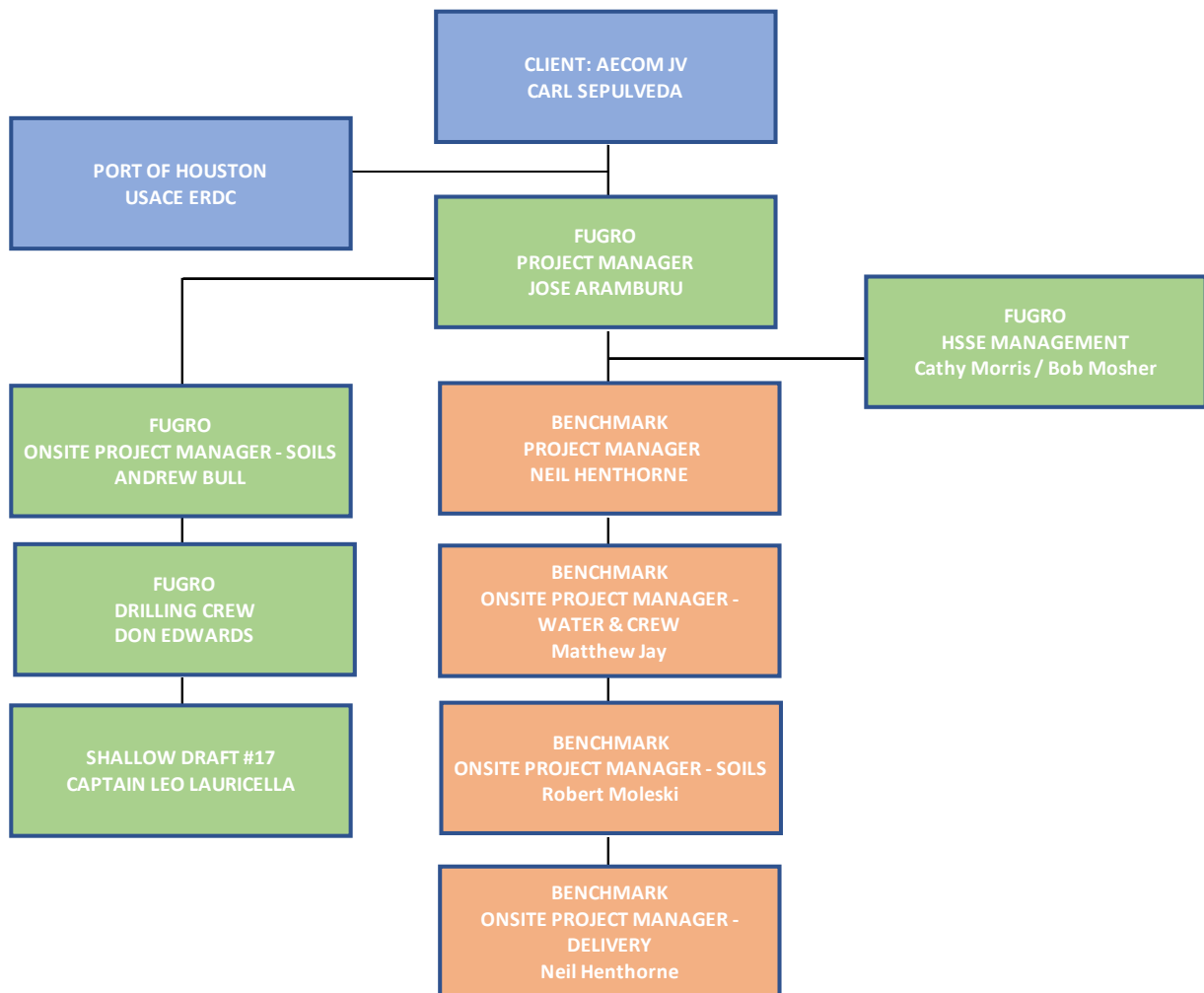


Figure 1: Project Team



2.3 CONTACTS

Contact telephone numbers for key Project Team personnel are summarized below on Table 2.

Table 2: Key Project Team Contact Information

Contact List and Phone numbers				
NEARSHORE				
Title	Name	Direct (Office)	Mobile	Email
Lift Boat Captain (LB SD#17)	<u>Leo Lauricella</u>	N/A	504 570-7727	N/A
Project Manager (Nearshore)	Andrew Bull	N/A	337-804-2130	abull@fugro.com
Drilling Supervisor (Nearshore)	Don Edwards	N/A	832-331-0051	dedwards@fugro.com
SD Support Boat Captain (32 ft)	<u>Emett Burtchaell</u>	N/A	504 912-3996	N/A
Benchmark Support Boat – Water Sampling	Matthew Jay	N/A	832-904-1153	mjay@benchmarkeco.com
Benchmark Sediment Field Supervisor – Lift Barge	Robert Moleski	N/A	850-228-6922	rmoleski@benchmarkeco.com
USACE Senior Project Manager	Cheryl Montgomery	N/A	781-530-8317	Cheryl.R.Montgomery@usace.army.mil
USACE Field Representative - SMP	Justin Wilkens	N/A	662-312-1691	Justin.L.Wilkens@usace.army.mil
USACE – Field Representative - NMP	Andrew McQueen	N/A	832-407-2628	Andrew.D.McQueen@usace.army.mil
Chief Operations Officer - Houston Pilots	JJ Plunket	281-476-8230	281-409-6119	jplunkett@houston-pilots.com
ONSHORE				
Fugro Senior Project Manager	Jose Aramburu	713-369-5427	713-775-7302	jaramburu@fugro.com
Shallow Draft (Lift Boat)	Jim Difatta	504-682-2100	985-852-0225	jdifatta@shallowdraft.com
Fugro HSE Manager Americas	Cathy Morris	713-346-4016	805-432-3115	cmmoris@fugro.com
Fugro Project HSE Manager	Bob Mosher	360-592-1178	281-658-9841	bmosher@fugro.com
Benchmark President	Neil Henthorne	281 934-3403	281 703-0257	nhenthorne@benchmarkeco.com

PROJECT EXECUTION PLAN

Sediment and Water Sampling Houston Ship Channel Expansion



AECOM Senior Project Manager	Carl Sepulveda	713 278-4620	832-860-4958	carl.sepulveda@aecom.com
Port of Houston	Richard Ruchhoeft	(713) 670-2471	(713) 301-0897	rruchhoeft@poha.com
Port of Houston - City Docks Operations	Joanna Kemper	(713) 670-2675		jkemper@poha.com
US COAST GUARD VESSEL TRAFFIC SERVICE				
VTS Watch Supervisor 24/7	N/A	281-464-4837	N/A	houstontraffic@uscg.mil
Operations Officer	LT Aaron Davis	281-464-4829	281-464-4837 (24/7)	Aaron.J.Davis@uscg.mil
VTSA Category II Channel Obstruction Request	N/A	N/A	N/A	http://txgulf.org/services/vt-channel-obstruction-requests
Director, VTS Houston/Galveston	Steven W. Nerheim	281.464.4826	713.818.4405 713.578.0841	snerheim@gmail.com
Waterways Management	N/A	N/A	N/A	houstonwwm@uscg.mil



3.0 FIELD EXPLORATION PROJECT EXECUTION

3.1 GENERAL

The Nearshore field operations will be conducted on top of the Lift Boat (LB) Shallow Draft #17 on a 10 to 12-hour basis (day-shift only), until the drilling program is completed. Drilling and sampling personnel will stay overnight on nearby hotels while the vessel's crew will stay onboard the LB. Personnel will be transfer on daily bases from a Land Point to LB and vice versa at about 0630hrs and 1700hrs using a support boat. **The support boat will stay with the LB 24hrs (TBD).** The Site Manager and Captain of LB will make sure that these transfers are done safely, during day-light hours only.

3.2 COORDINATE SYSTEMS AND POSITIONING

The coordinate system for reporting of the sampling program is NAD 83 State Plane. All coordinates and dimensions will be in feet. A Trimble Geo xH 6000 (sub-meter GPS) will be used to navigate to the channel sample locations and field coordinates will be recorded at each sample location.

3.3 VESSELS AND SAMPLE STORAGE

3.3.1 Lift Barge 70-foot Class Shallow Draft #17

The Lift Barge (LB) is a 70ft Jack Up type vessel, with a twin 671 diesel engine, length 64ft, beam 24ft and draft of 4.4ft. The LB has a 10-ton crane. Facilities aboard the Lift Boat (LB) Shallow Draft #17 consist of a work deck, small tea/mess room, portable potty, and drilling and ancillary equipment. Accommodations onboard the LB is mainly for captain and one crew member. The maximum working depth is 45 to 50ft which will allow for a 5 to 10ft air gap. Limiting sea (weather) conditions (swell and wave period, existing structures, seabed contours, vessel movements also require to be considered when moving and positioning the LB. The LB is self-propelled with average speed of 3 knots.

The LB operability is summarized on the following table. At all times, the decision of the LB Captain and/or Site Manager is final in determining the suitability of the conditions for the safety of personnel and equipment. The LB Captain and Site Manager will log the observations of conditions on a daily basis which will be presented in a Daily Progress Report (DPR) for Client's approval.

Item No.	Description	Sea State Hmax	Max Wind Strength
1	Crew Evacuation	5ft	Wind Force 5
2	Crew Changes	3ft	Wind Force 4
3	Moving Between Locations	3 ft	Wind Force 4
4	Fog	Visibility less than 1500 ft	
5	Current	1 knot	

Navigation and Communications. The LB will be fitted with the following communication methods:

- Cellular phone;
- VHF multi-channel marine radio;
- In compliance with USCG. Participates in the VTS systems when conducted;
- Equipped with onboard GPS.

3.3.2 Benchmark 24 Foot Sediment and Water Sample Vessel

Sediment grab samples will be collected and processed using the Benchmark 24-foot sample vessel. Samples from the offshore Reference sample station will be collected using this boat. When collecting sediment grab samples, the sample vessel will be equipped with an A-frame and winch to raise and lower the Van Veen grab sampler. Water samples from all sample stations will also be collected using Benchmark's sample vessel. For all sampling events, the sample vessel will be equipped (at a minimum) with a sub-meter Trimble Geo XH 6000 GPS unit, appropriate sample containers, coolers with ice to store processed samples, field data sheets, and drink cooler.

3.3.3 Shallow Draft 32 Foot Support Vessel

Shallow Draft will operate a 32-foot support vessel powered by dependable Yamaha outboards with 7,000 lb deck payload capacity. The boat will be used to transport personnel from/to the land points and the sampling vessel. The vessel will standby during operations tide all times to the LB. The support vessel will include all safety features to accommodate crew transfers and will be in constant contact with the LB captain. Samples will also be transported to shore via this vessel.

3.3.4 16 Foot Refrigerated Box Truck with Liftgate

Sediment and water samples will be stored in a sixteen-foot refrigerated insulated aluminum box truck powered by a Thermo King T-600 cooling unit with thermostat. The truck has on automatic transmission with diesel-powered engine, a tuck under liftgate, power locks and windows, and cruise and tilt controls. In addition to sample storage, the refrigerated truck will be used to transport all sediment and water samples to the ERDC laboratory in Vicksburg, Mississippi.

3.4 SITE FACILITIES – SOUTH OF MORGANS POINT

3.4.1 Galveston Yacht Club

The Galveston Yacht Club located at **715 N Holiday Dr., Galveston, Texas** will be the base location when sediment and water samples are collected and processed from the offshore Reference and ODMDS sites. If weather conditions cooperate, the sediment and water field sampling associated with Reference and ODMDS sites will be conducted in one to two days. The following daily tasks will be conducted at the boat ramp:

- Launching and retrieval of the Benchmark 24 ft. sediment and water sampling vessel.
- Loading and unloading of field sampling and processing personnel.
- Loading and unloading of sampling and processing equipment (e.g. Van Veen grab sampler, sample buckets, water pump, cubitainers, water sample jars, GPS, etc.).
- A refrigerated truck will be parked at the boat ramp when conducting field sample collection and processing for the two sample stations listed above. Sediment and water samples will be offloaded at the end of each day and stored in the refrigerated truck until they are delivered to the analytical laboratory.

3.4.2 Texas City Dike Boat Ramp

The Texas City Dike Boat Ramp located along **Dike Rd, Texas City, Texas** will be the base location when sediment and water samples are collected and processed from sample stations SMP-01 and SMP-02. If weather conditions cooperate, sediment field sampling and processing will be completed in three (3) sample days and the water sampling will be completed in one (1) day for sample stations SMP-01 and SMP-02. The following daily tasks will be conducted at the boat ramp;

- Loading and unloading of field sampling and processing personnel.
- Loading and unloading of sampling and processing equipment (e.g. sediment sample buckets, water pump, cubitainers, water sample jars, GPS, etc.).
- A refrigerated truck will be parked at the boat ramp when conducting field sample collection and processing for the two sample stations listed above. Sediment and water samples will be offloaded at the end of each day and stored in the refrigerated truck until they are delivered to the analytical laboratory.

3.4.3 Sylvan Beach Boat Ramp

The Sylvan Beach Boat Ramp located on **N. Bayshore Dr., La Porte, Texas** will be the base location when sediment and water samples are collected and processed from sample stations SMP-03 through SMP-07. If weather conditions cooperate, sediment field sampling and processing will be completed in eight (8) sample days and the water sampling will be completed in two days;

- Launching and retrieval of the Benchmark 24 ft. water sampling vessel.
- Loading and unloading of field sampling and processing personnel.
- Launching and retrieval of Fugro support boat to deliver personnel to and from the sediment sample barge.
- Loading and unloading of sampling and processing equipment (e.g. sediment sample buckets, water pump, cubitainers, water sample jars, GPS, etc.).
- A refrigerated truck will be parked at the boat ramp when conducting field sample collection and processing for the two sample stations listed above. Sediment and water samples will be offloaded at the end of each day and stored in the refrigerated truck until they are delivered to the analytical laboratory.

3.5 SITE FACILITIES – NORTH OF MORGANS POINT

3.5.1 Channelview Market Street Public Boat Ramp

The Channelview Boat Ramp located at **16581 Market Street, Channelview, TX 77530** will be the base location when sediment and water samples are collected and processed from sample stations NMP-01 through NMP-05. If weather conditions cooperate, sediment field sampling and processing will be completed in three (3) sample days and the water sampling will be completed in one (1) day for sample stations NMP-01 through NMP-05. The following daily tasks will be conducted at the boat ramp;

- Loading and unloading of field sampling and processing personnel.
- Loading and unloading of sampling and processing equipment (e.g. sediment sample buckets, water pump, cubitainers, water sample jars, GPS, etc.).

A refrigerated truck will be parked at the boat ramp when conducting field sample collection and processing for the two sample stations listed above. Sediment and water samples will be offloaded at the end of each day and stored in the refrigerated truck until they are delivered to the analytical laboratory.

3.5.2 Houston Mooring Company Ramp (TBC)

This company was contacted to help us load and unload field crews and samples. This privately-owned boat ramp is located at **709 S. 80th Street in Houston 77012**. The ramp will be the base location when sediment samples are collected and processed from sample stations NMP-06 through NMP-11. If weather conditions cooperate, sediment field sampling and processing will be completed in three (3) sample days.

Water samples will be collected using Benchmark support boat that which will be using the Channelview ramp. The water sampling will be completed in one (1) day for sample stations NMP-06 through NMP-11. The following daily tasks will be conducted at the boat ramp;

- Loading and unloading of field sampling and processing personnel.
- Loading and unloading of sampling and processing equipment (e.g. sediment sample buckets, water pump, cubitainers, water sample jars, GPS, etc.).

A refrigerated truck will be parked at the boat ramp when conducting field sample collection and processing for the two sample stations listed above. Sediment and water samples will be offloaded at the end of each day and stored in the refrigerated truck until they are delivered to the analytical laboratory.

4.0 FIELD OPERATIONS

4.1 PRE-MOBILIZATION

Fugro HSSE representative and Senior Project Manager will be onsite during mobilization and beginning of work to ensure equipment and personnel are fit for the project and Fugro and Contractors are properly coached on the daily processes and role and responsibilities to successfully meet the AECOM JV and Fugro project Goals and Objectives. Communication need to be established with the USCG in Houston and Harbor Master regarding the planned scope and work area along with being provided the project work schedule and contact information. All equipment will be checked prior to shipping to site along with critical spares appropriate for the project duration.

The Project Manager and other senior members of the team are responsible for planning all aspects of the proposed work scope; this work shall include:

- Review of final Client requirements;
- Review of Fugro proposed equipment;
- Preparation of project briefing for all field-going and relevant shore-based personnel; and
- Preparation of Project HSSE Management Plan, Emergency Response Plan and Project Procedures.

4.2 MOBILIZATION

The LB will be mobilized at Gulf Coppers dock in Pelican Island, Galveston, Texas where equipment and consumables for the project will be loaded. All deck items will be sea-fastened, and the Barge Master will complete an inspection form. Once all systems have been proved operationally satisfactory, they will be sea fastened for the transit to the working location at the ship channel. A meeting with the Port of Houston Authority, VTS Houston Galveston, Houston Pilots and Aecom was conducted on September 6 at the US Coast Guard offices ahead of the mobilization. At this meeting we were informed the project communication Plan consisting on:

- Each operation will be preceded by a VTSA Category II Channel Obstruction Request. Please submit 72 hours in advance to ensure the word gets out to all port partners. If no objections, these will be approved by VTS the day prior to the operation. The link to the channel obstruction requests is below.

<http://txgulf.org/services/vtsa-channel-obstruction-requests>

- 15 minutes prior to movement/operation of the jack up barge contact VTS on VHF Channel 05A where you will be shifted to the respective VTS frequency where you are working (11/12/21A). Monitor the designated VTS frequency and VHF Channel 13.
- The VTS watch supervisor is available by phone/email 24/7 at 281-464-4837 and houstontraffic@uscg.mil.

The drilling and technical crew will join the LB once in location using the support vessel. The support vessel will travel with the LB.

4.3 PROGRAMMING OF WORKS

The work scope currently comprises 9 sampling stations South of Morgan's Point (SMP) and 11 sampling stations North of Morgan's Point (NMP). The sediment sampling depths are planned to reach 50.5ft below MLLW with crew to support a 10-12 hr operation. LB crew will stay onboard 24-hrs.

- Operations will commence on locations SMP. Fugro, Benchmark and AECOM JV will Plan the sequence of locations with the Port Authorities.
- Borehole locations NMP will start once SMP locations are finalized and samples have been taken out of the LB. Tentative final locations were provided on Sep 6, 2018.
- Consideration will be given to the weather forecast when working, to facilitate the decision making with respect to the feasibility of moving the LB to and from the locations and to do crew transfers.
- Besides the weather conditions, seas, wind speed and direction and currents should also be taken into consideration to establish the presence of a safe window of operation. The decision of the LB Master and/or Site Manager is final in determining the suitability of the conditions for the safety of personnel and equipment.
- The LB Master is responsible for coordinating positioning of the LB.
- Communication with the POH pre and during LB moves on locations will be as per the Project Communication Plan.
- All moves of location will be started allowing time to complete the move and jack-up before end of shift. The time to perform moves will be assessed once on site and the decision on whether to make a move or not towards the end of a shift, will be taken by the Barge Master after consultation with the field team.
- Crew transfers will be coordinated in close proximity with AECOM JV personnel.

Once on location the LB will be jacked above the water level to allow a safe working operation. The LB will be elevated above seabed to an elevation equal to at least water depth plus the maximum tidal variation plus the maximum expected wave height (Hmax).

4.4 CREW TRANSFERS

Crew transfer will be conducted by support vessel. The support boat will pick up personnel on land point and transit them to LB. Once onsite, support vessel will approach the LB and communicate with the LB personnel. The boat will approach the LB access ladder and passengers will transfer onto the LB. Crew will also ensure life jackets properly ware and secured, hand and feet are position correctly, personnel are properly positioned.

4.5 EMERGENCY SPILL ARRENGMENTS

Equipment observations will be performed during mobilization and daily during the work scope to help reduce most typical environmental emergency response scenarios resulting from damaged hydraulic lines and hoses etc. Engineering controls will be in place including impermeable liners and spill response kits located on the LB for immediate deployment.

Equipment lubricants and fuels will be containerized appropriately with sealed lids and held on site at designated locations approved containers. Lubricants will be placed in safe areas outside of pathways to minimize contact. Flammable materials will be stored separately in approved containment. MSDS sheets will be available on site for all lubricants and operations fluids (e.g., fuel).

In case of a spill of hydraulic oil, a broken hose or fuel spill, there is an emergency spill kit located on the deck of the LB. In the event any of the fluids make it into the water then oil dispersants will be used and the oil boom deployed from the bow of the jack-up.

- The Barge Master or supervisor to stop all works and assess the situation. All trained and competent personnel to muster to their stations as per the roles and responsibilities schedule in appendices.
- Ensure suitable PPE is donned including eye wear, gloves and suitable overalls as required. If in doubt then refer to the COSHH register with the relevant material safety data sheet(s). If handling fuels, then ensure the correct protective gloves are being used to stop Diesel or Petrol being absorbed by skin.
- Using the absorbent pads all spill fluid must be contained on deck and dealt with using the spill equipment provided.
- If fluids have made it into the water then dispersants must be used immediately. The RIB will be manned with 2 crew members trained in its use and assist with the deployment of the spill boom(s).
- The project manager must be contacted via phone or radio immediately and notified of the incident. Either project manager or site manager will make the call to the emergency services as required.

Additional details for emergency spill response procedures for the nearshore drilling are provided for in the nearshore HSEMP.

4.6 DEMOBILIZATION

Following the completion of the Overwater Program, the LB will return to the Mobilization Point TBD to demobilize equipment and sail back to Louisiana.

5.0 SOIL SAMPLE AND WATER COLLECTION LOCATIONS

5.1 GENERAL

AECOM JV is conducting field investigations consisting of sediment and water sampling, environmental coordination and sediment storage and sample transport to the USACE ERDC laboratories as part of the USACE and Port of Houston Ship Channel Expansion Improvement Project (HSC ECIP). Samples will be taken at stations indicated on Figure 1 and 2 following the HSC ECIP Sampling Analysis Plans (SAPs) draft version presented to Fugro during the bidding phase and dated May 16, 2018. Our interpretation and involvement of the SAPs is presented in the following sections. Sampling stations have been divided as:

- South of Morgan's Point – 9 stations, and
- North of Morgan's Point – 11 stations.

Each sediment station consists of one to three sub-sampling locations (A through C). Samples will be collected in the field by Fugro/Benchmark and composited by ERDC. The coordinates, water depth, depth to sampling at specific location are presented on Table 3 for locations South of Morgan's Point. Table 4 presents similar information for locations North of Morgan's Point. Tables 3 and 4 also summarize Sampling Method, Sample Matrix, Type of Analyses and Bioassays. Each water sample point will consist of a single sample point at each location.

Table 3: Summary of Sample Collection and Testing – South of Morgan's Point

Sample Station	Sample Location/Sample ID	Coordinates (NAD83 State Plane, US Feet)		Proposed Dredge/Sample Depth (-MLLW ft)	Sediment Elevation (-MLLW ft)	Sample Method	Sample Matrix	Analyses	Bioassays
		Easting	Northing						
SMP-01	HSCNew-SMP-01-A	3305685.64	13706250.68	50.5	10.1	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
SMP-02	HSCNew-SMP-02-A	3285443.10	13747557.95	50.5	12.5	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
	HSCNew-SMP-02-C	3284353.05	13747030.40	50.5	15	Drill Rig	Sediment		
SMP-03	HSCNew-SMP-03-A	3267949.90	13772612.28	50.5	10	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
	HSCNew-SMP-03-C	3267056.59	13771965.29	50.5	11.6	Drill Rig	Sediment		
SMP-04	HSCNew-SMP-04-A	3255880.10	13789306.00	50.5	8.4	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
	HSCNew-SMP-04-C	3254976.27	13788651.38	50.5	12.7	Drill Rig	Sediment		
SMP-05	HSCNew-SMP-05-A	3248704.67	13806977.74	50.5	10.1	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
	HSCNew-SMP-05-C	3247662.33	13806593.22	50.5	12.6	Drill Rig	Sediment		
SMP-06	HSCNew-SMP-06-BSC	3243278.43	13792108.74	50.5	7.9	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
SMP-07	HSCNew-SMP-07-A	3242735.124	13819138.93	50.5	11.4	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Spp, Bioaccum
SMP-Ref	HSCNew-SMP-Ref-A ¹	NA	NA	<9"	NA	Grab Sampler, Geosub Pump	Sediment, Water	SD, SW, E, GS	Tox, Bioaccum
	HSCNew-SMP-Ref-B	3353825.81	13672148.97	<9"	NA	Grab Sampler	Sediment		
	HSCNew-SMP-Ref-C ²	NA	NA	<9"	NA	Grab Sampler	Sediment		
SMP-ODMDS	HSCNew-SMP-ODMDS-A	3364006.93	13694121.02	Mid-Column	NA	Geosub Pump	Water	SW	NA

SW = Analysis of a Surface Water Sample, SD = Analysis of a Sediment Sample, E = Analysis of an Elutriate, GS = Grain-size Analysis.

¹ Sample station will be located 100 ft. North of Location B

² Sample station will be located 100 ft. South of Location B

Table 4: Summary of Sample Collection and Testing – North of Morgan’s Point (to be updated)

Sample Station	Sample Location/Sample ID	Coordinates (NAD83 State Plane, US Feet)		Proposed Dredge/Sample Depth (-MLLW ft)	Sediment Elevation (-MLLW ft)	Sediment Elevation where Sample Begins	Sample Method	Sample Matrix	Analyses
		Easting	Northing						
NMP-01	HSCNew-NMP-01-A	3,209,849.82	13,844,693.72	41.5	20	20	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
NMP-02	HSCNew-NMP-02-A	3,190,724.85	13,835,593.58				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-02-C	3,190,667.90	13,835,066.25				Drill Rig	Sediment	
NMP-03	HSCNew-NMP-03-A	3,185,288.27	13,838,753.15				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-03-C	3,185,081.16	13,838,279.59				Drill Rig	Sediment	
NMP-04	HSCNew-NMP-04-A	3,177,189.71	13,837,617.03				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-04-C	3,176,953.78	13,838,168.70				Drill Rig	Sediment	
NMP-05	HSCNew-NMP-05-A	3,171,845.35	13,832,158.52				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-05-C	3,171,314.50	13,832,438.16				Drill Rig	Sediment	
NMP-06	HSCNew-NMP-06-A	3,157,353.36	13,830,614.75				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-06-C	3,157,165.64	13,830,261.54				Drill Rig	Sediment	
NMP-07	HSCNew-NMP-07-A	3,152,185.65	13,829,734.95				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-07-C	3,153,829.41	13,830,445.67				Drill Rig	Sediment	
NMP-08	HSCNew-NMP-08-A	3,150,325.05	13,831,780.07				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-08-C	3,149,956.07	13,831,625.64				Drill Rig	Sediment	
NMP-09	HSCNew-NMP-09-A	3,149,139.27	13,833,968.17	44.5	33	40.5	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-09-C	3,149,502.39	13,834,135.92	44.5	38	40.5	Drill Rig	Sediment	
NMP-10	HSCNew-NMP-10-A	3,147,553.13	13,836,442.15	44.5	32	40.5	Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-10-C	3,147,866.90	13,836,690.25	44.5	32.5	40.5	Drill Rig	Sediment	
NMP-11	HSCNew-NMP-11-A	3,145,713.20	13,839,584.69				Drill Rig, Geosub Pump	Sediment, Water	SD, SW, E, GS
	HSCNew-NMP-11-C	3,145,273.23	13,838,501.88				Drill Rig	Sediment	

SW = Analysis of a Surface Water Sample, SD = Analysis of a Sediment Sample, E = Analysis of an Elutriate, GS = Grain-size Analysis.

5.2 DRILLING METHODOLOGY AND SOIL SAMPLE COLLECTION

5.2.1 Drilling - General

The following summarizes the general drilling methodology.

- Drilling is performed through the center of the moon pool in the LB deck using a top drive CME 75 drill rig.
- All water depths will be measured and corrected to the nearest NOAA tide gauge station. It is preferable that a tape measure with weight at the end be used for this, in addition to careful measurement of the casing string length.
- Drilling CME hollow stem augers (4.5 in) will be used for obtaining the soil samples together with CME 4" bearing head Continuous Sample tube system.
- Mud rotary drilling will be accomplished only if we encounter difficulties drilling with Augers
- Sampling will be performed within soil materials (if encountered) using grab, pushed, or driven sampling techniques as appropriate.

- Bedrock materials are not expected.
- Drilling sampling tools and pipe will be deconned between sampling stations.

5.2.2 Procedure for Advancing the Borehole

The borehole will be advance using drill auger technique. Sediment samples will be taken with either a CME 4" bearing head Continuous Sample tube system, 3" Shelby tube or split spoon sampler. .

5.2.3 Sampling Procedures and Samples Handling-SMP

Driller and logger on shift will keep accurate logs of all activities performed and all recovered materials. Sediment samples will be collected from seven (7) channel sample stations South of Morgan's Point. One (1) to two (2) sample locations will be located at each sample station as listed in **Table 3**. Fugro personnel will collect sediment cores from each of the two sample locations at each channel station. Sediment cores will be collected from the sediment surface down to the proposed dredge depth. Based on AECOM JV provided cross sections, the number of borings needed to achieve the required volume of 35 gallons are summarized in **Table 5** below. An additional 40 gallons of sediment will be collected and processed from one of the channel sample stations for QA/QC analysis. This location has not been determined so far. Sediment and water samples from the two offshore stations (one for each type of collection) will be collected using Benchmark Support Boat and Grab sampler at the Reference Stations.

Table 5: Estimated Number of Borings for Sample Recovery – South of Morgan's Point

Sample Station	Sample Location/Sample ID	Proposed Dredge/Sample Depth (-MLLW ft)	Current Sediment Elevation (-MLLW ft)	Projected Number of Borings to Provide Sufficient Volume of Sediment
SMP-01	HSCNew-SMP-01-A	50.5	10.1	3
SMP-02	HSCNew-SMP-02-A	50.5	12.5	2
	HSCNew-SMP-02-C	50.5	15	2
SMP-03	HSCNew-SMP-03-A	50.5	10	2
	HSCNew-SMP-03-C	50.5	11.6	2
SMP-04	HSCNew-SMP-04-A	50.5	8.4	2
	HSCNew-SMP-04-C	50.5	12.7	2
SMP-05	HSCNew-SMP-05-A	50.5	10.1	2
	HSCNew-SMP-05-C	50.5	12.6	2
SMP-06	HSCNew-SMP-06-BSC	50.5	7.9	3
SMP-07	HSCNew-SMP-07-A	50.5	11.4	3

The sampling program for cohesive materials will involve pushing a CME 4" bearing head Continuous Sample tube system (soft sediments), and a thin-walled 7.62-cm (3-inch) Shelby tubes for firm to stiff sediments. Sampling in granular materials will be attended with a 3-in split spoon.



Benchmark personnel will process the sediment samples from all of the channel stations. Sediment samples will be processed on the LB. Fugro personnel will collect the sediment samples and provide Benchmark personnel with extruded sediment cores in either 2 or 5 foot sections. Sediment core sections will be placed in PVC troughs lined with clean aluminum foil. Prior to sample processing, each sediment core section will be photographed and a Fugro logger will record sediment characteristics in a bore log. Once each core section has been photographed and logged, pre-cleaned stainless steel spoons and spatulas will be used to cut the core into 5 to 6 inch sections that will be placed immediately into five (5) gallon buckets. All sample containers will be labeled with the station ID, collection date, time, and any additional information required by the analytical laboratory. Chain of Custody (COC) forms will be completed for all samples collected and processed. The total volume of sediment to be collected from each channel sample station is 35 gallons. An additional 40 gallons of sediment will be collected and processed from one of the channel sample stations for QA/QC analysis.

Prior to sample collection, all containers and sampling equipment will be cleaned according to protocols described in Plumb (1981). Any equipment that comes into contact with the sediment samples will be decontaminated between channel sample stations. Care will be taken to avoid contamination to sampling devices from the barge deck or other surfaces. Powderless latex or nitrile gloves will be worn during sample collection and sample handling.

One (1) sediment sample equipment blank will be prepared using deionized water (provided by the laboratory) and the pre-cleaned equipment that will come in contact with the sediment samples (i.e., stainless steel spoon, core tube, nitrile glove). The equipment rinsate blank will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment used for sample collection.

Immediately after the sediment samples have been collected and processed, the five-gallon buckets will be placed in insulated coolers with ice and transported to shore. Once on shore the five-gallon buckets will be transferred to the refrigerated truck where they will be stored and delivered to the analytical laboratory.

5.2.4 Sampling Procedures and Samples Handling-NMP

Sediment samples will be collected from eleven (11) channel sample stations North of Morgan's Point. Two (2) sample locations will be located at each sample station as listed in **Table 4**. Fugro personnel will collect sediment cores from each of the two sample locations at each channel station. Sediment cores will be collected from the specified depth down to the proposed dredge depth. NOTICE that the starting sampling depth is not the seabed. Based on AECOM JV provided cross sections, the number of borings needed to achieve the required volume of 5 gallons are summarized in **Table 6** below (number not defined so far since cross sections have not been provided).

Table 6: Estimated Number of Borings for Sample Recovery – NMP of Morgan's Point

TO BE INCLUDED (need cross sections)

5.2.5 Drill Cuttings and Fluids

All drilling fluid used in the program will be based on seawater (channel water). If necessary, the seawater will be augmented with drilling additives which are non-hazardous and environmentally friendly. During drilling cuttings recirculated aboard the LB will be discarded to the channel water.



5.2.6 Borehole Backfill

Boring holes will not be backfilled following the drilling activities at each location. Boreholes will be allowed to cave naturally upon removal of the rods and drill pipe.

5.3 WATER SAMPLING

Water samples for all nine (9) sample stations will be collected over a two-day period starting on the final day of sediment sampling and completed the day after sediment sampling has been completed. The sample schedule has been requested by the analytical laboratory in order receive all project samples within specified analytical hold time limits. Water samples will be collected from a 24 ft aluminum boat equipped to collect clean water samples. A Trimble Geo xH 6000 (submeter GPS) will be used to navigate to water sample stations and field coordinates will be recorded where water samples are collected.

A single water sample will be collected at all nine (9) sample stations. The water sample locations for each sample station are listed in **Table 3**. Water depth to the top of the sediment will be determined using a lead line and measuring tape. Water samples will be collected from mid depth at all sample locations where the water depth is equal to or greater than six (6) feet deep. If the water depth is less than six (6) feet, then water samples will be collected three (3) feet from the sediment surface. Sufficient water will be collected from all seven (7) channel sample stations and the Reference sample station for chemical analysis, the preparation of an elutriate sample, and bioassays. The water sample collected from the ODMDS will be collected and processed for chemical analysis only.

Water samples will be collected using a Geotech Stainless Steel Geosub Pump and clean tubing. To flush the tubing at each sample station, a volume of water at least five times the volume of the sample tubing will be pumped through the tubing. The flushing water will be discarded back into the ship channel after the sample is collected. Water samples will then be collected in laboratory supplied pre-cleaned bottles appropriate for the analyses to be conducted. Bulk water samples for elutriate preparation and bioassays will be placed in five (5) gallon cubitainers. A total volume of 30 gallons of water will be collected from the Reference and channel stations and 2 gallons of water will be collected from the ODMDS sample station. An additional 35 gallons of water will be collected and processed from one of the channel sample stations for QA/QC analysis. All sample containers will be labeled with the station ID, collection date, time, and any additional information required by the analytical laboratory. COCs will be completed for all sample collected and processed. Sample jars and cubitainers will be placed immediately in insulated coolers with ice on the sample vessel and transported to shore where they will be placed in the refrigerated truck. Water samples will be held at 2-4° C in the refrigerated truck until they are delivered to the lab.

Field parameters including dissolved oxygen (DO), pH, salinity, conductivity, and water temperature will be recorded using a YSI 556 meter at each water sample station. Field data will be recorded on field data sheets and will include but will not be limited to: date, time, water depth, sample depth, station (or sample) name, water parameters, and GPS coordinates.

WATER SAMPLING NMP TO BE INCLUDED

5.4 SEDIMENT COLLECTION AT THE REFERENCE STATION

Sediment samples from the offshore Reference sample station (HSCNew-SMP-REF) will be collected using a clean Van Veen Grab sampler. The stainless steel Van Veen Grab sampler consists of two opposable bucket halves which open and close as a clam shell style grab sampler. The Benchmark 24-ft sample vessel will be used to collect and process the grab samples. Sediment samples will be collected from sample location listed in **Table 3**. A Trimble Geo xH 6000 (submeter GPS) will be used to navigate to the Reference sample locations and field coordinates will be recorded at each of the three sample locations. The sample vessel will be equipped with an A-frame and winch to lower and raise the grab sampler.

Grab samples will collect sediment from the surface to 7.5 inches or resistance (whichever is achieved first). Sample depths will be measured from the surface of the sediment contained in the grab to the lowest depth obtained by the device. An equal volume of sediment will be collected from each of the three sample locations and placed into five (5) gallon buckets. Photographs will be taken of each sample before it is processed. Sample station information, water depth, and all other pertinent observations made during the study will be recorded on field data sheets. All sample containers will be labeled with the station ID, collection date, time, and any additional information required by the analytical laboratory. COCs will be completed for all sample collected and processed. The total volume of sediment to be collected from the Reference station is 35 gallons.

Prior to sample collection, all containers and sampling equipment will be cleaned according to protocols described in Plumb (1981). Care will be taken to avoid contamination to sampling devices from the boat deck or other surfaces. Powderless latex or nitrile gloves will be worn during sample collection and sample handling.

Immediately after the sediment samples have been collected and processed, the five-gallon buckets will be placed in insulated coolers with ice and transported to shore. Once on shore the five-gallon buckets will be transferred to the refrigerated truck where they will be stored and delivered to the analytical laboratory.

5.5 SAMPLE STORAGE AND SHIPMENT PROTOCOLS

Sediment and water samples will be stored in insulated coolers with ice when they are located on the sample boats or barge. An alternative method of a refrigerated trailer onboard the LB is being evaluated during mobilization. At a minimum, sediment and water samples will be transferred to shore and placed in a refrigerated truck at the end of each day. Multiple trips to shore to drop off sediment and water samples may be conducted as needed. The refrigerated truck will be locked at all times when it is left unattended. The internal temperature of the refrigerated truck will be kept at 2-4 °C and temperatures will be recorded at least twice a day on field data sheets.

Once all south sediment and water samples have been collected, the refrigerated truck will be driven to the analytical laboratory in Vicksburg, Mississippi. The southern sediment and water sampling study is expected to take ten (10) to twelve (12) days and it will take an additional day to travel from Houston, Texas to Vicksburg, Mississippi. If the field sampling event starts on September 11, 2018, the tentative expected delivery date of all southern sediment and water samples is September 24, 2018.

SAMPLE STORAGE AND SHIPMENT NMP TO BE INCLUDED.