Great Lakes Dredge & Dock Company

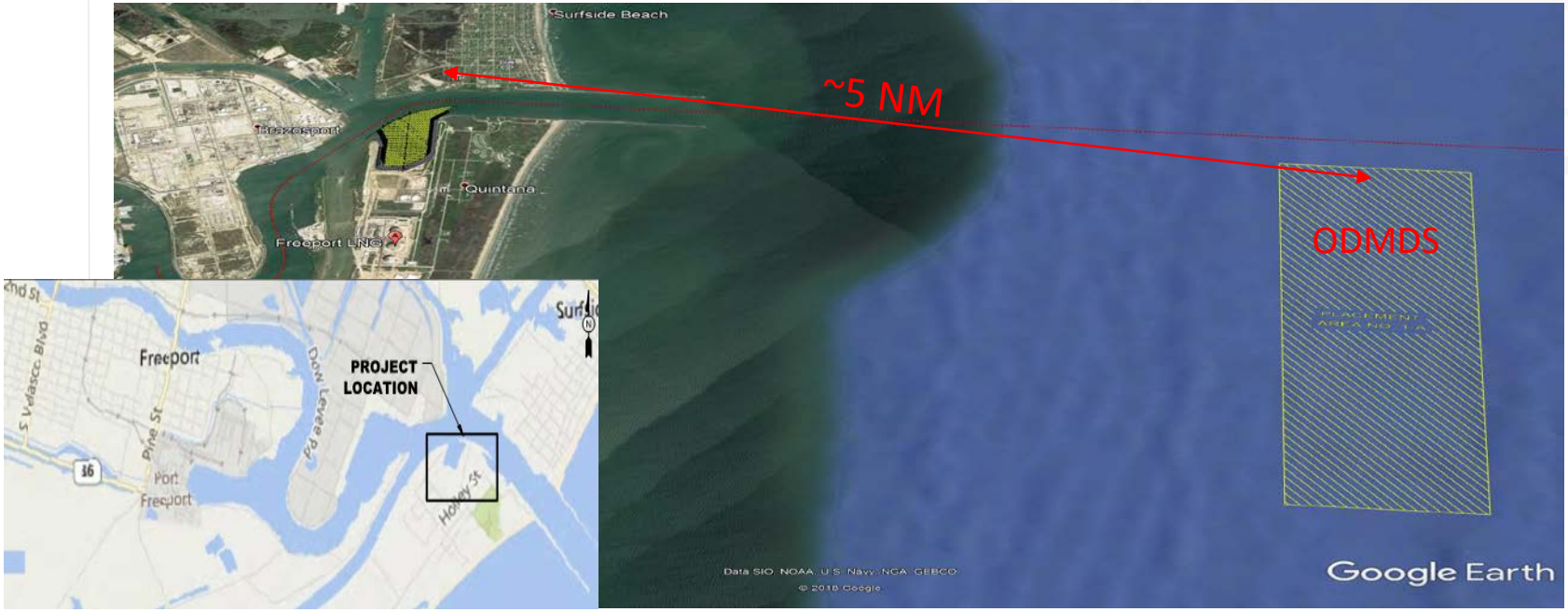
Freeport LNG Maintenance Dredging

NOVEMBER 2018

FREEPORT LNG MAINTENANCE DREDGING

PROJECT SCOPE

- CLIENT: FREEPORT LNG EXPANSION L.P.
- MAINTENANCE DREDGING OF ~967,000-CUBIC YARDS OF ACCUMULATED SILTS AND SANDS WITHIN EXISTING FLNG BASIN.
- BASIN LOCATION ON QUINTANA ISLAND NEAR THE CONFLUENCE OF FREEPORT HARBOR CHANNEL AND GIWW.
- USACE AUTHORIZED DISPOSAL (SECTION 408) OF DREDGED MAINTENANCE MATERIAL FROM FLNG BASIN TO FREEPORT MAINTENANCE ODMDS (~5 NAUTICAL MILES SAIL FROM FLNG BASIN).



FREEPORT LNG MAINTENANCE DREDGING

EQUIPMENT

- UTILIZED CLAMSHELL DREDGE ‘NO. 53’ FOR THE DURATION OF THE PROJECT.
- TO ENSURE PROJECT COMPLETION PRIOR TO 15 JULY DEADLINE A SECOND CLAMSHELL, THE ‘NO. 55’, WAS ADDED.
- UTILIZED MAINTENANCE BUCKETS FOR LARGE MAJORITY OF WORK. A HARD DIGGING BUCKET WAS USED IN ISOLATED AREAS CONTAINING SANDS.
- (3) SPLIT BULL HOPPER BARGES WITH A TOTAL HAUL CAPACITY = 20,000 CY
- (2) x 3,000-HP TOWING TUGS
- (1) x 2,000-HP TENDING TUG
- SURVEY VESSEL / CREWBOAT

GLDD MECHANICAL DREDGE FLEET

	BUCKET CAPACITY (CY)	TOTAL INSTALLED POWER (HP)	DIG DEPTH RANGE (FT)	TYPE of PROJECTS
NEW YORK	12 - 24	3,434	0 to 65	Capital / Rock
No. 54	12 - 50	2,340	0 to 150	Maintenance / Capital (sand/clay)
No. 55	12 - 40	1,745	0 to 150	Maintenance / Capital (sand/clay)
No. 53	10 - 30	2,550	0 to 150	Maintenance / Capital (sand/clay)

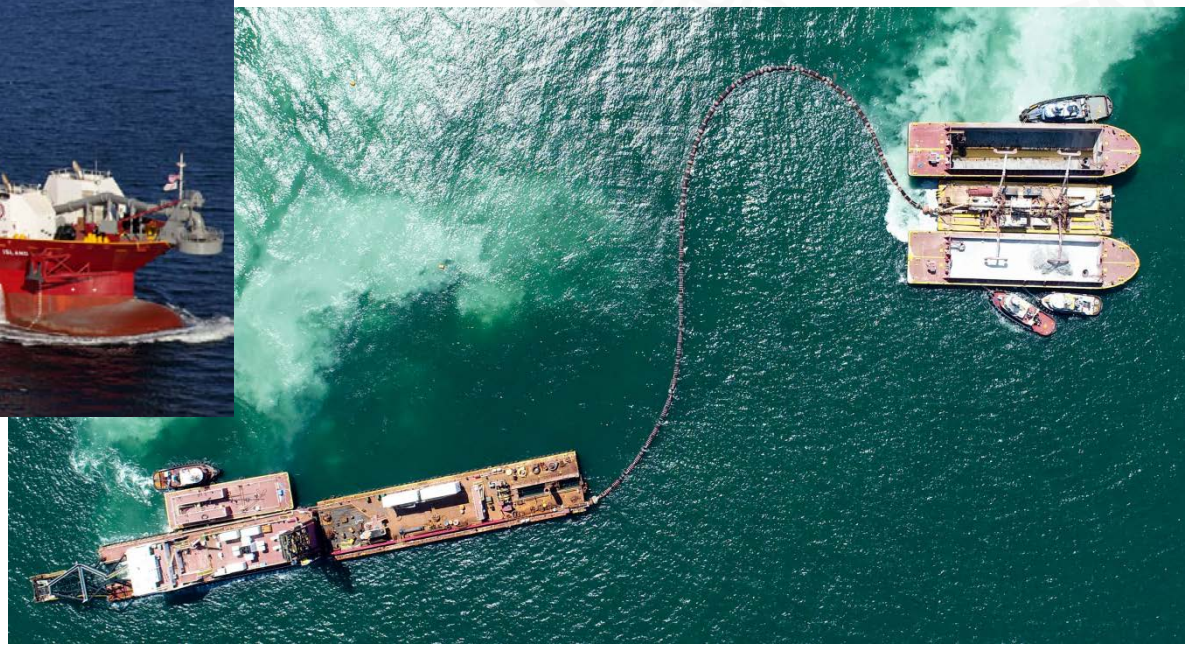
Clamshell No. 55

Clamshell No. 53

FREEPORT LNG MAINTENANCE DREDGING

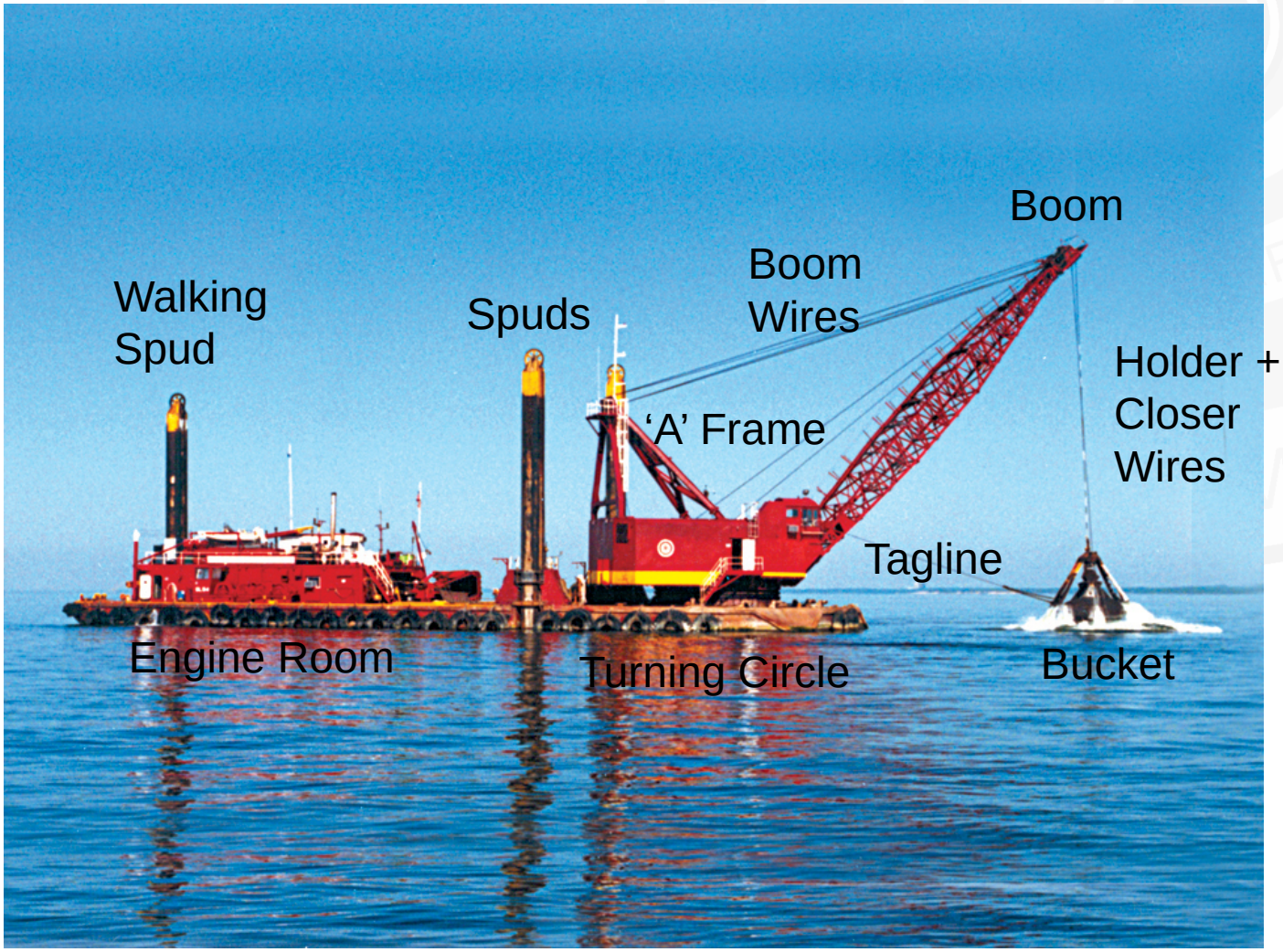
WHY A CLAMSHELL DREDGE AT FLNG?

- DREDGE AREA TOO RESTRICTIVE FOR MANEUVERABILITY OF A TRAILING SUCTION HOPPER DREDGE (TSHD).
- HYDRAULIC CUTTER SUCTION DREDGE (CSD):
  - ADEQUATE UPLAND DISPOSAL CAPACITY WAS NOT READILY AVAILABLE
  - HYDRAULIC LOADING OF DUMP SCOWS CONSIDERED UNFEASABLE
- FLNG BASIN PROTECTED FROM OFFSHORE SEA CONDITIONS ALLOWING FOR A SAFE WORKING ENVIRONMENT FOR MECHANICAL DREDGE.



FREEPORT LNG MAINTENANCE DREDGING

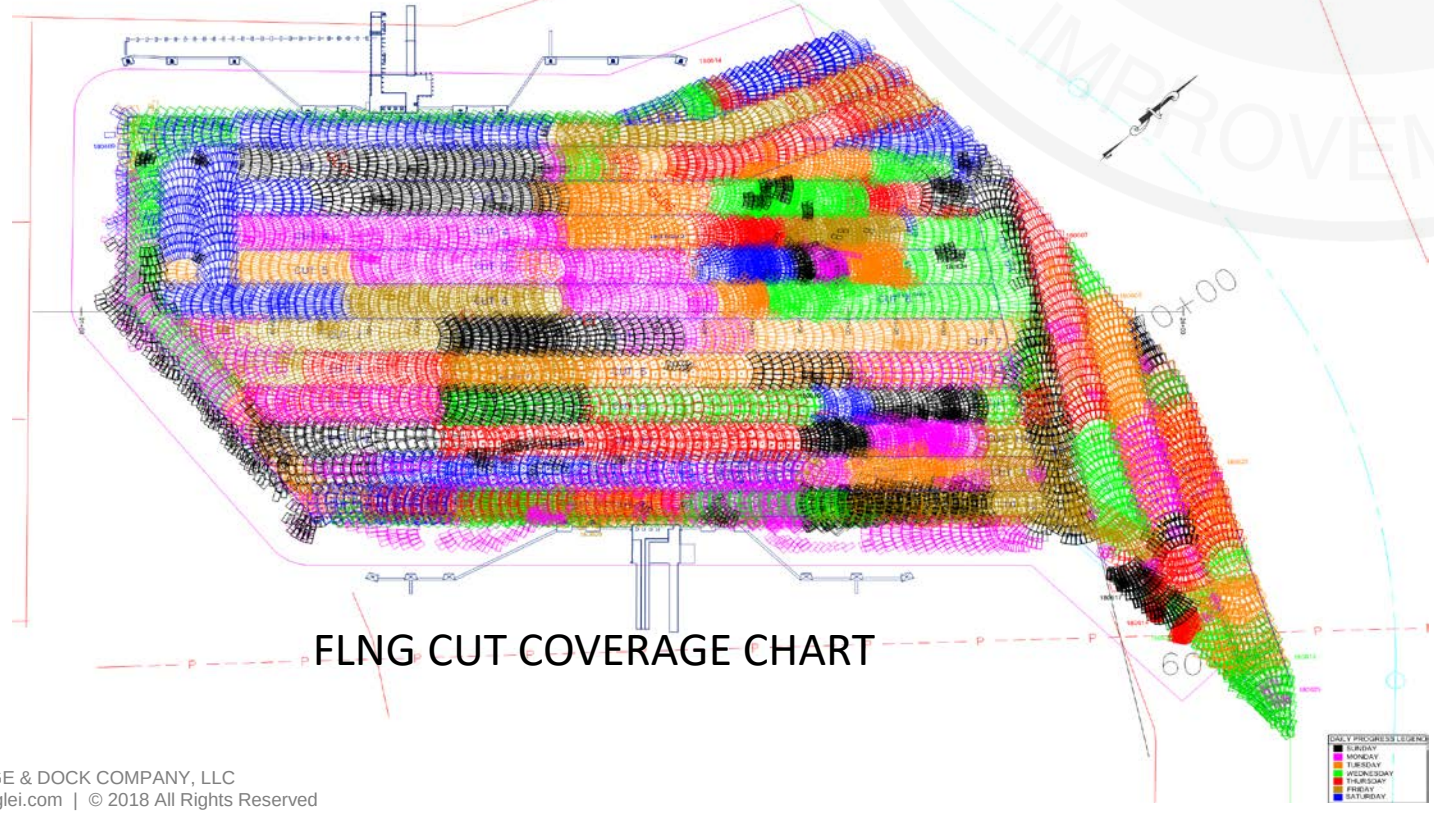
ANATOMY OF A CLAMSHELL DREDGE



FLNG MAINTENANCE DREDGING

PROJECT PERFORMANCE

- 82 DREDGING DAYS TO COMPLETE WORK (OVERLAP OF 2 DREDGES FOR PORTION OF PROJECT).
- PROJECT PERFORMED INJURY-FREE
- DAILY PRODUCTION (PER DREDGE) UP TO 18,000 CY/DAY
- PRODUCTION MAXIMIZED WITH AMPLE DIG FACE.
- CLEANUP AND SLOPE DREDGING YIELDS LOWER PRODUCTION.
- ACHIEVED SUBSTANTIAL COMPLETION PRIOR TO JULY 15TH DEADLINE.



FLNG CUT COVERAGE CHART

FREEPORT LNG MAINTENANCE DREDGING

ADVANTAGES OF MECHANICAL DREDGE OVER CSD

- LOWER MOBILIZATION COST
- LOWER DAILY OPERATING COST OF EQUIPMENT SPREAD
- BUCKET DREDGE GENERATES LOW TURBIDITY
- CAPABILITY TO DREDGE NEAR EXISTING STRUCTURES (WITHIN ~10-FT) AND ALONG PROTECTED SLOPE REDUCING RISK OF DAMAGE.

FREEPORT LNG MAINTENANCE DREDGING

SUMMARY

- PROJECT CHARACTERISTICS THAT CAN MAKE DREDGING WITH A CLAMSHELL DREDGE A PREFERED SOLUTION:
  - MAINTENANCE MATERIAL, VERY SOFT TO SOFT VIRGIN CLAYS, OR LOOSE SANDS.
  - ENVIRONMENTAL RESTRICTIONS (TURBIDITY AND/OR MAMMAL / TURTLE)
  - OFFSHORE DISPOSAL
  - LONG SAIL TO DUMP.
  - INSTANCES WHERE MANUEVERABILTY IS RESTICTIVE FOR TSHD (E.G. DREDGING NEAR EXISTING STRUCTURES).
  - DEEP DREDGING REQUIREMENTS. SOME GLDD MECHANICAL FLEET CAPABLE OF DIGGING ON WIRES ALLOWING FOR DREDGING IN DEEP WATERS.
  - CAPABILITY FOR HYDRAULIC UNLOADING OF MATERIAL TO UPLAND DISPSOAL SITES.

- PROJECT CHARACTERISTICS THAT MAY RESTRICT CLAMSHELL DREDGING:
  - HARD CLAYS/SANDS MATERIALS (N > 40).
  - UPLAND DISPOSAL REQUIREMENT CAN BE MORE CONDUSIVE TO HYDRAULIC DREDGING METHODS (PUMP OUT). IF UPLAND LOCATION IS BEYOND THE PIPELINE LENGTH LIMITATIONS OF A CSD, A CLAMSHELL DREDGE WITH HYDRAULIC UNLOADER IS A VIABLE SOLUTION.
  - OFFSHORE WORKING ENVIRONMENT WHERE WAVES (>3-FT) COULD RESULT IN SIGNIFICANT WEATHER DELAYS.

FREEPORT LNG MAINTENANCE DREDGING

Thank You!

