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Global Dredging: Best Practices Enhance Beneficial Re-Use, Productivity & Reduced Cost

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Our world

- Stock listed global dredging & maritime expert
- With 9,900 employees and 650 vessels (incl JV's)
- Active in more than 90 countries across 6 continents
- Customers in Energy, Ports and Infra

Offices

Projects and operations

Three business segments

1. DREDGING & INLAND INFRA

- Construction & maintenance of ports & waterways, land reclamation and coastal defense
- Earthmoving, roads, civil structures, soil remediation & improvement

2. OFFSHORE ENERGY

- Key markets: renewables and O&G
- Activities (market agnostic): Marine Survey, Subsea Services, Marine Transport & Services, Seabed Intervention, Heavy Lifting and Subsea Cables

3. TOWAGE & SALVAGE

- Harbor Towage, Terminal Services, Salvage



Forces driving our business



Towards a Zero-Waste Nation

Singapore aims to move towards becoming a zero waste nation by reducing its consumption of materials, and reusing and recycling them to give them a second [Sustainable Singapore Blueprint]

lease of life. It keeps Singapore clean and healthy, conserves precious resources, and frees up land that would have otherwise been used for landfills.



TUAS TERMINAL PHASE 2 (FINGER PIER 3) - Base Offer

■ <u>Design & Construction</u> Contract → 108 MONTH D&C PROGRAMME

OPTION A : EMPLOYERS DIRECT SAND SOURCE - ~12M m3 sand

OPTION B : REHANDLING SAND – DESIGNATED STOCKPILE

- ~40M m3 sand

OPTION C : DREDGING OF TEMASEK FAIRWAY

Project Value: S\$1.5 Billion



PROJECT OVERVIEW

		Description	Unit	Package 3
	FAIRWAY DREDGING (OPTION)	Delivery of Reclamation Material	m³	~125M
TUAS TERMINAL PHASE 1 (FINGER 2)	TEMASEK	Reclamation Area	ha	366
WHARF STRUCTURE (CAISSON)		Soil Improvement Area	ha	403
RECLAMATION BASIN DREDGING		Caisson Fabrication / Installation	nos	227
36 ha	a como	Tuas South Boulevard Extension Road (TSBE) Width 45.4m	km	2,2

Design Scopes

Permanent Works Detail Design Scopes:

- TSBE Soil Improvement Works (SIW)
- TSBE Road and Drainage
- Wharfline Foundation
- Caissons
- Containment Bunds
- Port Land SIW
- Sand Bund 2
- Scour Protection



CAISSON FOUNDATION



TYPICAL SANDKEY DESIGN



• SANDKEYS RANGE FROM 2 M TO 40 M BELOW SEABED

CAISSON FOUNDATION



CAISSON QUAY WALL

- 227 CAISSONS 13,000 TONS
- Typical dimensions 29M X 40M X 20M





CONTAINMENT BUNDS







- RECLAMATION
 BACKBONE
- ENVIRONMENTAL
 MEASURE

SOIL IMPROVEMENT – Sand



SOIL IMPROVEMENT – Clay

PORT LAND SOIL IMPROVEMENT WORKS:

- SURCHARGE LOADS 10+ M HIGH
- ~45,000 KM OF VERTICAL DRAINS (PVDs)



HOW DOES THIS WORK IN THE REAL WORLD?



Containment Bund Sand Filling QotN - TRAILER SUCTION HOPPER DREDGER





Caisson SK Rock Mound PETRA1 - ROCK WORK BARGE





DM / EM - from approved user LTA - SPLIT BARGES

Reclamation





e	Value
12	View feature form
PLANNING/ETA F3 Location	2018/12/03 21:00:00
Date & ATA Dumping Location	2018/12/03 19:50:00
Trip User	MESG-F3
Trip Number	11
Trip ID (PHBJV)	MESG-F3-0011
Hopper Barge Name	STL-H7
Barge Capacity (m3)	1500
Pusher Tug Name	STL-H7
Dredger ID	NA
Dump Material Type	EM
Dredge Location	MESG
Dredging Box (F2 Grid)	C9088 Marina East Staging Ground
PHBJV Inspector	DDJV SUPERVISOR
Weather	GOOD
Delays	N
Draft PS Front Full Load	4.400000000000004
Draft PS Stern Full Load	4.8
Draft SB Front Full Load	4.400000000000004
Draft SB Stern Full Load	4.8
Draft PS Front Empty	1
Draft PS Stern Empty	3
Draft SB Front Empty	1
Draft SB Stern Empty	3
Avg Draft Full Load	4.5999999999999996
Avg Draft Empty	2
Slurry	N
Debris	N
Rocks	N





COMBINED SURVEY & SOILS DATABASE



Reclamation – Beneficial Re-USE





- ~125M m3 fill material demand within the reclamation, of which:
- 32% is DM/EM from other construction projects within Singapore
- 19% is DM/EM from the Works
- Lower CO₂ footprint
 Lower project realisation costs

Future: 100% Circular!

