

Field Pilot Studies for In Situ Stabilization (ISS) of Hydrocarbon Contaminated Sediment in Kendall Bay, Sydney, NSW, Australia

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VENTIA

(Specialist Remediation Contractor)

22 MGP Projects

6 Sediments Projects



JEMENA

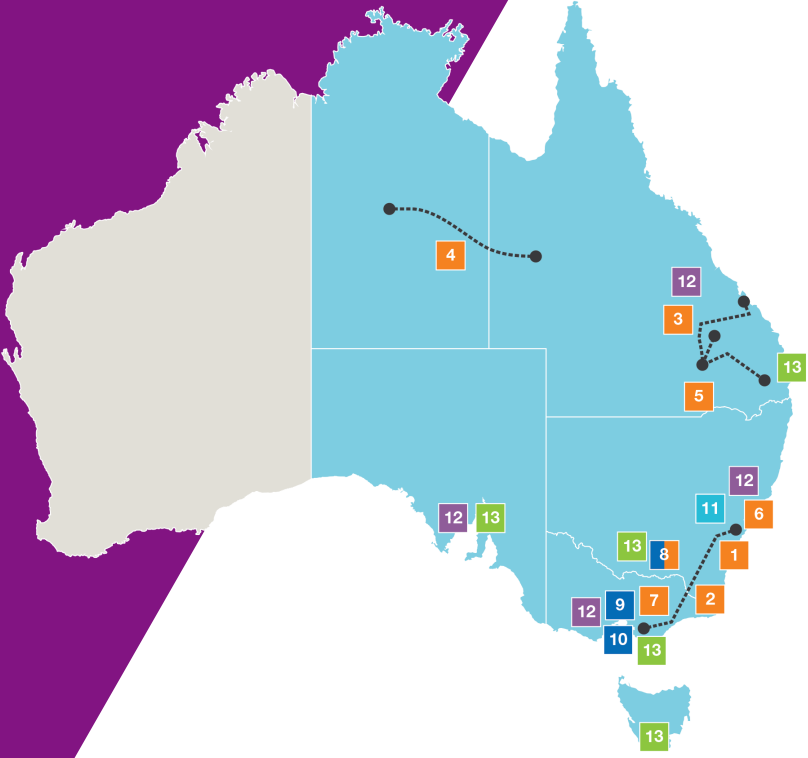
(Project Principal)

A \$10.5b Business
c.1.6m customers

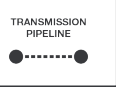
NSW gas distribution network
 Victorian electricity distribution network

Gas pipelines across eastern and northern Australia

Also gas hubs, transmission, storage and water recycling



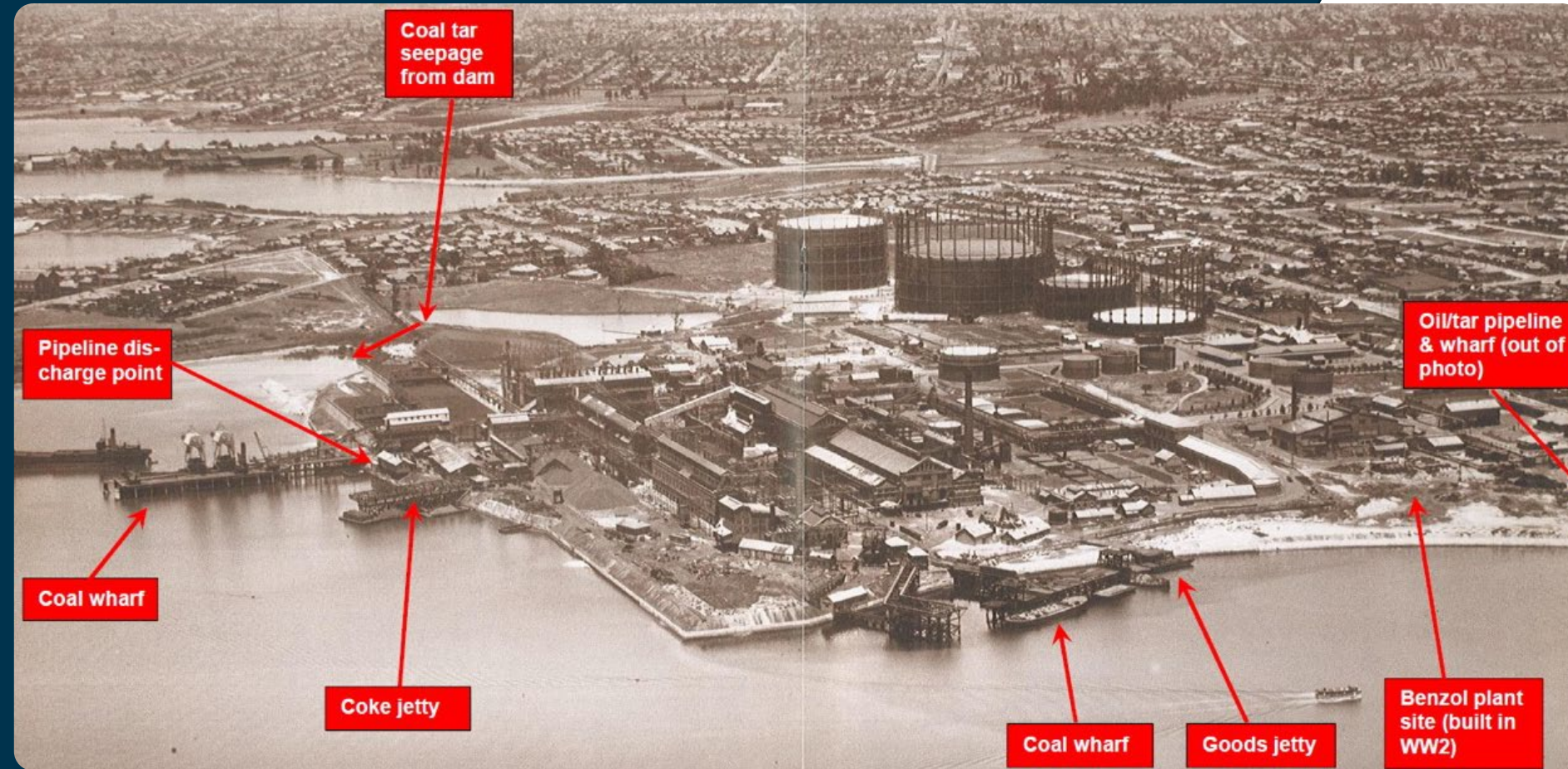
- Gas**
- 1 Jemena Gas Network
 - 2 Eastern Gas Pipeline
 - 3 Queensland Gas Pipeline
 - 4 Northern Gas Pipeline
 - 5 Darling Downs Pipelines
 - 6 Colongra Gas Transmission and Storage Pipeline
 - 7 VicHub
 - 8 ActewAGL Distribution Partnership (50%)
- Electricity**
- 8 ActewAGL Distribution Partnership (50%)
 - 9 Jemena Electricity Network
 - 10 United Energy Distribution (34%)
- Other businesses**
- 11 Rosehill Recycled Water
 - 12 Ovida
- Service business**
- 13 Zinfra



SITE SETTING

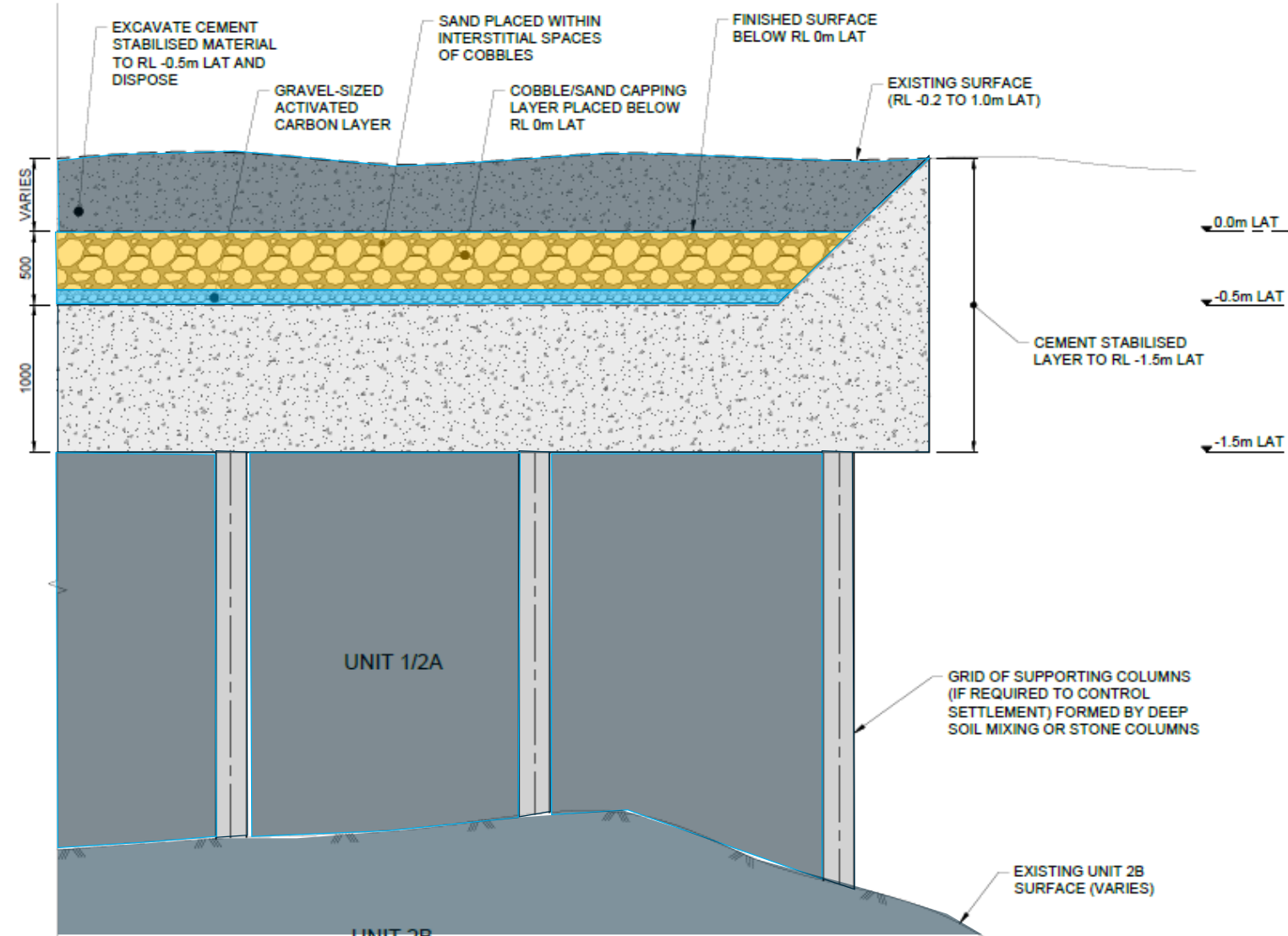


SITE HISTORY



OVERVIEW OF REMEDY

Southern
Remediation Area



PROJECT PERFORMANCE CRITERIA

CHEMICAL PERFORMANCE

- ▼
> 90% reduction in cumulative mass release compared to existing conditions

PHYSICAL PERFORMANCE

- ▼
 - Unconfined Compressive Strength (UCS)
 - Shallow ISS Raft – 1 MPa (145 psi)
 - Deep ISS Columns – 2 MPa (290 psi)
 - Hydraulic Conductivity < 1×10^{-5} cm/sec

TRIAL OVERVIEW

PHASE 1 Bench-Scale Laboratory Study

PHASE 2 Clean Field Trial

PHASE 3 Contaminated Field Trial



LABORATORY TRIAL

Overall tested 78 mix designs as part of the treatability study:

PHYSICAL TESTING

- Grout Marsh Funnel Viscosity
- Unconfined Compressive Strength (UCS)
 - 3, 7 and 28-day standard curing
 - 2 and 7-day accelerated curing
- Hydraulic Conductivity

CHEMICAL TESTING

- LEAF 1316 (untreated sediment)
- LEAF 1315M (ISS Monolith)

LABORATORY TRIAL

Conclusions

Phase 1 conclusions were:

Moisture identified as driving factor.

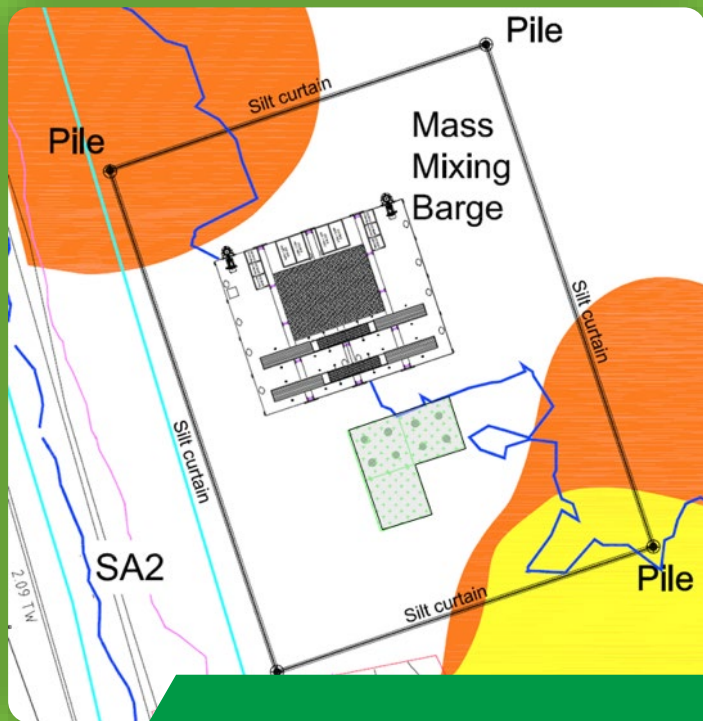
No treatment enhancers required.

Mixture for field trial confirmed as:

ISS Raft: 300 to 350 kg/m³ marine cement (1 MPa)

ISS columns: 375 to 425 kg/m³ marine cement (2 MPa)

FIELD TRIALS



Phase 2 Pilot Study
(Clean Commissioning)



Phase 3 Pilot Study
(Permanent Work)

Two phase pilot study was performed in the Southern Remediation area to assess ISS performance, constructability and productivity.

PHASE 2



CLEAN SEDIMENT COMMISSIONING TRIAL

PHASE 2



CLEAN SEDIMENT TRIAL

PHASE 3



ENVIRONMENTAL CONTROLS

PHASE 3



CONTAMINATED SEDIMENT TRIAL



MASS SOIL MIXING

RAFT SLAB MIXING TOOL

DEEP SOIL MIXING



COLUMN MIXING TOOL

SAMPLING TOOLS



**Mechanical Wet
Grab Sampler**



**PVC
Sampler**



**Russian-D
Sampler**

RESULTS

WEIGHT OF EVIDENCE APPROACH

INDICATORS OF SUCCESSFUL ISS APPLICATION

Increased pH

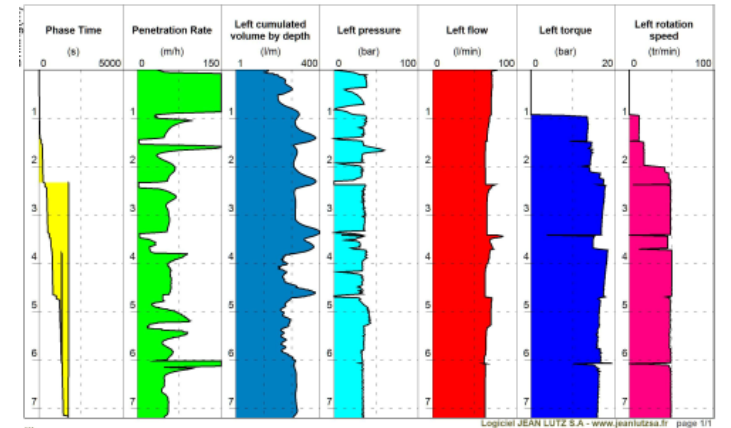
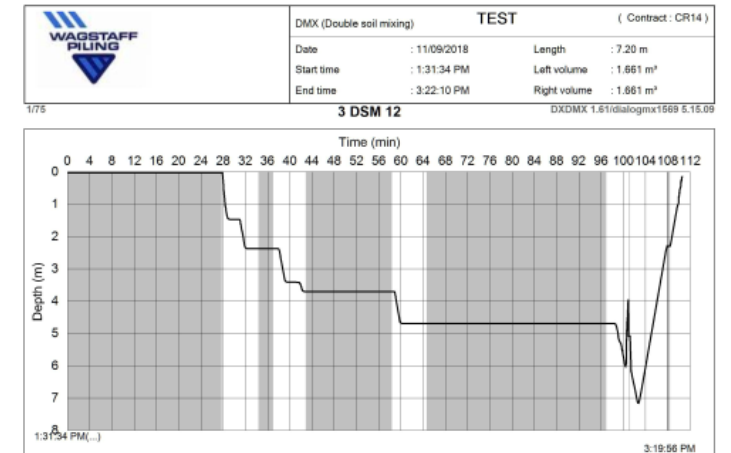
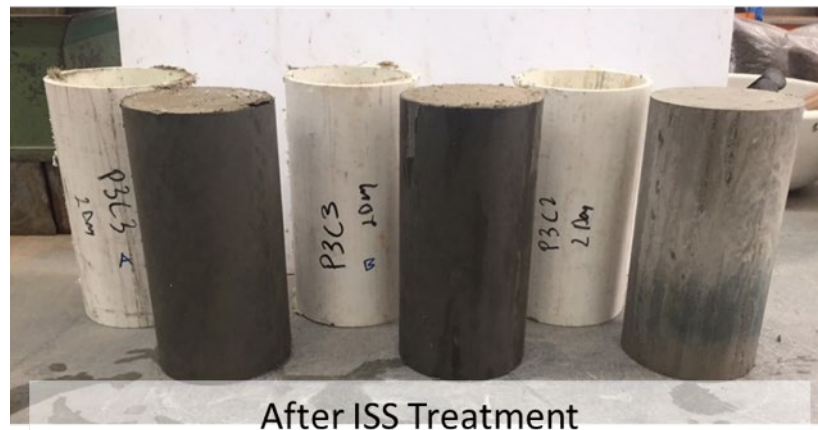
Increase temperature

Moisture content



RESULTS

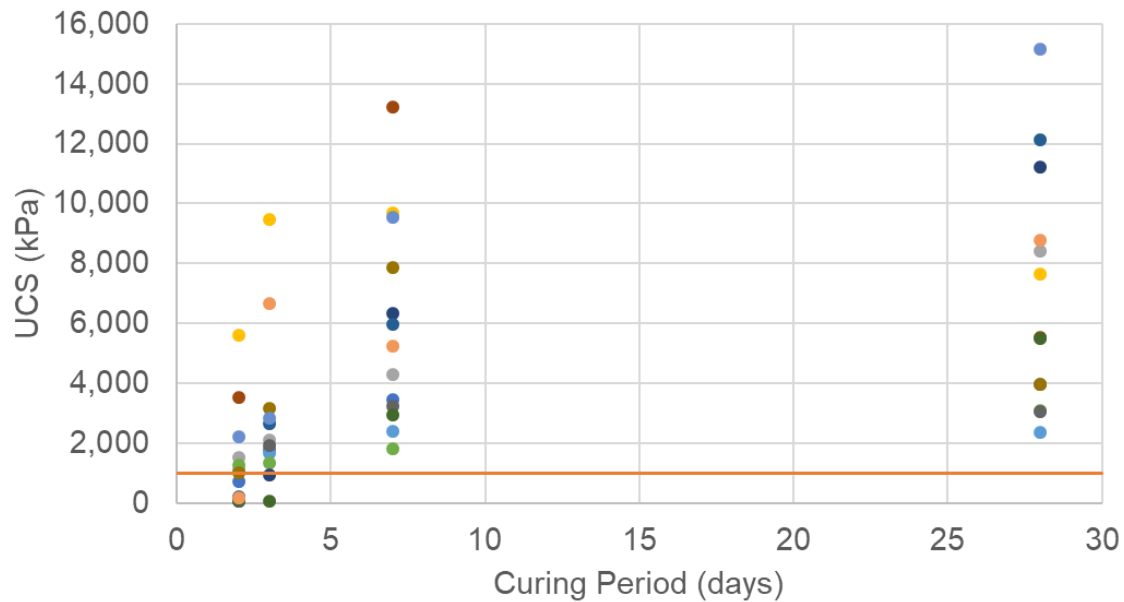
WEIGHT OF EVIDENCE APPROACH



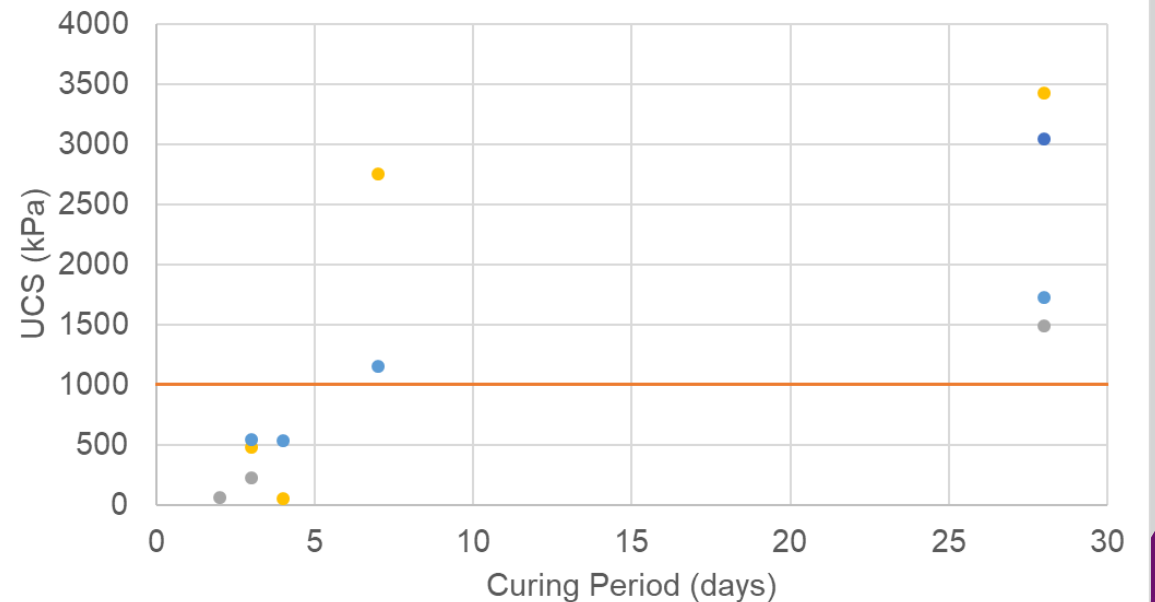
LABORATORY RESULTS

UCS PHASE 3

Phase 3 Columns

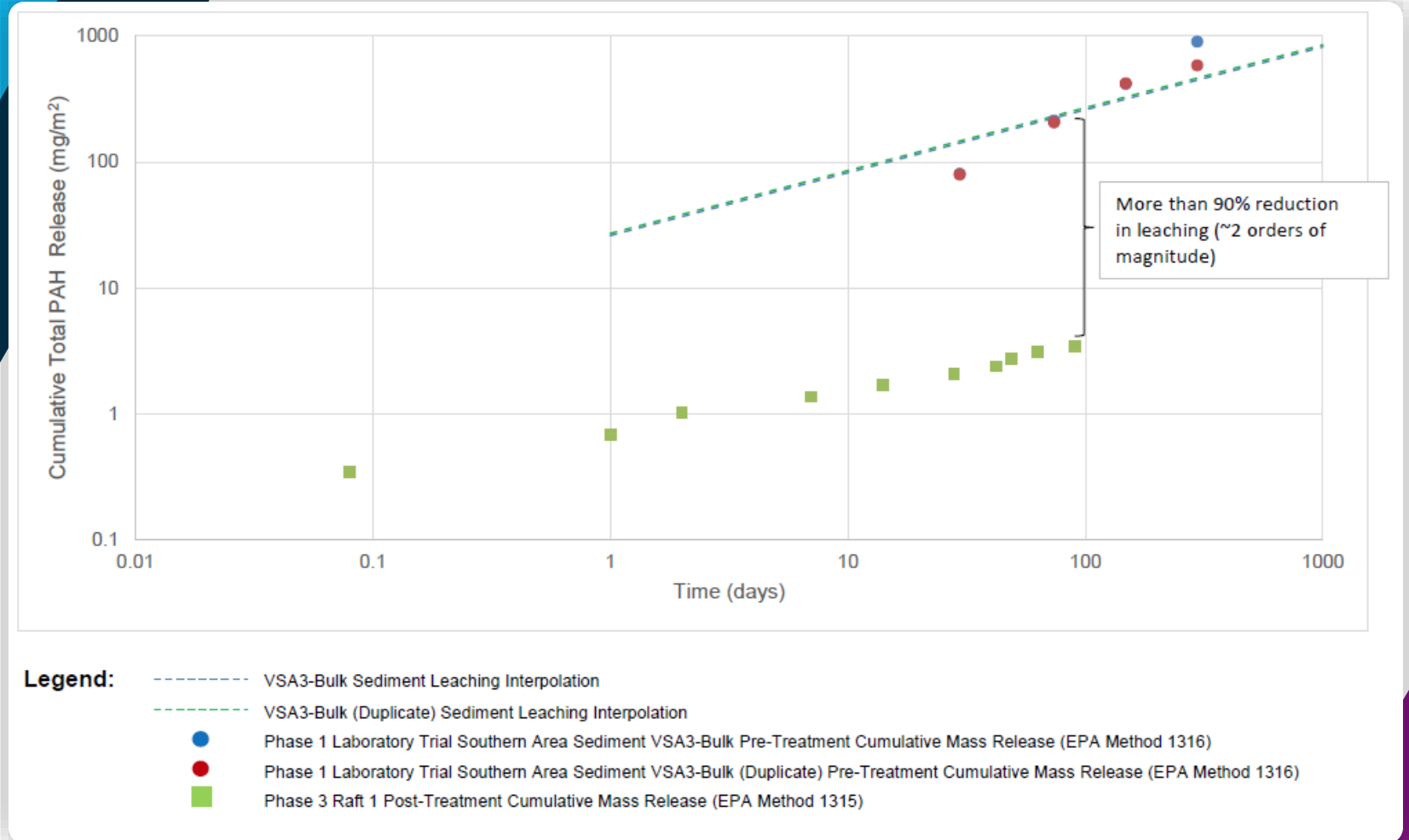


Phase 3 Rafts



LABORATORY RESULTS

Leaching Phase 3 Raft





KEY LESSONS LEARNT

Plant, equipment & environmental controls appropriate.

Validation sampling - proved to be a challenging task.

Strength gain exceeded expectations.

Movement & positioning of barges challenging.

Design & sequencing requires careful consideration.

Stakeholder engagement - community & regulator key focus.

CONCLUSION

EPA ACCREDITED AUDITOR TRIAL REPORT CONCLUDED

*“Trial demonstrated practicality and applicability of ISS
remedy to Kendall Bay. Works should progress to full-
scale remediation”.*



QUESTIONS?
