

**RESERVOIR CLEANING -  
18 YEARS OF VACUUMING AND  
REFLECTING**

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S&V

Fuck you BZ ... What sur tag??



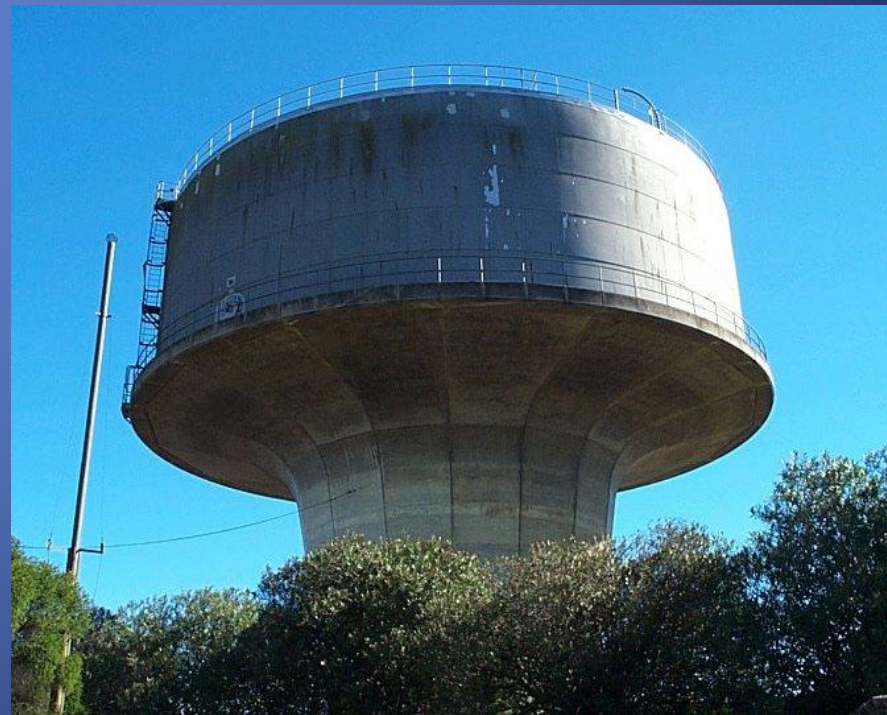
# Why clean reservoirs?

- Important for safe & clean drinking water
- Keep sediment loadings manageable
- Asset inspection opportunities



# History - Drain and sweep method

- Reservoir had to be off line – no water for emergencies
- Confined space entry
- Difficult working conditions
- Ageing workforce
- Waste disposal issues on site



# Diver Cleaning – In the beginning

- Started in 1993
- Tried to clean like a swimming pool
- Innovations to equipment for safety and water quality
- Fresh approach to diving operations
- Tanks took 3 days to clean – now 3 hours!
- Water savings and cost efficiencies

- Tank remains online
- No sediment disturbance
- 'Real time' observations



# The Mentality

- Cant drink it – wont dive it!
- Pathogen control
- Water more at risk from diver
- Keeping all equipment clean
- Dry suits for all conditions
- Full face mask







# The process

- 2-3 years training to be good at it!
- Vacuuming patterns
- Obstacles
- Airline that floats above sediment
- Diving only a small part of the operations



# The process

- Technical Rope Access combined with diving
  - Improved access
  - Increase safety
  - Versatility



# Process

Understanding of steel and concrete structures

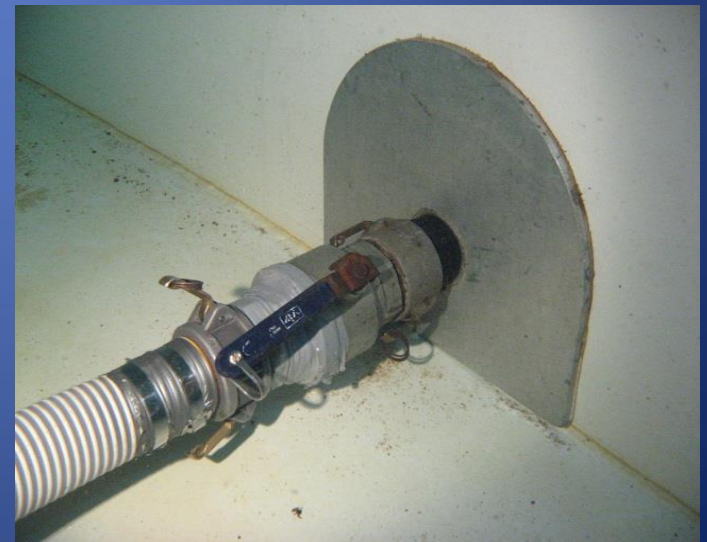
- Cathodic Protection
- Coatings
- Carbonation



Good communication skills to pass on findings!

# Vacuum methods

- Type of tank
- Water depth
- Scour
  - Access
  - Plugs of various shapes and sizes
  - Functioning
- Pumping
- Siphon





# Hoses

- Sizes and lengths required
- Floatation
- Non kinking
- Cope with weight



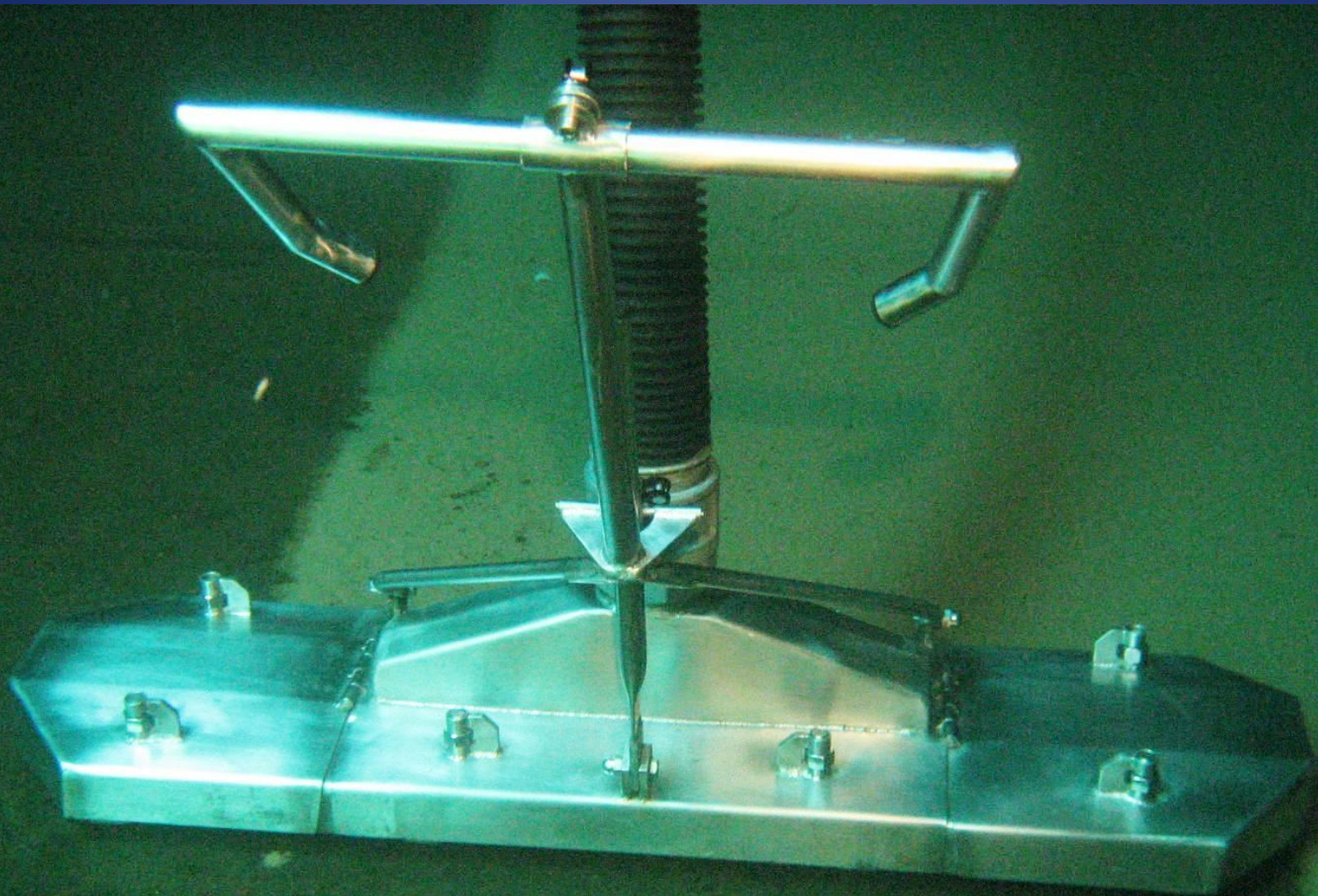
# Vacuum Heads

- Different sizes and adjustments
- For different
  - Sediments
  - Tank shapes
  - Debris









# Waste Water

- Disposal methods
- Discharged to ground – cheapest option
- Contained in coffer dams – space required
- Sewer – best practise
- Tankers – dearest option

# Coffer dam

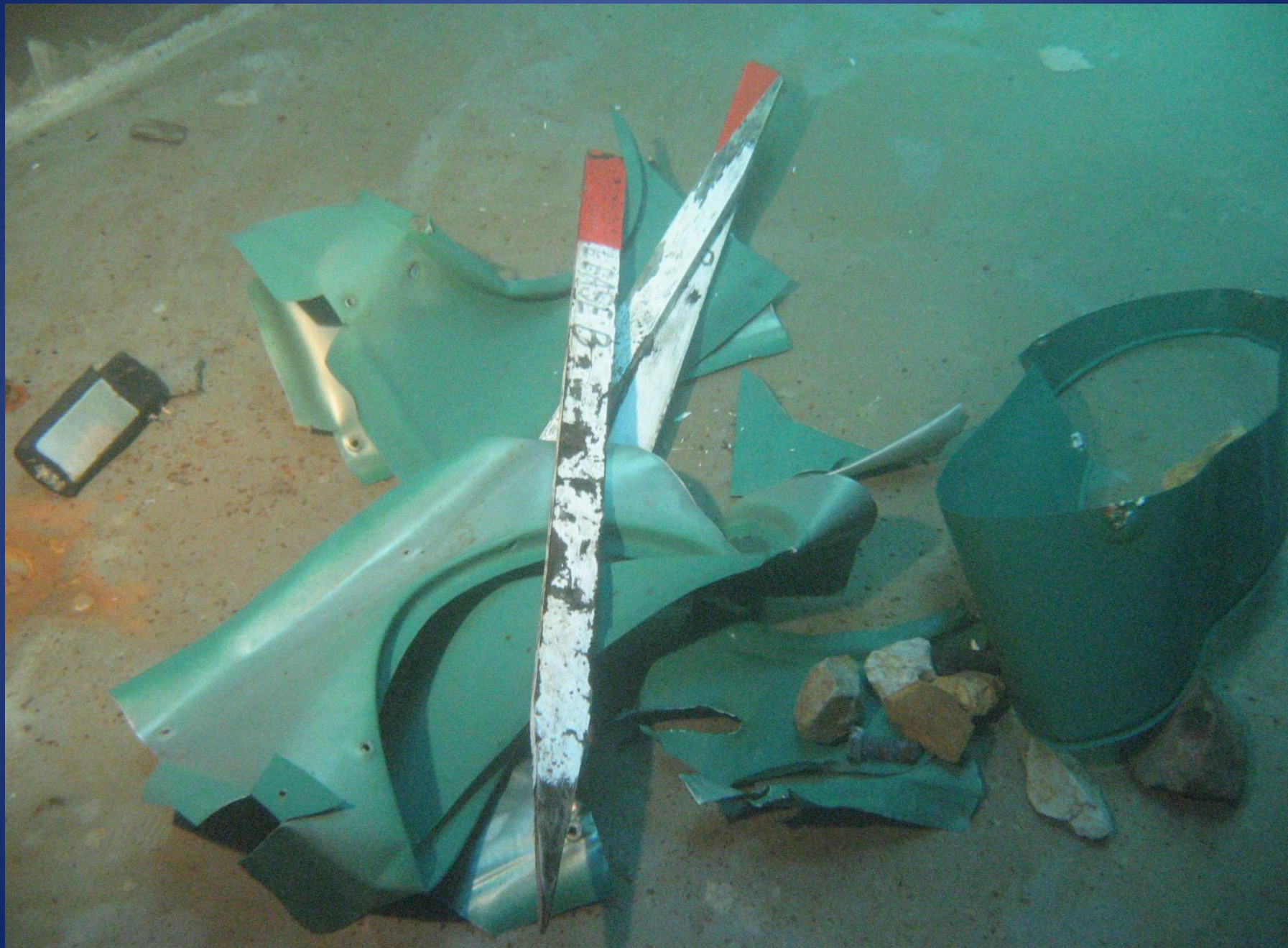


# Tankers - one stationary and one mobile to disposal site



# Things robots will struggle with



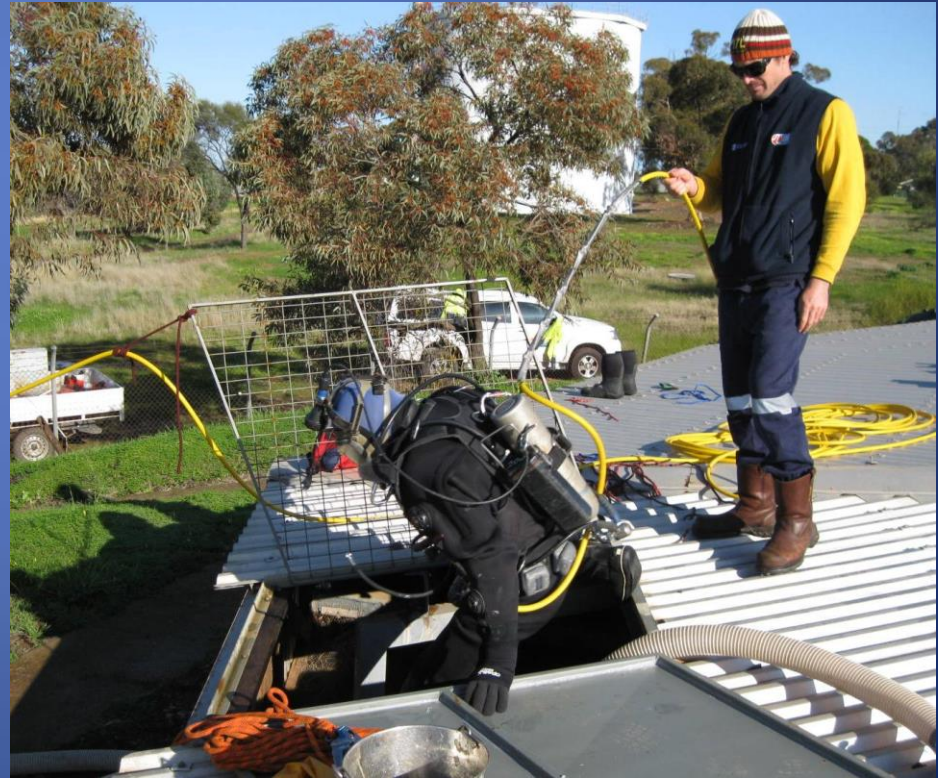






# The inspection

- 1-3 hours of diving
- All internal features looked at
- ‘Look Listen Feel’
- How bad is it?
- Defects uncovered
- ‘Inspection only’ would disturb sediments



# Summary

- Holistic approach
  - Safety / Diving / Inspection / Cleaning
- Innovation to diving and equipment systems
- Requires skill and training for efficiency and water safety
- Responsibility to public safety – clean water
- Important - reporting back to client
- 18 years and still innovating