



Better Environmental Outcomes from Hydrocarbon Spills using RemScan™

Golden Gecko Awards Pre-event presentation

29 October 2015



Fortescue Overview.

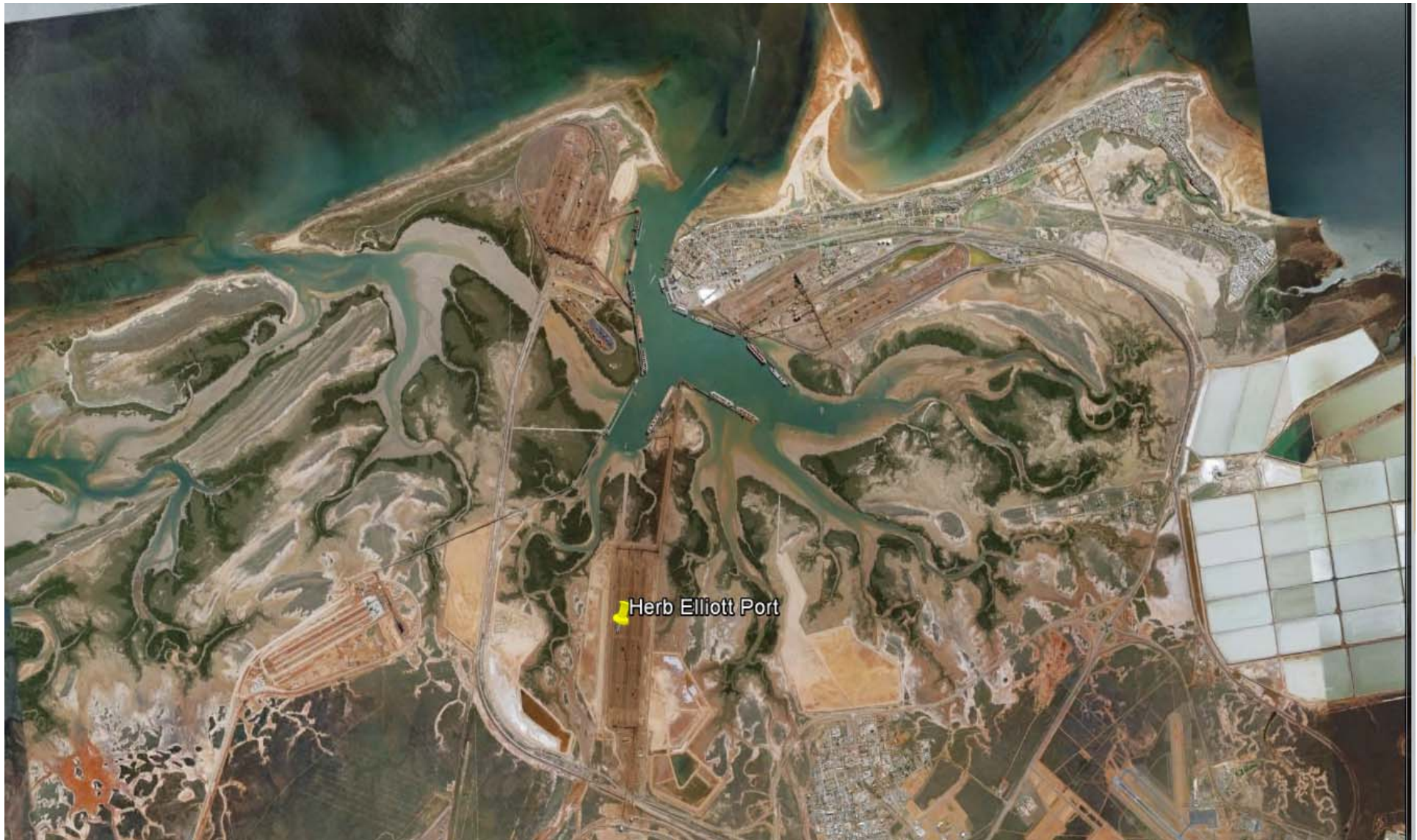




- Founded in 2003
- First Ore in 2008
- Shipped over 550mt
- 165mt production rate
- Integrated Mine, Rail and Port Operations
 - Focus on Safety, Environmental management, cost reduction and product quality .



Port Overview



Rail- Overview

- Heaviest haul railway in the world
- Rakes up to 250 cars, 2.7km long and 32,000 tonnes.
- 15 locomotives
- 600+ km of Rail

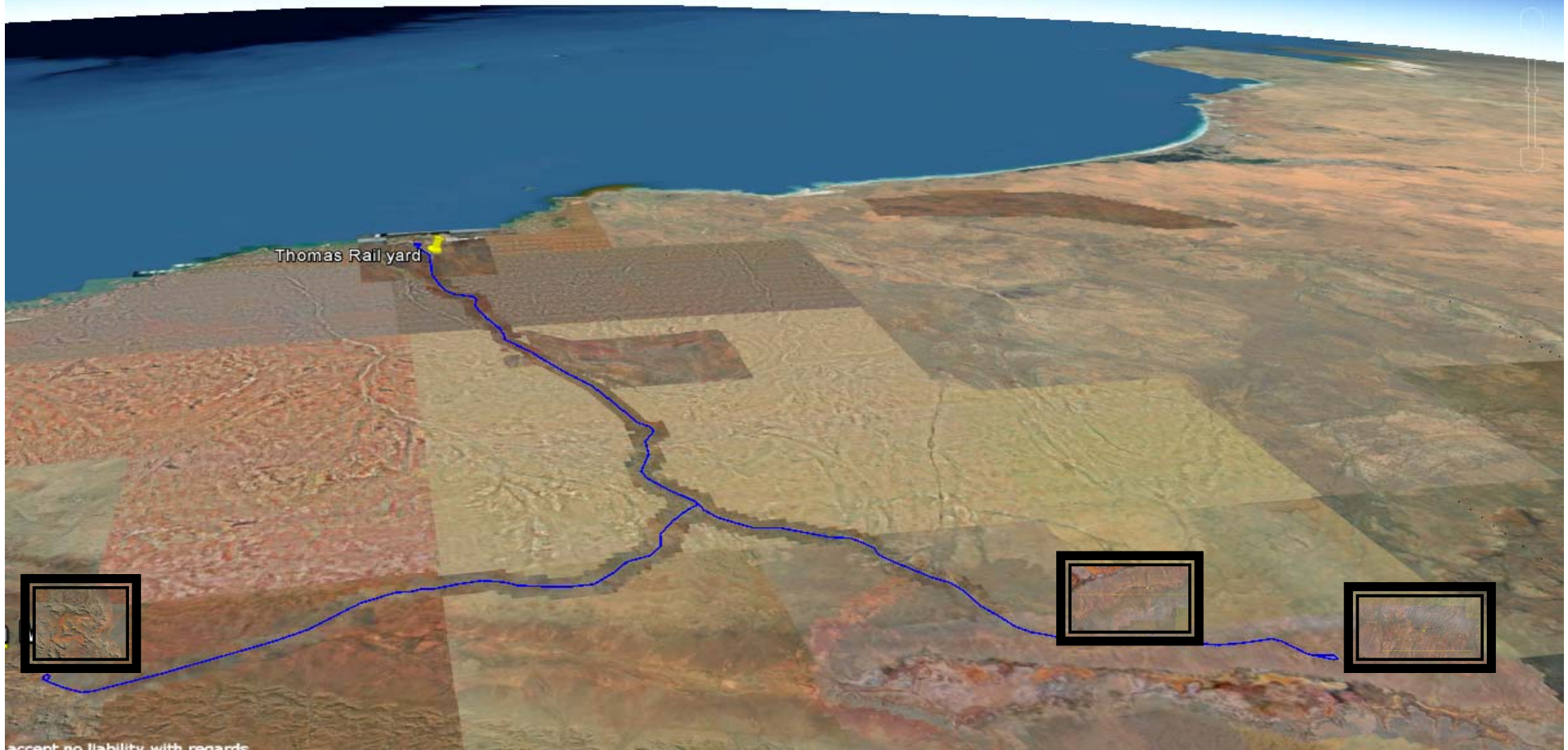


accept no liability with regards



Mine- Overview

- Two Hub, 4 mine operations
- Wet and Dry hematite processing
- Surface mining and truck and shovel



accept no liability with regards



Minimising and managing the impact of our operations

- Mining results in both planned and unplanned impacts upon the environment.
- Fortescue has a clear focus on minimising these impacts.
- Planned impacts include the clearing and development of land for mining and infrastructure.
- Unplanned impacts include accidents and incidents resulting from these planned activities.

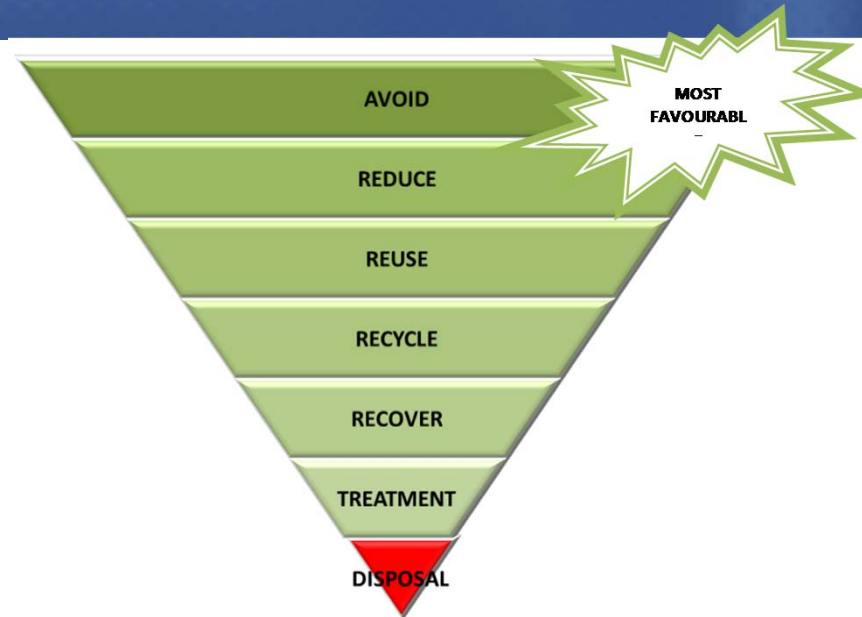
- FY15 – 1299 Environmental incidents were recorded across all operations.

- 838 involved chemicals or hydrocarbons ranging from 0.5 – 1000L+.

- Chemicals and Hydrocarbons are the predominant category of unplanned events and as such, innovative solutions were investigated and class leading practices were implemented to minimise associated impacts on the environment.

Why we need to care for and manage our Environment





Fortescue and PTES have developed a progressive and innovative relationship working together to take Fortescue waste management to best practice, delivering Recycling of total volumes to landfill to greater than 85%

Fortescue acknowledges PTES for bringing forward initiatives in line with the Fortescue waste management and Bio remediation goals and is appreciative of the collaborative working relationship that provides benefits and solutions to effective and Best Practice Waste Management



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Cloudbreak Bio remediation

Remscan Implementation



2012 Bio Remediation area

Fortescue identified that best practice wasn't happening in the bio pads. Volume and placement management needed review – it was a time for change.



A new approach – best practice implementation



Bioremediation Design

Engineered to maximise microbial growth for fast and effective bioremediation of soils.

Effective bioremediation area of 34 m x 34 m or 1,156 m². capable of accommodating approximately 350 m³ of material.

Lined cells to minimise environmental impact.

64000ltr water capacity irrigated through poly lines to ensure correct moisture content is maintained.

Treated with high quality trace elements to help break down TPH through microbial growth.

Aerated / monitored using Remscan (Process).

2015 – Bio Remediation area Cloudbreak Mine

Bio remediation area today – well managed and environmentally responsible



THE REMSCAN ADVANTAGE

- Immediate clean up of spill
- Excavate in layers
- Sample each layer
- Map sample locations (hot spots)
- Monitor TPH until below EIL



RemScan project

Site: FMG Inxhreak
 Site specific model TPH (C₁₀ - C₃₆) mg/kg
 Cell 1 Stock piles
 13-Apr-14

date_time	Sample id	TPH Displayed (C10-C36 mg/kg)	RSD (%)	Indicative Moisture (%)	Location/Comments
Model: 1.A.0 (ToxFree)					
[2014-04-13 13:57:10]: 2014-04-13 13:57:10	sample.1	19600	6	1	Sludge Piles from Cell1
[2014-04-13 13:58:14]: 2014-04-13 13:58:14	sample.2	18000	7	0.7	Sludge Piles from Cell1
[2014-04-13 13:59:56]: 2014-04-13 13:59:56	sample.3	20600	6	0.8	Sludge Piles from Cell1
[2014-04-13 14:04:32]: 2014-04-13 14:04:32	sample.4	21400	6	0.2	Sludge Piles from Cell1
[2014-04-13 14:05:24]: 2014-04-13 14:05:24	sample.5	22300	6	0	Sludge Piles from Cell1
[2014-04-13 14:06:17]: 2014-04-13 14:06:17	sample.6	19000	7	2	Sludge Piles from Cell1
[2014-04-13 14:07:44]: 2014-04-13 14:07:44	sample.7	19500	6	0.7	Sludge Piles from Cell1
[2014-04-13 14:09:10]: 2014-04-13 14:09:10	sample.8	23100	5	1	Sludge Piles from Cell1
[2014-04-13 14:11:05]: 2014-04-13 14:11:05	sample.9	21800	6	0.2	Sludge Piles from Cell1

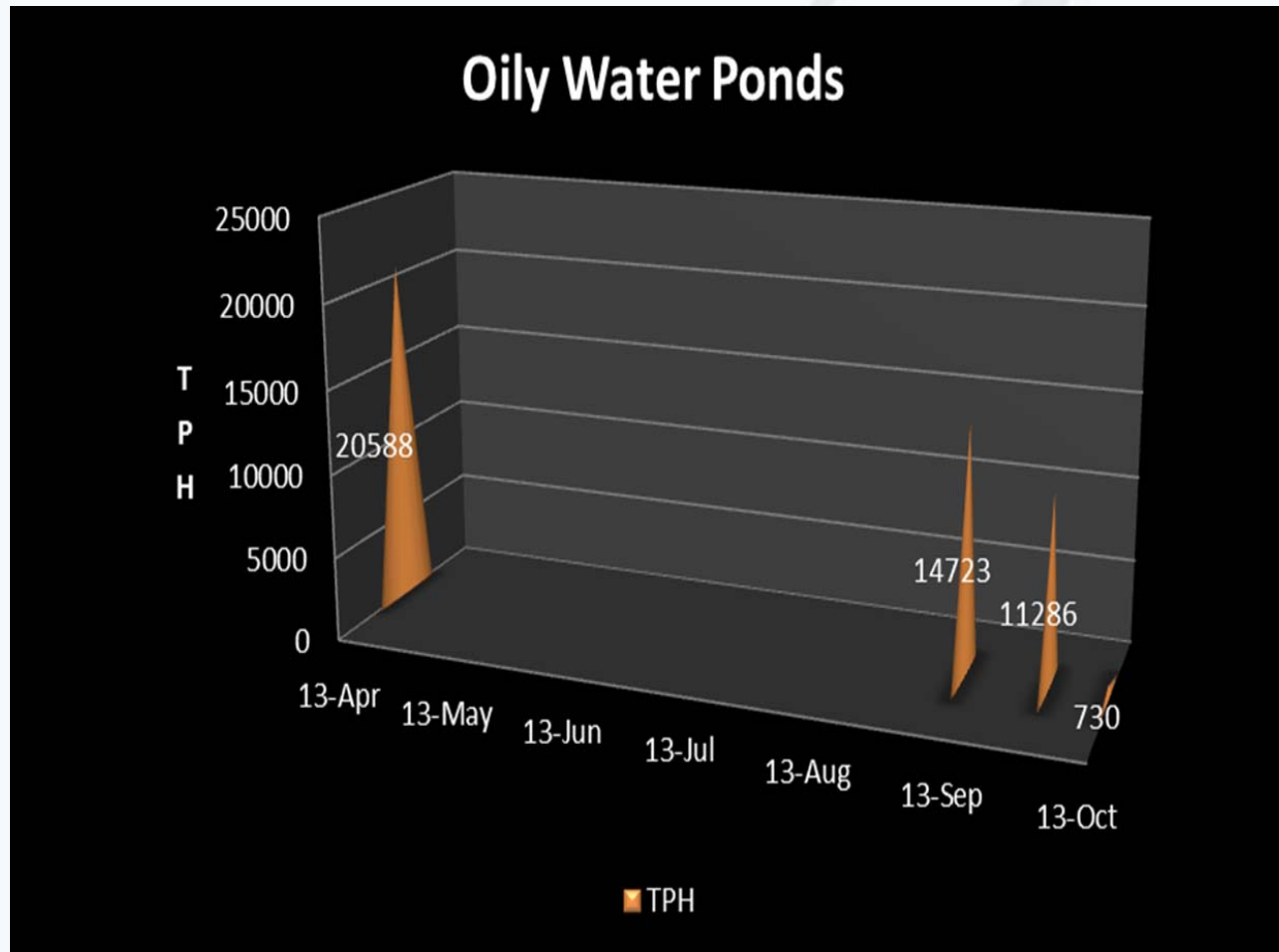
Remscan

Onsite management capabilities to effectively manage contaminated soils

Sample mapping for collection of soil samples



Monitoring Results – TPH in remediated soil over 6 mths



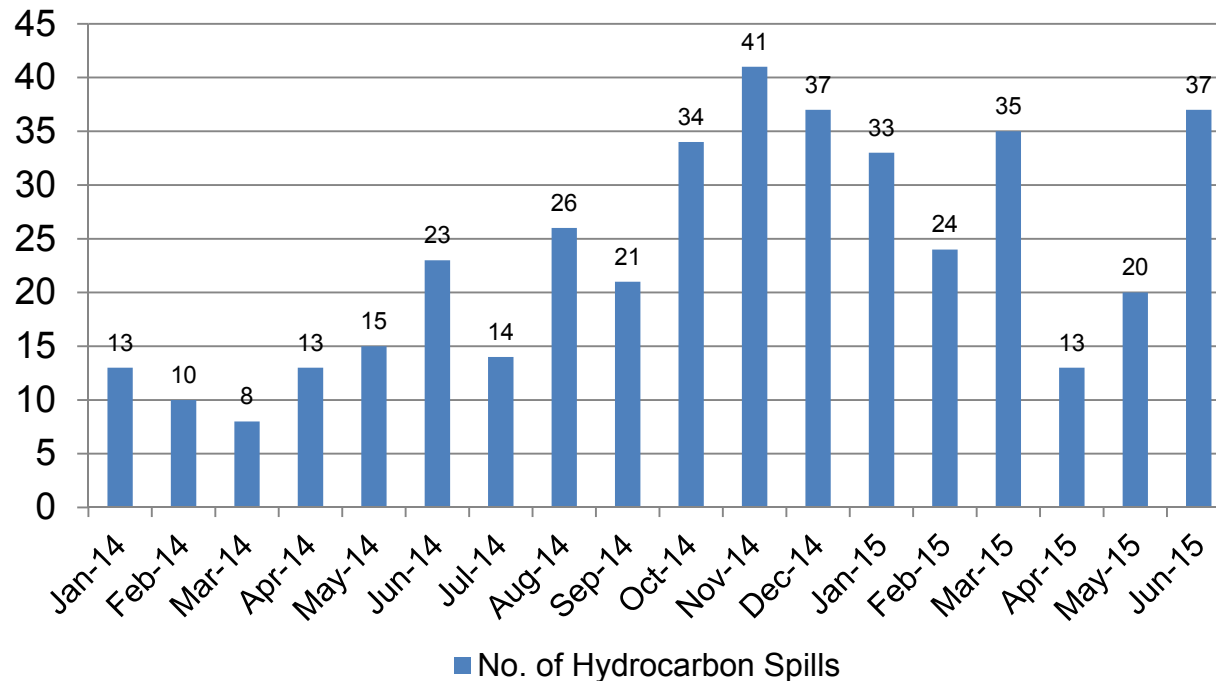


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Solomon Implementation



Hydrocarbon Incidents at Solomon



- More than 80% of recorded incidents due to hydraulic hose failures on Heavy Mining Equipment causing loss of hydraulic oils
- Spill volumes typically between 0 to 200 L, with minor amount of spills between 200 – 1500 L
- Recovery of hydrocarbon contaminated variable based off visual assessment and results of NATA-accredited lab analyses



Hydrocarbon Incident Management – before RemScan™

- Incidents reported via Fortescue Business Management System (BMS)
- Clean up dependent on visual observations of Operators / Fitters / Mechanics of spill area, using spill absorbent material and / or removal by use of earthmoving equipment
- Subsequent inspection of areas where large spills (≥ 100 L) had occurred by Environmental staff often observed remnant contamination
- Where samples taken by site environmental function to determine hydrocarbon contamination status – results not received for seven (7) days unless additional costs paid for quicker turnaround of analyses (i.e. 24 hours).
- Main issue was inability to immediately determine lateral and vertical extent of hydrocarbon contamination of soils and sediments as part of ongoing monitoring and spill response process.

Hydrocarbon Incident Management – After RemScan™

- Wash pad sediment – able to test it after removal to identify appropriate disposal location (biofarm or waste rock dump)
- Used to monitor the biofarm monthly not quarterly
 - Currently showing levels too high to consider releasing material.
 - Costs saved in not sending samples to NATA-accredited laboratory unnecessarily
- Large spill from grader
 - Able to pinpoint and circle clean up required saving time and material to biofarm
- Demobilising contractors where suspected or known hydrocarbon contamination is in-situ in areas under their control due to their activities
 - Able to identify down to a very small area the contamination present thereby only excavating contaminated material for treatment in the biofarm



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RemScan™: Technical Overview

Dr Grant Webster
Chief Scientific Officer



History of Technology



CSIRO was using infrared (IR) light to measure soil properties for agriculture



Ziltek funded collaboration to test if IR light could measure total petroleum hydrocarbons (TPH) in soil

Success on a laboratory instrument led to commercialisation in a field instrument



Demand for Real-Time Data



- Closing sites screening tool for petroleum hydrocarbons detection
- More data, increased confidence
- Real-time, smarter decisions
- Accelerated project closure, less cost

What is RemScan?

- Handheld infrared instrument for the direct measurement of TPH in soil
- User simply pulls the trigger for a ~15 second readout of TPH ($C_{10} - C_{36/40}$) in mg/kg
- No consumables or chemicals required

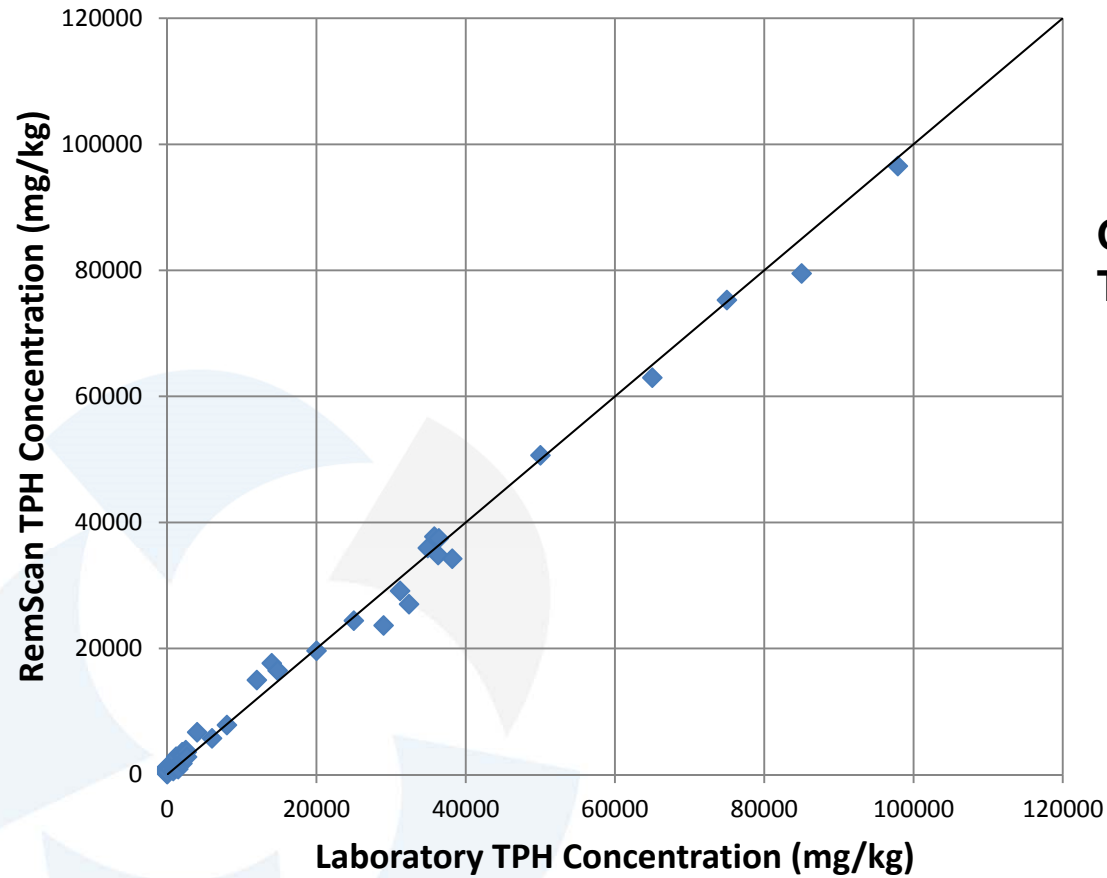


The RemScan™ Advantage

NATA Lab Analysis	RemScan™
5-10 day turnaround	Real-time results (15 sec)
Cost \$70+ per sample	Nil incremental cost
Limited data set	More data – more certainty
Delayed actions	Real-time decisions

TPH accuracy

RemScan vs Laboratory TPH (C₁₀-C₃₆) Concentration



**Good agreement with laboratory
TPH results**



Summary of Benefits

- Environmental risk reduction – better spill response management
- Better monitoring of site bioremediation area – production of results to determine contaminated site status of open / inactive cells (site calibration)
- Able to provide advice in the field to clean-up crews regarding lateral / vertical extent of hydrocarbon contaminated soil / material
- Reduced carbon footprint
- Transportability / portability



- Implementation of the Ziltek RemScan™ has ultimately allowed Fortescue to:
 - Provide better advice on spill clean-up requirements;
 - Better identification of material for on-site bioremediation; and
 - Provide immediate “on the ground” management of hydrocarbon issues
 - Manage and maintain Bio Remediation cells for optimal performance



Questions?



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