

LEAN, LANDFILL & OPERATION

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Landfill lean management

Creating value and improving efficiency



Landfill Lean

- Lean management is about continuously improving work processes, purposes and people.





Landfill Processes

⇒ KEY PROCESSES

- Waste acceptance
- Waste placement
- Mobile plant management
- Landfill gas management
- Bioreactor management
- Leachate management
- Construction – cell and cap
- Landfill master planning

Landfill Lean Rules

⇒ EACH RULE IS EQUALLY IMPORTANT



— Know your costs -



— Know your environmental impact



— KPI Management



— Implement visual management



— Loss identification e.g. truck cycle times



— Structured meetings



— Problem solving mechanisms and culture



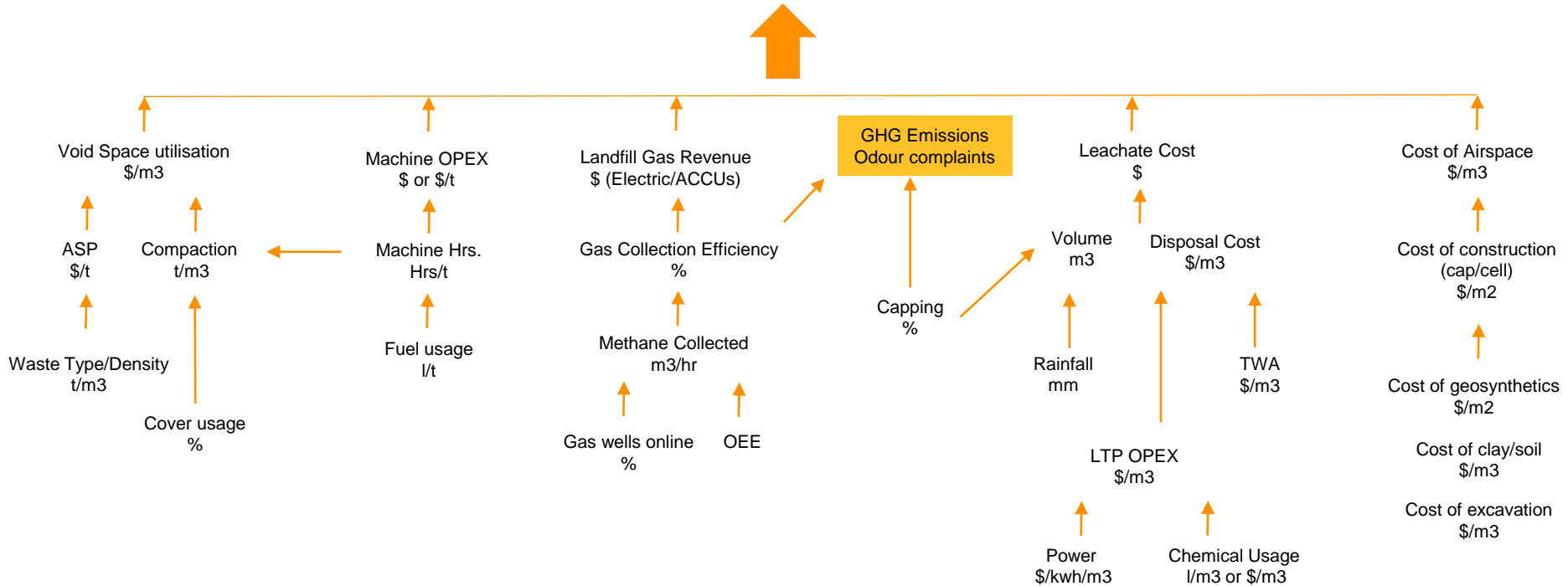
Landfill manager skills matrix

- Mining Engineering
- Finance
- Law
- Safety
- Environmental science
- Chemistry
- Civil engineering
- Geology and hydrogeology
- Contractor management
- Stakeholder management
- Asset management
- Water/leachate treatment
- Geotechnical engineering
- Surveying
- Management/leadership
- Fluid dynamics
- Thermodynamics
- Soil/rock mechanics
- Mechanical engineering
- Meteorology
- Information technology
- Landfill gas management
- Lean management
- Etc, etc



Management by KPIs

Operational TBL Performance



Lean applied to landfill gas

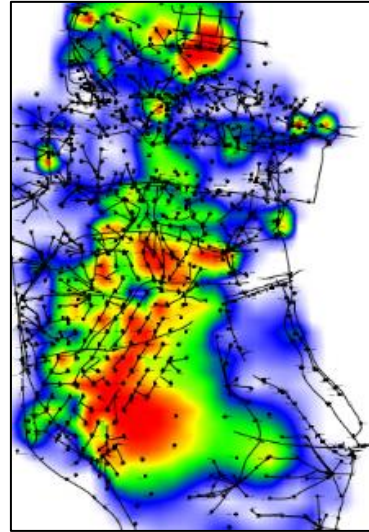
	5S, Visual Management	Standards	Indicators	Skills	Lean Maintenance
Biogas well network	<ul style="list-style-type: none"> • Gas well layout drawing • Tools required • Heat map of emissions • Heat maps of flows • Trend graphs • Run charts • Gas fittings storage • Visual odour tracking 	<ul style="list-style-type: none"> • Balancing procedures • LFG Risk Assessment • Calibration and maintenance • Licence 	<ul style="list-style-type: none"> • Collection Efficiency • Methane Collected • OEE • Flare running hours v downtime • % wells +55% CH4 • Odour complaints • Gas field OEE 	<ul style="list-style-type: none"> • Balancing of gas wells • LFG modelling • Fluid dynamics • Meteorology 	<ul style="list-style-type: none"> • Gas well maintenance programme • Daily checks • Engine OEE • Pump maintenance
Electricity Production			<ul style="list-style-type: none"> • OEE of engines 		

Landfill gas lean, 5s and visualisation examples



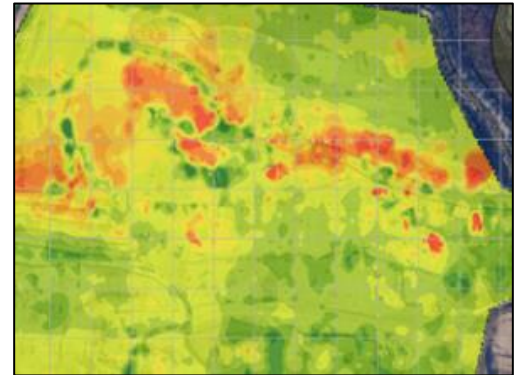
⇒ VISUAL MANAGEMENT

- Visualise actions and decisions to be made
- Base visuals on performance, issues or quantities

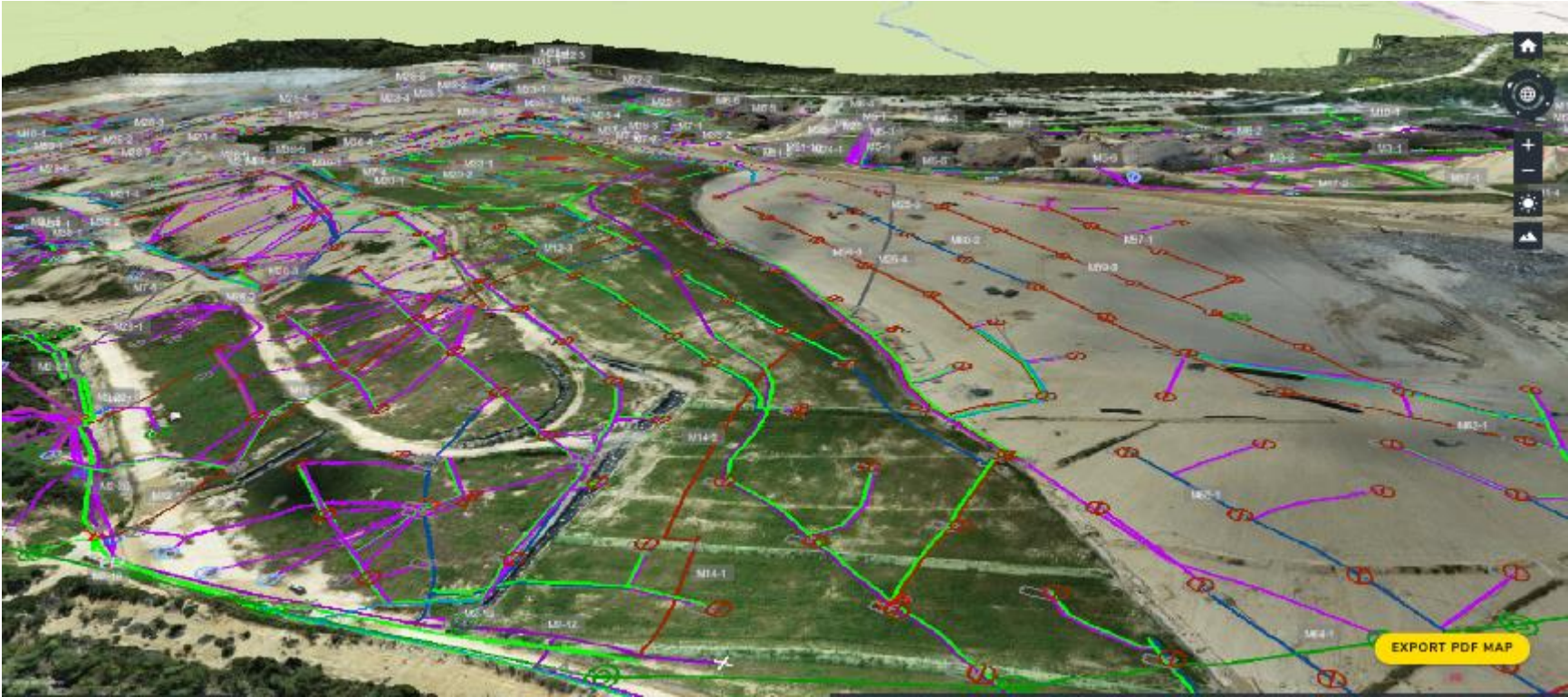


Heat map showing gas flows, leachate levels and pressure

Heat map showing emissions



3D Visualisation of a gas network



3D Visualisation of a gas network



keep safety in mind on this site

Days since last lost time incident: **677**

Month:	MTD	YTD	Month:	MTD	YTD
Slips	0	0	Lifting and handling	1	1
Fall from heights	0	0	Other	0	0
Struck by objects	1	2	Cuts, lacerations	0	0
Excavation / collapse in or nearby	0	0	Check by object	0	0
New sites / hazards reported	14	56	Fall from ladders	0	0
Safety to Work communication	12	275	Check by moving vehicle	0	0

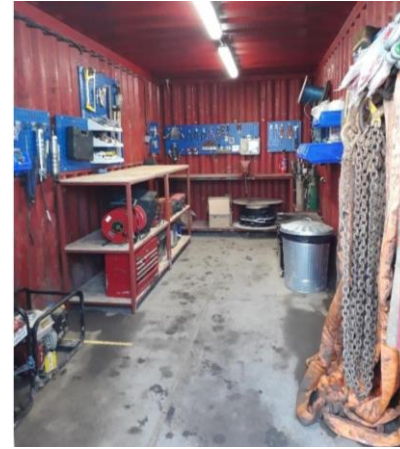
SUEZ SAFETY HUB



Workplace organisation, 5s



⇒ **UTILISING THE 5S PRINCIPALS TO ACHIEVE WORKPLACE ORGANISATION**

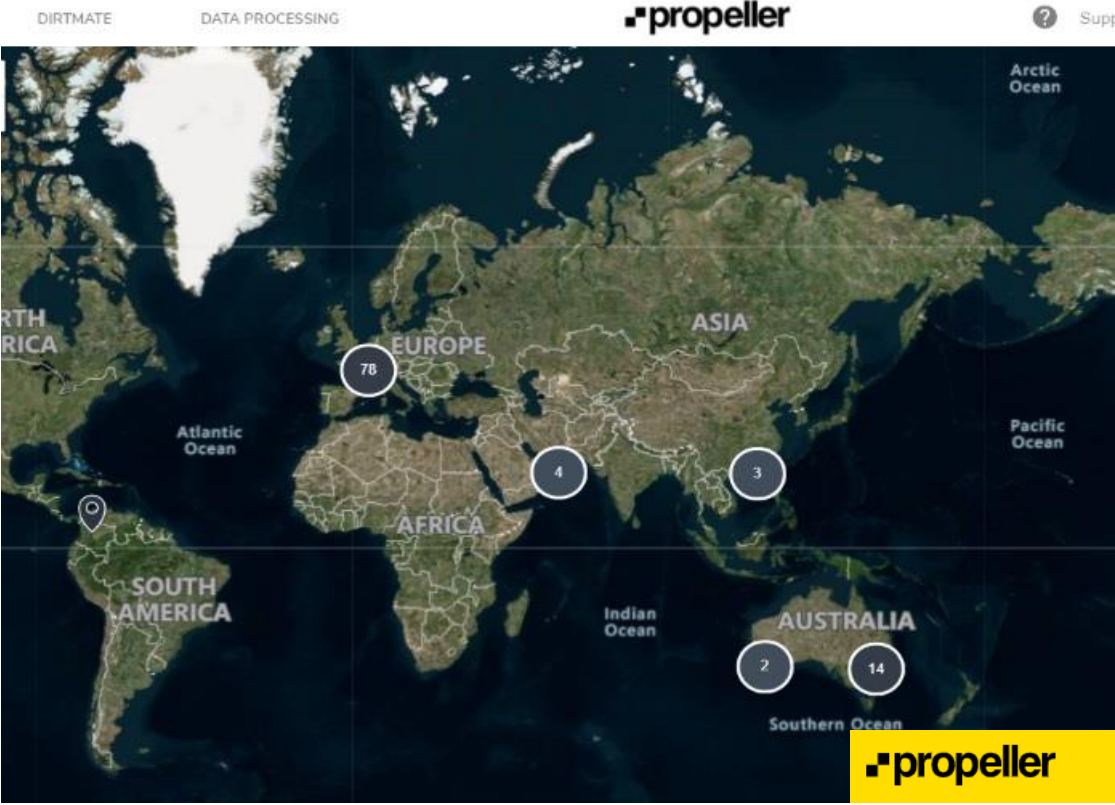


Innovation

AI, Machine learning, IoT sensors,
robotics

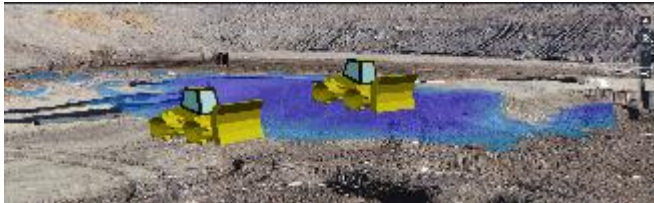


Global deployment of drone surveying and Propeller platform



Propeller - DirtMate

- **measure volumes** moved on a daily basis, quickly and cost-effectively.
- **optimize vehicle routes** and improve the efficiency of vehicles working.
- **reduce reliance on contractors** for progress data and start collecting the data themselves.
- and, **quickly identify traffic management issues**, such as pinch points or areas of high risk, using the snail trail feature.



Pedestrian Detection System

Sentinel Vision A.I.



- Real time A.I. Human Recognition System
- Uses cameras to detect humans rather than objects, warning both machine operator and pedestrians while reducing nuisance alarms
- Fitted to compactors and dozers
- Alters machine operator and pedestrian behaviour using internal and external alarms and warnings
- Pictures show system in use at Lucas Heights Landfill



Spot

⇒ DEVELOPED BY BOSTON DYNAMICS

- Surface emissions monitoring
- Confined spaces entry
- Fire patrols
- Gas monitoring (CO, H₂S, CH₄)
- Surveying
- Security





THANK YOU

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