



# Kookaburra Gully Graphite Mine

## Tumby Bay District Community Consultation Group

Mine design, environmental assessment & PEPR progress  
7 March 2017



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# Project Status & Key Issues



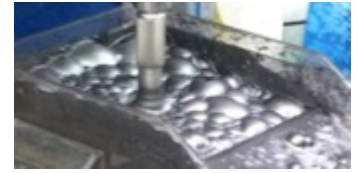
- Design studies (to feasibility study level) essentially complete
- Environmental assessments nearing completion
- The Program for Environment Protection and Rehabilitation (PEPR) drafting has commenced

The outcomes of these studies define the project, enable preparation of the PEPR and other infrastructure related approvals.

## **Key Issues requiring further work:**

- Ways to reduce capital & operating costs
- Better define target market segments
- Consider optimal production rate to match market demand
- Produce sufficient concentrate to test suitability of products for applications (pilot plant test-work)

# Design Studies



## 2016 geotechnical and design studies:

- ▶ Geology & resource model (Orewin)
- ▶ Mine design – pit & waste rock facilities (AMC)
- ▶ Metallurgical test-work & process plant design (Inception Group & IMO)
- ▶ Tailings storage facility design (Golder Associates)
- ▶ Site water management (Golder Associates & CDM Smith)
- ▶ Road & transport logistics (Tonkin Consulting)
- ▶ Water supply options study (Inside Infrastructure)
- ▶ Power supply options study (GPA Engineering)
- ▶ Mine site general arrangement (Golder Associates)

# Geology & Resource Model



- ▶ Drilling, sampling, analysis & data compilation
- ▶ Resource & waste rock modelling updated by OreWin provides basis for mine design and preparation of ore & waste rock schedules
- ▶ Q1 2017 – in-fill drilling program completed to better define ore reserves at Kookaburra Gully & mineral potential along strike to southwest



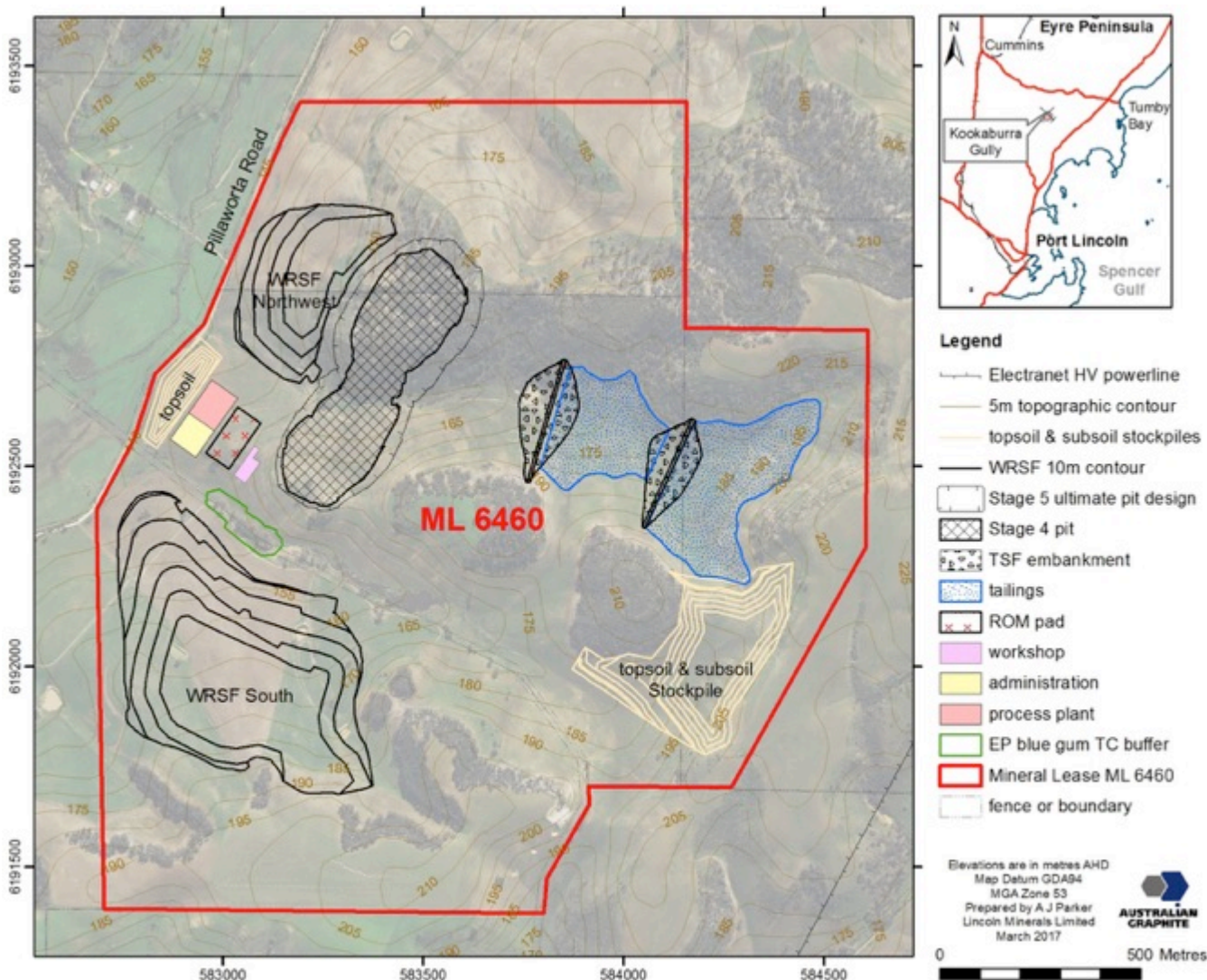
## Next Steps:

- ▶ Drill sample analysis
- ▶ Detail geology
- ▶ Refine Resource Model
- ▶ Define Ore Reserves





# Mine design – pit & waste rock facilities



- Geotechnical core drilling & analysis undertaken H1 2016
- Geotechnical report completed by AMC
- Optimised pit shell, mine & waste rock facility design prepared by AMC

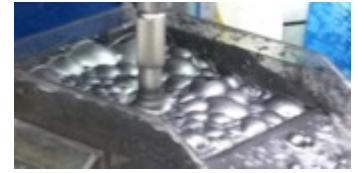
## Next step:

- AMC to finalise mine design report as basis for description of operations in PEPR





# Mine design – pit development stages



- Mine optimisation software supports an initial 4 stage mine based on current graphite prices
- Mine up to 250,000 tonnes ore per year
- Mine life (6+ years) will depend on progressive mine development & marketing strategy



# Metallurgical test-work & process plant design



- ▶ Inception Group supervised metallurgical test-work & prepared process plant design
- ▶ Comprehensive laboratory-scale test-work program was undertaken at IMO (Perth) July-December 2016
- ▶ Process flow sheet & OPEX prepared (Inception Group)
- ▶ Process flow diagrams & CAPEX prepared (ammjohn)
- ▶ OPEX & CAPEX estimates used in mine pit design & financial model



## Next step:

- ▶ Review & finalise reports as basis for description of operations in PEPR

Size Fraction ( $\mu\text{m}$ )	LMC 11 - Master Comp			LOX 1 - Oxide Comp		
	Mass	TC (%)	LOI (%)	Mass %	TC (%)	LOI (%)
500						
300	0.1%	93.20	96.00	0.4%	97.80	97.11
180	3.5%	93.20	96.00	5.2%	97.80	97.11
150	3.9%	95.80	97.22	4.7%	96.40	97.72
106	11.4%	96.60	97.46	14.8%	97.00	97.31
75	11.4%	96.70	97.41	12.7%	97.10	97.18
-75	69.7%	96.80	96.84	62.2%	93.80	94.52
Calc Head	100.0%	96.60	96.96	100.0%	95.04	95.57



# Tailings storage facility design (TSF)

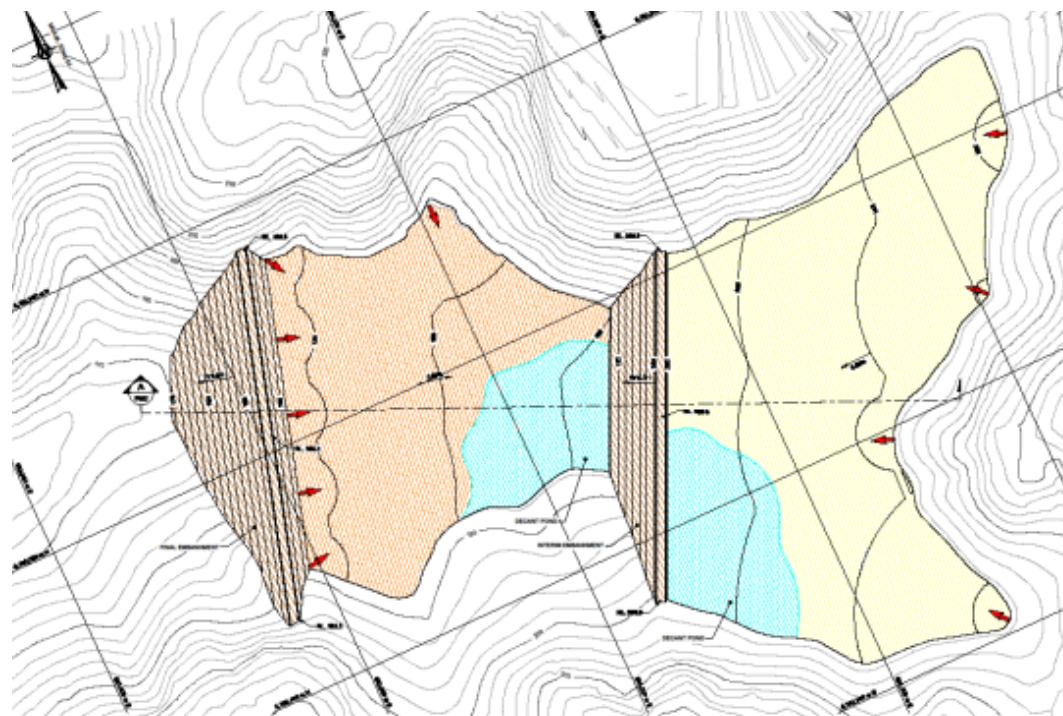


- ▶ Detailed geotechnical soil test pits & soil tests completed H1 2016
- ▶ Geotechnical investigation report for TSF received
- ▶ Tailings laboratory test-work report received
- ▶ TSF concept design & cost estimate received



## Next steps:

- ▶ Review & finalise TSF design report as basis for description of operations, water management & closure plan in PEPR



# Site water management

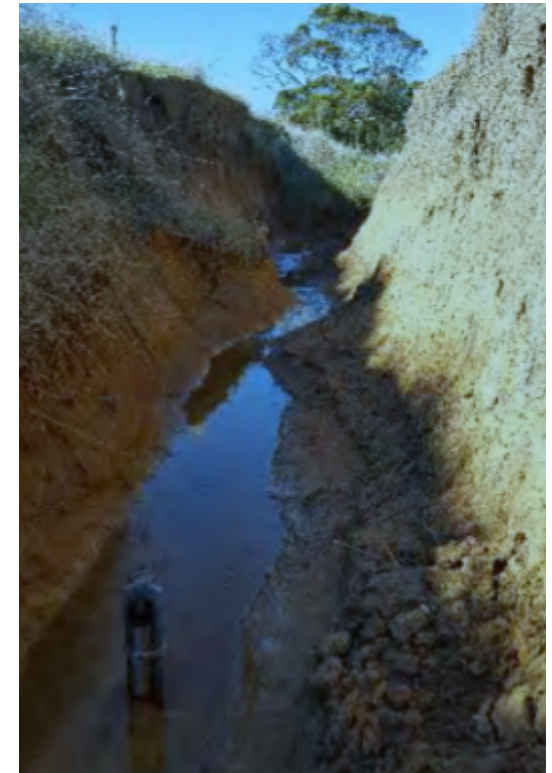


- ▶ Surface water-flow monitoring stations installed early 2016
- ▶ Golder Associates engaged to prepare site-wide water balance modelling and storm-water & sediment management review
- ▶ Water balance will inform make-up water requirement & enable refinement of water supply from Tod Reservoir



## Next Steps:

- ▶ Design storm-water and sediment management system
- ▶ Water management report will form basis of water management section in PEPR



*Surface water-flow monitoring station*

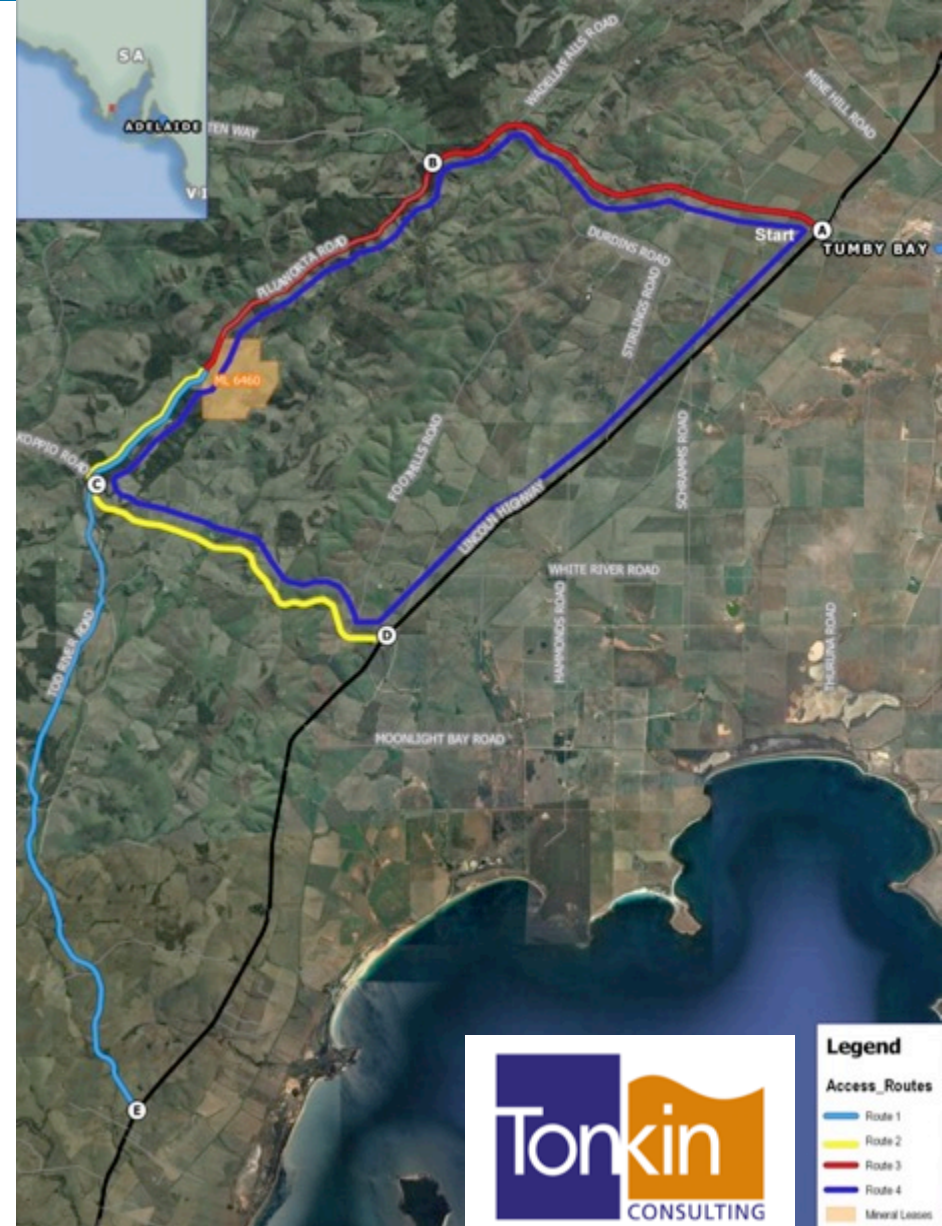


# Road transport route options study

- ▶ Tonkin Consulting undertook road route assessment, design & costing mid-2016
- ▶ All routes re-assessed including a ring route option (dark blue line on map)
- ▶ Considered road / public safety, overall travel distance, upgrade cost, maintenance costs, environmental constraints, community acceptability
- ▶ Recommended route is via Pillaworta Road & Bratten Way (red line on map)
- ▶ Report provided to DCTB & meeting held to discuss report recommendations

## Next steps

- ▶ Prepare detailed design of road & intersection upgrade & seek approval from DCTB & DPTI
- ▶ Prepare road maintenance agreement with DCTB





# Road transport route options study

## Key recommendations



### Pillaworta Road – Bratten Way intersection:

- ▶ Shoulder widening for left turn from Bratten Way into Pillaworta Road
- ▶ Sealing the Pillaworta Road approach to Bratten Way

### Pillaworta Road:

- ▶ Upgrade to Category 2B requirements
- ▶ Upgrade drainage to ensure water ponding does not occur
- ▶ Provide delineation to highlight hazards along the roadway
- ▶ Prune vegetation to provide required clearances.

### Traffic management:

- ▶ Implement car-pooling (or provide buses) for employee access to the mine
- ▶ Develop entry / exit staging to prevent two-way heavy vehicle congestion



# Transport logistics



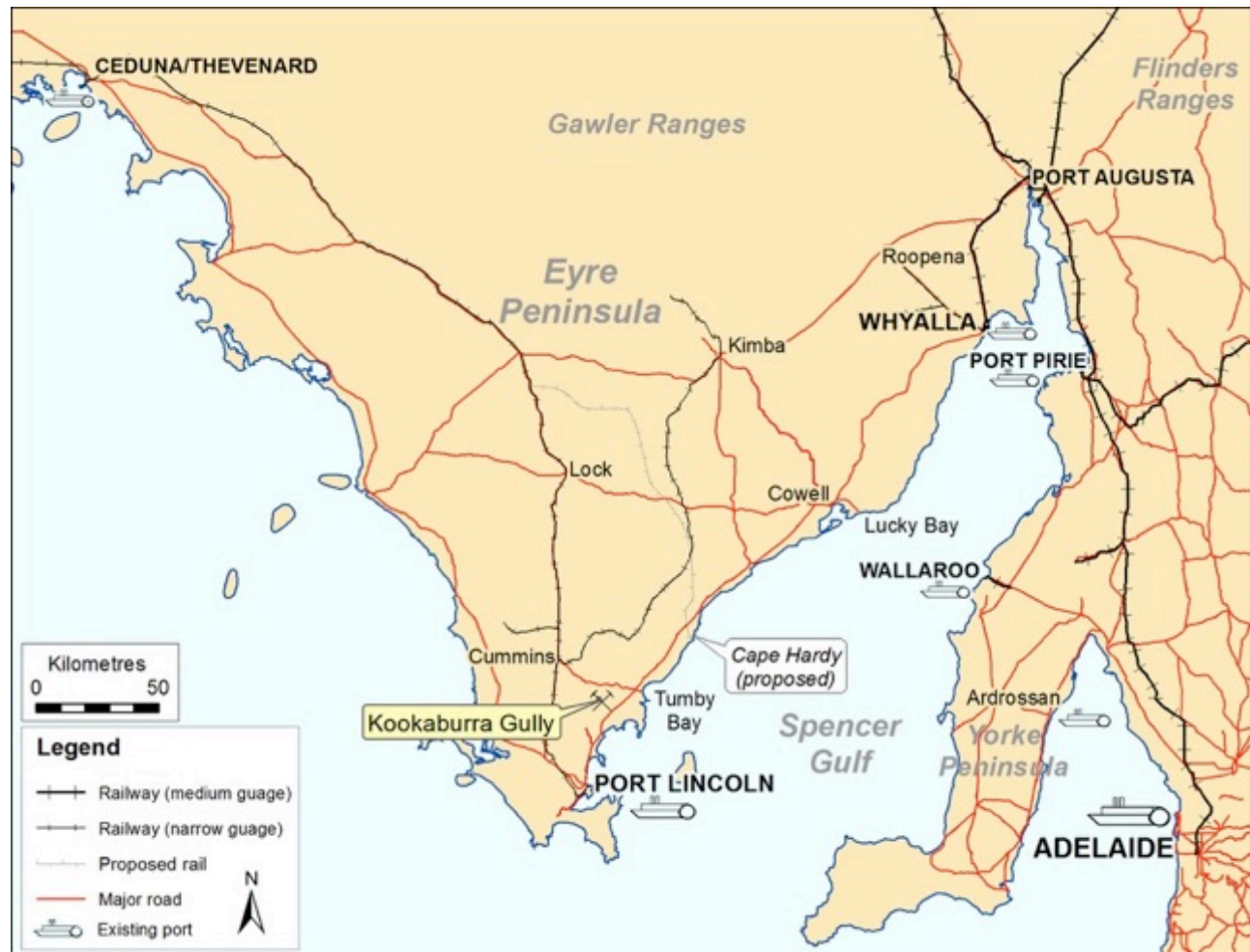
## Further work required to confirm export port & transport logistics

- ▶ Graphite concentrate in containers to Port Adelaide by road or road/rail
- ▶ Freight depot in Tumby Bay
- ▶ Bulk samples to China (for metallurgical test-work)

## Alternate ports:

Containers or bulka bags

- ▶ Port Lincoln
- ▶ Whyalla
- ▶ Port Pirie
- ▶ (? Cape Hardy)



# Water supply options study

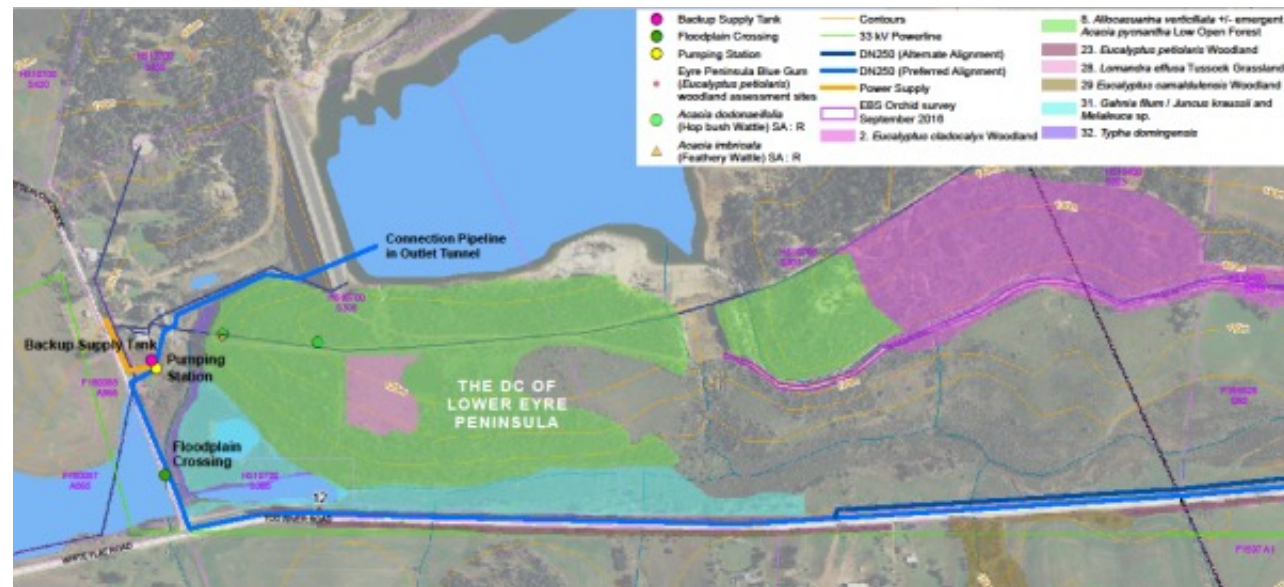


- ▶ Inside Infrastructure engaged to evaluate options for water supply & make recommendation
- ▶ Options considered: Tod Reservoir, SA Water mains supply &/or groundwater
- ▶ Final report received & meeting held with DCTB to discuss report recommendations



## Next Steps

- Define approval pathway & requirements
- Negotiate agreement with SA Water for supply of Tod Reservoir water and access for construction & maintenance of pumping & pipeline infrastructure





# Water supply options study

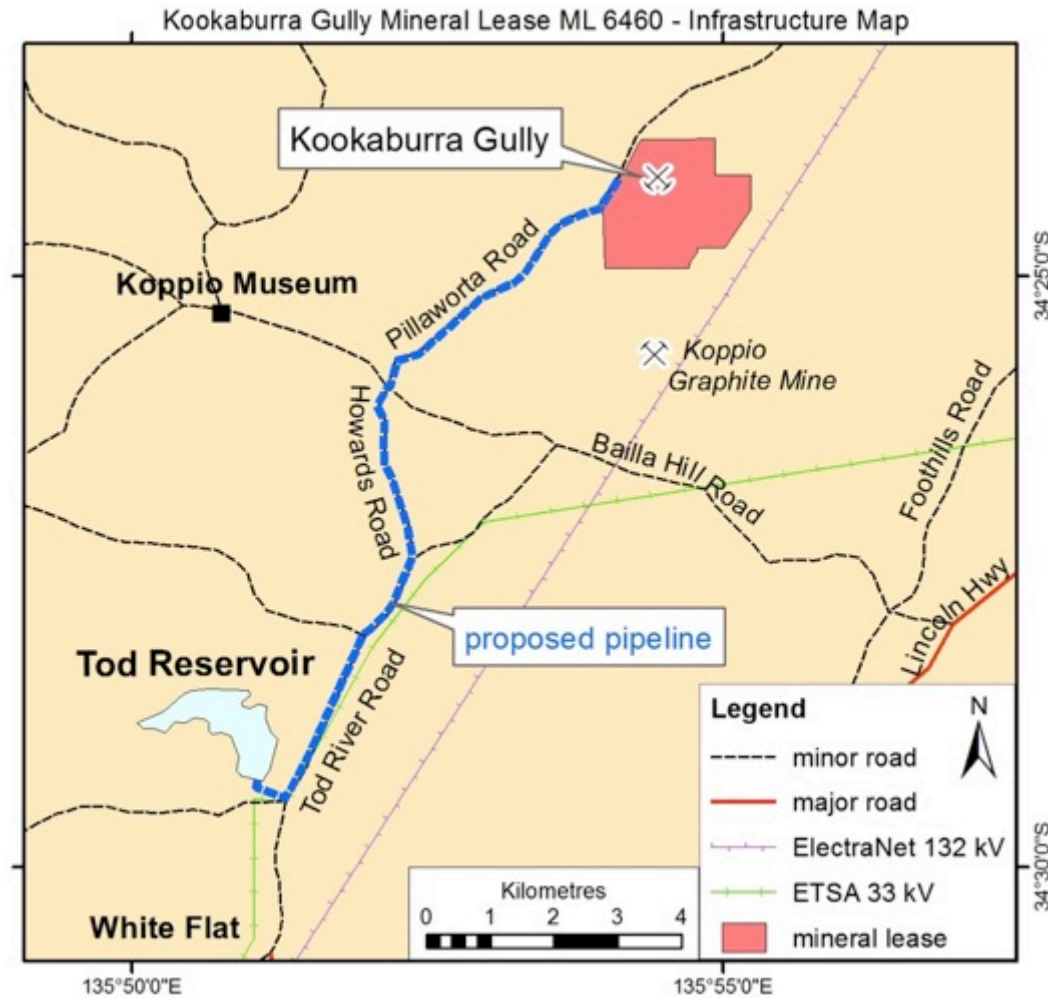


**Recommendation:** Raw water supply from Tod Reservoir with a standby potable connection (necessary to provide security of supply due to only 50% reliability of the Tod Reservoir supply)



## Components:

- Connection to Tod Reservoir outlet
- Standby potable connection from the SA Water network
- Construction of a new pumping station adjacent to Reservoir Drive
- Buried PVC pipeline from Tod Reservoir to site
- High quality water provided by desalination plant & rainwater harvesting



# Power supply options study



- ▶ GPA Engineering engaged to prepare power supply study report

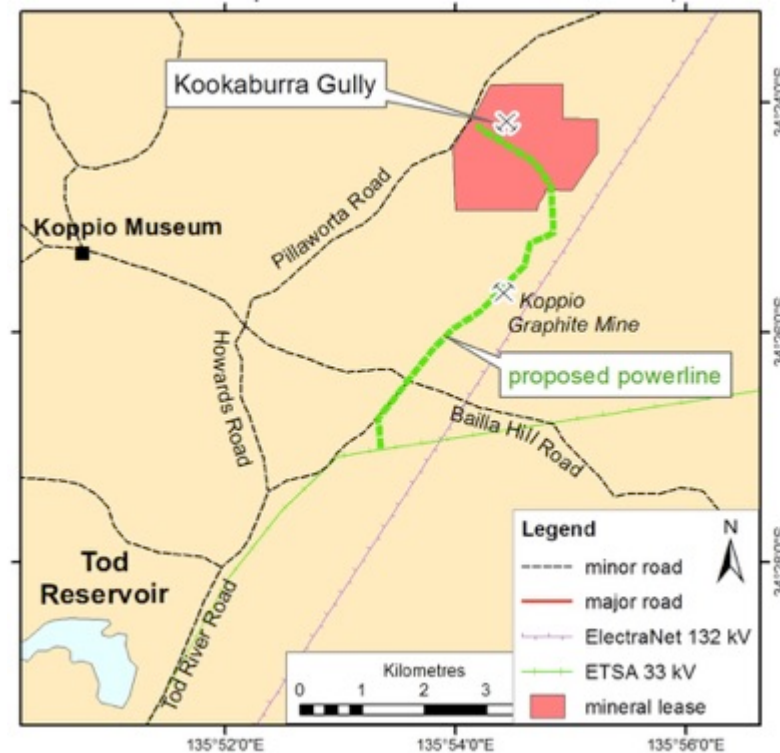


## Option study outcomes:

- ▶ On-site diesel generation & alternate power generation sources such as solar, not commercially viable
- ▶ **Recommended:** HV grid connection via tee-off from the nearby 33 kV distribution network followed by a 5-6km overhead power line to the mine supply point
- ▶ Power transmission line route defined
- ▶ On-site gas generation is a potential alternative

## Next steps

- ▶ Ecology survey along proposed route
- ▶ Finalise route design
- ▶ Negotiate landowner access agreement(s)
- ▶ Detailed design of connection, power transmission line, substation & site distribution
- ▶ Negotiate agreement with SA Power Networks



# Mine site general arrangement

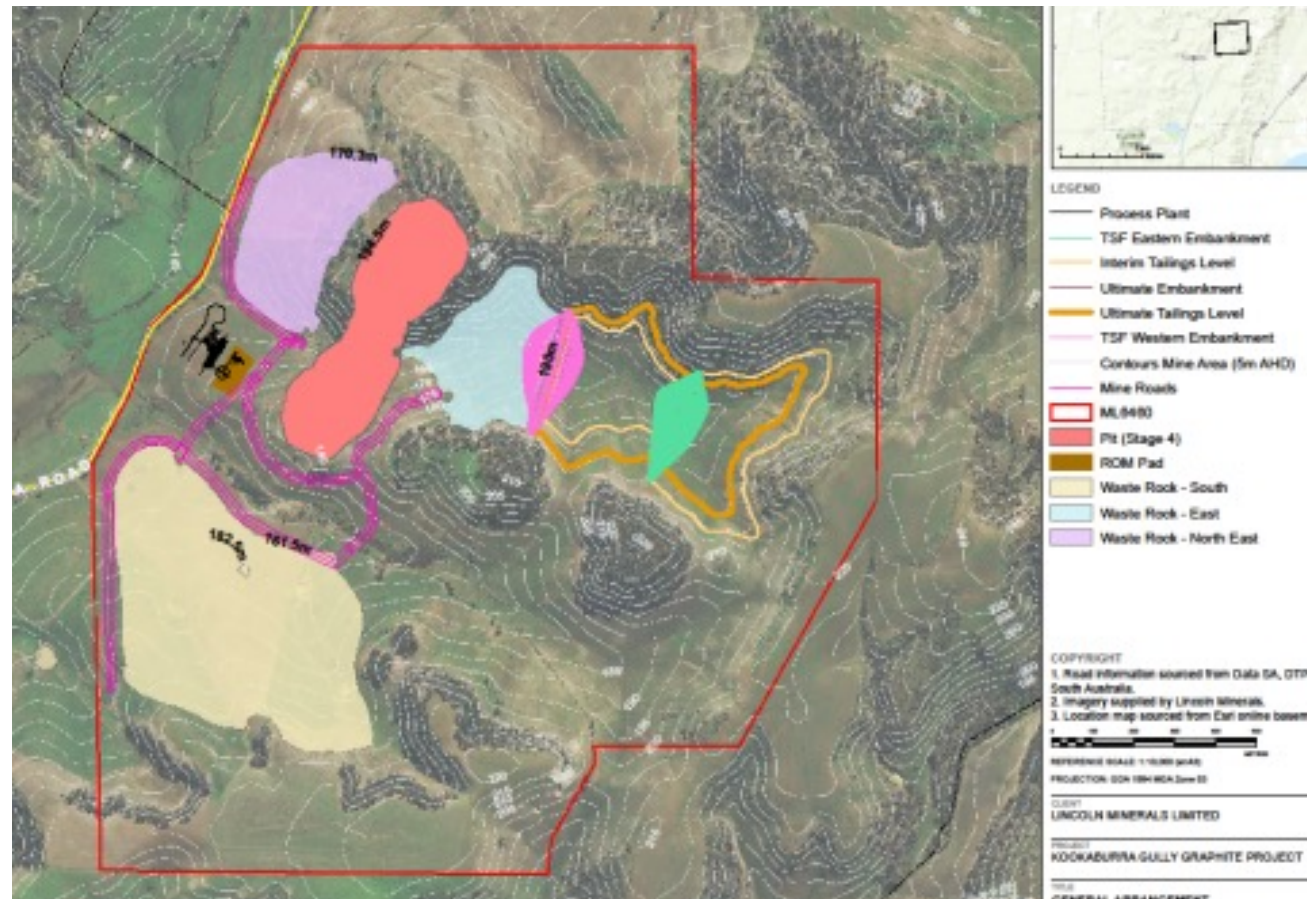


- ▶ Golder Associates engaged to prepare a mine site general arrangement (GA) drawing
- ▶ Draft GA includes all mine and process plant related infrastructure on the Mineral Lease



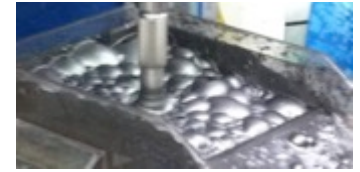
## Next steps:

- ▶ Finalise mine site GA following site water management design
- ▶ EBS Ecology to review mine disturbance footprint
- ▶ Use GA as a basis for mine site disturbance & SEB offset calculation
- ▶ Use GA as base plan for the PEPR





# Environmental Assessments



## Environmental assessment studies:

- ▶ Air quality & noise (Pacific Environment)
- ▶ Groundwater & surface water (CDM Smith)
- ▶ Geochemistry (Earth Systems)
- ▶ Biodiversity, SEB offset & heritage (EBS Ecology)
- ▶ Mine rehabilitation & closure plan (Earth Systems & Golder Associates)

These assessment reports will form Appendices and the basis of the PEPR sections.

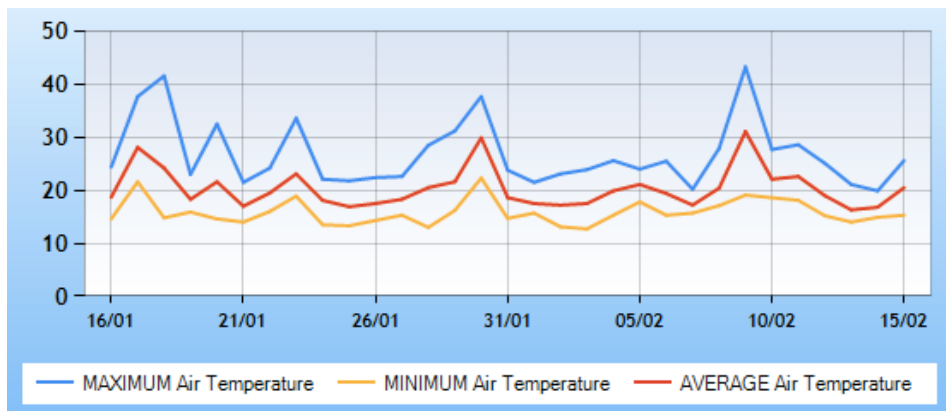
# Air quality and noise



- ▶ Pacific Environment engaged to advise on installation of a weather station & to advise on the implications of air quality related ML conditions
- ▶ Weather station installed mid-2016
- ▶ Pacific Environment also engaged to prepare air quality & noise management & monitoring plans

## Next Steps

- ▶ Review air quality & noise management & monitoring plans
- ▶ Incorporate into PEPR



Pacific Environment  
Limited



# Groundwater & surface water



- ▶ CDM Smith engaged to:
  - design & install baseline groundwater & surface water monitoring program
  - undertake groundwater supply options assessment
  - water impact assessment, including groundwater model development and surface & groundwater impact assessment
- ▶ Monitoring bores & gauging stations installed & monitored

## Next Steps

- ▶ Pump tests on new groundwater monitoring wells
- ▶ Complete water impact assessment study following TSF design & site water management system design
- ▶ Water impact study report will form the basis of the water section in PEPR

**CDM  
Smith**







- ▶ Earth Systems engaged to facilitate development of an environmental layer for the mine block model with specific attention to any potential acid forming rock (PAF) or acid mine drainage (AMD)
- ▶ Laboratory test-work completed on ore, waste rock & tailings samples
- ▶ Geochemical impact assessment report in progress



## Next Steps

- ▶ Geochemical impact assessment report to be used as a basis for:
  - the finalisation of TSF design
  - site water system design
  - water impact assessment
  - final pit void management
  - waste rock facility design
  - mine closure plan
- ▶ all components of the PEPR

# Biodiversity & Heritage



- ▶ EBS Ecology & EBS Heritage engaged to do:
  - baseline survey work for the Mining Lease Proposal
  - baseline & orchid surveys for transport, power supply & water supply pipeline routes
- ▶ Proposals received from Eyre Peninsula NRM Board and Nature Foundation for SEB offset



## Next Steps

- ▶ Survey power transmission line route
- ▶ Complete draft biodiversity & heritage baseline & impact assessment reports for inclusion in PEPR
- ▶ Update SEB offset calculation and include in PEPR
- ▶ Recommend SEB offset approach following meetings with Eyre Peninsula NRM Board and Nature Foundation



# Mine rehabilitation & closure plan



- ▶ Earth Systems & Golder Associates have been engaged to prepare the closure plan
- ▶ The closure plan will incorporate care & maintenance and rehabilitation plans and will require input from CDM Smith, AMC, Inception & EBS Ecology



## Next Steps

- ▶ Review and discuss key aspects of closure plan with stakeholders
- ▶ Review, finalise and incorporate into the PEPR





# Project Schedule



Milestone	Target Date
Infrastructure design studies completed	end 2016
Mine site general arrangement	Feb 2017
Mine design & impact assessments	Feb 2017
Project financial model update	Feb-Mar 2017
Project risk assessment	Mar 2017
Community consultation (ongoing)	Feb–Apr 2017
PEPR draft prepared	Apr 2017
Land access agreements complete	Apr 2017
PEPR approval – target	July 2017

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