

# HILLGROVE RESOURCES

## KANMANTOO PUMPED HYDRO

STEVE McCLARE IIIII CEO & MANAGING DIRECTOR

PUMPED HYDRO ENERGY STORAGE CONFERENCE SYDNEY MARCH 2018



No representation or warranty is or will be made by any person (including Hillgrove Resources Limited ACN 004 297 116 (“Hillgrove”, “HGO”, or the “Company”) and its officers, directors, employees, advisers and agents) in relation to the accuracy or completeness of all or part of this document (the “Document”), or the accuracy, likelihood of achievement or reasonableness of any forecasts, prospects or returns contained in, or implied by, this Document or any part of it. This Document includes information derived from third party sources that has not been independently verified.

This Document contains certain forward-looking statements with respect to the financial condition, results of operations and business of Hillgrove and certain plans and objectives of the management of Hillgrove. Forward-looking statements can generally be identified by the use of words such as ‘project’, ‘foresee’, ‘plan’, ‘expect’, ‘aim’, ‘intend’, ‘anticipate’, ‘believe’, ‘estimate’, ‘may’, ‘should’, ‘will’ or similar expressions. Indications of, and guidance on, production targets, targeted output, mine development or timelines, exploration or expansion timelines, infrastructure alternatives and financial position and performance are also forward-looking statements. Any forecast or other forward-looking statement contained in this Document involves known and unknown risks and uncertainties and may involve significant elements of subjective judgment and assumptions as to future events which may or may not be correct. Such forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties and other factors, many of which are beyond the control of Hillgrove, and may cause actual results to differ materially from those expressed or implied in such statements. There can be no assurance that actual outcomes will not differ materially from these statements.

Various factors may cause actual results or performance to differ materially. These include without limitation the following: risks specific to Hillgrove’s operations; credit risk; levels of supply and demand and market prices; legislation or regulations throughout the world that affect Hillgrove’s business; insurance expenses; the risk of an adverse decision or other outcome relating to governmental investigations; class actions or other claims; growth in costs and expenses; and risk of adverse or unanticipated market, financial or political developments (including without limitation in relation to commodity markets).

You are cautioned not to place undue reliance on forward-looking statements. These forward-looking statements are based on information available to us as of the date of this Document. Except as required by law or regulation (including the ASX Listing Rules) we undertake no obligation to update these forward-looking statements.

This Document is provided for informational purposes only and is subject to change without notice. Subject to any obligations under applicable laws, regulations or securities exchange listing rules, Hillgrove disclaims any obligation or undertaking to release any updates or revisions to this Document to reflect any change in expectations or assumptions. Nothing in this Document should be interpreted to mean that future earnings per share of Hillgrove will necessarily match or exceed its historical published earnings per share, or that there has been no change in the affairs of Hillgrove since the date of this Document.

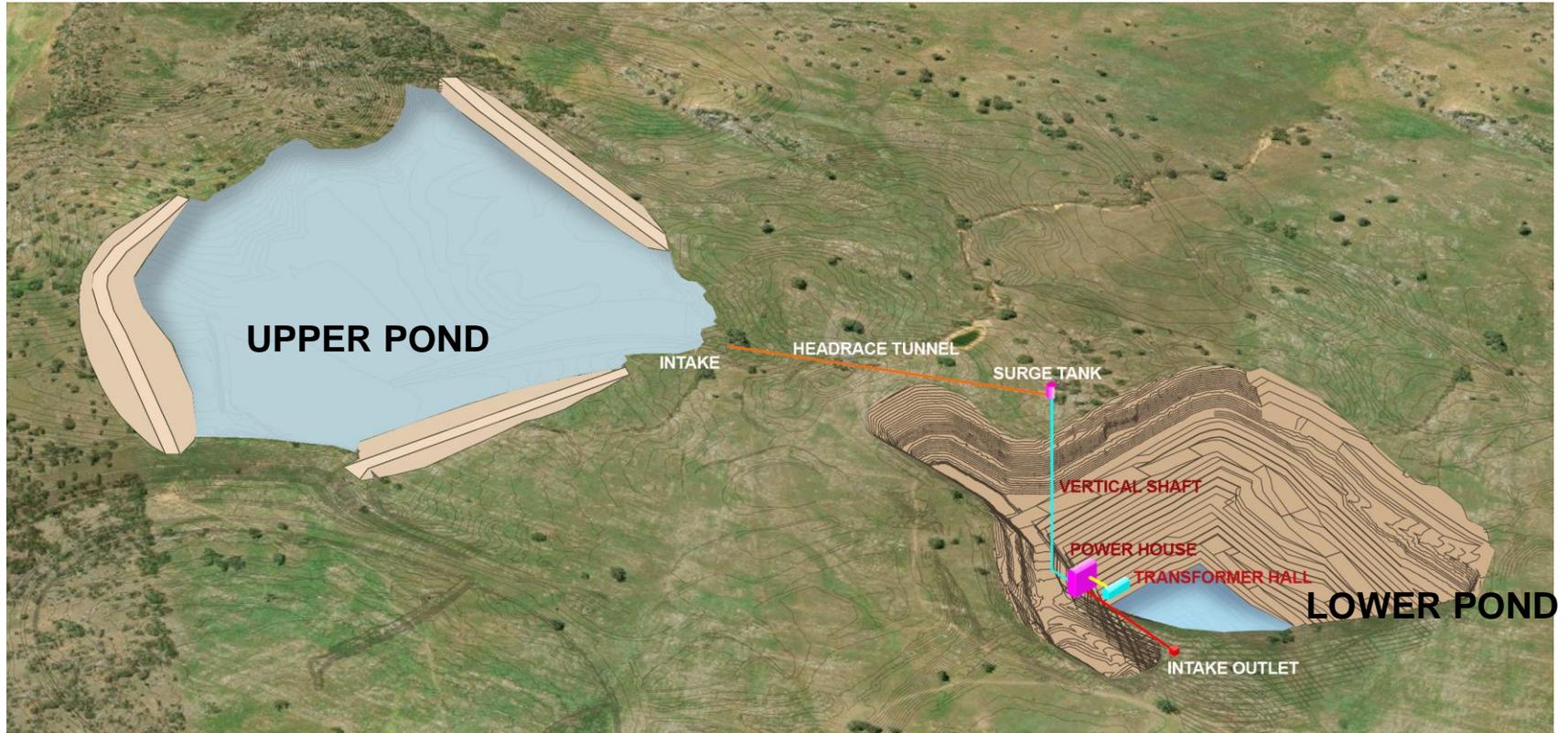
Nothing contained in this Document constitutes investment, legal, tax or other advice. The information in this Document does not take into account the investment objectives, financial situation or particular needs of any recipient. Before making an investment decision, each recipient of this Document should make its own assessment and take independent professional advice in relation to this Document and any action taken on the basis of this Document.

All currency referred to is Australian dollars (\$) unless otherwise indicated (e.g. US\$).



# PROJECT OVERVIEW





### KEY TAKEAWAYS

- 220MW for 6 hours generating over 1,300MWh
- 5km to 275KVA line
- Site studies already complete to Regulator standards for mining project – transferrable to PHES
- Plausible commissioning by Q4 2021



- Key metrics highlight that the Kanmantoo site is one of the best sites for Pumped Hydro Energy Storage in Australia:
  - ❑ Very low capital cost at < \$1M / MW and < \$160 / kWh
  - ❑ Fast to market; possibly commissioned by end 2021
  - ❑ Infrastructure already in place (ponds, water, buildings, roads, power)
  - ❑ Proximity to grid and proposed renewable energy projects
  - ❑ Existing studies and knowledge (environmental, geotechnical, geology, hydrogeology)
  - ❑ Long established social licence to operate
  - ❑ Project site 100% owned freehold land with room to establish 40MW solar facility
  - ❑ Responsiveness provide spot market arbitrage and FCAS opportunities
  - ❑ Low technology risk

## KEY TAKEAWAYS

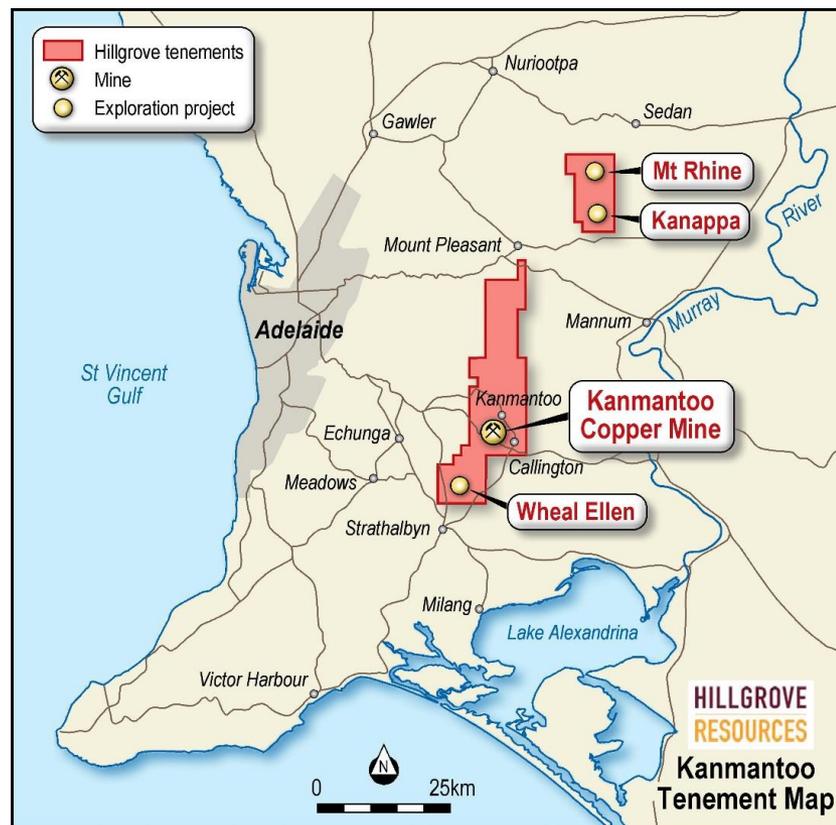
- Speed to market potential due to infrastructure and site knowledge, with low capital cost to develop, and access to various revenue streams making Kanmantoo one of the best sites for PHES development in Australia.



Hillgrove Resources (ASX:HGO) is a copper / gold producer with production and exploration assets in South Australia.

Hillgrove's goal is to become a mid-tier copper/gold resources group with growth from the Kanmantoo Copper Mine and regional exploration discoveries.

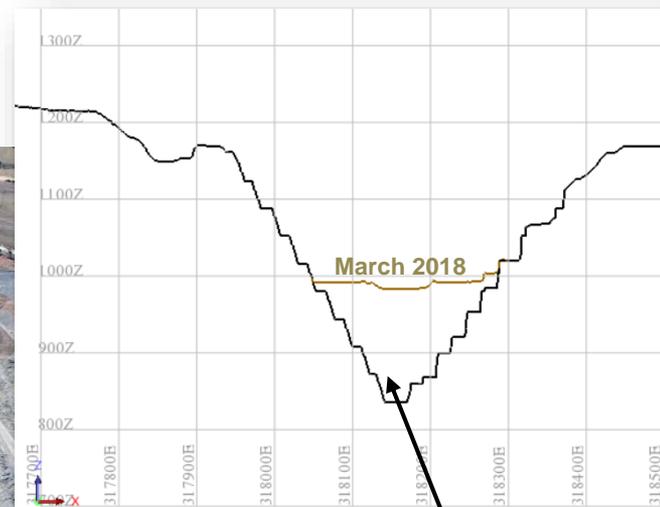
In addition, there is an opportunity at the end of pit life to establish a Pumped Hydro, which is an enabler as a one off value generator, revenue stream or combination; **IT IS NOT CORE BUSINESS**



## KEY TAKEAWAYS

- Hillgrove has no desire to become an energy generator and is actively looking to realise value for the pumped hydro asset

- Mining of the lower pond anticipated completion by mid 2019
- Preliminary study for Pumped Hydro Energy Storage Facility complete
- Definitive feasibility study underway

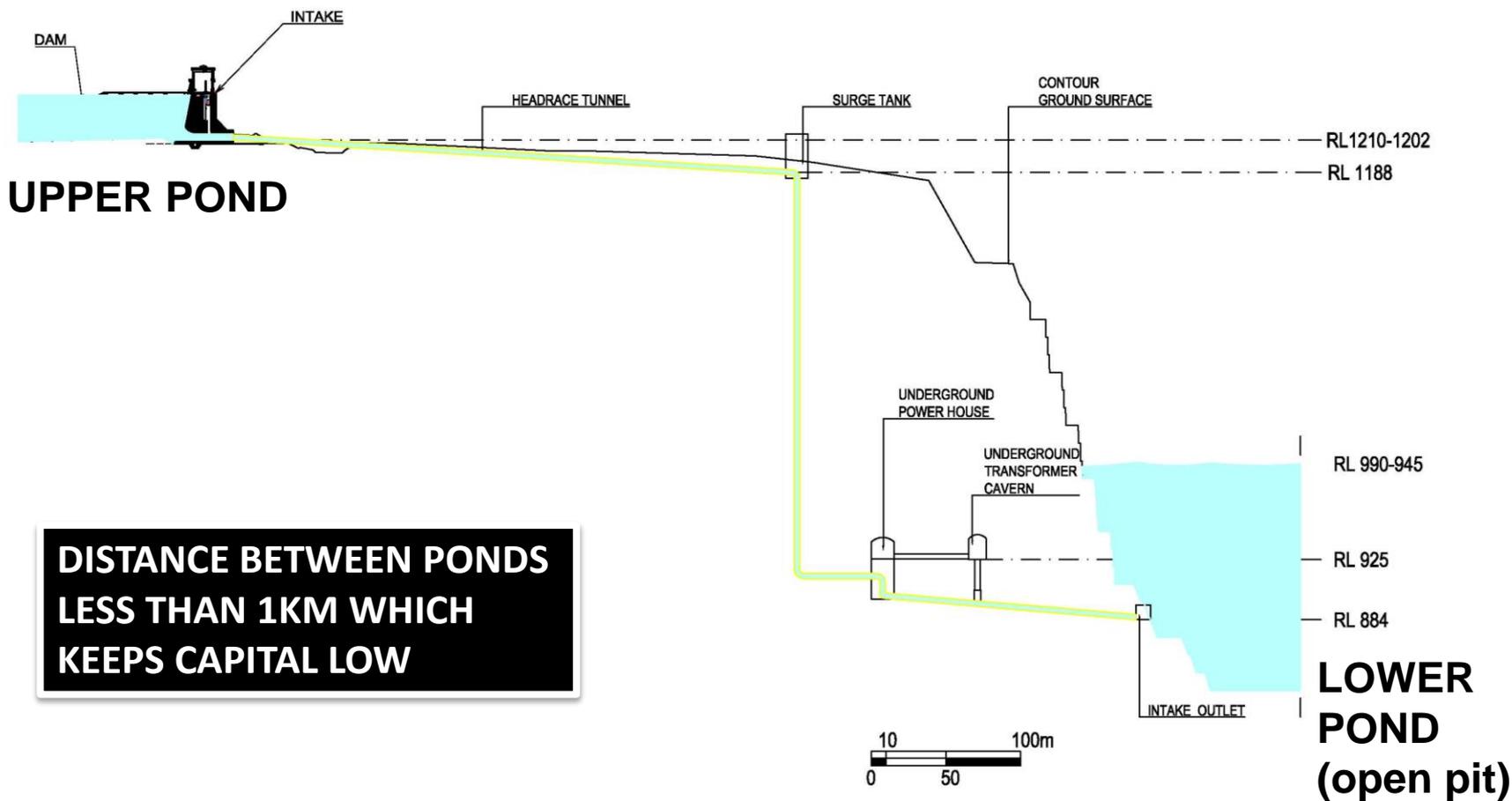


**COMPLETE MID 2019**



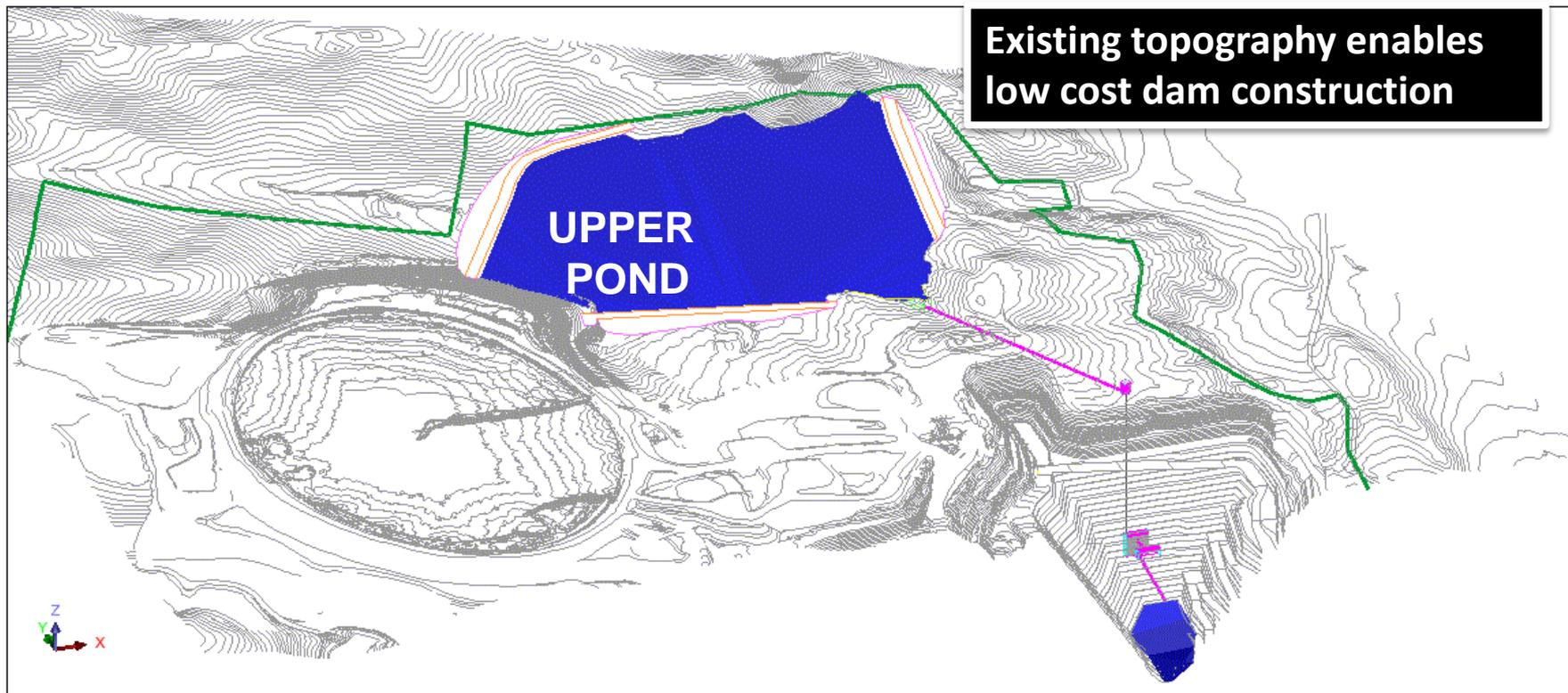
# KEY CRITERIA





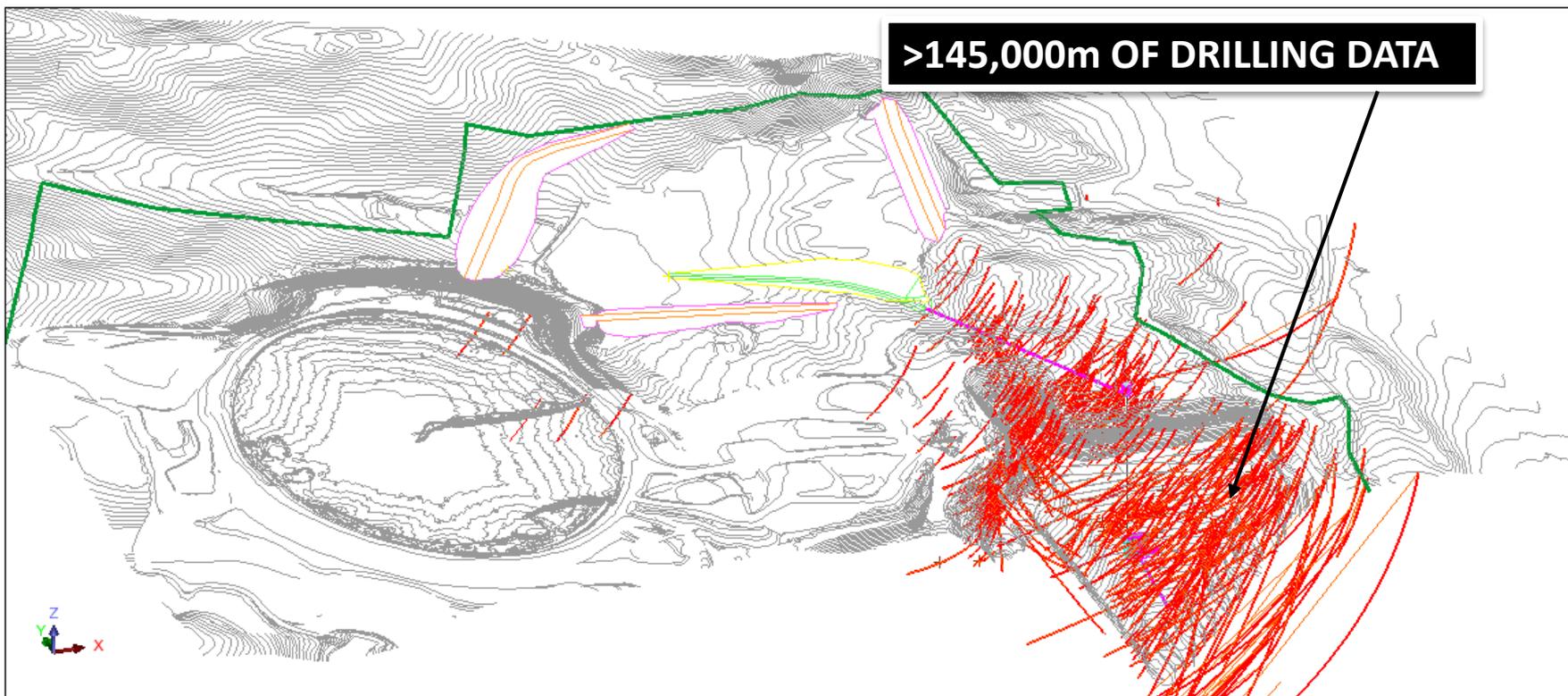
### KEY TAKEAWAYS

- Over 400m available head at site; initial studies shows optimum head between 212m and 270m
- Short distance between ponds keeps capital cost of penstock low



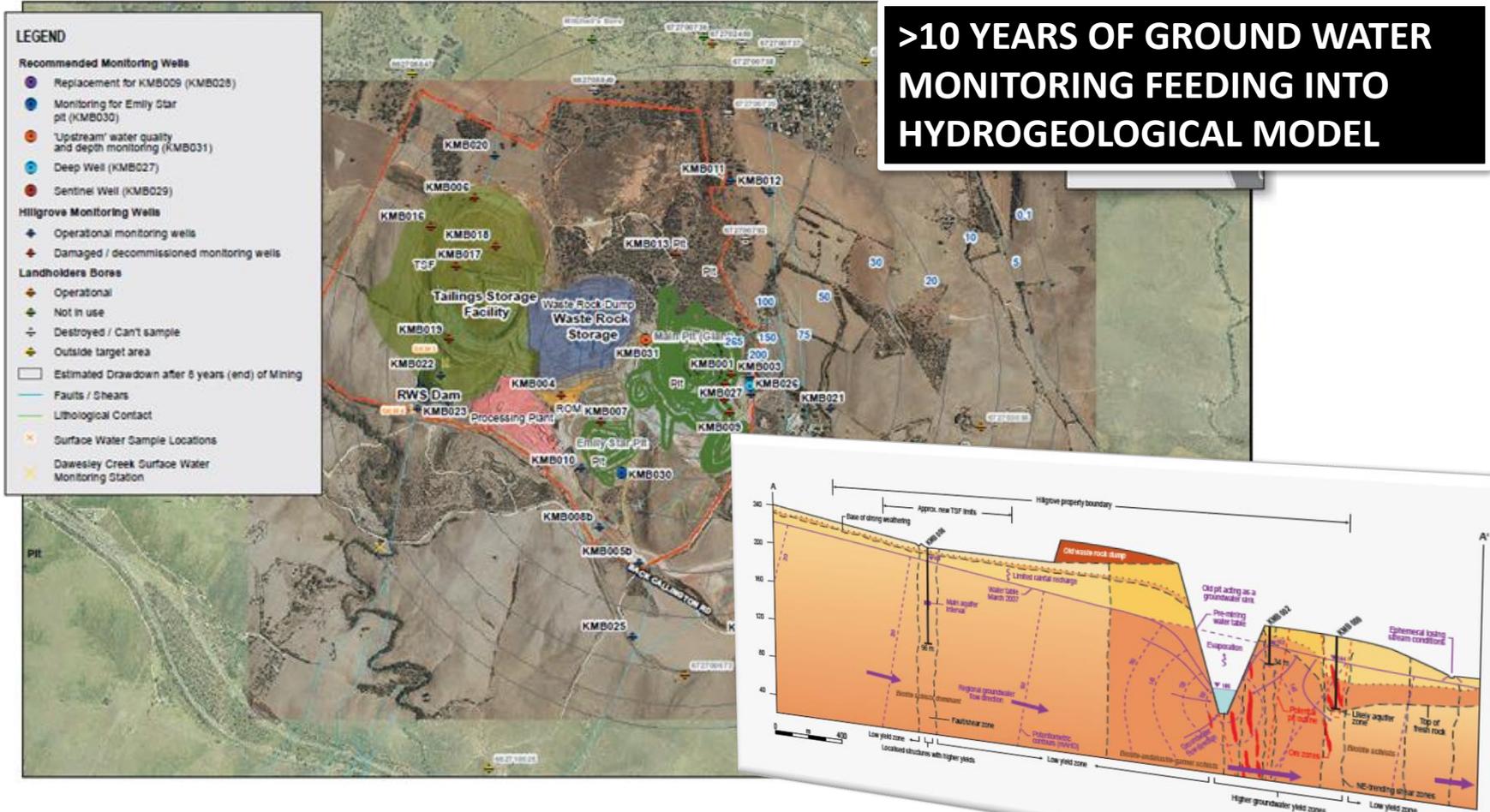
### KEY TAKEAWAYS

- Concept uses available mine waste rock to construct 3 GL dam.
- Waste rock has been used on site to already construct 28 GL tailings dam to ANCOLD standards.



## KEY TAKEAWAYS

- Over 145,000m of drilling and 200m vertical of exposed pit face with structural mapping.
- Historic underground mining and geotechnical assessment of drill core provide excellent understanding of cavern, shaft and tunnel requirements.
- Previous 6m x 6m tunnelling experience with minimal rock support.
- 3D stress analysis completed demonstrating acceptable FOS for proposed lower pond walls.



**>10 YEARS OF GROUND WATER MONITORING FEEDING INTO HYDROGEOLOGICAL MODEL**

**KEY TAKEAWAYS**

- Array of water quality monitoring bores established for over 10 years and measured regularly
- Extensive baseline, operating data and modelling complete for the mining operation to standards already accepted by Regulator for major project development.

- Flora / Fauna – baseline, operational and Ecosystem Function Analysis
- Noise – established monitoring program and sensitive receptor modelling
- Air Quality – real time monitoring network established using 6 beta-attenuators ensure compliance during PHES construction
- Rehabilitation – established rehabilitation program and endemic seed propagation facility to meet SEB offsets created by PHES



## KEY TAKEAWAYS

- Extensive baseline, operating data and modelling complete for the mining operation to standards already accepted by Regulator for major project development.

- Over 13 years of ongoing consultation with the local community and Regulator
- Recognised as best in industry as recipient of Premier's Award for "Excellence in Community Support"
- Project support from Federal MP and State MP

**BEST IN INDUSTRY COMMUNITY RELATIONS AT KANMANTOO**

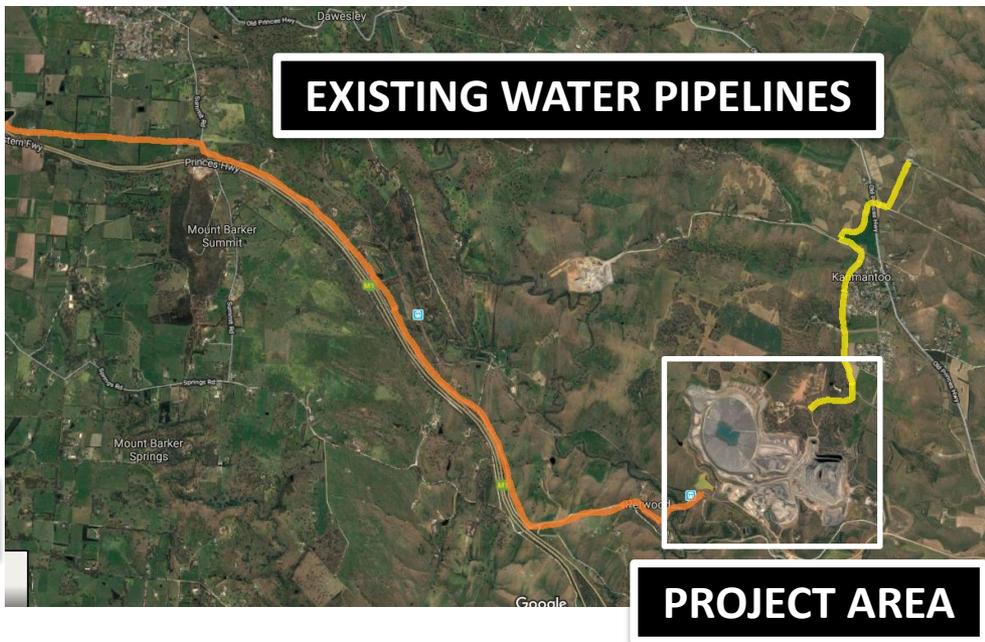
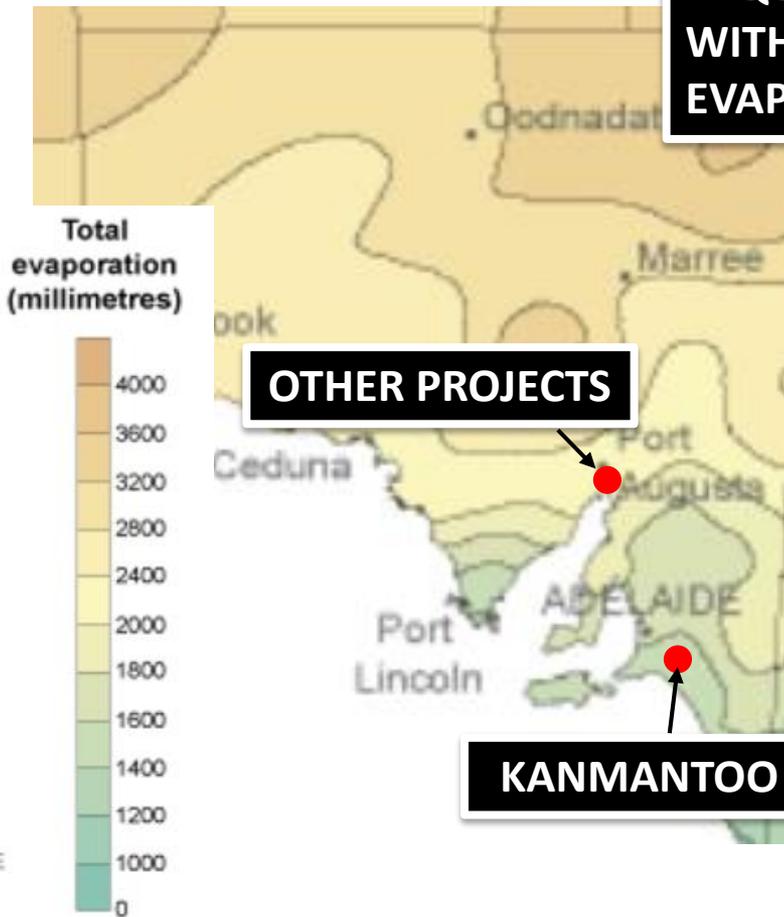


**KEY TAKEAWAYS**

- Local community supportive of Pumped Hydro at Kanmantoo

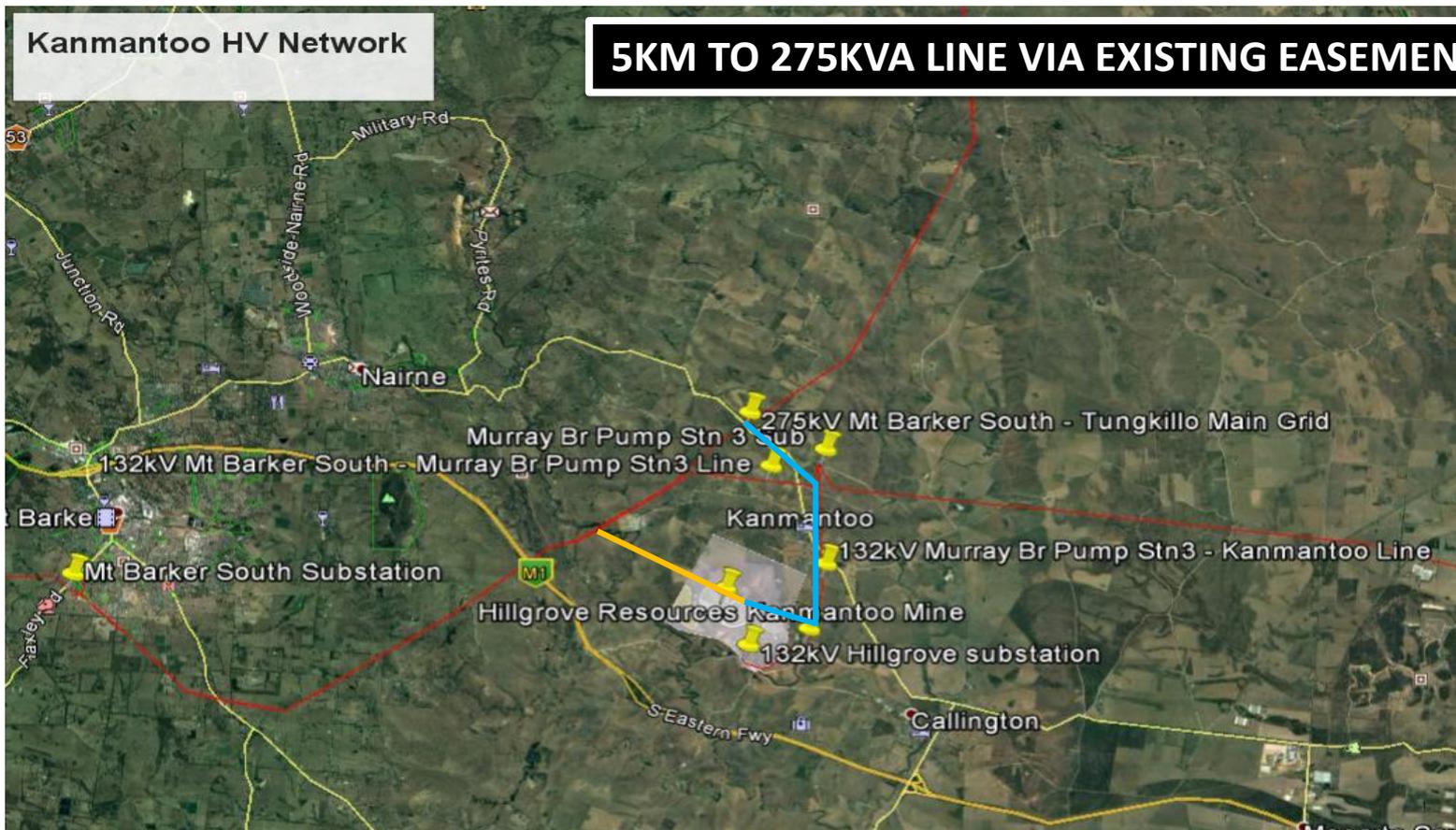


**SEMI-ARID ENVIRONMENT AND EXISTING PIPELINES RESULTS IN MORE WATER THAN REQUIRED ALREADY DELIVERED TO SITE WITHOUT TECHNOLOGY RISK SUCH AS EVAPORATION COVERS OR SEAWATER SUPPLY**



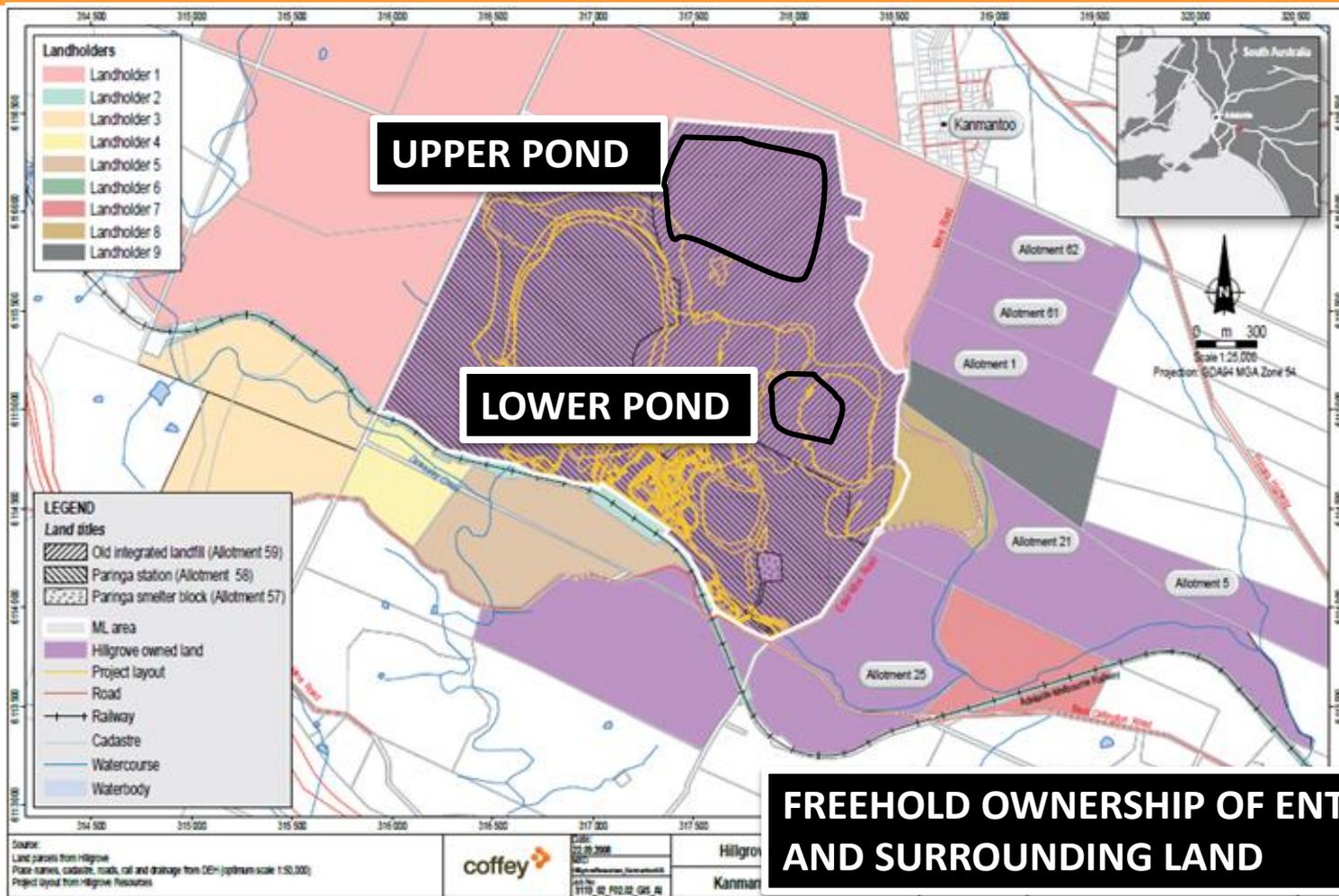
**KEY TAKEAWAYS**

- Two existing pipelines provide 2.5GLpa of water to the site from separate sources with contracted water supply and water licence in place.



### KEY TAKEAWAYS

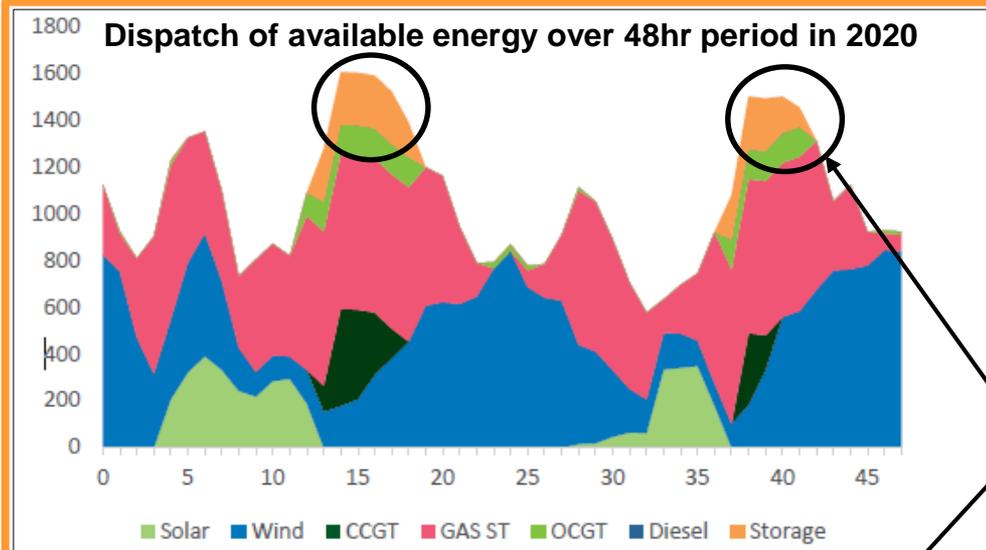
- 5km to 275KVA line via established easements. Two options under consideration.
- Location of proposed PHES in close proximity to proposed 375MW wind facility at Mannum and 127MW solar facility at Taillem Bend.
- Connection enquiry process underway with ElectraNet.



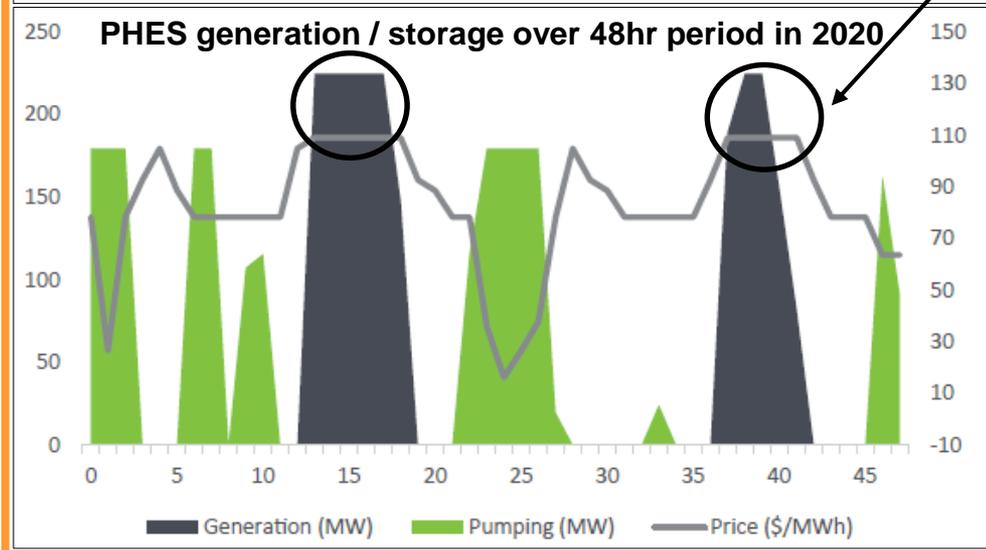
**FREEHOLD OWNERSHIP OF ENTIRE SITE AND SURROUNDING LAND**

**KEY TAKEAWAYS**

- Hillgrove own the land of the proposed PHES site freehold with no Native Title claimants



**DAILY GENERATION FROM STORAGE OPTIMAL OVER 4-6 HOUR PERIOD**



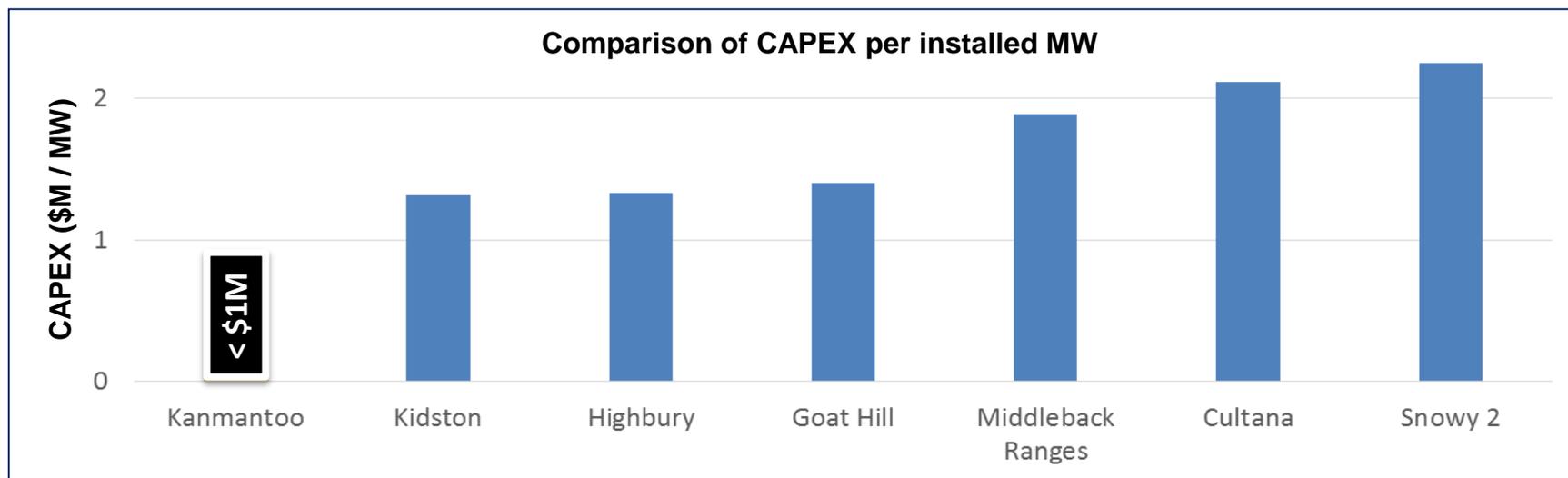
**KEY TAKEAWAYS**

- Basis of design 220-250 MW for 6 hours producing upwards of 1300MWh.
- Additional storage capacity in upper and lower pond to run longer if economical but optimal returns in current SA market achieved with 4-6 hour operation.

Source: Cultana Knowledge Sharing Report 2017



- Capital cost less than \$1M / MW driven by;
  - ❑ Short distance between ponds reduces penstock capital.
  - ❑ High head arrangement reduces machine and cavern size, which are in good ground.
  - ❑ Close proximity to grid.
  - ❑ Existing infrastructure and knowledge from mining operation applicable to PHES studies.
  - ❑ 100% freehold of site.
  - ❑ Simple process with low technological risk.

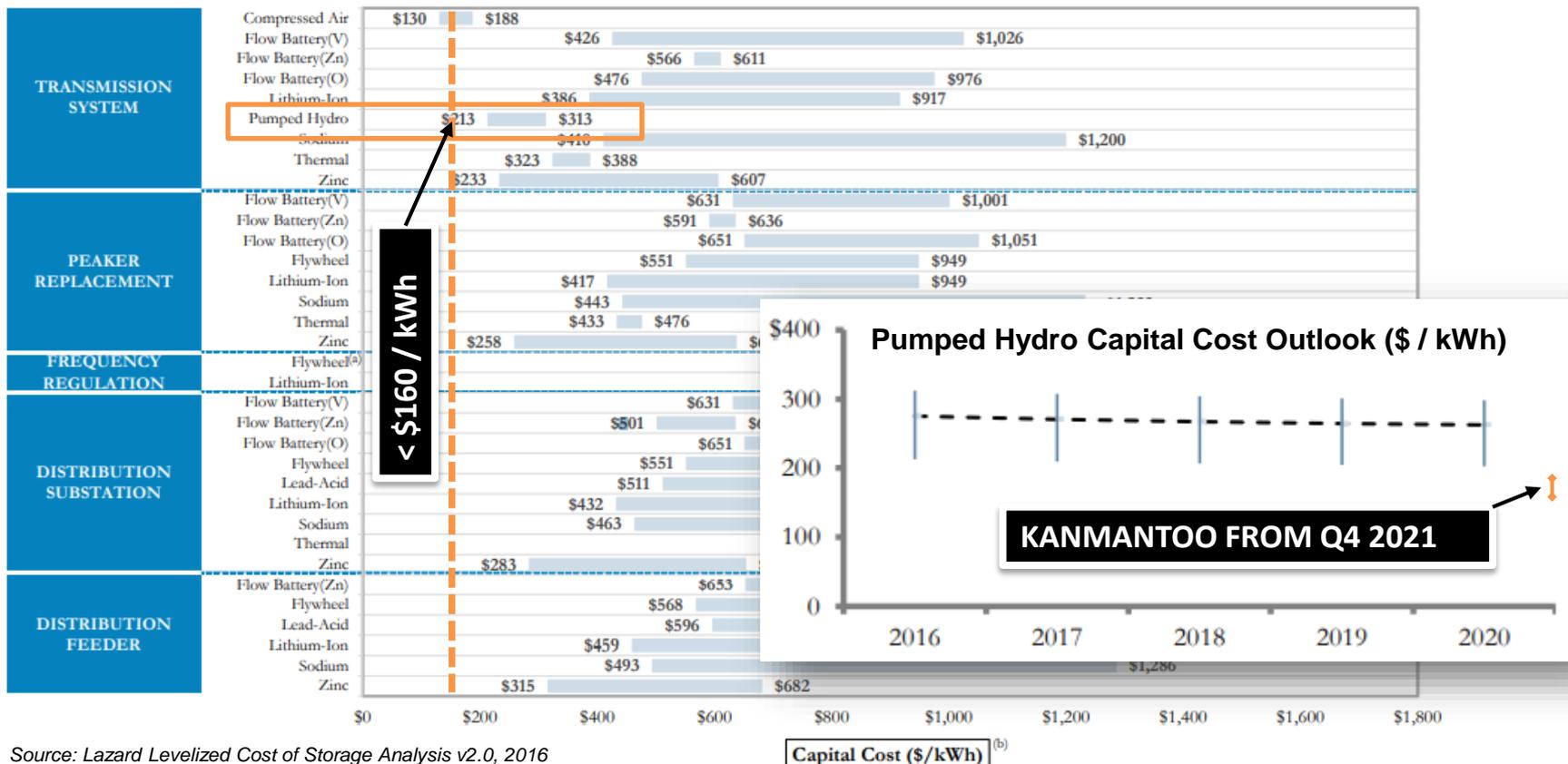


Source: Public data on respective projects

### KEY TAKEAWAYS

- One of the lowest capital cost per installed megawatt storage projects in Australia.

- Capital cost less than \$160 / kWh which places project well below industry range and competitive with other storage technologies



Source: Lazard Levelized Cost of Storage Analysis v2.0, 2016

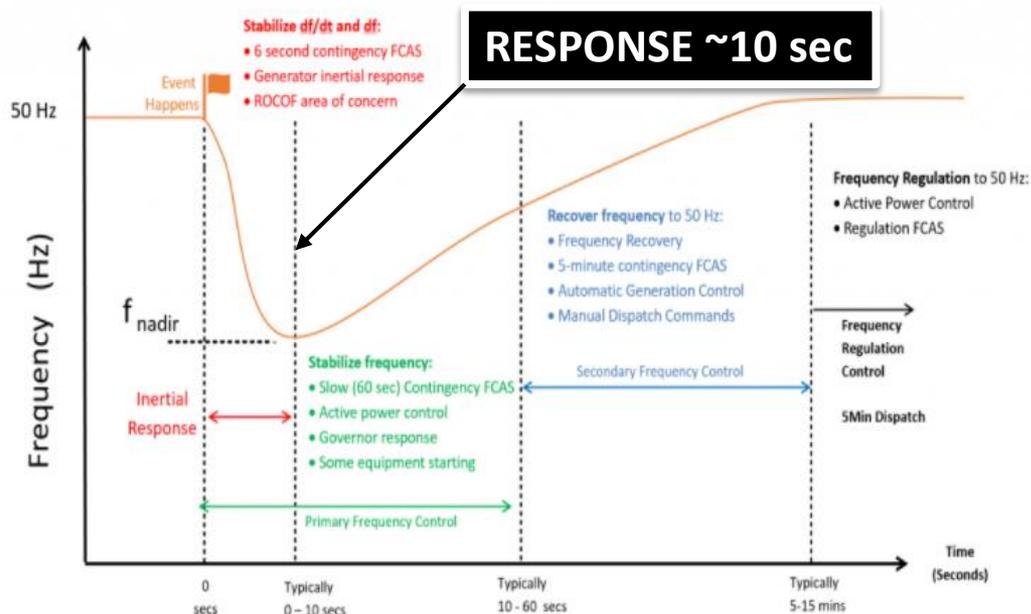
### KEY TAKEAWAYS

- One of the lowest capital cost per kWh generation in Australia.

- Fixed speed reversible pumped turbines, fast response (~10 sec) due to short waterways and low capital cost of project provides market opportunities in:
  - ❑ Arbitrage in spot market.
  - ❑ Firming contract with RE projects.
  - ❑ \$300 caps.
  - ❑ FCAS; Synchronous condenser mode with ~10 seconds mode change to full load.
  - ❑ Potential for black start.

### KEY TAKEAWAYS

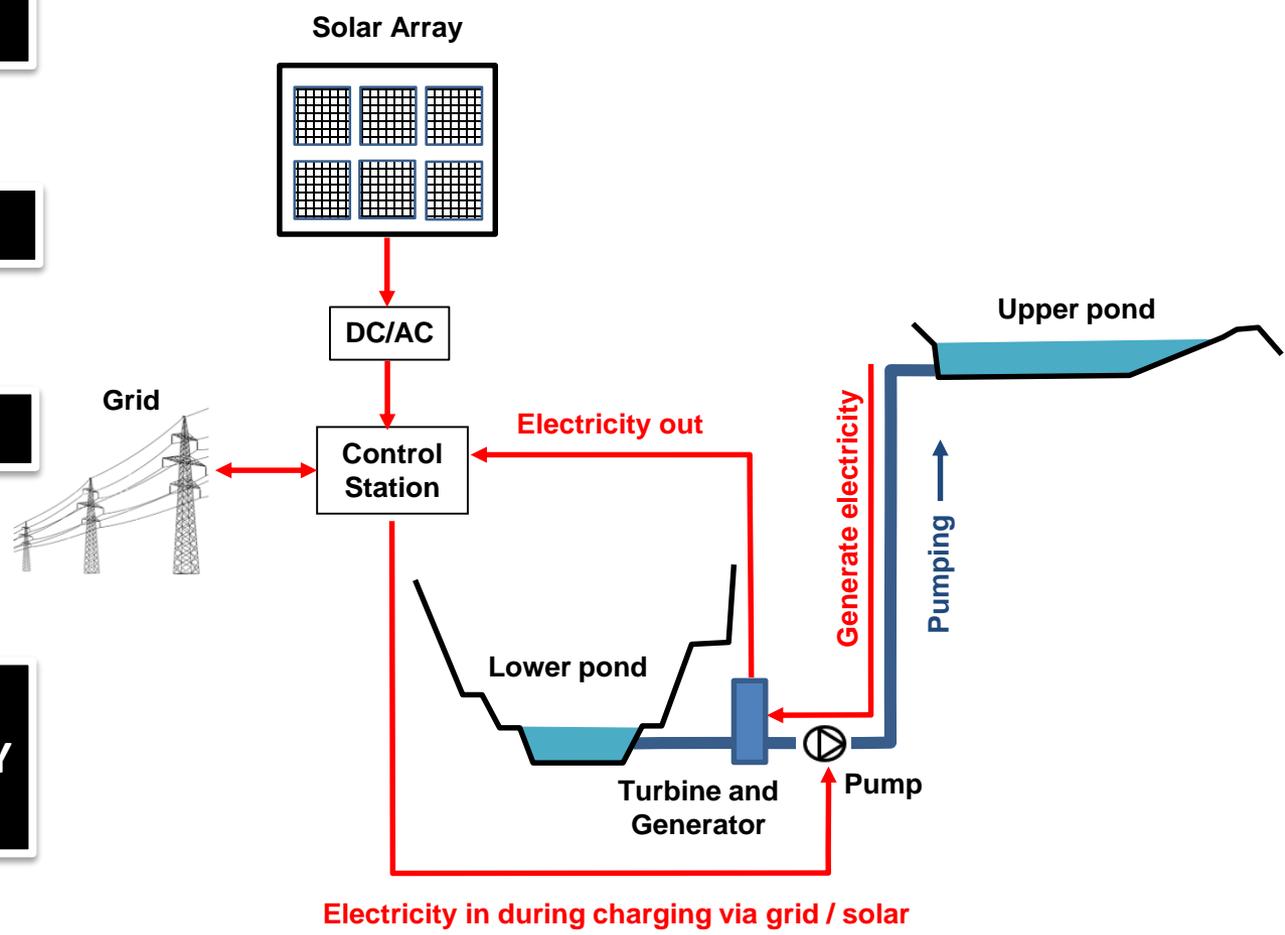
- Kanmantoo is well suited to compete in both the energy and the FCAS market because of the low capital cost and very rapid mode change capability due to the short water ways.
- Low capital and fast response enables opportunity to chase arbitrage in spot market.



Source: Watt Clarity



100% LAND OWNERSHIP  
+  
GRID CONNECTION  
+  
PUMPED HYDRO CONSUMER  
=  
OPPORTUNITY FOR LOW  
CAPITAL COST SOLAR FACILITY  
AT KANMANTOO



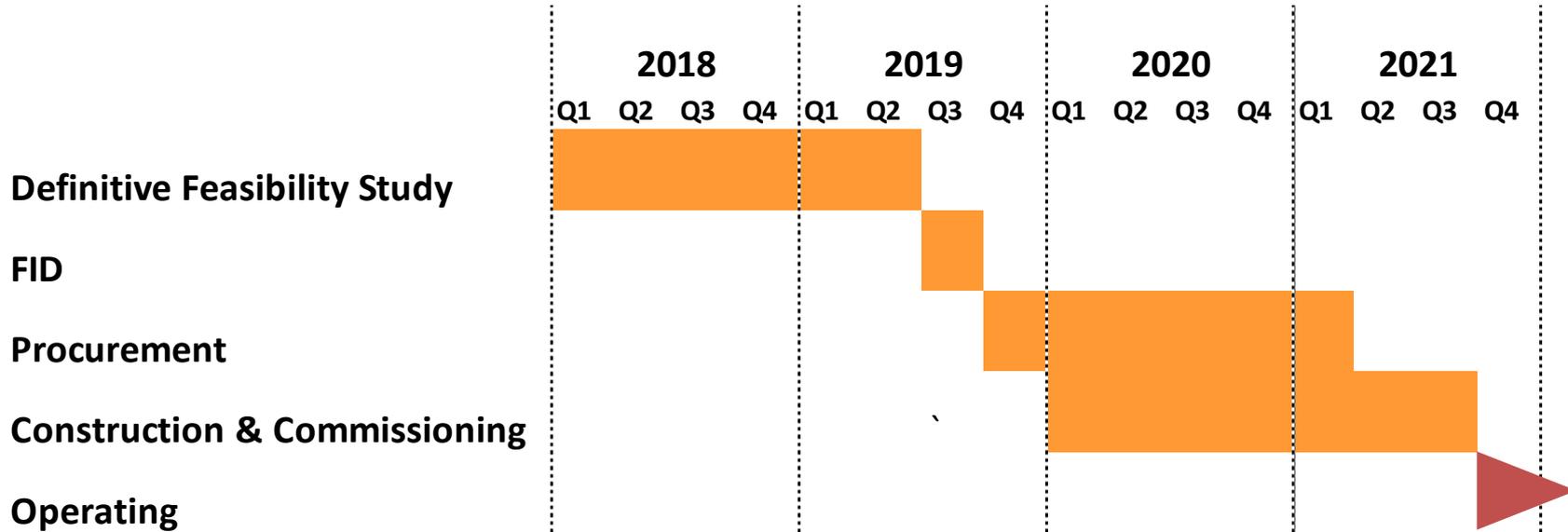
**KEY TAKEAWAYS**

- Sufficient freehold land adjacent to the network connection point to establish a 40MW solar facility to supply power to PHES and / or directly to market.

- Design uses simple, proven processes and technology
  - Not reliant on unproven / novel concepts to be successful such as using seawater or developing evaporation covers.
  
- Site is 100% owned as freehold
  - No native title claimants.
  
- Site is already permitted and established as a mining project.
  - Excellent understanding of geotechnical risk, hydrogeological risk, environmental and social impacts.
  - Successful ANCOLD dam construction using rocks stockpiled near upper pond site, established rehabilitation processes.
  - Existing infrastructure speeds build; lower pond being constructed as part of mine, water supply already on site, existing easements for nearby network connection to 275kVA line.

## KEY TAKEAWAYS

- The existing mining operation de-risks the PHES project through existing knowledge, infrastructure, and permitting, which reduces cost and time to market.



### KEY TAKEAWAYS

- Operational by Q4 2021 which makes it one of the first to market in Australia.



Hillgrove have no desire to become an energy generator but seeking to realise value for shareholders by monetising the pumped hydro opportunity.

- Continue definitive feasibility study to increase project value and maintain timing to market.
- Seek partner to take this forward with / without Hillgrove.
- Open to buy out, revenue royalty stream or combination.

### **KEY TAKEAWAYS**

- Hillgrove intend to advance the project to maintain timing to market whilst assessing divestment and development options.



- Key metrics highlight that the Kanmantoo site is one of the best sites for Pumped Hydro Energy Storage in Australia;
  - Very low capital cost at < \$1M / MW and < \$160 / kWh.
  - Potential to be first to market; commissioned by end 2021.
  - Infrastructure already in place (ponds, water, buildings, roads, power).
  - Proximity to grid and proposed renewable energy projects.
  - Existing studies and knowledge (environmental, geotechnical, geology, hydrogeology).
  - Long established social licence to operate.
  - Project site 100% owned freehold land with room to establish 40MW solar facility.
  - Responsiveness to provide spot market arbitrage and FCAS opportunities.
  - Low technology risk.
  
- Hillgrove actively seeking investors to develop Kanmantoo PHES project

**Further information:**

Steve McClare | +61 8 7070 1698 | [steve.mcclare@hillgroveresources.com.au](mailto:steve.mcclare@hillgroveresources.com.au)

