Ecologically Sustainable Design at Lark Quarry

The Lark Quarry buildings have been built using ecologically sustainable design (ESD) principles. These ensure developments minimise impacts on our local and global environments, while benefiting the local community.

While we can look at ESD elements individually, they are designed to all work together – the sum is bigger than the parts. There are environmental and economic costs to generate, collect, purify, transport, process and dispose of water, waste and energy. Water, energy and waste efficiencies underlie all aspects of design, materials, construction and operation at Lark Quarry.

Conservation is the trackways building's prime function. The fossils had been perfectly preserved for 95 million years sealed underground, but exposure to sun, rain people and wildlife were now taking their toll. To halt further damage to the trackways, the building:

1. stabilises temperature and humidity fluctuations
2. stops water running over the tracks
3. keeps humans and animals off the fragile trackways.

Temperature regulation

Conservation issue: Expansion and contractions in the rocks containing the fossilized footprints were causing cracks. Daily temp fluctuation at Lark Quarry range some 20 degrees in summer, and these are not great conditions for either humans or fossils!
Sustainability issue: Using air conditioning to regulate temperature uses massive amounts of energy.

Sustainable solutions:

- Create high thermal mass via rammed earth walls and the ground. Thermal mass takes longer to heat up and cool down, thus stabilising the temperature to around 22 degrees C.
- Reduce heat absorption by insulating, shading and reflecting using sunscreens, insulated panels and verandahs.

Damage to trackways

Conservation issue: dust, dirt, and people and wildlife were damaging fragile track surfaces.
Sustainable solutions:

- Dust minimisation: seal walls to halt windborne dust, install external walkway grids remove shoe grit
- Install a walkway and supervise visitors to visitor keep people off tracks.

Energy generation

Conservation issue: the electricity supply via the powerline is not reliable and the site needs continuous power.
Sustainability issue: conventional electricity generation creates greenhouse gases and much electricity is lost in transmission.

Sustainable solutions:

- Use solar generation as the main power supply, stabilising and augmenting the mains power
- Utilise energy-efficient (and minimal) equipment (light, pumps, etc).

Water and waste efficiency

Sustainability issue: water is scarce, has a high cost to purify, transport and treat. Disposal of waste and wastewater on site creates weeds and pollution problems.

Sustainable solutions:

- Cut water use by using minimum flush toilets
- Collect pure rainwater (no treatment needed) from roofs
- Overflow from storage tanks mimics site's natural water runoff
- Process wastes via the toilet system and then remove off site.

Construction impacts

Conservation issue: avoiding damage to site during construction
Sustainability issue: the project needs to benefit the local economy via jobs and materials

Sustainable solutions:

- Develop a site construction plan to dictates minimal impacts by builders
- Prefabricate components to maximise labour on site. This will benefit the local economy, and minimize transport and wastage
- Use rammed earth for the internal walls. This is a local material and needs far less manufacture and transport than concrete.

Queensland Museum is monitoring the trackways over time to see if the building is conserving the trackways as it was designed to while minimising the impact on the surrounding landscape. Time will tell, but after the first year of operation it seems as if the skills of the architects, engineers, builders and park managers involved in lark Quarry redevelopment are paying off.

The Lark Quarry buildings and infrastructure have been designed using ecologically sustainable design (ESD) principles to minimise impacts on our local and global environments, while benefiting the local community.

- Where possible local materials and labour have been used
- Materials were selected for low embodied energy and are reusable or recyclable
- Water is collected from the roofs and waste water processed on site
- Closed system composting toilets use little water with the end product disposed off site or used as fertiliser
- Power is supplied by the grid connected to a solar system
- The buildings have been designed for natural daylighting, passive heating and cooling
- The site incurred minimal impact during construction and has been revegetated with local native plants