**CONSTELLATION**

**Design Strategies**

*Constellation* proposes a dialogue between interrelated design elements – both existing and new - to form a new urban composition. The freedom of the wavy meadow, the energy producing Dunes, the Promenade, the preserved Slopes, the backdrop of trees and the prominent Palais Theatre, all are bound to create a large-scale, clear and singular scenery. Simultaneously, there is an intention to reconnect the site with its pre-existing condition by introducing a new abstracted, organic-inspired landscape that underlays St Kilda´s coastal character. The concept outlines a pattern of shapes emerging from a vast background, like a constellation of stars in the night sky.

Perhaps the most prevalent element of the design is the *Dune Field* at its core. The open lawn terrain and wind harvesting *dunes* are materially unified, like the tactile system of braille. The raised geometric forms become recognizable from a distance, graphic imprints juxtaposed to the coastal landscape. Together, they unfold a strong visual effect, a three-dimensional field of dynamic light and shadow patterns.

The new topography of the *Dune Field* is a single waving cloth with subtle changes and smooth transitions, connecting all urban spaces around it. In this process, the main topographical features of the site are preserved. On one hand, this strategy is intended to optimize the relation with the surrounding urban fabric. On the other hand, there is an intention to avoid massive excavations and landfills that demand the waste of valuable resources.

The project tries to remind us of the history of the site, linking the past with the present. There was a decision to preserve the recognizable physiognomy of The Slopes, still relevant as both a diverse historic landscape as well as a natural amphitheater with clear panoramic views of the shore. Nevertheless, efforts should be made to reconfigure the northern balcony along The Esplanade in favor of an improved and open border.

Two organic slopes emerge from the central grassy plateau to create new volumetrical accents. The *New Arch* is a gently raised landscape bridge on the northwest corner of the public space connecting to the foreshore. It creates an imprint architectural element evocative of Catani´s arch. Below the bridge, new indoor spaces provide niches for economic activities, a multipurpose pavilion, access to the car park and technical areas underground. On the northeast corner of the site, a similar structure establishes a visual and functional connection with the Palais and its forecourt. The two undulating structures would be able to operate as informal outdoor amphitheaters.

**The *Dune Field* – energy producing landscape**

*Constellation* is a reflection on how to integrate energy producing systems in a public urban environment, scaling the systems to the human proportions and making them compatible with the activities that take place on the street level.

534 geometric *dunes* colonize both the primary and secondary sites. Each *dune* is an individual wind harvesting machine equipped with a set of micro wind turbines. The turbines harvest energy directly from the prevailing winds and also by funneling the draft downwards to the underground level. This means that the system has the potential to remain active even with a small breeze. It also means that possible variations in temperature or wind direction would allow the system to invert its flow upwards. As so, the car park takes an active role in the energy producing strategy.

The dune system aims to create individualized micro-spaces at the ground level, sheltered areas for relaxation and leisure. The *dunes* were designed having the human proportions in mind, with the larger units about 1,50m high. The raised grass-surface is large enough for people to sit and lay down. The platform on top may be impregnated with a rich diversity of textures and colours. Vehicular and urban noise around the perimeter – Jacka Boulevard in particular – will be minimized by the layout of three-dimensional shapes. The implementation strategy is completely open, units may be deployed all at once or scaled through time without affecting the coherence of the design.

The *Dune Field* was designed to be used all-year around intensively. Each *dune* unit is to be equipped with a retractable hydraulic system to completely shut down and provide a flat ground surface. This means that some areas or even the entire park might be leveled and used for large open-field activities such as festivals or gatherings. The St. Kilda Festival ground, for example, would remain compatible with both the energy-producing program and the local festivities.

The lighting design strategy focuses on offering a dimmed and continuous flow of artificial light at night. LED lights are integrated in each of the individual units, exacerbating the geometric qualities of the *dunes* in a unique nocturnal composition. The LEDs might be powered on real time by the energy harvested from the wind. The design has also a great potential of plastic expression – by exploring all the variations made possible by operating each individual piece by day (shifting patterns) or by night (light art and video mapping).

The *Dune Field* was also designed to last. The retractable system would protect each unit from unexpected, unpredictable actions such as extreme weather events or acts of vandalism (preventing other units from being corrupted).

**The promenade**

The second conceptual driver of the project is a continuous pedestrian carpet. The *promenade* was designed to favour pedestrian movement and to become a stage for both informal and structured activities during day and night, wrapping the new park and creating an urban loop. As a complement to the *Dune Field*, we saw the opportunity to integrate the energy producing program into this pedestrian surface. The concept combines two different existing technologies to create a flexible matrix: *Pavegen*®units - which generates piezoelectric energy from footsteps, and *Platio*® - horizontal surfaces harnessing energy from the sun. The apparent seamless design of the pavement overlays a pattern of triangular solar tiles over electro-magnetic generators.

**Energy generation**

*Constellation* relies on three complementary energy systems:

**Wind Park:** Each of the 534 dunes is equipped with a set of vertical-axis micro wind turbines. The *dunes* vary in size, and so the number of turbines inside. In total, there are 27.912 units combined to generate 1.222 MWh per year on an average wind speed of 20km/h and 25% efficiency.

**Combined Pavement:** The solar pavement produces an average of 160 Wh at 16% efficiency, totaling 927 MWh/year. An estimated daily influx of 750 people on site - taking 500 steps each - produces 685 MWh of piezoelectric energy (5 W per step). The combined energy of both systems is expected to generate 1.612 MWh per year.

**Solar roof + facade:** CIGS modules line the roof and façade of the new proposed building and the Palais Theatre roof. With an estimated roof area of 4.703sqm, the modules produce 274 Wh at 20% efficiency, generating 2.258 MWh per year. The new building façade would total 1.140sqm of useful area and produce 160 Wh at 16% efficiency, generating 300 MWh per year.

The streetlights embedded on the dunes consume an estimated **62 MWh** each year. *Constellation* has a total annual capacity of **5.330 MWh,** enough to power 533 inefficient homes (10 MWh) or 888 efficient homes (6 MWh).

**Environmental impact**

No high/vertical structures were considered in the design, therefore no potential danger to bird routes is foreseen. All existing views from the local community and Esplanade to the beach were preserved by the proposal. Each wind harvesting unit is equipped with a protective mesh, which ensures that both people and animals are not directly exposed to the wind turbines.

The Slopes and the existing trees were maintained by the design proposal, combined with new trees and extensive green areas. The topography of the *Dune Field* is intended to improve the natural drainage of the site, and each individual dune may be equipped with water drains.

Excavation and earthmoving was limited to the car park and complementary technical facilities in one single underground level. The *Dunes* double as skylights and ventilation shafts in one cohesive technical solution.