

VEIL Ballarat Centre Structural Plan



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VEIL was established by the Victorian government in Australia through the Victorian Sustainability Fund, as part of the government's Sustainability Action Statement, 2006.

VEIL is a project of the Australian Centre for Science Innovation and Society at the University of Melbourne.

University partners include: Monash University, School of Design; RMIT University, School of Architecture and Design; Melbourne University, Faculty of Architecture, Building and Planning and the School of Land and Environment, Swinburne University Faculty of Design

VEIL

victorian eco
innovation lab

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ABOUT THE VICTORIAN ECO-INNOVATION LAB

*A sustainable future demands new knowledge and renewed creativity;
it depends ultimately on our ability to change direction.*

We are in the early stages of a sustainability revolution. Climate change is forging a new global dialogue that may prove to be unlike anything before it in human history. That dialogue has already shifted from a focus on the scientific evidence of global warming to the need for urgent action.

What will be tested in the years to come is our ability to change direction.

Mitigating climate change (and adapting to a rise in global temperatures) points to an historic shift in the past trajectory of development. The transition to a sustainable economy, to a low carbon (and for Australia, a low water) economy, represents an unparalleled challenge to our systems of social and technical innovation. Incremental improvement – doing more efficiently what we currently do – will not be enough. We have only decades to transform the 'carbon' basis of our economy; the best current modelling suggests we will need a global reduction in annual CO₂ production of between 60-80% (compared to current levels) by 2050. With such targets, we are not talking just about the re-construction of our world, but about its re-invention.

If ever we needed the spirit of entrepreneurial action, of creative destruction, it is now.

Change is needed rapidly; the effects of global warming (e.g. rainfall, or the incidence of significant weather events) appear to be accelerating; the slower the response the greater the long-term social and economic cost. We need to find ways to urgently overcome the 'inertia of the market', the inherently slow process of changing consumer and producer expectations and investments in future products, services, built environments and life-styles. We need a paradigm shift in the way that we think about systems of production and consumption, and about quality of life and prosperity.

This is what we mean by 'eco-innovation'.

VEIL proposes a new way to accelerate eco-innovation in Victoria. VEIL aims to influence the 'marketplace of ideas'; but more importantly the VEIL concept is based on a recognition that that marketplace is strongly shaped by concepts and visions of future goods and services emanating from producers and researchers. In fact the dynamic of a rapidly changing economy has meant that these future visions of goods and services now form an important 'conceptual market', increasingly vital for business competition. Future product concepts are widely marketed to test potential directions for production and to build the reputation of companies that need to be seen by their business and consumer audiences as being innovative and 'in command of future technology'. With modern communications and design skills these future concepts are increasingly 'real' and seductive; consumer response and feedback is critical to investment decisions.

This conceptual market is pervasive, shaping expectations of the future. But whilst this market may be innovative it is inherently conservative, generally allowing only for incremental change in terms of environmental performance.

VEIL works to bring public research and designers from public institutions (university design schools) into the conceptual market to provide a radical alternative set of visions of possibilities that extend beyond incremental change. The aim is to shape both consumer and producer expectations at the same time.

Those future visions are used to 'seed' 'vision-driven' projects for short-term development and to identify emerging social and technical innovations that could be precursors of change.



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BALLARAT 2032

The Locally Productive City
The Low Consumption City

LARGE ENVIRONMENTAL FACTORS SHAPING THE FUTURE DEVELOPMENT OF BALLARAT

CLIMATE CHANGE

Projected direct effects:

- Increase in average temperatures and extreme temperature periods (both heatwaves, and cold days) little night time respite)
- Reduction in average rainfall and increase in frequency of heavy/extreme rainfall days
- Increase in (and more unpredictable) storms (wind / hail)

Potential impacts on Ballarat development- e.g:

- Heat stress for residents
- Increased peak demands on energy (heating /cooling)
- Less available water for consumption (residential and food impacts) - reduction in catchment run-off
- Increased fire risk
- Infrastructure breakdown - e.g: road flooding; rail buckling; blackouts (electricity demand overload); food production; building fabric life (repair - cracking from dry heat, ground movements)....

Projected indirect effects (mitigation):

- 'Carbon pricing'
- shift to low-carbon energy sources (replacement of fossil fuels with renewables)
- major focus on energy efficiency - reduced consumption

Potential impacts on Ballarat development, e.g:

- building and infrastructure retrofit programs for efficiency
- new land use for renewable energy
- new uses of raw materials (e.g. waste) for energy generation
- change in food production-distribution (lower water consuming; reducing production-consumption distances)

"PEAK OIL"

Projected effects:

- Significant and steady increase in cost of oil (petrol etc) - e.g: \$200 barrel (period uncertain)

Projected impacts, e.g:

- increasing costs of inputs to agriculture
- changes in patterns of transport and mobility (reduction in transport distances and shifts in mode)





BALLARAT 2032

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DANGER: CASCADING EFFECTS

Water, energy, temperature, food, living systems, built-environments and infrastructure are all interlinked and impacts can 'cascade' leading to the breakdown of critical support systems.

WATER

- An increase in population combined with continued reduction in rainfall has changed Ballarat water systems.
- Alternative water sources were established in 2009; LGL Gold mine reverse osmosis water recycling project (see other water recycling projects in document).
- Algae blooms in stressed water catchments
- Increased challenges in securing water supply
- Costs to council assets - parks and gardens (value of this to Ballarat)
- Damage to existing water infrastructure due to heat and trees looking for water, burst water pipes etc
- Parks and gardens under continues strain

STORM INUNDATION

- Flash flooding
- Mass strandings
- Damage to road infrastructure / buildings
- Disruption to rail and road to Melbourne
- Damage to waterways
- Road accidents

WIND

- Disruption to transport and electricity
- Damage to buildings
- Damage to vegetation
- Stress on emergency services
- Rise in insurance premiums
- Cost of repairing and removing damage

ELECTRICITY

- Increase demand for electricity in summer due to peak cooling
- Effect on infrastructure (increased fires / heat)

TRANSPORT

- Increase disruptions to transport systems (increased heat, storms, flash flooding),

HEALTH AND SOCIAL ISSUES

- Increase hardship (increase price of water, electricity, food, fuel)
- Increase in health matters and heat-related deaths - extreme heat
- Increase pressure on emergency services, fires, heat, storms
- Increase mental stress (heat, hardship, disruption to services)

ECONOMIC

- Electricity disruptions (damage to infrastructure, peak blackouts)
- Bushfire disruptions
- Workers' ability to come to work
- Heat stress performance at work (increase hot weather at night etc)



References: Maunsell / AECOM: Draft Climate Change Adaptation Report; A Risk Assessment and Action Plan. Discussion Paper: Responding with Resilience



RESPONSE TRAJECTORIES 2009-2030

VISION:

Ballarat as Victoria's Premier Green Zone: the Rural-City model for a climate resilient community.

STRATEGIC OBJECTIVES:

(1) BALLARAT – THE LOCALLY PRODUCTIVE CITY

Goal: All precincts in Ballarat (exemplified by the CBA) aim to maximise production of environmentally and socially critical resources.

Target: To be a net exporter in as many of the following areas as possible:

- Renewable energy - diverse systems – wind, solar, geothermal, bio-mass
- Water - rainwater, grey water, recycled
- Food production – close to points of consumption
- Community services
- Knowledge – research, innovation, education and skills. E.g: climate adaptation solutions; low-carbon solutions; sustainable agriculture (food and bio-mass)
- Green businesses, green services, eco-innovation (agricultural best-practice and re-mining) "green zone"

(2) BALLARAT – THE LOW CONSUMPTION CITY

Goal: Living and Working Better – Consuming Less

Target: To develop the highest quality of living and working conditions with the lowest per-capita consumption and production of waste, in as many of the following areas as possible:

- greenhouse gas (e.g. target: reductions of greater than 60%)
- electricity use (e.g through retrofitting – 40% reduction)
- water: (e.g. target 80 litres/person/day of reticulated potable water)
- transport /mobility (e.g. target greater than 30% shift from car to walking & cycling; 25% reduction in car trip distances; 40% increase in public transport use)
- waste reduction (e.g. in all sectors, 40%)

(3) BALLARAT - THE REGENERATIVE CITY

Goal: Avoiding cascading breakdown effects, enabling quick bounce-back from challenges - creating a social and physical fabric that is diverse, decentralised and locally inter-connected, so that any shocks (environmental or economic) will be limited in the spread of their effects.

Target: To approach all planning and design decisions with the intent of increasing the diversity of communities, production systems (as in 1 above) and public facilities, particularly in relation to:

- access to energy, water, food, transport,
- the provision of work and residential facilities
- life in extreme weather conditions
- community engagement

(4) BALLARAT – THE INVENTIVE CITY

Goal: To achieve all of above through the development of innovative new solutions and approaches, building on the strong history of inventiveness and creativity in Ballarat (in agriculture and mining in particular).

Target: Ballarat to be known nationally and internationally as supporting a culture of creative risk-taking, experimentation, and innovation in relation to climate resilience and sustainable solutions.



ENERGY

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FUTURE GLIMPSSES: HIGHLIGHTS

In 2009 there were several innovative energy projects within the Ballarat area, these included the Solar Park from the Central Victoria Solar Cities Project and the BerryBank Farm Biogas project. The success of these projects attracted attention to Ballarat and its spirit of inventiveness. The CBA area was recognised for its potential to showcase sustainable initiatives to local residents as well as tourists. The city became a leader in Ballarat's Sustainable Energy strategy developing and showcasing renewable decentralised technologies and systems; and undertaking widespread consumption efficiencies projects. Systems are adaptable and allow for change and upgrading with new technologies.

2010 - 2014

- Solar Park initiated in 2009 by the Central Victorian Solar City Project
- Solar Street Lights: to celebrate the opening of the Solar Park Ballarat council installed solar street lighting throughout the CBA area
- Central Victorian Solar Cooperative (CVSC) formed with profits from the Solar Park. The organisation is a community owned electricity producer and management company.
- Ballarat Energy efficiency program: A major retrofit project starts within the CBA initiated in joint program between Ballarat City Council and the Central Victorian Solar Cooperative. All buildings within the city area are assessed for energy efficiency; an inventory or retrofit projects is developed and actioned. Several local energy managements and service companies are created to support the project. Project received additional funding from the federal and state government.
- Rollout of energy consumption monitors across the City area.
- Ballarat Local Council and The University of Ballarat cooperate to install renewable energy on council and university owned assets.

2015 - 2019

- Renewables: New scheme that supports assessment and installation of renewable energy within the city. Buildings are assessed on their wind, solar, and biogas potential. Flexible grid connected systems are installed in key areas. After the success of the Solar Park and the efficiency programs, leasing and subsidy schemes assist retailers, accommodation industry and businesses to invest in renewables.
- Co-generation District Heating and Cooling. The council and university renewable systems have paid off, the partnership continues in a research and training center led by the university. Council allows for two experimental cogeneration (heat and cooling) systems to be trailed

council holdings and in two new developments.

- Rooftop Gardens: Initially rooftop gardens are installed to mitigate the heat island effect, increase insulation of buildings, and filter rainwater. Initially buildings with flat roofs and strong supports were selected. The gardens are part of the building's environmental systems and are watered with recycled and stormwater from the building.
- Roll out of third generation energy monitors. The visual monitor provide consumption statistics against the state and national average. They also communicate peak load for Ballarat, energy pricing and the amount of energy produce by the onsite production systems.
- Building energy systems are set to be flexible operating within 18 - 26 degrees throughout summer and winter. A summer and winter clothing policy in encourage to moderate individual temperature within this range.
- Renewable recharge stations are installed throughout the city. The stations charge mobile phones, computers, personal devices, mobility scooters and electric assisted bicycles and are sponsored by Berrybank Farms biogas.

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- Ballarat Thermal mining (see Catalyst Innovation for more details)
- Solar Shutters (see New Services for more details)





FOOD

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FUTURE GLIMPSSES: HIGHLIGHTS

Ballarat is now known as Victoria's top regional food producer, outclassing the traditional wine regions such as the Yarra Valley and the Mornington Peninsula. Sustainable Agriculture has become an important regional industry with many people travelling to Ballarat to learn best agricultural practice and also partake in the local produce. The industry is represented within the CBA through not only the restaurants that showcase local produce but also the unique regional food depot and small-scale demonstration projects. Examples include the Urban Bee Hive atop Craig's Hotel and the fruit and nut trees dispersed throughout the city plantings, and particularly in the Bridge St Mall. The Ballarat Regional brand that the food depot produces is regularly freighted and distributed throughout the regional Victoria, metropolitan Melbourne and other states of Australia.

2010 - 2014

- BREAZE Food Co-op established. The co-op continues to foster grassroots activity around sustainable local food strategies including community gardens, backyard production, produce swaps, bulk buying for local and organic foods. The co-op also takes excess produce from farmers at the farmers' market.
- Farmers' Market continues at the Botanical Gardens; a second market becomes part of the Ballarat City Market held on alternative weekends.
- Ballarat Local Food and Wine Festival becomes a seasonal event. Held in the CBA, the festival features food stalls and local food products, while classes and information are available on local crops, farming techniques, composting, aquaculture and hydroponics. There is also a section on Sustainable Agriculture Restaurants, cafes, local producers, BREAZE and the CWA.
- Local Worm farm business introduces closed loop nutrient recycling to Ballarat farmers. Changes farming practices and adapts system for urban use.
- Local Food Waste strategy is implemented across the city. Restaurants and supermarkets participate as part of their Corporate Social Responsibility programs. SecondBite use one of the hospitals at the kitchen and meals are provided for the elderly and those in financial hardship.
- Hospital initiates local food procurement policy, purchasing all fresh food from local farmers.
- BREAZE extends their community food programs, supporting healthy and sustainable cooking classes, food swaps within the city and a fruit picking program
- Stephanie Alexander Kitchen Gardens are created at primary schools, the university, and churches.

- Restaurants showcase local food produce on their menus
- Local produce shops and small last-minute fruit stalls appear in the CBA offering quick fresh food and an alternative to the large supermarkets.
- Council plants fruit and nut trees as a part of street plantings

2015 - 2019

- The Ballarat Local Brand is started. The Food Co-op specialises in Local Food Hampers for tourists, available to be picked up from the railway, or delivered to apartments and other city accommodation. Preserves, condiments and produce supplied to local restaurants and retailers.
- Food Depot is initiated out of the success of the Local Food Brand. The Food Depot is a central point for local food activities in Ballarat (see Catalyst project for more details).
- Composting Service is started within the CBA. After the success of Dave's Worms with farmers, compost is in demand. A local compost service delivers and maintains a compost system within the CBA. The service delivers bins and picks up food waste from restaurants, hotels, offices, cafes and apartments in the city. Compost is sold to local farmers and residents. The service is located within the Eco-Business strip.
- Craig's Hotel follows the lead of many international hotels and starts an Urban Bee Hive on its rooftop garden. Guests find a small sachet of honey in their rooms upon arrival.
- Agricultural practice exchange is located in Bakery Hill. A knowledge exchange and training program uses the expertise of Ballarat farmers. These farmers are known for the innovative practices in closed-loop nutrient cycling and low rainfall farming. Information technology and monitoring systems developed in Ballarat have played a large part in this.
- There are delivery points for groceries within the city. Workers and residents are able to order and pick up fresh food regularly on their way home. Some of these use existing retailers, while others are Ballarat-designed self-operated lockers. These are co-located around public transport interchanges such as the railway as well as bus stops and bike share stations.

2020 +

- Ballarat Local food produce and food festivals become the region's premier tourist attraction, drawing more tourists than Sovereign Hill.
- The Agricultural Exchange wins international agriculture awards with its innovative watering system.



WATER

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FUTURE GLIMPSES: HIGHLIGHTS

Ballarat has become a Water-sensitive City. Water and the biological treatment of water has become a central feature of the city. Extensive Water-sensitive Urban Design (WSUD) projects have softened the city, adding more native landscape alongside the bluestone paving and historical buildings. The CBA area produces water from rainfall, grey-water, and sewerage, all biologically treated. Excess water goes through biological and technical filtration systems to Lake Wendouree, Yarrowee River and Park and the retention / CBA reticulation facility next to the Bridge St Mall.

2010 - 2014

- Rainwater Gardens were established extensively within the city. As a response to the Ballarat Central Area Structure Plan an extensive Water Sensitive Urban Design program was designed for the city. The gardens became an important foundation for the City's new Sustainable Water policy. Rain-gardens were used along footpaths and roadways to separate slow mobility lanes (bikes and pedestrians) from roads.
- LGL's Reverse Osmosis water recycling project, delivering water to Lake Wendouree, prompts onsite water recycling and three-pipe systems to be installed in new developments.
- Fit-for-purpose water-use policy established for the CBA. Water efficiency services, sponsored by Central Highlands Water, initiate a retrofit of existing buildings within the CBA. The program offers subsidies for installation of rainwater tanks, efficient toilets and taps throughout the CBA.
- Sustainable Urban Drainage systems developed (calculations of land contours, natural landscapes). The Sturt St retention ponds located in the boulevard are established. These ponds feature native vegetation, and slow and clean the stormwater flows along Sturt St. Other retention ponds are built in Civic Park and alongside the Big W carpark.
- The university trials rainwater gardens for cleaning stormwater. In partnerships with the Dana St churches it also builds wetland systems to biologically treat stormwater run-off.

2015 - 2019

- Yarrowee Park established (see Catalyst project for more details)
- Rooftop Gardens installed in other parts of city (see Food and Energy sections for more details)
- Large community water retention tanks are built under the carparks on either side of Bridge St Mall. Another is located under the new commercial development located on the site of the old Civic Hall.

- Retrofit program continues;
 - Visible water meters are rolled out throughout all city buildings,
 - Three-pipe systems installed in retrofits and all public buildings,
 - Community-scale waste-water tanks with monitoring systems
- Innovative water-quality monitoring systems are designed by the IT and Water incubator
- Waterless toilets replace all public toilets and are managed by BerryBank Biogas

2020 +

- Individual buildings' and the councils' WSUD initiatives form "CBA Water Systems": building and open space strategies forming one holistic system. Gravity-fed systems supported by off-peak pumps and community tanks support the system.
- Water trading systems (grey water / rainwater) are established. Main consortium are local government, retailers and commercial. Large producers donate water to environmental flows, sell water to industry and the community who purchase for additional environmental flows.
- Heat warning system established. In peak heat periods, water flows are sent into rainwater gardens and key sites throughout the city for cooling.





MOBILITY

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FUTURE GLIMPSES HIGHLIGHTS

Over the years innovative and enabling policy has seen Ballarat create a low-carbon transport community. By promoting efficient vehicles, fit-for purpose transport solutions and innovative city center Ballarat has achieved its low-carbon targets and is able to function in times of climate crisis.

2010 - 2014

- The Pedestrian and Bicycle strategy undertaken by ARUP and Design Cycle is implemented by council. Further user driven studies identify particular priority journeys for bicycles, personal mobility vehicles and pedestrians. These include:
 - Railway to Sturt St and University via Camp St,
 - Hospital to Bridge St Mall and Bakery Hill via Sturt St,
 - Armstrong St to Railway via Sturt and Lyliard St.
- Innovative cycling amenities and lightweight public infrastructure installed includes lockers, parking stations with security cameras, showers.
- Greater number of weekend tourists arrive via train and hire or bring bicycles. Rather than heading out to Sovereign Hill the tourists start to create their own Slow Transport Ballarat guides. The guides feature architecture, local cafes and restaurants, locally produced goods, the farmers market and Lake Wendouree.
- Local company develops a small electric motor for bicycles. The motors are designed specifically to assist bicycles negotiate Ballarat hills. Share bicycles are fitted out with motors, and locals start to convert their bikes.
- Rainwater gardens buffer on-road cycle lanes in Camp St and Lyliard St; the raingardens form a green corridor.
- Traffic Calming undertaken in Sturt St and historical areas, and schools. 40km speed-limit introduced within these zones; traffic lights give cyclists and pedestrians right of way; crossing time allocations increase across Sturt St intersections.
- "Sustainable Mobility" targets introduced by council. Targets aim to reduce percentage of trips by cars and increase use of public transport.
- Council, University and Hospital adopt green travel plans designed to meet targets. Car-pool, bicycle and public transport programs designed to change employees' behaviour are introduced. Within 12 months these institutions reach targets.
- Local consultants start a Low Carbon Mobility service in Ballarat. They win the contract to advise Ballarat business, schools, residents and industry on low carbon transport and freight solutions.
- Flexicar Bicycle and Car Share clubs move into Ballarat. Council, the University and the Hospital use the car share for fleet vehicles. Further sites are identified throughout the CBA including the railway station,

Bridge St Mall, and the University. Council provides on-street priority parking for car share vehicles.

- Bus tracker displays integrated into bus stops, displaying real-time timetable information.

2015 - 2019

- Parking reduced within the city. The cost of on-street parking increases as a deterrent.
- Park and Ride stations are created at key transport interchanges. The Park and Ride stations encourage people to park cars and use public transport for journeys within the city.
- Trackless Tram is introduced into the CBA, particularly along Sturt St and other key tourist and pedestrian routes within the city. The city opted for the historical version which looks like the turn of the century Ballarat trams which still operate at Lake Wendouree.
- Interchanges are upgraded to suit new bus and trackless tram system. Interchanges provide information and support modal shift, e.g. ergonomically designed trolleys, mobility vehicles, lockers, maps, and public amenities are available at the interchanges.
- Laneway Strategy is introduced to create filtered permeability within the CBA. Some properties open up back entrances to allow pedestrian thoroughfare. The laneways are lively and house many creative incubator businesses, and due to their natural shading they become important public places during heatwaves.
- Camp St and the DaVinci Walk are created (see Catalyst project)
- Digital Trails are created through the city. Personal mobility devices receive information automatically from RFID tags placed throughout the city. Digital billboards appear around transit interchanges.
- Freight Depot has relocated. A local cargo system is implemented for city deliveries. Retailers form a cargo cooperative and combine deliveries for efficiency. Smaller vehicles are used for deliveries throughout the city. This changes the scale of vehicles that travel through the city.
- On-demand after-hours public transport system is introduced. Security hotspots are set up within the city for late night travel.
- Council introduce an active feedback system for the monitoring of pedestrian pathways and bicycle routes. Users are able to submit feedback for repairs and changes to the system.

2020 +

- Transport nodes increase, particularly around new residential areas
- Transport impacts are monitored; system adjustments are made to keep low carbon transport plan effective and convenient.



KNOWLEDGE

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FUTURE GLIMPSES HIGHLIGHTS

Ballarat has always been known for its spirit of inventiveness. Due to a need to build resilience and the rapid deployment of sustainable systems, this spirit of inventiveness is shaping the cultural and urban fabric of the Ballarat CBA. The university has diversified its programs building and focusing on local knowledge and opportunities. Collaborating with local business, organisations and institutions the university has become a leader in education for regional sustainability a mixture of practical, creative and technical knowledge, these models are exported to other regional cities.

2010 - 2014

- Ballarat Knowledge Incubator established in partnership with the university, council and local training and employment agencies. The main purpose is to develop specific skills to support the transition to self-sufficient sustainability for the region. Specific streams include Water, Energy, Agriculture, Information Communication Technology (ICT), and Creativity for Resilience.
- Two residential sustainable developments proposed; Phoenix Mall Sustainable apartments behind Town Hall and Nolan St Eco-Community. the developments were national design competitions.

2015 - 2019

- The Phoenix Mall sustainable development: became a showcase for high-density sustainable living reaches capacity and requests are made for other sites to be developed in the same manner (see catalyst projects for more details).
- The Nolan St Eco-Community (see project catalyst for more details) was socially and environmentally innovative: The early 2000 model of Men's Sheds has been recognised for its contribution to community resilience and spirit. Living Sheds on the eco-community are places for resources and common tasks to be shared, such as washing machines, tools and gardening. Their strategic placement throughout the neighbourhoods increases the speed of new-arrivals' assimilation into the community.
- The Knowledge Incubator now supports training of locals and international guests coming to learn the region-specific knowledge the Incubator has become famous for. The education streams have developed into specific Centres.
- The Agriculture Centre researches and demonstrates best-practice sustainable farming in low-rainfall areas.
- Renewable energy harvesting in heritage-critical cities requires ex-

tremely specific experience, which the Energy Centre is well-placed to provide.

- Retrofitting for and maintaining water harvest and supply is also a well-regarded career in Ballarat, and the Water Centre regularly trains technicians and planners to send interstate and overseas.
- The ICT Center at the Technology Park has continued to be a center of excellence. The City based ICT Cluster collaborates closely with other incubators,. Places at the Center are in high demand as new systems and services across the globe require increasingly sophisticated logistics and communication technologies, particularly in areas of monitoring and metering carbon emissions and sustainable systems.
- Creativity for Resilience has evolved into a discipline in its own right, as it becomes clear that the unpredictable nature of weather and communities requires rapid, well-considered and inclusive responses in all fields
- Exchange programs are commonplace at all the Centres, as it has emerged that Ballarat's particular situation has produced highly-specific rural and urban knowledge.
- Building on Ballarat's practical education Green trades and the knowledge from retrofitting the CBA has created a new green services TAFE, training trades people from all over regional Australia. A large international student population has diversifies the city, creating a cultural, academic and practical knowledge exchange.

2020 +

- Residential in-fill continues within the city using the ongoing learning from the Nolan St Eco-Community and the Phoenix Mall developments. Other regional areas are also using these as model of development, the construction of these sites is supervised by returning Ballarat Knowledge Incubator graduates
- The various training Centres continue to experiment and exchange research with other national and international Knowledge Incubators. The diversity and flexibility of the expertise developed allows Ballarat to respond quickly to new challenge as they emerge, promoting a sense of resilience within the community and reassuring the population of continued well-being.
- Expertise in specialised areas has led to the development of "guild" models that incorporate training, demonstrations and fully-established businesses. These include high-quality electrical repairs (rejecting the earlier practice of replacing damaged goods) and Component Banks for rare and valuable farm machinery.



GREEN BUSINESS

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FUTURE GLIMPSES HIGHLIGHTS

2010 - 2014

- A range of green business establish themselves within the CBA, many of these are electricity and water consultants. These represent a growing niche business sector arising out of local opportunities.
- Small incubator business (initially part-time) use serviced office spaces. These businesses include; freight logistics (load-sharing of freight vehicles), Ballarat Green Guide, Wholistic health and fitness experts, Student / Elderly residential matching, sustainable specialists (environmental planners, building raters).
- After the post Copenhagen announcement of targets and the following federal election announcing funding for regional sustainability there is an influx of low-carbon specialist; including low-carbon mobility consultants that advise residents, institution and industry. This has become particularly important for Ballarat conference industry.
- Ballarat conference industry continues to snare large conferences particularly those focused on sustainability; delivering a low-carbon package that includes eco-accommodation, local food and access to great public transport.
- BREAZE and several other eco-businesses initiate the Eco-Business precinct (see catalyst project for more details).

2015 - 2019

- Ballarat has several unique tools for supporting the creation of new businesses these include the range of CBA festivals and markets e.g. the international and local food fair; the government sponsored CBA revitalization projects and the local incubators.
- Following the Ballarat Business Innovation Festival and branch of the Victorian Sustainable Business forms in Ballarat. The association is active and locally campaigns for the promotion of local sustainable businesses.
- Council supports a local procurement policy, the hospital and university follows suit.
- Sustainable retailers group forms and publishes a map and guide (and guide) promoting best practices.
- A creative industry emerges following the initiation of incubators and art / work studios. Particularly important to this is the Creative Goods Shed project and the retail incubators in the Sturt St park and Boulevard.
- More niche business develop in response to the changes in the CBA in-

cluding; Craig's Hotel Honey Bee,

- The Ballarat Food cooperative supports a local food production sector. The number of food specialists business also increases.
- Sustainable tourism service advises on transport, water limits, local foods
- There is also a increase in practical trades and in particular repair and recycling businesses, and swap shops. The most prominent of these is the Ballarat Re-mining company.
- Development of the old Civic Hall site into 8 star sustainable offices the building is the highest in Ballarat and also houses government offices.
- Changes in the urban environment create new businesses including urban water engineers, bicycle deliveries,
- Other businesses have emerged form policy changes eg: car share companies, laundromats (out of water restrictions), district energy specialists,

2020 +

- Ballarat is recognized nationally for its exports.
- It has the lowest unemployment levels in all of regional Australia. The model for this was looking at relocation of resources and services, of which the CBA exemplifies.
- The creative and inventive risk taking has paid off; this is most evidently seen with the innovations and industry that has arisen around Ballarat renewable energy industry particularly the Thermal mining project, the CHP plants and the Solar Cities Park.



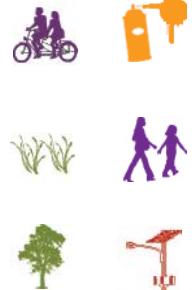
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CATALYST PROJECTS

- 1 Da Vinci Walk
- 2 Living Sheds creative community
- 3 Eureka Sustainable Apartments
- 4 Yarrowee Park
- 5 Water Detention Tanks
- 6 Civic Park
- 7 District Heating and Cooling
- 8 EcoBusiness - Re-mining
- 9 Ballarat Food Cooperative

...integrating design responses to climate-change pressures into the CBA....



ELEMENTS

BIKE PATH

PUBLIC ART

RAIN GARDENS

PEDESTRIANS

TREES

SOLAR STREET LIGHTS

MOVING FOOTPATH

TAPAS BARS

PUBLIC TOILETS

FACADE LIGHT SHOWS

TRANSPORT INTERCHANGE

TRACKLESS TRAM

DAVINCI WALK

Catalyst project: Da Vinci Walk demonstrating a new hierarchy for streets within the CBA. The DaVinci walk is a medium-slow modal pathway for pedestrians, slow personal mobility vehicles & bikes. The walk starts from the station and continues across the new railway bridge which runs alongside the Creative Goods Shed and the Backpacker accommodation into Camp St. After leaving the lively Camp St. district the walk then continues across Sturt St through the civic precinct and into Lydiard St, ending at the University entrance. Along the entire path there is a range of public art: a mix of technology and art, showcasing two of Ballarat's leading exports.

The bridge offers a covered walkway from the station into Camp St. Although it is a gentle slope down to Camp St there is a moving footpath for those who need mobility assistance. The moving footpath assists those who are returning to the station. It is activated by energy-efficient motion sensors, and powered by the solar film that covers the walkway roof.

CAMP ST. PRECINCT

The Camp St. end has become a lively place at night with buskers and street performers entertaining residents and visitors. Small bars have opened up along the street, selling alcohol, coffee and after dinner snacks. Several years ago there was concern about bringing more nightlife into the city, as people feared more violence and public misbehaviour. However it was found that diversifying late-night entertainment, creating smaller venues, bringing entertainment out into the street and employing civic security professionals alleviated these fears.

During the day, the area has become a pedestrian- and cycle- thoroughfare, bustling with university students travelling between campus buildings, tourists discovering the CBA and city workers moving throughout their day. The trees, raingardens and street furniture encourage people to pause and appreciate the surroundings and catch up with each

other. The area has become a haven on hot summer days.

Other measures include;

- Screened public urinals that collect the nightly urine, turning what was once a public annoyance into a valuable nutrient source.
- Displays of coloured lights flood the facades of historical and modern buildings, showcasing what was once only appreciated during the day.
- Landscaping added shading and aesthetics, with trees and raingardens installed along with entire street. The raingardens define the mobility pathway from the sidewalk activities whilst filtering stormwater runoff from the surrounding buildings and paved areas.
- At night the bike and vehicle path is lit with LED lights which are activated by motion sensors.
- Wayfinding: Street signs show average walking times and distances to nearest amenities (water, seats, toilets).

STURT ST. INTERSECTION

The walk leaves Camp St and crosses over Sturt St. This part of Sturt St is for local traffic which has a speed limit of 30kms. Upon crossing, the walk continues across Civic Park to Lydiard St. Public art, rain gardens and porous paving continue to define the walk. The Civic Park transport interchange is easily accessible. Buses and the CBA trackless tram can be caught from here.

LYDIARD ST

The walk continues into Lydiard St past Her Majesty's theatre. The road is split with one half for local traffic and the other for pedestrian and cycling thoroughfare. A raingarden separates the two traffic uses down the centre of the road. The walk crosses Dana St and ends at the University entrance. Here there is another transport interchange which also has bike and car-share facilities.

TRAVEL MATES: A LOW CARBON CAR POOL SYSTEM

The council, university, state government offices and hospital were the first to adopt green travel plans. "Travel Mates" matched people from the three organisations for car pooling. This not only cut trips by matching people who lived locally, but also created new community connections. Fleet cars were switched to electric car-share vehicles. The travel plan and the user experiences were placed online to encourage other companies within Ballarat to join the scheme. The scheme was so successful that the plan was exported to Bendigo, Geelong and regional towns in other Australian states.



© www.my-italy-piedmont-marche-and-more.com/italy-restaurants.html



EMBEDDED ECOSYSTEMS

The three catalyst projects below demonstrate how Ballarat has built resilience by integrating urban water cycles and Water Sensitive Urban Design (WSUD) into the urban fabric of the CBA. These systems have allowed the CBA to become a producer of water, making the most of water that flows through the pipes and gutters of the city. Introducing water back into the urban environment has softened the feel of the CBA and created more greenspace for residents, visitors and workers. The greenspace interventions have important ecological functions in reducing the heat island effect, increasing biodiversity and providing ecological services for the city. The rainwater and wetland systems clean, manage and store stormwater and recycled water for non-potable reuse.

After the success of Melbourne City Council "City as a Catchment" Ballarat Council initiated research into possible city catchment systems. Despite innovative recycling projects the city's dams were still below 10%. Alternative water sources were sought for all non-potable, fit-for-use needs. Along with this there was a need to introduce more greenery into the CBA to offer respite in hotter summers and provide new city residents with a greater share of green open space in the city.

Water Sensitive Urban Design (WSUD) had proved that managing water pollution at source was extremely efficient. In 2010 Ballarat began to install rainwater gardens along streets and geographically important areas.

YARROWEE PARK

As a part of urban catchment investigations, engineering surveys of the pipe section of the Yarrowee River along Grenville St, between Dana St and the beginning of Bridge St Mall were undertaken. Several large cities including Seoul had great success in restoring altered river systems that had been previously paved to manage floods. The systems are now able to be managed with a sophisticated combination of WSUD and Sustainable Urban Drainage (SUD).

ELEMENTS



GREEN SPACES

WETLANDS



BBO AREAS

WATERLESS TOILETS



NATIVE LANDSCAPE PARKS

WATER-DETENTION PONDS

RAINWATER GARDENS

ECO-SYSTEM PARK

UNCOVERED YARROWEE RIVER

VEHICLE RECHARGE STATIONS

EDUCATIONAL WATER SCULPTURES

AMPHITHEATRE

Plans to restore the Yarrowee were passed through council. Additional project funding came from the State Government and Melbourne Water, to not only restore the river but to create a eco-system park along Grenville St from Dana to Sturt St. The area buffered the river and provided the much needed pedestrian link to Bridge St Mall and the Sturt St shopping strip. The council purchased key buildings on the edge of the Bridge St Mall, and rerouted Grenville St traffic. A slow bus lane was retained on Grenville St between Lewis St to Dana St. Pedestrian and bicycle paths and emergency vehicle access continued through the park.

The area has always been of historical importance, from aboriginal times to the settlement of East and West Ballarat. This history is incorporated through public art within the park.

The park provides quality of life for those in the CBA, becoming a place where families meet at the weekend. Park features include:

- Native landscaping able to survive the long hot summers.
- Public Art
- Picnic tables and shelters, and gas barbeques that facilitate picnics in the park
- Flood Warning system and indicators
- A water sculpture that runs off recycled water and reflects how much water the community has saved.
- Waterless toilets
- Seats and play equipment for children

WSUD technology used includes:

- Wetlands for water cleaning and bird habitat
- Underground stormwater pipes
- Swales
- Detention ponds
- Bio-retention

WATER DETENTION TANKS

Community-sized water detention tanks were installed in key areas throughout the city to manage stormwater and assist in reticulating and moving water through the city. In dry periods treated water is moved into the tanks and used for street cleaning, watering of parks, cooling systems and some industrial uses. Technology is used to monitor and measure the quality and quantity of the water which can be sent to ecological systems or the sewer in times of peak loads or contamination. The underground tanks were placed in prominent carparks along Bridge St Mall and in the new development located at the Civic Hall.

GIS and computer hydrology models monitor and predict rainfall volume and control water movements within the system. Recycled water tanks in commercial, council and university buildings are also part of the system. These tanks act as smaller detention tanks and can release water into the system when needed.

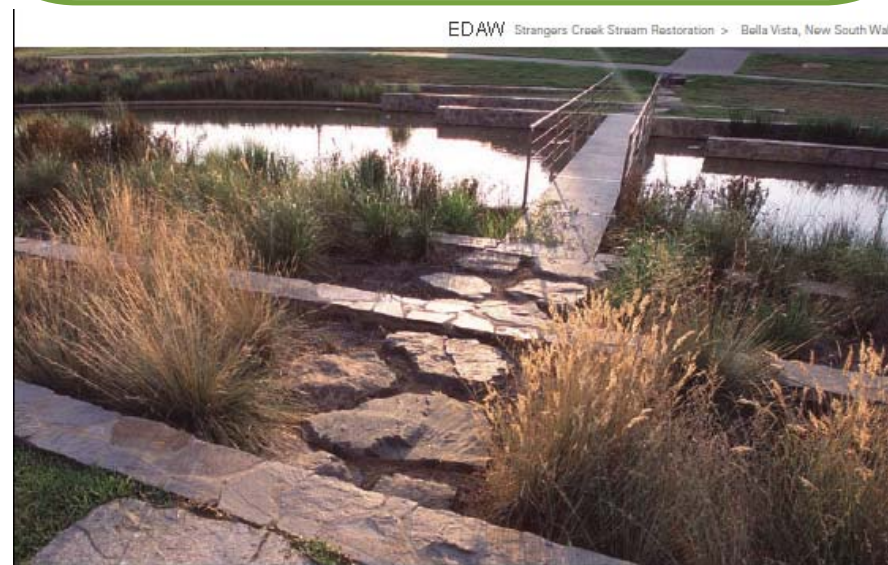
STURT PARK

After the success of Yarrowee Park and the change of the local traffic policy in Sturt St, it seemed only natural to create another city park, east of Lydiard on the south side of Sturt St. The creation of Yarrowee Park had closed off the Grenville St and Sturt St intersection south of the boulevard, limiting vehicular traffic to this area of Lydiard St (public transport was still accessible). The area had become an informal pedestrian mall full of prams, mobility scooters and bikes.

Hydrological monitoring of the area has shown that this part of Sturt St has an important function for water flow and is a natural water sump, as water flows there from other parts of Sturt St. As part of the Ballarat Sensitive Water Cities project, a series of natural water treatment processes were incorporated into the Sturt St Boulevard. These were designed for flood mitigation, slowing flows, cleaning and detaining water in sections of the boulevard and providing water for the Boulevard gardens.

Other features of the Sturt St Park include:

- Incubator market spaces (replicating the old Lydiard St newstand)
- Trackless tram
- A covered moving walkway powered with solar
- Recharge stations for mobility vehicles, electric bikes and trolleys
- Waterless Toilets
- Tourist information
- Amphitheatre
- Street Furniture / shaded areas
- Planting of fruit and nut trees



EDAW Strangers Creek Stream Restoration > Bella Vista, New South Wales



ELEMENTS



COMBINED HEAT & POWER UNITS

DISTRICT HEATING & COOLING PIPES



PIPE MAINTENANCE POINTS

COOLWATER WELLS



DESALINATION WATER PURIFIER

GEOHERMAL RESEARCH CENTRE

INCUBATORS & WORKSHOPS

ECO-BUSINESS SPACES

FOOD CO-OP

CREATIVE GOODS SHED

BALLARAT RE-MINING CO.

BALLARATS' BEST CO.

THERMAL MINING

BALLARAT DISTRICT WIDE HEATING AND COOLING

A Ballarat District geo-thermal modelling program was started in partnership between the University of Ballarat and the University of Melbourne. Investigations started to model Ballarat mine depths, mine water quality and quantity, groundwater temperature and storage potential. A team from European mine water projects joined the research center to provide their expertise and help with technical and financial modelling.

Suitable abandoned and flooded mine shafts were identified in the feasibility study, with two test wells drilled to access water (one as source, the other for re-infiltration). The shafts were within a reasonable distance from the city center, so with the use of low carbon heat pumps, transfer of heat to a local CHP plant was possible. The mine-water was to be used in conjunction with the Town Hall and Phoenix Mall Combined Heat and Power unit (CHP). Initially it supplied council and public offices within the Town Hall and the residential area in Phoenix Mall. Buildings within this site had been created to be as energy efficient as possible; insulated district heating and cooling pipe systems were integrated into the development. The pipe system was plastic rather than metal to guard against corrosion from contaminated mine water. A Ballarat-designed leak detection system was also incorporated which was able to detect moisture and alert engineers prior to a full leak developing. Maintenance points allowed for access and seasonal cleaning, while cleaning devices monitored chemical build-up within the units.

The success of the mine-water project led to implementation of cool water wells and systems. After the success of the council area, the hospital, university and all new developments signed on to the Ballarat Thermal Mining project. CHP units were soon upgraded across the city to include a desalination water purifier, which ran off the electricity generated

onsite.

The industry has become a showcase for geo-thermal energy research. Knowledge and innovations are exported nationally and internationally. The industry has become an important local employer with jobs in engineering, design, maintenance, administration and research. The research center with LGL Mines has initiated a phytoremediation project to clean up other mine sites for use as low-grade water storage.

2009 References

Thermal heat exchange using mines

<http://www.inhabitat.com/2008/12/10/heerlen-minewater-project/>

<http://www.thefreelibrary.com/Timmins+geothermal+project+lands+city+in+hot+water:+use+of+abandoned...-a089162752>

NEW SERVICE: SEASONAL HEATING

One of the most innovative companies is **Solar Shutters**, a seasonal company that transforms the city facades during winter. The company installs seasonal street shutters that offer thermal protection during the winter months. The shutters are installed under awnings in front of restaurants and bars, in the Bridge St mall, and enclose the pergolas on Sturt St. The installation of the shutters has become something of an event signaling that winter is coming and the city is preparing for a change of season. The shutters are not a heating solution but are passive solar extensions, similar to a greenhouse, creating a more consistent temperature for those who wish to be outside. Some restaurants boost this ambient temperature at night with portable bio-energy ovens, while others simply provide blankets and hot-water bottles for their patrons. Energy reports show that businesses who use solar shutters have increased energy efficiency during the winter months, with the shutters insulating against heat loss from winter air.

Solar Shutters also designs, manages and installs active and passive solar heating and cooling systems in new buildings and retrofits within the CBA.

ECO-BUSINESS PRECINCT

A combination of council, federal and state government funded projects led to the relocation and start up of a number of serviced-based companies. The consultants initially worked with the public sector to deliver energy and water efficient services. At the same time two prominent community based organisations, the Central Victorian Solar Cooperative and BREAZE sought premises within the CBA. The organisations joined forces to lease a premise on Dana St next to the railway station, alongside the Camp St precinct. Using BREAZE's local contacts, sustainable-practice tradespeople were brought in to renovate the building. The retrofit was slow, but eventually produced a low-cost sustainable small office building. A hands-on approach was taken and the group moved in during the renovations. As sections were finished, the low-cost rental spaces were made available to eco-business start-ups.

The building itself showcased integrated sustainable systems. Waste-water was filtered and recycled; renewable energy harvesting was installed and supported by passive solar design; a shaded rooftop garden produced food like lettuce, herbs, lemon trees, tomatoes while kitchen waste fed a wormfarm; recycled materials were used in conjunction with non-toxic paint and carpentry; and a bike share hub was introduced. The organisation decided to share the knowledge gained from the renovation, commissioning artists to communicate the process publicly. The slow evolution of the building and its innovative appearance attracted interest not only from the local CBA community but also from the media and architects.

Several of the businesses who partook in the renovation decided to rent out space. It was soon realized that different businesses needed different types of space. Additional buildings were leased and renovated for green trade practices - particularly those involved with the original collaboration. An incubator & workshop, supported by the regional training program, created low-cost rental spaces for work and equipment storage within the city. This allowed local tradespeople to reduce their vehicle dependency and carbon footprints. This new model, more importantly, led the spread of the incubators that now operate throughout the city.

The eco-precinct has grown and now supports many innovative businesses. The largest of these is the **Ballarat Re-mining Company**, a dismantling and re-use supplier. The company receives recycled industrial equipment via rail, which it dismantles and uses to build new equipment.

INCUBATORS

Due to the success of the initial incubator project, local land owners, the university, TAFE, the state government and the local job networks sourced vacant retail and office space within other areas of the city. The Ballarat Incubator project initiated unusual collaborations - to work on projects or just to share low-cost spaces. IT people shared workspace with artists, health services shared offices with interior designers, and landscape architects shared offices with insurance companies. This was especially beneficial for creative and startup businesses.

The **Creative Goods Shed** initially started as an incubator for artists. Studio spaces were set up in one half whilst renovations were taking place in the other. The area has now become a showcase for artists and includes a Craft Victoria outlet and several artist-in-residency programs.

THE BALLARAT FOOD COOPERATIVE 2020

Ballarat has become a food-lovers' destination, well-regarded by amateur and professional gourmands alike. The focus shifted due to a realisation of the importance of regional identification of local food – a concept vitally important in European food marketing. The twin notions that food was valuable because of where it was made and that the naming rights of that produce could be defended legally shifted perceptions of value.

Ballarat's local farmers had been attending the farmers' market for several years when demand for local fresh produce grew due to the population growth of the area. It became clear that there was a market for daily, rather than weekly access to local food. Further enquiries revealed that market shoppers were coming by train from Melbourne and Geelong to purchase Ballarat produce. Managing food surplus became very important, due to the natural inclination of locals to waste as little as possible.

Modern knowledge of food-preservation techniques was limited, and so the CWA started to hold classes. Demand grew beyond the capacity to deliver, and so the local employment agencies went into partnership with the CWA, the Council and the University to develop Food Preserving apprenticeships. **Ballarats' Best** commercial kitchen opened in 2012 with a staff of 10 locals producing a wide variety of preserved foodstuffs. Local restaurants showcased the produce as part of that year's Ballarat Local Food & Wine Festival, and the feedback was phenomenal.

The kitchen staff has grown to 45 full-time trade-qualified Food Preserving professionals and apprentices. Additional employment is provided through the supply to local restaurants and shops, staffing the retail outlets, managing the refillable containers return system, managing the delivery or collection of fresh produce from local farms and fresh-food retailers, research fellowships on innovative sustainable processes and collaborating with farmers to provide high-demand high-quality produce.

Regular visitors to the city swap their empty Ballarat's Best containers for the latest seasonal preserves, and luggage space on the train-ride home is always in demand.

NEW SERVICE: COMMUNITY COMPOST

More than ever, the links between the inner-city and rural regions of Ballarat are being strengthened through the use of shared resources. The Community Compost program emerged from the Ballarat Worm Farm company which was working with farmers back in 2008 to encourage them to re-use their green waste as nutrients for their crops.

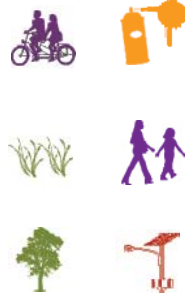
The program has expanded to include inner-city residents, food retailers, restaurateurs and the Best's commercial kitchen. Green waste is collected at several points in green spaces around Ballarat, and resulting compost is used to feed rooftop gardens (such as the famous Craig's Hotel Garden and Urban Bee Hive), street-level plantings and rural crops. Of course, local gardeners are also heavily involved in the program. The Program provides direct employment for 45 locals and supports other industries in the Ballarat region.





New developments
 1. Armstrong St Redevelopment
 2. Nolan St Eco-Community
 3. Creative Arts Shed and Backpacker Accommodation

ELEMENTS: NOLAN ST



- EXHIBITION SPACES
- MENS' SHEDS
- DANCE / YOGA STUDIOS
- CHILDCARE
- COMMUNITY GARDENS
- BACKPACKERS' HOSTELS
- MEDIUM-DENSITY RESIDENTIAL

ELEMENTS: ARMSTRONG ST

- ACTIVE LANEWAYS
- HIGH-DENSITY RESIDENTIAL
- RETAIL / COMMERCIAL
- SOLAR & WIND HARVESTING
- ROOFTOP GARDENS
- WATER TANKS & RECYCLING SYSTEM

A PRODUCTIVE, SUSTAINABLE AND CREATIVE PLACE TO LIVE

Over the years Ballarat has seen a continued increase in its population. A number of factors including the state government's regional growth strategy, the expansion of Ballarat University and the revitalization of the CBA attracted a great number of new residents to Ballarat. Many of these residents wanted to participate in an urban lifestyle by living in the CBA area.

Over the years there had been a lively debate about how Ballarat could increase its density. The debate centred on the costs of creating new residential areas on the outskirts of town, versus city in-fill. Meeting carbon targets and the cost and impact of building new infrastructure (sewerage, electricity, roads) were issues central to these discussions.

Ballarat Council selected two sites within the city to investigate how the historical centre might also accommodate residents. The first was in the railway precinct bound by Lydiard St North and Nolan St. Its working title was the Nolan St Eco-Community. The second was the Phoenix Mall Sustainable Apartments, located on Armstrong St between Dana and Sturt St. The two sites had different characteristics and suited two different styles of developments.

The sites were demonstration projects that encouraged research, experimentation and the spirit of inventiveness. Flexible planning permits were introduced to encourage designers to be innovative with systems and infrastructure, while risk was mitigated across the PPP partnership. As demonstration projects, the developments also needed to include areas where the public could trial and test new sustainable systems. This sped up the adoption of new technologies and efficiency programs within the CBA and the wider community.

The council launched a national competition for the design of both developments. Designers were to showcase a new standard for developments within regional Australia. The winning designs would need to

demonstrate innovative approaches to sustainability by:

- exceeding environmental targets of the era (achieving 2030 targets in 2010)
- having low environmental impacts,
- being highly productive,
- supporting and promoting sustainable lifestyles
- encouraging the use of shared facilities
- accommodating sustainable services
- monitoring and measuring the impacts of the development during the lifecycle of the projects including the design, remediation, and construction stages.
- adding architectural value to the character of Ballarat and its heritage buildings.

The innovations developed in the construction and design of both projects led to an extensive retrofit of other CBA buildings. The projects were also innovative in introducing co-generation district heating and cooling systems to the CBA. The knowledge and innovations created from these projects was exported to other regional areas within Australia.

NOLAN ST ECO-COMMUNITY

The Nolan St Eco-Community was to be a creative place. A medium density eco-community, it would incorporate the existing heritage buildings and provide open space, community services, commercial leases and community gardens. This development had a focus on low-technology as compared to high-technology solutions. The site included the old freight sheds which were used for flexible community services including child minding, dance and yoga studios, cafes and restaurants, and a men's shed. The site was to host a community garden, promote the use of public transport, host a weekend market and have an innovative workshop area.

As a part of the development, the Goods Sheds on the southern side of the railway were developed into a backpackers accommodation and a Creative Arts exhibition and workspace. CarriageWorks in Sydney was used as a model for this.

PHOENIX MALL SUSTAINABLE APARTMENTS

The Phoenix Mall development was a mixed use development. This site was chosen to exemplify a retrofit residential project creating sustainable apartments. The site was positioned behind two significant heritage buildings (the Town Hall and Craig's Hotel), alongside Bath St, Chancery Lane and adjacent to Town Hall Lane. All appropriate lane-ways were activated and turned into pedestrian / community spaces. It was close to the university and other city amenities and fronted a well-established Mall.

The site was chosen to investigate the ways that new styles of architecture might complement and / or contrast the heritage aesthetic of the area. The development was a mixture of retrofit and new additions. It was a prototype for new buildings within the CBA. The development introduced new sustainable infrastructure and modern buildings into the historical civic precinct. The development needed to provide for diverse residential types (students, families, retirees, couples), community services and commercial space.

SUSTAINABLE BUILDING GUIDELINES

All new buildings to meet a carbon reduction target of between 80- 100%

- Use of materials with low embodied energy (increased recycled and reclaimed materials, e.g. green concrete)
- Durable buildings with extended lifecycle, building systems *design for flexibility*, upgrading
- Design for deconstruction (reuse of materials at end of life, design for reconfiguration)
- 50% on-site renewable energy generation (solar, wind, biogas, geo-thermal). Considering total energy demand of the building.
- Energy monitoring systems installed for demand management.
- Additional pipe system laid for future district heating and cooling
- Retrofitting existing buildings; draught proofing, insulation (wall and ceiling cavity), improvements in heating and cooling systems.
- Installation of energy and water monitoring systems, including leak detection system for water pipes.
- Three-pipe system; recycled water to be used for all non-potable purposes (cleaning surfaces, gardens, laundering)
- On-site grey and black water recycling or waterless toilets (on new developments). Emergency connection to sewer should be maintained.
- Where possible community-scale water tanks retrofitted and included in new developments. Information sensors fitted to ensure and manage water quality and quantity.
- Separate gray and recycled water tanks where possible.
- WSUD principals to treat and manage external water systems. Rooftop gardens installed to filter water and provide insulation. Gardens watered with recycled or storm water.
- Passive and active solar design for new developments. Including the following elements;
 - Thermal mass
 - Natural ventilation
 - Solar orientation
 - Community scale shelters and cooling rooms designed for climate change events
 - Existing developments retrofitted with active and passive solar systems
 - Solar Air conditioners
- Building fitted with energy efficient appliances. Shared goods and facilities should be promoted.

Example of solar art

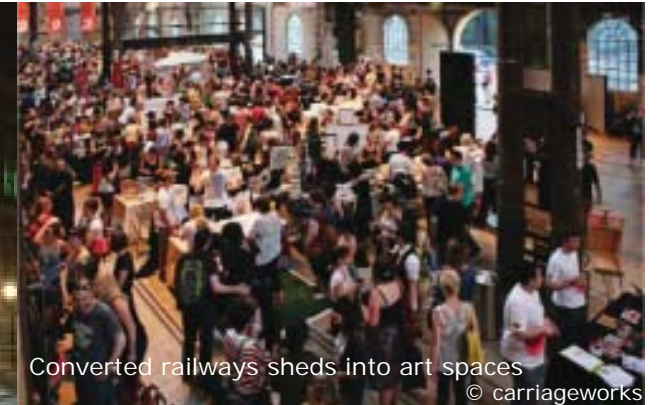


© Light In Jerusalem festival

Solar street lights against heritage buildings



© ross lovegrove



Converted railways sheds into art spaces

© carriageworks

Bicycle showers and lockers



© penny farthing pushbike parking



Converted railways sheds into art spaces

© carriageworks

Localised freight solutions

Small electric trucks for freight



© modec electric



Electronic wayfinding against heritage building

© SENSEable



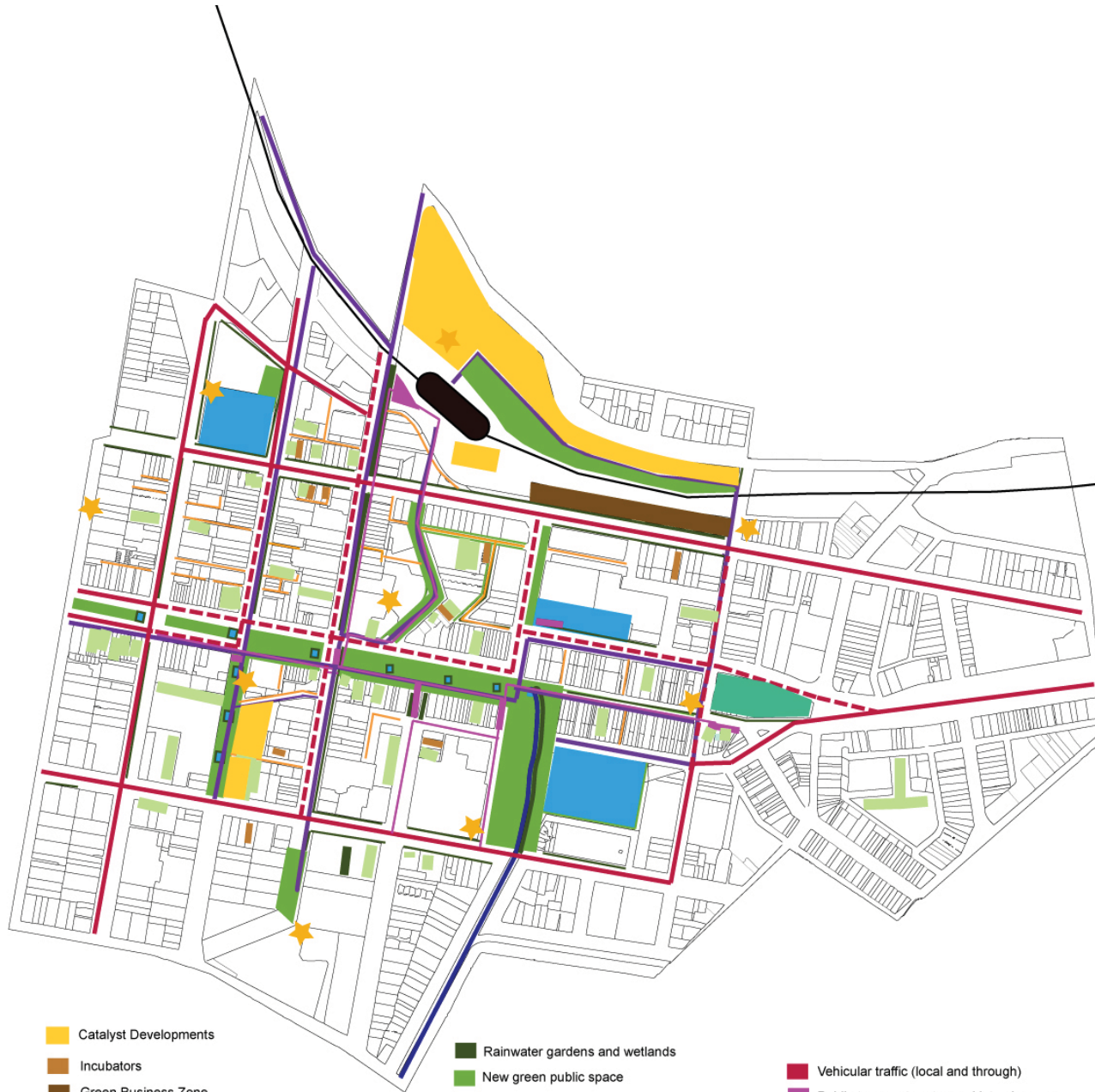
Example of wetland park, for Yarrowee Park

© EDAA

Example of the how the exposed Yarrowee River could look.



Wetland Garden at Ballarat Botanical Gardens / Lake Wendorree



- Catalyst Developments
- Incubators
- Green Business Zone
- Food Co-op / Depot
- ★ District Heating and Cooling / CHP

- Rainwater gardens and wetlands
- New green public space
- Retention ponds and tanks
- Yarrowee River
- Rooftop gardens / some food plantings

- Vehicular traffic (local and through)
- Public transport routes and interchanges
- Key pedestrian / bicycles routes
- Active laneways



VEIL | victorian eco innovation lab