selvage
master of landscape architecture
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reconsidering the efficiency of market garden sites
disclaimer

acknowledgments

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declaration

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Horticultural production zones have always been considered as dynamic landscape. Landscape spaces used for the intensive cultivation of vegetables. They present a landscape of change that is not only seasonal but also devoid of all other vegetation – a continual re-grading of topographical form. Seasonal change is brought on by an intensive, streamlined production of monocultures, efficiently tended, harvested, and delivered to markets. Intensive field farming maximises cropping outputs and achieves highest yields through rapid turnaround times. It is a process focused on maximum efficiency that operates through a rigid geometric form imperative to efficient and intensive production. The rigidity of the form is driven through rigid irrigation systems.

Green one day, fallow the next – reflects the nature of production in the Werribee South market garden precinct. Monoculture production, involving a range of geographically-selected produce, is repetitious and singular in its programming. The horticultural production zone is contextualized by a particular geologically-driven production conditions and continually redefined by technological advances in machinery and production science.

Residential occupation in horticultural production zones are minimal in the majority of the Australian regional landscape. The number of residential farm buildings is diminishing and are often used only for servicing equipment. The majority of farmers are either seasonally employed or living in local town centres. They commute and often tend their fields after dark with computer-based systems. Infrastructure is kept to a minimum so as not to compromise the growing of vegetables. Irrigation is economically efficient and structured, operating through a strict grid layout. Roads are rectilinear. Production is accelerated and proficient, always operating as close as possible to maximum output and, therefore, maximum productivity. Efficiency is the goal!

However, modern efficiency creates production shadows (or, as I will term this condition for the research, ‘selvage’). Pieces of land that can’t be efficiently serviced by modern horticultural practices are, therefore, redundant to current horticultural production practices. This project is interested in the opportunity to re-program these ‘selvage’ spaces and bring efficiency to the land.

My background as a practicing horticulturists has had nothing to do with market gardens but, like many production-orientated careers, is driven by a fascination for any part of the activity involving plant production and cultivation. My interest in horticultural production or as they are also termed market gardens was furthered in 2001 while in working in China and living across the road from an urban Chinese vegetable garden. This market garden site in Yanshi
exploited the installation of different soil fills on a future building site. The construction of the building (triggered by population demand) would signal the end of the market garden. In the meantime, a temporary, amateur vegetable garden existed, tended by part-time Chinese bank employees, the resultant produce highly valued as a supplementary for their families and as gifts for their relatives. The site also seemed to offer more complex opportunities for investigation as an insight to understanding practices of horticultural operation.

Of significant interest were the patterns formed by the installation of the fill used to elevate the site. The intention of this fill was to lift the entire town a metre above the rest of the landscape and out of risk of flooding from the adjacent river. However, the fill was installed without any particular logic, in a manner that could be considered uninformed. Interestingly, the distribution of the fill dictated the form of the vegetable garden planting beds on the site! The form of a horticultural production zone relates to its technology, efficiency, adjacencies and the associated requirements in cultivating the species.

Processes of redundancy and efficiency were out of the hands of the vegetable growers. Instead, they were predetermined by the actions of the original workers who installed the fill for the purpose of construction and not horticultural production. Consequently, the layout of the vegetable garden was not dictated by horticultural practices or land titles (as it is in Werribee South), but by the manner in which the fill landed on the site. The unintended use or appropriation of the fill site for vegetable production had inbuilt redundancy. The efficiency of vegetable production was dependent on the techniques and skills of the gardeners. The manner in which the site’s form was dictated by the fill contributed to its efficiency.

Observation of the Yanshi site prompted my interest in exploring how market garden production can be an understanding of redundancy through processes, efficiency and the opportunities to cross-program traditional horticultural production. The project investigates horticultural production site at a commercial and suburban scale in Werribee South, Victoria, Australia, through the condition I have defined as ‘selvage’.
Research question: How can the redundant spaces in Werribee South’s horticultural production zone provide an opportunity for urban intervention?

Key terms for the research:
1. Selvage Framework – applying the hectare grid to the site to expose redundant spaces
2. Selvage – land identified as redundant, horticultural inefficient, and available for reprogramming
3. Spoil – land required to service horticultural production
4. Redundancy – condition resulting when a new program is overlaid on the infrastructures of another (e.g. horticultural production on dairy title boundaries)
5. Symbiosis – condition created through the sharing of two program infrastructures, allowing for relationships and interaction between the two land uses, and exposure of each program's practices
INTRODUCTION

The Werribee South horticultural production zone operates on alluvial soils of the Werribee River in intensive horticultural production mode. The processes of modern market gardening involve intensive back-to-back production with no dormant times of the year (fields left fallow). The market garden fields are highly mechanised. Technological advances continually streamline the process. These advances create an effect I have termed ‘selvage’. Selvage spaces are inefficient within the current practices of horticultural production. The spaces vary in size, configuration and location. They occur across the site with a range of different adjacencies, which provide different opportunities according to their locations. Their current usage is considered inefficient. Narrow or irregular spaces are less productive due to shape, relationship to the irrigation grid, and the greater effort required to farm them. They vary in size; the smaller spaces are often limited to providing easements for storage of equipment. These spaces, if consolidated across the broad landscape, provide opportunities for reprogramming and a shift in production efficiencies. The site provides opportunities for new programs and to allow existing redundant and ineffective spaces to be reprogrammed. These spaces are evident in the image above. Opportunities of cross programming could offer exploration of new relationships between traditionally mutually exclusive programs.

In situations where land title and land use are adjacent to non-rectilinear forms, they collide. This condition of non-rectilinear forms is a result of existing land titles, waterways and infrastructures. Water systems include coastal fringes, rivers, creek systems, supply channels, and drainage swales. These systems have limitations. Their boundaries are dubious. They have a range of flow rates that present risk to their adjacencies. They require easement spaces to accommodate the fluctuations and to allow servicing. Easements could be rectilinear but often aren’t. Risks in many cases are limited due to the low value assets they abut. Nevertheless, their current state can be adjusted to accommodate cross-programming. Where spaces are occupied by multiple users and can provide opportunity through their operations of forming the space and affecting procedures of those involved. Programs include horticultural production, residential development and dairy.

Current water systems in the Werribee South region are of poor quality and low technology. Drainage swales and supply channels are crude, sized to meet the requirements of a system that has shifted up in consumption and, therefore, demand. Current irrigation practices look to supplementary supplies from the neighbouring sewage treatment plant, as opposed to mains or bore water. The condition and levels of the sub-aquifer in this location have led to concern about inundation by sea waters. In places, the ocean is only metres away. High salt content of the treated sewage water has created production issues, requiring higher irrigation application rates to ensure salts are washed out of the root zone.

Across Victoria (and, for that matter, Australia) similar concerns have seen a shift to such hydrological systems. In some cases, these shifts involve returning drainage systems from open systems with some barrel drainage (as is the case in Werribee South) back to riparian systems. To reduce evaporation, water supplies are being developed into sealed systems, in contrast to the open systems currently in use. However, the open drainage system allows for increased percolation of water back into the aquifer and, in the case of concealed supply lines, a chance for utilizing or cross-programming traditional easements spaces over the supply line for other activities. These activities could be specific to the range of programs sharing the location.
This project was interested in using these spaces to explore new opportunities for market gardens at Werribee South. This includes adding efficiencies to market gardens and extending production areas over easements. Adjacencies could be used as recreational spaces, for cross-programming, and as buffers between programs (such as residential development and active production fields). These spaces are defined as selvage in this project.

Improved efficiency in the current industry of market gardens at Werribee South demands a shift in land use and the introduction of a range of programs through the consolidation of rectilinear irrigation hectare spaces. These spaces can be considered productive – as market gardens, or new programs that utilise selvage spaces. Cross-programming brings greater efficiency to the existing market garden productions by supporting better-value practice and allowing infrastructures to be shared.

Productive landscapes are understood through their productivity. Efficient in manner of operation they are understood through productivity based on the amount produced harvested in relation to amount of land. Horticultural lands at Werribee South are less efficient as a result of the disjuncture with land titles and methods of production. However productivity can be understood through other programs. These programs add different conditions of operation that could bring new efficiency to the site. By refining horticultural production and introducing new programs to selvage land, the overall site productivity takes on different perimeters and new productivity’s. The programs involved could operate in a coexistent manner and create new site relationships as part of the process. These include efficiencies to horticultural production.

The irrigation system is a rigid collection of pipes and pumps. It waters the landscape in a manner that responds to both crop requirements and horticultural production approaches. Current water quality requires around one and half times the usual amount of irrigation water to ensure that high levels of salt are washed through the system. The system of irrigation critical to the cultivation process is rigid and privileged over other systems in the landscape. This condition of privileging generates a particular rigid landscape form, determined by the constraints of the irrigation system. The system is inflexible and requires investment further contributing to the fixed condition it has on the landscape.
Selvage
The term 'selvage' is redefined in this masters research as 'a piece of land, generally irregular, that has become redundant to the current land use,' is the construct of the author and specific to this project. The term is normally associated with the edge of a piece of fabric that is woven so it will not fray or unravel as a result of the manufacturing process. The selvage of the fabric is generally inconsequential to an article of clothing or final product. It is usually cut off and discarded. In this research, selvage is used as a means of understanding a condition of horticultural production. It provides a way of considering efficiency and redundancy with regard to horticultural production. Land that is outside or redundant to the grid irrigation system (and other technological streamlining practices that leave land spoil) could be considered as selvage.

Selvage, specific to this project, is used to describe pieces of land (identified through the hectare irrigation grid) as being under-utilised or inefficient to the current processes of market gardening. These selvage spaces could be deemed less efficient than regular field production areas. In the case of Werribee South, redundancy has occurred as a result of: incompatibility of title boundaries and contemporary infrastructures, deflection from road and hydrological systems, historically irregular title boundaries (previously derived for dairy farms), and technological advances in horticultural production (e.g. streamlining from tractors and attachments creating production shadows). Shifts in the dimensions of modern machinery and advances in more efficient equipment have come with corresponding drawbacks. This research is interested in reassigning or cross-programming these inefficient spaces via coexistence. Coexistent in the sense where programs can operate efficiently, independently and bring operational effect to each other through requirements such as infrastructure.

Redundancy
To this research, spaces understood as being 'redundant' are redundant in the process of horticultural production. The redundancy has been generated as a result of the selvage process of market gardens. The current irrigation grid unit of one hectare shows disjunction with irregular title boundaries. Other factors, such as shifts in technology that have streamlined horticultural production, have created production redundancy.

Redundancy assumes that the current production processes are operating less efficiently than they might on the land available for production. Shifts in systems alter efficiency. The redundant non-production spaces that exist, therefore, inhibit production as a result of the systems of operation. Land measures and technology are examples of this. The production zones identified through land titles are inefficient to production and, therefore, contain redundant land spaces. These spaces vary in size, depending on the shape and area of the land title and their relation to the alignment of the one hectare irrigation grid.

SELVAGE + REDUNDANCY
Efficiency
The current method of horticultural production on the Werribee South site involves intensive production and, therefore, intensive irrigation. It requires complete irrigation coverage of the production surface, on a grid system, in a permanent manner, and with limited flexibility. Pump technology for the system allows for only a hectare of land to be irrigated at any one time. Larger parcels of land are divided into irrigation units of one hectare and watered sequentially, as the broader system of pumped water allows. This hectare grid is then divided again, according to the width of the machines that service the rows of produce between each irrigation line. Efficiency is brought into question when irregular allotments clash with both the hectare unit and the rectilinear modes of the farming equipment. Irrigation, therefore, is the system that reorganizes the landscape through horticultural production.

Land titles
Farmers own or lease land. Their farming practices are limited to these different shaped spaces. Not all of these spaces are rectilinear or of a shape that suits farm machinery practices. They have been surveyed over many years and are subject to many systems of calibration, metric and imperial. The legal boundary of a site is often not represented through fence lines. Boundaries are only legalized when land is sold up or council assets need to be located.

Technology
Advances in machinery focus on efficiency. Economical, efficient and accurate production is driven by economical factors to rationalize production procedures. However, the most efficient tractor can’t service corners of fields or narrow spaces and requires certain turning circles to return up rows. In the case of modern four-wheel drive tractors, this is a ten metre turning circle. The tractor is disengaged from the sowing, spraying or harvesting and turned to continue its function. Previous two-wheel drive tractors turned in eight metres. Technology drives the condition of operations and comes with extensive landscape implications. Technology has created redundancy. The turning circle requires unproductive service roadway which, although imperative to production, could be cross-programmed with other uses. The one hectare irrigation grid mimics these production forms and adds further constraint.

Land titles
In Werribee South, a disjuncture between horticultural technology and land titles is a condition of current production. The titles of land were laid out across a range of different time frames, wherein different conditions informed the land and were identified through the title. Shifts in ownership have also changed landscape operation. Dormant programs, easements for electricity, open water channels, roads, and land use zonings have lead to irregularities that are clearly visible on the aerial photograph of the region. This site is a test for a model of coexistence between market garden programs, residential development, and dairy farming.
The City of Wyndham also amended the subdivision allowance on the horticultural production zone. The new limits to lot sizes only allow development to include a single dwelling on a minimum of fifteen hectares (previously five). In scenarios of two or more dwellings, an additional single dwelling is also allowed on an extra suburban-sized lot. The intention is to restrict land use to horticultural production. However, the change in subdivision size from five to fifteen hectares is limiting, both on the sale ability and affordability of farms, and also on some productions that may economically operate on smaller lot sizes, and vice versa. Fifteen hectares is the new unit of farm size and farm subdivision. Current smaller land holdings with correlative production size would be excluded, including some current models of residential development. Dairy farming, however, would be allowed.

The housing subdivision regulation does provide new opportunities for investigation into different subdivision types for agricultural housing. New housing across the zone would move towards cluster type settlement patterns. Development of additional houses is added to existing housing stock in groups of three (on a regular residential allotment size, two houses are allowed to have an additional house added to the group).

The cluster type of agricultural settlement offers greater rural residential efficiency, as well as new social relationships. The cluster type is driven by changes to the planning laws for subdivisions in Green Wedges. Although only accommodating three houses in situations where two consecutive houses occur, the policy change will have implications on development in the Werribee South zone. Varying land titles would drive the concentration of cluster housing. This shift in planning policy allows for the sharing of suburban infrastructures and could be seen as a positive move from current housing type. Simplifying occupation of farms allows for rationalisation of some of the utility infrastructures that service homes, which currently affect farming practices. Bundling these infrastructures has the potential to positively affect efficiencies in rural production. Less land put aside for easements allows for less selavage space to occur and, therefore, greater efficiency.

This research uses Werribee South Intensive Agricultural Precinct as a test site. It acknowledges the precinct is already protected under the Green Wedges Policy and seeks to explore the site as a case study. The research could be considered as a design methodology that might be considered elsewhere in Melbourne, where protection is not offered by strategic frameworks such as the Green Wedges Policy. The methodology could also be used in the development of cross-programmed agricultural suburbs, where the one hectare grid could inform the development from the outset and effect greater integration of social relationships.
The site is bounded on the south-east by the coast, to the north by a freeway and new housing estates, and to the west by the Werribee Sewage Farm. The Werribee Mansion and Open Plains Zoo occupy the corner of the site and were established concurrently with the horticultural production. A new housing development is being established in the north-west corner. Currently, none of the adjacent housing estates show signs of responding to the horticultural production zone. Facades respond to economic requirements of the development, rather than addressing opportunities of view. Sanctuary Lakes estate on the north-east border aligns itself away from the horticultural production zone to its own designed landscape elements (golf course and lake). The permanence of the vegetable production area is guaranteed by the Green Wedge Policy; therefore, we can assume it will exist in a range of forms in the future. Fixed landscape elements include the coast and the Werribee River. The edges of the site are precisely defined by the water systems that create the alluvial conditions so advantageous to vegetable production. Without this geological condition, the site may have been reprogrammed a long time ago.

The Werribee South site was initially developed as a dairy zone and now services an extensive horticultural production industry. The site is intensively irrigated to support an extensive cropping program. Irrigation is the key to modern production. Only a certain number of major factors can be controlled in production; the control of moisture controls the time frames in which production progresses. Growth rates are controlled through factors such as fertiliser delivery via irrigation. Current irrigation allows for one hectare to be irrigated at any one time, per pump. Title boundaries (which belong to a previous use of the land) clash with this hectare unit. Not all fields are devisable by exactly one hectare; this creates redundancy for horticultural production (as is illustrated in the aerial image).
Werribee South currently has a range of orders that operate across scales to facilitate and enable the market garden production zone to operate. At the broad scale end of the range, these include management bodies and broad infrastructural systems – such as federal and state governments, local councils and industry bodies – who legislate policies that direct the industry at different levels. Federal government influence is fed through export deals that control and direct trade across the world; state government acts through interstate trade and the movement of produce around the country to local agents, as well as in the relationships and agreements they have with a range of suppliers and distributors. The effect these systems tend to have on production is minimal in regard to the crops that are grown. The more tangible large scale infrastructures include hydrology, road systems; these systems shift and change over broad time frames through physical conditions.

Road systems on the site are mainly minor secondary roads, although the Princess Highway to the north-west is a major six lane highway. Access to this from the site is limited to prescribed entry and exit points off the freeway. Roads mimic broad rural subdivision patterns in the sense that bends are scarce and corners limited. Roads tend to have ‘dogleg’ formations where they shift to make connections with intersections further away. In another situation, these would normally bend but navigation around broad-acre fields inhibits this. Minor vehicular traffic occurs on private land as farm machinery moves across commonly-owned market gardens. Road shoulders are narrow; many of the roads are bordered by swales or water channels servicing runoff and irrigation for production. Water is stored on each property in storage dams until it is pumped to create pressure and drive production sprays.
URBAN EVOLUTION

Urban evolution operates through orders of road systems. Horticultural production lands include secondary road systems to shift produce and supply consumables. These systems have extensive easements and are often located adjacent to these road systems. As urban development occurs in fill road systems are installed within these road systems. New hierarchy of road systems develop, including secondary road systems that make broad connections between existing secondary road frameworks.

SUBURB TYPE STUDY

Current housing subdivision topology are representative of a broad range of responses.

URBAN EVOLUTION

Typically the overlay of suburban development on a range of agricultural lands and varying agricultural programs may include: market garden sites, grazing lands (including dairy), and a range of other crop fields. Suburban development is installed in the spaces of the farm. Infrastructures (including road and hydrology systems, as well as topography) inform the development. Road systems are regularly maintained and added to, as is evident in the study of urban development in City of Frankston and Altona Meadows.

In City of Frankston and Altona Meadows the primary roads are often original horticultural roads and remain to form the dominant road structure. The memory of agricultural road is maintained and road infill starts to occur. Secondary road systems are designed to connect the neighbourhoods. Road scales are characteristic of the development. Shifts in the minor road systems as investigated in the section titled urban evolution are the flexible and shifting patterns of road systems operating within the original scale of the agricultural system. The characteristic at the neighbourhood scale are representative of current trends as is the case with the vast court development in Altona Meadows.

The research suggests a similar approach. Primary roads that carry majority of traffic and are afforded substantial easement spaces are privileged and could accommodate service roads. Current major farm access road systems would be sealed and due to their characteristic to accommodate to the tractor turning circle, could accommodate new programs of residential development. Curvilinear road systems provide a response to this strict rectilinear form of the agricultural road systems. The curvilinear nature allows for shifts in alignments of house to respond to view and aspect as required. In the case of Altona Meadows the court road type became the device to orientate homes and direct traffic. In this research, horticultural production and understanding of its permanence inverts the condition of Altona Meadows and orientates houses towards the fields. If the condition of horticultural production is understood as fixed, then landscape responses can be employed to engage with this condition.

URBAN EVOLUTION

Minor roads are vulnerable to approaches to suburban road developments. This is illustrated in the development of Altona with a broad range of suburban developments each contextualized through their construction time frames. Many of these systems are experimental in their own right however are often driven by marketing approaches. The Court as illustrated in the layout to the left is evidence as a marketing approaches drive the layout of the road system.
As the gap between Melbourne and Geelong has diminished, the Werribee South region has become surrounded by booming housing developments. A number of development typologies exist. The two extremes of these occur where a. lifestyle is marketed through a recreational activity, and at the other end of the scale, where b) developers look for the greatest number of lots per development space. The current lifestyle developments or low yield model, have a range of personalised architectural types; the high yield developments have a set number of housing types.

The recreational housing development is often situated around particular landscape features. They often include water, in particular lake or wetland systems. Houses that are fronted on to the spaces have a greater monetary value. You wake in morning to the sun coming up over the water, or you have an evening drink as the sunsets over the lake frontage property. In the case of the recreational model it suggests you don’t need to start the car to get to golf. Walk straight on to the fairway and tee off. In the case of Werribee south could the experience of living on the edge of the horticultural production space draw on understanding what sin season before you head off to shop for produce? Could the idea of waking or having the sunset experience relate to the sun setting or rising over the summer crop of lettuces?

The current low yield development, marketed through golf, is curvilinear in its response to the lake it surrounds. Houses are positioned with a strong relationship to views, aspect and the lake edge. In many cases, the artificial waterways dictate the alignment of houses, which are generally well-sited within surrounding garden spaces. Title boundaries are less rectilinear and allow for irregular alignment of homes. They offer premium lifestyle quality and are priced accordingly.

The low yield model currently on offer in neighbouring suburbs has minimal response to environmental conditions. Access to landscape is less resolved. Space doesn’t allow for these qualities to be explored. Houses have clearly defined front and rear garden spaces with only 1200 mm access each side. In some situations, party walls economise on structure, providing access down one side only. Both models offer on-site parking. The low yield model shows little environmental response and poor solar penetration to the internal spaces of the home as a result of the tight spacing of buildings. Houses are very much in alignment with title boundaries and rectilinear road systems. An advantage is that they are substantially cheaper than the low yield models.

More recent developments or renovations have greater opportunity to engage with productive landscapes through second story additions.

Fencing is still the response to territory, facades primarily respond to road frontages and in many cases roads and residential property meet with little engagement.

Redundant dairy facilities have now been either left idle or appropriated for the market garden industry.

Second storey homes with are more likely to engage with views and light afforded by production fields.

Historical homes show little engagement with site other than road frontages.
Neither, the low yield model or high yield model shows evidence of previous horticultural occupation of the landscape. However, the low yield model focuses on a redundant salt mine, now developed into a lake. In a sense, the central lake becomes the focus of the homes and provides opportunity for irregular house siting. The external boundary of the Werribee South site is inverted where build-able land exists. The developers assume that, at some point, an adjoining development will take place. The north boundary is on a water course and invites alignment of houses both to the view and the northerly aspect.

The model suggested for the horticultural production residential developments could address both extremes and therefore price ranges. They could include both low yield, high yield models and apartment buildings. The decisions of which model would be considered would be site driven as suggested through the three sites in the synthesis process, page 47, however the view of horticultural production is privileged. In zones abutting water systems, the view of the water systems would be privileged. The rectilinear nature of the market gardens creates a condition similar to the high yield model and may rely on curvilinear road systems to offset this condition. In conditions where selvage restricts the curvilinear nature and housing models are required to offer high yield model, then corner allotments and multi-storey homes on inner streets could offer over-view to fields. The limit to multi-storey homes is limited by over shadowing issues. Aspect in terms of horticultural production is a limiting factor. The desired housing typology needs to engage with horticultural production. Other landscape devices could employed to further this relationship between horticultural production and residential development as is explored through the three insertion points for synthesis process and the scales.

The devices considered could explore a range of fence treatments, including no fences, shared or body corporate landscape spaces, habitat spaces and cross programmed recreation spaces. Wetland systems that provide access to site water and filtrate horticultural waste could offer conditions suitable for recreation. All of these spaces are subject to the opportunities the selvage space could offer and would be depend on adjacencies and available space. Could the proposed market garden typology offer similar qualities to the lake and golf course system?
The investigation of both Indonesia and China was selected to explore approaches to the relationship between residential development and horticultural production. Both countries show differing relationships to production lands through units of production. In the case of China the entire country was reorganized according to a fixed unit of land that was to feed the family. The landscape changed in a very short period of time to privilege horticultural production. As a result of the relationship of family and their small parcel of land the need to live on the land or close was imperative. In Indonesia the relationship is similar however the land unit sits within the broader landscape according to requirement to grow a particular crop. Both models provide opportunities to explore the connection between residential home and the field and the activities that are accommodated between the two programs.

This research focused on field work in China and Indonesia – investigating and documenting different scales of land use for market garden production systems, and interviewing farmers. An understanding of production units allows the farmer to gauge the efficiency of production from year to year. It offers a predictable production model where inputs (in terms of fertilizer, seed and water) can be administered in such a way as to understand and, in some ways, predict the harvest; and therefore anticipate profits.

The case studies present a range of conditions and relationships. In the MU the farmer operates in a system of maximum land use. All land is farmed and very little space is offered for servicing of production. In many cases only walking tracks exist between fields. In the ARES the condition is different, service spaces around productive plots provide conditions for other activities. The plots although intensively farmed operate in a landscape where supervised grazing can freely occur around plots. Both case studies demonstrate opportunities in a scenario where all titles were removed and a new, efficient land unit applied (MU). They show how horticultural production spaces are colonised by the residential and that certain conditions carry through to the new housing development.

In China, the unit is the MU – a political division, allocating land to each rural member of the population, to farm and feed the family. In Indonesia, the ARES is the understood measure of land, the origins of which are cultural. What each unit-based production has in common is a shared understanding of inputs and outputs.

CASE STUDY CHINA
This exploration involves the testing of the selvage process with a different scale of production unit. The application of the Mu 6.6 X 10 and the Ares 10 x 10 on to a representative allotment of land at the Werribee south research site to explore how redundancy and efficiency responds according to these smaller increments of production.

The site chosen indicates the condition of irregular title boundary and the misfit of the hectare irrigation grid. In both cases the units create greater amounts of selvage. There are a larger number of parcels or production land or Mu’s and Ares that are actually cut into or not complete. This would indicate greater efficiency. However the overall parcels of land areas are far smaller than the selvage created by the one hectare grid. So the number of production units is high while the actually selvage area is low.

The smaller production units are however indicative of highly manual labour subsistence horticultural production model and in many ways creates a technological redundant model of horticultural production. If the technology of Werribee South was to be reversed and manual labour systems were to be reinstalled the smaller units of production would bring efficiency to the zone. The hectare grid could superseded in coming years and the grid reconsider.
A set of rules drives the process and exposes redundancy and the opportunities for insertion of new programs. The research privileges exact hectares to horticultural production through irrigation; this program is most reliant on the site's context (such as geomorphological condition to produce vegetables) and is therefore the least flexible.

1. Production grid

The production grid is a landscape organization tool to intensify growing conditions through production across the entire site. The grid responds to aspect and maximising growing conditions. The research takes this condition of production grid and reconsiders how it organizes the landscape to provide efficiency and expose opportunities for the insertion of new programs in the selvage spaces. The grid promotes horticultural production over other alignments and allows for management of the crop by maximizing a perimeter of horticultural production.

The production grid is operating with a method of production land that aligns the grid to the preferred east-west alignment of cultivation and production. Visible in the aerial photograph, the most desirable cultivation direction maximises vegetable growth rates by cultivating and sowing crops in a direction that operates with solar patterns. Intensively cultivated the landscape is precisely worked to reduce overshadowing through solar shadows created by the crop itself. The crop is aligned with the same path as the sun. The east west production grid alignment operates with this condition. It can be understood as an overall approach to aligning production consistently across the site.

The selvage method identifies redundancy and reformats land use according to efficiency. The method privileges horticultural production by allocating the irrigation unit across the site.

Selvage method rules:
1. Production grid: Application of 100 x 100 metre (10,000 m² = hectare) grid across the extents of the site.
2. Orientation & boundary: Orientation of this grid privileges title boundaries, aspect, Infrastructure & Cross programming
3. Syntheses: Three different syntheses are explored according to the above alignment.
4. Spatial Outcomes: Three further points of investigation are analysed as representative conditions.

Classification rules for selvage produced spaces:
1. Exact hectares remain horticultural production as a result of irrigation restraints.
2. Selvage with road frontages are allocated as residential, facilitating access.
3. Selvage with no road frontage is allocated as dairy as a buffer between the two programs and, with modification, could meet the local planning scheme requirements of access to public open space.

The research investigates production units across a range of scales and countries. It does this as a means of understanding efficiency for market garden areas through the process of selvage. It uses an understanding of horticultural production through irrigation production units and overlays this on land titles. The methodology exposes opportunities and redundancies in the horticultural system, wherein selvage can be deemed productive landscape and the insertion of other programs – residential development or dairy farming – can be considered. The clash between irregular land titles and modern streamline farm technology creates these opportunities.
Aspect offers an opportunity to insert buildings without issues of over-shadowing. Selvage on the south side of any production zone could be seen as the most desirable site for development.

Selvage that abuts existing infrastructure offers a different level of efficiency. Infrastructure in a southerly aspect zone would allow for narrow transition zones between two programs. Pedestrian networks would also affect the experience of horticultural production.

Controlling the selection of varieties grown in the fields presents another opportunity to manipulate the experience of horticulture. These could also meet horticultural requirements of crop rotation.

Manipulation of site topography develops false aspects. This assumes that the soil type on the site can accommodate grade.

The macro scale of the field could be manipulated at a scale that begins to address how the field operates over and above the previous scale in a manner that begins to address the opportunity of selvage operations. In the four manipulation shown are range of shifts in production methods has been considered. The adjacencies become critical and the relationship of how one affects the other dictates how some of the relationships could play out on the ground. The affects shift boundaries of operations backwards and forwards as consideration for over shadowing or equipment access begin to affect how scenarios play out.

Micro + Macro Explorations
2. Orientation & boundary

The Werribee South site offers various selvage opportunities due to its peripheral conditions; coastal edge, river edge and location between two major cities. The urban development on its fringes offers a range of typologies that could be explored on the site. This grid is aligned with title boundaries. It privileges the most dominant title boundaries across the site and exposes selvage that sits outside of regular title boundaries. The most desirable title boundary would be divisible by exact hectares, however this is not the case. When ownership of multiple title boundaries occurs then the condition is less important. Farmer’s farm across their land regardless of title boundaries. In the situation where ownership of parcels of land are not next to each other, and irregular to the hectare grid then the grid exposes these conditions. The grid system exposes and explores these conditions according to the grid system. The system also shows relationships with a range of irregular site boundaries. The boundaries on the site at Werribee South site are mostly water boundaries. The site is surrounded on three sides by water with the Princess Highway on the final western boundary. To the south and some of the west the Werribee River winds its way along the site edge. To the east and some of the south the coastline is also quite irregular. All of these boundaries have an impact on the title boundaries as in most cases the fields are cropped within meters of the waters edge. The grid affects the interface with water systems and creates selvage and therefore provides an opportunity for the inclusion of another program. As per the selvage rules in situations of road access, residential development is selected. In situations with no road access dairy farms are selected. The condition of the interface with the water systems interface is varied suggesting different levels of recreation, public access and activities.

Horticultural production in this grid alignment and the arrangement of production in a desirable east west alignment is not met. In some situations the crop would not be operating at optimal production condition. However this is the current production condition on the site at the present.

Seasonal crops drive a dynamic landscape that operates through a range of time frames dictated by characteristics of the vegetable in question.

Technology streamlines the growing fields within the one hectare production spaces.

Service spaces between fields vary depending on alignment to the crops and adjacencies.

River frontages dislocate the efficiency of production and promote a condition of selvage.
Privileging selvage along coastal areas offers the developer marketing opportunities.

Privileging selvage according to aspect (as it relates to horticultural production) allows for new parts of the area to be developed that may not normally be considered. Southerly aspects allow multi-storey developments without over-shadowing. In fields where horticultural production is to occur to the boundary of residential development, only the southern side can be built above one storey. Buildings on the north side would cast shadow on to fields. The heights of buildings on this side of the field define the edge of the field.

Privileging selvage along coastal areas offers the developer marketing opportunities.

Privileging selvage around towns would allow for the extension of infrastructure from the existing urban fabric and bring economic benefits.

Privileging selvage near existing infrastructure areas, such as roads and streets, allows for evolution of the town infrastructure and, therefore, development of community by offering marketing angles.

The urban macro scale of the horticultural production zone considers features of the site in its entirety. It starts to consider the site through conditions that operate only through residential development, and privilege this one program at this scale in an opportunist manner.

In the case of residential development edges of water system, infrastructure and aspect become the most desirable. The explorations assume all of these spaces would occupied at this scale by the singular program with outcomes that seem in most investigations to create a facade to the dominant site program of horticultural production. Because the residential program is dependent on abutting other programs the residential zone has the tendency to spread across the site in a linear manner. Occupation of the site privileges a range of edges.

URBAN MACRO INVESTIGATION

MICRO + MACRO EXPLORATIONS
The irrigation grid was tested on the Werribee South horticultural production site. The grid exposed a disjuncture between irregularity on the site and possible selvage. Selvage is understood as offering space that can also be considered production space. It brought efficiency to the main program of horticultural production. The three synthesis investigations offered an exploratory approach to the alignments of the irrigation grid on the Werribee South market garden site. Each of the shifts in grid alignments privileged one particular force on the site. These forces include title boundaries, solar aspect of production, and infrastructure. On its own, each force currently contributes to site operations and inherent efficiencies.

The proposed alignments of the grids suggested through the research have been selected for a number of reasons. The first of these – title boundaries – are important legal perimeters of production. They are by far the most definitive in terms of production edges. Produce from land other than that of the farmers’ is, by law, the property of the land owners. Produce grown outside of the title boundary other than through agreement can be claimed by someone else. In most situations, this edge or title boundary defines where cultivation will be operating. However, these boundaries are also dubious. Fence lines are often assumed to be title boundaries and often they are but, in the case of horticultural production, fences are mostly either non-existent or in disrepair. Some have been removed and others have been rebuilt on assumed existing lines of title boundaries. As lands are not regularly surveyed, title boundary locations are blurred. In the research the need for fences is reduced to facilitate free movement across the site. Landuse and materiality could offer delineation of users and therefore land ownership.

Assets understood as infrastructures are also reasonably permanent. Often, they have the added condition of requiring easements. Sewage, water, power, roads, and drainage are critical to servicing horticultural production space. In this synthesis, road systems were chosen as an offset point from the grid. This application of the irrigation grid privileges residential development by allowing road junctions to create selvage. The road systems allow cross programming to occur through amalgamation of easements. The spaces when combined allow for proposed programs to be accommodated and for these spaces to become important access routes for recreational networks and current mixed vehicles.

The third application of the grid responds to solar aspect of horticultural production. Regular production aspect allows for driving north-south along rows. This is not the case across the entire site; in some cases, efficiency within the title boundary is driven by opportunities to restrict turning machinery and to minimize turning circles. In situations of multiple adjoined hectares, the efficiency is lifted. Small-sized machinery allows irregular parcels of land to be worked more efficiently, but machinery sizes are generally as large as possible to ensure maximum machine contact with the field and lower labour usage. Smaller machines are more labour intensive. This approach privileges horticultural production efficiency by ensuring that all fields operate at maximum efficiency in terms of solar aspect.

SYNTHESIS EXPLORATIONS
3. Infrastructure and crossing programming

The infrastructure grid aligns to major roadways across the site. These are secondary road systems that provide major links to the external road systems such as the Princess Highway on the west of the site. The secondary road systems carry the most traffic within the site and service heavy transport such as transport trucks shipping produce to markets and further distribution points. By classification, secondary roads have substantial lanes and generous road shoulders. They also provide space for other infrastructures such as open water channels, power lines, drainage swales and underground services such as gas and telephone lines. They are wide road systems and could accommodate further pull off or minor residential service road systems. In these locations the grid alignment privileges residential development by ensuring the irregular hectares have road frontages. According to the selvage rules this condition is assigned residential development. At major road systems and in locations where the infrastructure is not perpendicular to the grid, more selvage is exposed and residential development is privileged. The model would suggest intensification of residential program at these types of road conditions. Further intensification occurs on other road systems where title boundaries clash with roads. The model generally creates a residential zone along the edges of road systems only as is suggested by the rules of selvage.

Overall

The lifestyle in Werribee South could be marketed to urban residents as a rural model. The homes would respond to suburban models of medium density. Exploring the potential for residential development, dairies, and horticultural production to symbiotically co-exist and be cross programmed on the site carrying an implicit suggestion that all systems would undergo minimal adjustment. The market garden experience is imperative to the research.

Selvage space creates inefficiency of cultivation or market gardening. These spaces vary in size, shape and location across the site. Selvage seems to be more prevalent when the title of the land parcel (and therefore the field) is adjacent to an irregular boundary. Around this site, the hydrological boundaries are the most critical in terms of irregularity. Major water systems are, in essence, natural and have not been straightened mechanically. These conditions are also exposed through selvage process for cross programming. The nature of the loam on the site creates a naturally variable edge. Supply water systems for irrigation within the site are mostly channelled to ensure the water movement on the site is a closed system, allowing the greatest possible control over the application of moisture for production. These channelised systems create redundancy in their relationship with production fields, but also with larger infrastructure elements that cross the site, such as roads and power supplies.

This redundant land offers a range of possible insertions of new programs in these spaces according to the grid processes. The redundant spaces in many ways dictate the point of insertion and define limits as to how other programs can operate. The opportunity for reprogramming these spaces is already shaped by their relationship to production. Obviously the spaces vary according to their dimensions, locality, shape, location, adjacencies, current requirements, and grade of each piece of redundant land.

The grid applications all privilege different outcomes and would format the landscape differently. What is critical is how the alignment of the grid occurs and what it reacts against according to the location of the element it is offset against. Clashes of the grid creates selvage. Selvage is assigned across the site differently according to general infrastructures; such as roads and hydrological systems and at each location the cross programming implication is different. However horticultural production is potentially the common feature. It is always one hectare or multiples thereof. The conditions around the hectare increments change.
In Indonesia, a 100 m² land unit known as the ARES (10 x 10 metres) operates in a similar manner, however, this unit of land ‘floats’ in space. It doesn’t dictate the areas it occupies. Often the space around the ARES could be farmed but isn’t, for particular reasons. The ARES is only important for understanding inputs and outputs of horticultural production. The harvest is understood by produce volume extracted from the ARES. Indonesia contributes to the research by offering another condition of selvage. If the Chinese models consume the entire landscape as the MU where production land is privileged over selvage space, the ARES is the inverse. Production land sits within a space that is not productive and in a sense is selvage to the production land. These two extremes provide alternative conditions to Werribee South. The research considers the conditions of each.

In the case studies examined, land ownership is not by the farmer, rather by either the government in China or a silent owner in Indonesia, who receive half of the profits after costs have been covered. The Chinese crops feed the families who farm them. Any additional produce might be sold to supplemental other family necessities.

Residential development in this case study offers a range of design responses to its adjacencies, exposing the processes and value in developing what is essentially the same site. In the case studies undertaken on subsistence-based farming, residences engage with farm plots in both a temporary and permanent manner. Subsistence-based farming relies on observable horticultural production for security and monitoring of the crop. Some homes are built within the field, suggesting ownership for extensive time frames (China). Temporary accommodation structures are built specifically for intensive farming times such as sowing or harvesting when timing is critical (Indonesia). This engagement with the field exposes the process of farming.

The Indonesian ARES plot is intensively farmed with manual labour and may have a large unused area around it that is used simply to service the land. In the case of rice production, the service space may be used to control water for flood irrigation techniques. Interestingly, farming is dominated by females and, in most cases, run by the mother of the family. The father may have a different career and, therefore, another income stream less dependent on seasonal production successes. The farmer has agreed rights to use the land for periods of time (generally around ten years). However, problems often occur when owners sell off topsoil as fill and farmers are left without the friable topsoil nurtured over their time of land use.

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Cross-programming

The relationship between horticultural production and residential areas has been mostly lost. Previously, these programs coexisted due to: the laborious nature of production or tending the fields, the amount of land that could be reasonably tended, and the technology on offer to get to and from the field. Historically, they were connected, but changing technology and planning laws have divided them. Planning laws deemed these two land uses unable to coexist on the grounds that they have conflicting requirements.

The amalgamation of horticultural production zones with suburbs proposes a new urban typology that retains the connection between local production and community. Could experiencing production in this form brings value to both stakeholders? Production zones could increase their capacity to deliver food as a necessity and a commodity, and residential developments would be connect to a dynamic landscape. Currently, the relationship of residential areas with primary produce and its source is fragmented. In the past, market gardens were fundamentally important in sustaining a sense of local community. Today, this connection has shifted to the retail experience or shopping mall. Seasonal patterns of produce supply could also contribute to the fundamental nature of community. Has this shift been translated to sale cycles dictated by economic trends and, in some degree, to the festival calendar? By offering another time system (a produce calendar), it exposes different opportunities – time frames through which the community can be understood, and with which it can set up new relationships.

Market gardens are valuable green spaces and part of a broader productive landscape. The scale of market garden spaces could accommodate residential recreation in and around such spaces, while at the same time exposing production to the residential experience. For many, the production process remains invisible – accessed only on supermarket shelves. With production exposed, both the monetary and non-monetary value of the produce shifts.

Suburban market garden typology could be about the physical engagement with the ‘working landscape’. Current interfaces with production landscapes assume peri-urban areas will eventually shift and be replaced by more suburban houses; layout therefore responds accordingly to current marketed design typologies of the suburb with minimal reference to previous land use. Fronts of houses regularly address streetscapes. Designs of facades don’t respond to aspect or views over neighbouring horticultural production zones. By formalising this relationship, the physical engagement of the suburb with the working landscape could be seen as the revival of the historical village typology or subsistence farming – the relationship previously experienced with surveillance of the crop. The model no doubt requires consideration of refined design sitting of homes but celebrates the rural rather than forcing an interface through urban densification. If adjacencies are guaranteed not to be suburbanised, then potentially there could be a willingness to build houses that address views, without the fear of being out-built at a later date.

Werribee South is a large area of production land. Other redundant urban farms have been developed as farm theme parks, in many ways the have surrendered to market forces and offer a shift in economic focus from production to display as a means of conservation. A new suburban typology would present a chance to preserve a production zone and justify its existence economically. Many suburbs are built on highly productive landscapes in circumstances where only economic decisions are made. The nature of the research is to test the idea of a horticultural suburb.
Irrigation responds to water use efficiency and the height of crops. The majority of the crops grow to a maximum height of one metre and, therefore, set the irrigation heads at this dimension. However, other forms of agriculture engage technologies with different efficiencies and outcomes. These explorations require the irrigation systems to run for different times to deliver the same flow rates.

The edge conditions of each are variable and offer different effects. The symbiotic condition responds variably to different technologies. In some instances, the definition of the edge of the field could be altered, depending on water application methods. Large irrigation heads create an irregular irrigation edge. Low-flow systems would require the system to run for longer, affecting access. New technologies in irrigation could even conceal this process altogether, allowing for closer proximity; the edge of the field would be defined not by the throw of the irrigation head but by the final plough line.

**IRRIGATION INFRASTRUCTURE**
Infrastructure sections are broad and expose intensity of different systems, such as services, utilities, roads and hydrological systems (the red sections underlined). The broad section lines indicate (at the correct scale) zones where a number of infrastructures or utilities exist and at points where they are intense through the section. They offer suggested insertion points for residential development, based on the concentration of infrastructural systems. The greater intensity of infrastructures or utilities suggest the more resourceful the location and economical the setting up of a residential development could be. These approaches assume that development is attracted to locations where existing infrastructures and utilities can service the new development. The more utilities available to the developer, the greater the design and economic advantage of proposing a residential development at that particular point.
The site consists of a range of components that respond to existing conditions on the current site. These components reflect infrastructures and aligned according to the location of these infrastructures. They include road systems and hydrology systems. Very few site components exist outside of this framework of infrastructure. The selvage method would distort this condition as the grid reacts against the range of edges and infrastructures. The new conditions of site componentary could increase across fields in location where title boundaries are dense. This shift in components is illustrated through the three synthesis explorations in this research.
ALIGNING THE SELVAGE GRID TO PRIVILEGE HORTICULTURAL PRODUCTION
Grids are aligned to accommodate cropping alignments in an north south manner
Synthesis 1 – The grid is aligned to horticultural production (privileges aspect of production)

Edges and roads attract residential development
Housing hectares increase by 300%
Population increases as a result by up to 400%
30,000 new homes

Selvage rules:
1. Exact hectares remain horticultural production (dark green) due to irrigation restraints.
2. Selvage (areas less than 1 hectare) with road frontages are allocated as residential (grey) to facilitate access.
3. Selvage with no road frontage is allocated as dairy (light green), a buffer between the two programs. With modification, this could meet the local planning scheme requirements of access to public open space.

Application to the entire site shows the effect of the grid alignment in each scenario, offering different adjacencies and, therefore, different symbiosis conditions.

By applying the grid to the entire site, the extent of each program can be seen. This models suggested which land use would be dominant and the effect this mix could have on the horticultural production industry. The synthesis also suggested opportunities across the entire site for symbiosis, i.e. the extent of new edges each synthesis model offers.

The synthesis investigation shows how the hectare grid is applied to the entire site and the consequence of then assigning programs according to the selvage rules.

Key to colour codes are applied according to the following rules:
1. Exact hectares remain horticultural production (dark green) due to irrigation restraints.
2. Selvage (areas less than 1 hectare) with road frontages are allocated as residential (grey), facilitating access.
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Synthesis 1 – The grid is aligned to horticultural production (privileges aspect of production)

Edges and roads attract residential development
Housing hectares increase by 300%
Population increases as a result by up to 400%
30,000 new homes
One hectare of the high yield model offers 15 new homes (refer to the image of high yield subdivision in insertion one). This offers the potential to strengthen links for the Werribee Township beyond the site.

Horticultural production is reduced by 60% but efficiency is increased. This reduction questions the potential viability of horticultural production in this synthesis. Potentially, crops and production could shift to more valuable crops with higher returns.

Horticultural production is separated by shadowing; suggesting the experience of land use would be different for the new population transiting the site daily. The requirements of horticultural production would be less in this zone and other programs privileged. Overall water requirements for the site would fall as a result of less horticultural production, allowing for some hydrological systems to be either removed or reprogrammed.

Dairy dominates the site; minimal roads offer more open space and public access in places that are currently restricted by horticultural production.

This model created a shift away from horticultural production, allowing infiltration of residential development in a manner that reflects current occupation. This outcome indicated a loss of horticultural production that would lead to radical changes in the nature of the site and its current operation.

SYNTHESIS EXPLORATION #1
ALIGNING THE SELVAGE GRID TO PRIVILEGE TITLE BOUNDARIES
The grid is aligned to dominant title boundary direction across the site.

SYNTHESIS EXPLORATION #2
Synthesis 2 – Grid aligned to title boundaries

Increase in residential development over previous synthesis
Population increases by 600%
New homes increase to 47,000

Key to colour codes are applied according to the following rules:
1. Exact hectares remain horticultural production (dark green) as a result of irrigation restraints.
2. Selvage (areas less than 1 hectare) with road frontage are allocated as residential (grey), facilitating access.
3. Selvage with no road frontage is allocated as dairy (light green) as a buffer between the two programs and, with modification, could meet the local planning scheme requirements of access to public open space.
Upgrade in road systems as a result of the increase in occupation would require consideration. This would further divide the site; potential speed limits and service roads would shift the classification of the road systems to new formats.

Horticultural production is increased over the previous synthesis with a concentration in the centre of the site. Greater synthesis occurs between horticultural production and residential occupation, due to increased boundaries.

Dairy is reduced compared to the previous synthesis. This creates opportunities for either of the other two programs to operate at greater efficiency, due to greater capacity and size.

This model shows equilibrium between the programs. The horticultural production has been rationalised; it occupied exact hectares across the site and a specific zone of intensity in the centre. Residential development shares the interface with both programs in response to title boundaries. Title boundaries are fixed, although multiple ownership could allow for amalgamation. This lead to a change in the response of the grid and therefore the outcome.
SYNTHESIS EXPLORATION #3

ALIGNING THE SELVAGE GRID TO PRIVILEGE INFRASTRUCTURE
The grid is aligned against the major road system on the site.
Synthesis 3 – Grid aligned to dominant road infrastructures.

Decrease in residential development over previous synthesis
Population increases by 500%
New homes increase to 32,000

Key to colour codes are applied according to the following rules:
1. Exact hectares remain horticultural production (dark green) as a result of irrigation restraints.
2. Selvage (areas less than 1 hectare) with road frontages are allocated as residential (grey), facilitating access.
3. Selvage with no road frontage is allocated as dairy (light green) as a buffer between the two programs and, with modification, could meet the local planning scheme requirements of access to public open space.
As the dominant edge in each zone provides the setout point, the grid starts to change orientation of the fields. This condition is most noticeable in spaces where hydrology, title boundaries, or roads are irregular. Increased residential development from the previous synthesis results in roads now being almost completely encased in residential usage and the view of farmland concealed. Creating new facades of homes towards fields would be possible.

Horticultural production is reduced compared to the previous synthesis. An increase in the south of the site allows flexibility in production as the hectare module’s potential would allow amalgamation and consolidation, shifting the scale of horticultural practice.

This synthesis setout for the grid starts from dominant infrastructures and takes on the alignment of those objects. This mode suggests the most efficient way of developing fields relates to and privileges the dominant edge of space within that zone, regardless of title boundaries or horticultural production lines.

This synthesis enabled the insertion of residential development in response to the infrastructures on the site. The experience of the site would take cues from the current alignment.

This synthesis created particular zones across the site that privileged each program as the dominant land use. Although efficiency is met, the irregularity of the model suggests different edge conditions to the previous two syntheses.

SYNTHESIS EXPLORATION #3
SCALE OF OPERATIONS
Each interface (point where programs meet) of residential development and horticultural production can be understood through a range of scales. The interfaces suggest a mixed condition of participating programs at the junction of the program, where one program stops and another begins. The boundaries of these programs could become blurred. In some situations where infrastructure is required, consideration has been made to accommodate new programs on top of easements. The research also suggests combining conditions of programs into shared systems where possible. The symbiosis of programs varies, depending on availabilities at each scale. Residential development, horticultural production, and dairy share infrastructures in a manner that allows for integration of many of the systems they require to operate. Many of these systems are duplicated side by side in typical adjacencies and only converge at a regional scale, such as at the periphery of cities or rural townships. Residential development has requirements of circulation, open space, drainage and recreation, many of which are relevant to horticultural-based industries. Potential interchangeability allows the sharing of these systems and for programs to engage with each other within these systems.

At medium scale where road systems, drainage swales, water storage dams, wind breaks and buffer zones can be understood and articulated, opportunities for reprogramming and, in servicing both interests, can take on the form of either as required. Water systems could be combined to accommodate storage, disposal and recreation on the same space. Hydrological systems could be designed with residents in mind, servicing outdoor recreation while still holding, delivering, or removing water. Edge conditions could work at a aesthetic minimum for farms and additional planning strategies could address the amenity of residents. As the scale shifts, so do the conditions of the components and the subsequent relationships that develop. At the next scale, road systems could respond to increased collection points and speculative traffic flows.

The interfaces can offer a range of scenarios, depending on the differing infrastructures they accommodate. In situations where turning circles are required, differing materials in these spaces could delineate different users such as mountain bikers or recreational walkers. The interface is critical to how all programs coexist and operate together. The choice of materiality offers a system of identifying zones for different users while still accommodating the turning circle. It is here that the programs processes are exposed and negotiation can occur. The tractor needs to undertake the process of cultivation which are often muddy so therefore the mountain biker needs to negotiate challenging surfaces. Spaces have the ability to take on the processes of either or both of the two programs, or a symbiosis of the two. This research is interested in the symbiosis condition and opportunities in cross-programming these spaces.
Three insertion points (sites one, two and three) were investigated to expose redundancy and explore the selvage method through representative conditions. Two edge conditions, the coast (site one) and river (site two), and one central condition of road intersection (site three) offer points of difference for horticultural production. Each site has a quality specific to its location and evidence conditions such as title boundary, edge condition, and growing condition, as well as a range of possible residential development conditions and opportunities.

Site one, situated on the coast, with rectilinear road systems and regular title boundaries, maintained extensive amounts of horticultural production. Residential development exposed the coastal fringe. Dairy emerged in the centre of the site as a response to hydrological systems. The site still offered substantial amounts of horticultural production.

Site two, situated along the river, again exposed minimal redundancy of land use for horticultural production. The process allocated dairy to the river’s edge as a result of limited road access to this boundary. Both site one and two maintained similar outcomes to current land use and privileged horticultural production.

Site three, however, showed a propensity to residential development. Title boundaries and road systems in this location are non-perpendicular to the alignment of horticultural production. Again, dairy emerged as the next highest land use, with only limited horticultural production remaining. These outcomes seem to suggest substantial residential occupation or a township. Potentially, this efficiency rectification could offer a commercial centre for the increase in population evident in later models.

SCALE MEDIUM: OPERATION  _2
La Fayette Park, Detroit
Hilberseimer + Mies Van der Rohe
1956

Scale L precedent, La Fayette Park in Detroit is a garden city park system. Major buildings define both the boundary and the qualities of space, light, surveillance, and the views into and out of the park. Residents view the park from their homes. The park system operates at a civic level as public space and at a residential level as body corporate space for the residents of the apartments. The park is an extension of living space similar to the fields lived on and viewed by the subsistence farmers. The model of research suggests that the dairy could offer similar space to Werribee South residents as recreational space. The suggested model of apartment housing replicates a similar condition as La Fayette Park. The Recreational space is available to the public, however the visual ownership is taken by residential developments that view the space and have surveillance over it.

The population of the park is substantial given the footprint of the buildings. The park sits in alienation to its context, introducing a radically different program and density to what was a derelict industrial site. It offers the luxury of an expansive, green back garden in a high density suburb and shifts responsibility for the maintenance of this space to the local management body. The project replicates the population density of similar suburban areas, offering multi-storey apartment dwellings but positioning them in an extensive park system and expansive green space.
The three urban types have been inserted into the selvage on the road frontage in the south east of the site opposite the coast. Each allotment responds to the selvage condition at hand and provides a range of responses to the horticultural production zone. The high yield model privileges the largest number of houses to the interface as a result of the density it operates at. In this particular scenario the next layer of houses facing the streetscape are also privileged in that they have the opportunity to respond to the coastal view. The low yield houses as a result of the character of allotment size, capture both views of coast and fields. The final housing type apartments can operate without compromising the horticultural production as the aspect of the selvage limits overshadowing. It also facilitates free access to the fields and around the buildings as a result of shared common recreation space. All model is highly successful in this location.

SELVAGE INVESTIGATION SITE #1
The three models operate differently on this part of the Werribee South horticultural production zone than they did in the previous location. The high yield model forms a dense barrier to access to the Werribee River and would require the formalisation of access points to ensure internal houses could have pedestrian access to the river. The high yield model again creates a thin layout of homes that occupy the selvage that has been created on the rivers edge as a result of the methodology. With dairy in this location and homes only fronting available roads, a new interface of dairy, river and horticultural production are available. The low yield model also responds well to this site. The larger allotment size ensures exposure to all interfaces, with some selected blocks being privileged with access to all three at once, offering a hierarchy of site qualities. Some sites would be seen as highly desirable. The nature of the aspect driven sittings of homes responds well to the river edge by capturing river views. The apartment view is problematic on this location as a result of overshadowing. The maximum build height available would be a low number of stories and as the buildings gain height its setback to the horticultural field increase until the shadow cast restricts it siting. Estimated height in relation to setback would be around two storeys at some locations closer to the rivers flood boundary. Only two of the housing models would be successful on this location in the site due to the selvage method.
On this location the nature of the selvage method on infrastructure privileges residential development and restricts horticultural production. The interface opportunities are limited compared to the other sites. The high yield model takes on a similar characteristic that it does outside of the site. The nature of complex title boundaries and dense road systems compared to the rest of the site maximises the number of houses. This site is densely populated according to the outcome of the selvage process. The exposure to with dairy and horticultural production is limited. The low yield model is similar. Without edges to act against this model also is unable to engage with an edge as it has at Sanctuary Lakes. Both of these models essentially invert themselves against the broader conditions of site due to the nature of the abundant selvage created at this location. The apartment model is in a stronger position. The reduced amounts of horticultural production enables taller developments with no issues of overshadowing of fields. In this location the apartment model could operate through a range of different heights depending on the relationship to adjacencies and other apartment buildings. This location suggest dense building developments through the selvage methodology.
The symbiosis sections speculate on the spatial experience of synthesis experiments for the same location in each of three models. The sections provide a spatial framework for the interface between speculative programs. Some systems can be used by both programs with mutual benefit and associated spatial experience. The requirements of each address and take on the form of the dominant program. In areas where the hydrological system is concentrated, water systems could be cross-programmed.

The sections also indicate how redundant spaces are programmed, where pedestrian networks could operate in the interface of horticultural production lands. Farm tracks could be utilized for recreation. It also indicates how the research suggests site movement and changes as a result of new access, transiting, and exposure of new spatial experiences for residents and farmers. Hydrological systems are now accessible, when previously they were disconnected through horticultural production only occupying the site.

The residential experience of horticultural and dairy production processes (through use and views systems) vary. Once only seen and experienced by farmers, these systems are now exposed to residential occupants. The practices of each program influence how the others operate and are understood. Peaks and lulls alter the pace of adjacent programs. New time frames are imposed on programs that in the past have been mutually exclusive as a result of the planning laws that separate these programs. Time frames would engage on one program the activity of another as a new cycle that responds to a different calendar. Horticultural production responds to a seasonal calendar and residents to the cycles of the western year. Dairy responds to the cycle of the growing season and to the cow lactating. New hybrid time frames would emerge and continually change due to cycles in global systems and markets.

Dairy activity as indicated through the synthesis research is gated and fenced and a shift of herds facilitates public access. To meet public open space requirements of residential planning schemes, this condition needs to be exposed on the interface of dairy and residential zones. Herds moving across fields for milking seven days a week affect how the public open space is used. The symbiosis of movement changes how the spaces operate and are occupied.

The sections also expose some of the narrow spaces (previously redundant to horticultural production) that can now be active zones. The operation of selvage allows more of the sites to be occupied and facilitates diversity through the symbiosis created by cross-programming.

The sections indicate important hydrological systems as critical zones for cross-programming symbiosis. They are understood as fixed pieces of infrastructure that react to the grid and, in most situations, attract new programs. The new programs bring different requirements and, therefore, opportunities for the infrastructure to take on the conditions of the new programs. Recreation in these spaces represents an important urban intervention.

SCALE X-LARGE: OPERATION _4
The collages indicate the conditions generated by selvage as a rationalisation of horticultural production. The experience of rationalisation changes according to the infrastructures serviced. The rationalisation process: shifts and aligns programs, changes the condition they operate in, offers new boundaries with different adjacencies, and provides opportunities for programs to be aligned where they haven't previously. It brings opportunities for new production efficiencies through infrastructure sharing.
For instance, when residents return from work, an increase in traffic flows on roads will occur. The timing of this will affect farm operations. Peak hour and school hours become a consideration for systems of operation, taking on practices that avoid these times of day. Likewise, when farm machinery moves across the site, shared roads would slow down. In this instance, residents may choose to take other routes or accept this new condition.
SYNTHESIS ONE SITE THREE

SYNTHESIS TWO SITE THREE

SYNTHESIS THREE SITE THREE

SYMBIOSIS SECTIONAL COLLAGES
The primary question asked by this research is how can the research Selvage identify the redundant spaces in Werribee South’s horticultural production zone and provide an opportunity for urban intervention.

This research Selvage reconsiders the site of Werribee South horticultural production zone by rationalizing, reorganizing and reconsidering how the site currently operates and how it could operate if residential development and dairy were introduced through the selvage process. The methodology of selvage uses irrigation units to reform the landscape, to reconsider redundancy as an opportunity, to consider efficiencies, explore limits of land titles, investigate cross-programming, and reconsider settlements in horticultural production zones, in a site specific approach in Werribee South. The research operates across a number of scales focusing a range of approaches to reconsidering horticultural production zones.

The selvage methodology employed through this research uses technology to reorganize the landscape. Intensive horticultural production relies on advanced technology in terms of equipment and control over growing conditions as a means of minimizing risk in growing vegetables. The research brings efficiency to the horticultural production zone by ensuring each production unit is exactly one hectare. The selvage process where irrigation was used in this research has limits and in the case of Werribee South the hectare is identified as the limit, a current unit of horticultural production. The hectare grid is placed over the site and the site is reconsidered against what could be considered as a conflict of contemporary horticultural systems and site conditions. The conflict presents an opportunity to engage with new programs on the site according to the space and condition at hand. My understanding of the preciseness of the context as it reacted to the methodology was expanded. The context revealed qualities I couldn’t have preempted. The rigour of the hectare grid as placed over the site revealed these qualities as the site is reconsidered against programs being used. However this reorganisation exposes a range of redundancies when hectare units are considered through title boundaries, aspect and infrastructures. Irregular details provide further opportunities through the selvage method than traditional development approaches offer. This process through the research has provided a close insight into how the site operates and how when the grid is shifted the site reacts in different ways. The site context offers a range of outcomes through inherent site conditions.

The research considers redundancy as a condition to enable efficiency and as an opportunity to insert the programs of either residential development or dairy farming. The processes engaged through the research expose irregular spaces as redundant, and considers possibilities of cross-reprogramming and program coexistence on these spaces. Exploration of interfaces provided this intimacy of detail. Operating at scale allows the experience of the cross-programming to start to reveal the qualities on being in the conditions explored. The redundant spaces are made productive through the Selvage rules whereby different condition evoke different outcomes and a range of new experiences that reconsider the junction of the explored programs. The research also offers new ways of considering the conditions between these programs at Werribee South that in the past haven’t been valued.

The research considers cross-programming across the site and specifically at three locations on the site according to the rules established through Selvage. The outcome at each point is site specific and therefore different according to the location. New relationships at each site interface of programs such as shared infrastructures and ideas around public open space, offer opportunities to renegotiate operations between the programs in a mutually beneficial manner. Circulation on the site between farm vehicles and cars shifts the way in which they need to operate. Speeds would have to be reduced. Site operations would affect the actions of both programs. Minor alterations in how the site operates are implicit, however new ways of operating that are specific to the Werribee South programs could emerge. Mutually exclusive hydrological and road systems could amalgamate and requirements of each program as an example; recreation and vehicular movement, be reconsidered in light of mutually beneficial opportunities. Cross-programming offers the point of difference by exposing different program operations in a common space according to the site.

The settlement pattern offered in this research is specific to both the Selvage methodology, the mix of programs and the conditions offered by the site. The current site settlement patterns would become intensive on all edges including invisible boundaries generated though land ownership, as the grid reacts to these conditions. The new settlement pattern combines previously mutually exclusive programs through a process of selvage for a coexistence of these programs. The research explores how coexistence through shared infrastructures can be considered through each program and possible experiences as a result. The research offers a new model of residential development, horticultural production and dairy that is informed by the operations of each program. Site conditions drive the outcomes. The new model of settlement pattern could be used to reconsider existing horticultural production zones or to set up new site for the growing of vegetables. The model is transposable and is unique to each sites context.

The research has enabled me to understand the opportunities and conditions of horticultural production zones. It has exposed me to ideas of contemporary production systems and offered a way of combining and informing my current understanding of horticulture and landscape architecture. The research has enabled me to apply new approaches to complex systems and operations and reconsider programs considered to be mutually exclusive. By undertaking this research and engaging with field conditions the importance of site specific approaches has been evident. The research has offered me a way of challenging current planning schemes and to reconsider where people live, how they recreate and their understanding of global systems relating to food. The Selvage research suggests a coexistence lifestyle where the production of food is part of a daily experience.
EXISTING FARM BUILDINGS
MANY OF THESE ARE THE REDUNDANT DAIRY BUILDINGS THAT HAVE NOW BEEN APPROPRIATED FOR MARKET GARDEN PRODUCTION.

The site is littered with structures identified on the aerial image. These include farm houses, horticultural buildings, dairy buildings, nurseries, packing sheds, storage facilities and transport depots. The structures range in size, experience, and materiality, suggesting a range of quality and permanence. In most cases, structures are limited to single storey and seem to be a response to overshadowing. Privileged horticultural production is also shown in buildings located on road edges to reduce impact on fields and the loss of farm land.

The buildings primarily address road frontages and don't occupy selvage spaces. In many cases, buildings and auxiliary structures aren't built on selvage space when they could be. They are clearly visible on straight sections of the road systems where they are close to the road edge to reduce loss of production land through long driveways. They interfere with rectilinear title boundaries and, in turn, the irrigation grid. By moving some of these buildings onto selvage spaces, greater efficiency could be brought to market garden fields.

SITE INDUSTRY SPECIFIC STRUCTURES
The City of Wyndham planning laws require developments to provide public open space no further than 400 metres from each residential allotment. To test this condition against a generalised synthesis outcome (and assuming the project’s proposition of dairy lands are considered an alternative to public open space), a grid of 400 x 400 metres is placed over the site to indicate the distance from residential development.

Dairy pastures are considered a substitute for public open space. The operations of a dairy farm require cows to be milked twice daily – early morning and early evening. The herd is rotated across a range of paddocks. In organised production, the rotation of pastures is seven days (i.e. seven fields are required). Cows often require feeding when the growth rate of pastures is at its lowest in autumn, but the cycle of rotation continues. In this system, six of these fields are unoccupied at any one time and have the potential for cross-programming. Recreation activities are a possibility and could offer a new park typology. Park-like facilities could be applied without compromise to the pasture land.

In this diagram (where pale green represents dairy and public open space, and brown represents residential), the planning scheme is met. This may not be the condition over the entire space. If this model is applied, implications of land use could shift and privilege the condition of dairy. Dairy would increase to meet this planning scheme. Dairy becomes another force to shape the development and to self-generate as a result of this condition. Land use constituents would again shift and a redundant agricultural program increase.
Site One

The experience of this site doesn’t change from the road edge, which is currently occupied by horticultural production. In this situation the selvage process has no effect on the experience of using the road. The visibility of horticultural production has not changed as a result the selvage processes in this location.

Insertion of dairy in the centre of this zone would not be seen from the road. The residential development inserted on the road edge according to the selvage rules in this part of the site screens the view. Minimal infrastructure would come into the view as fields require fencing to secure grazing animals. New infrastructures for moving the herd would occupy existing easements. Once again, these are in the centre of the zone, the internal spaces within the site, around existing water channels, which run through site one. Public access would remain as it does now with no access in the current view. The condition of access to the fields is different from the other side of the site where residential development aligns with the road. Access to the fields is serviced by dairy that is isolated form the road edge by horticultural production.

New farm infrastructure would be required to service the dairy unless existing dairy infrastructure could be revitalised. However, no residential development is proposed for this side of site one according to the outcomes of the selvage process.

The condition of symbiosis is only apparent within the site at the junction of horticultural production and dairy. Here, the hydrological system a service current land use and is important as a circulation route. A new relationship commences. Two farmers will need to negotiate how the space is managed and accessed. This experience of the site would remain in much the same condition as is currently experienced. However the view of cows and fences would be visible form the road edge. Access to the dairy land as public open space would occur from the adjacent boundary as interface with residential and dairy provides this opportunity.
Site Two

The interface between dairy, residential land uses, and the Werribee River currently offers limited access by road infrastructure. This condition of minimal access privileges dairy and restricts the infiltration of residential development according to the rules of the selvage method. Residential development requires selvage with road frontage. This relationship privileges public access and allows the existing experience of the river's edge to be maintained, at the same time allowing long views that currently exist to continue. The river is currently accessible to the public for recreation. The limited infrastructure of dairy would also ensure residential development is kept further away, maintaining the amenity of the river. Dairy lands are assigned to space that has no road access. Dairy land is considered public open space and accessible through existing public open space systems such as the river easement or residential zones.

In this zone, in the west of the site on Werribee River of residential, dairy and horticultural production, the selvage rules offers the conditions of all three programs and creates a shared interface condition. A fourth condition of the Werribee River flood plain (and associated river frontage) involves an additional interface; management by a government body elevates different priorities and avoids possible conflicts of those within the site. The river verge remains in its current state although, over time, insertion of residential development may bring changes in the vegetation.

The interfaces visible within the site occur between residential development and dairy. As these spaces are not exclusive to residential traffic, occasional farm machinery is anticipated. The farm roads will remain and service pedestrian traffic as the space rotates between dairy and recreational use. An intensity of all three conditions occurs in particular in the west of the site with the interface of the Werribee River and in a location with restricted road access. The river is currently isolated by horticultural production zones and is not paralleled by a road system. Pedestrian access is the common means of access currently in this zone. The research will increase this condition and offer new experiences as the proposed programs negotiate how they operate through new relationships of production and occupation on this part of the site.
Site Three

The road intersection in this location and central to the site was previously only occupied by horticultural production. It operated in a redundant manner as a result of limited access for new horticultural machinery due to the number of corners in the horticultural production lands created by the road system. Horticultural production was absent from much of the adjacent land in the intersection itself due to the nature of allotment shape clashing with the machinery turning circle. New technologies require generous operating areas around the edges of the field for turning space. Turning circles cannot be accommodated by narrow sites as is evident in the existing condition. The research reprograms these spaces and inserts residential program. The intersection now becomes a residential development and the horticultural production space loose land but gains efficiency.

The residences have changed the nature of the experience of the intersection and closed off previous views to the fields that driver previously had. The new experience is of a built up area made up of residential housing. Access roads between houses offer entry and exits to the fields for farm machinery. Residential traffic is serviced directly from roads.

The veneer of residential development on the road edge obscures the view into fields from the roads and occupants of passing vehicular traffic. It potentially provides a buffer to horticultural production from strong winds on the site. The experience of the fields has now shifted from the road edge and privileges the experience of the residential interface. This new interface offers opportunities for symbiosis; depending on the model of residential development, the spaces between these two land uses can be negotiated for mutual benefit. This space can be programmed to allow recreation up to the edges of the field, while still allowing either program to maintain integrity. This new condition brings further efficiency to the horticultural production by dealing with the corner by cross programming the site. The selvage methodology allows for the insertion of residential development on redundant horticultural production lands. The space was previously farmed inefficiently has now been cross programmed to and in the process brought efficiency to both programs.
Horticultural access systems

The shift from redundant field to efficient hectare units requires either a new infrastructural system to service production, or cross-programming of existing horticultural production systems. The current horticultural production system responds to land ownership and often duplicates systems to service different owners. This research in the south east of the site would allow the symbiosis of infrastructures within a program. Although land ownership is still unclear, multiple hectares within fields require temporary tracks to delineate and service production as crops are cultivated. This research also contributes edges to residential homes. This track edge defines the zone interface of residential occupation and horticultural production and offers access to both the residential and farming zones by engaging occupants through the sharing of minor road for recreational purposes. The residential home could still have some formal landscape response to provide buffer to the processes of farming where this buffer could provide further recreation opportunity or habitat zone. It could connect into broader hydrology systems on the site, such as coastlines or rivers and offer benefits to horticultural production by providing biological controls. In locations such as this where an existing windbreak protects the fields form coastal gusts, the residential development could be the new device to do this. Efficiency could also contribute to the site by allowing the boundary between the two programs to accommodate tractor turning conditions. This new boundary would replace the previous rigid incompatible boundary.
I. Rowe, Peter Towards a middle landscape, The MIT Press 1991
II. Wright, Gwendolyn, Building the Dream, The MIT Press 1981
IV. Oase, #63 Platte land, Countryside, 2002
V. Schumacher, Patrick Productive Patterns, March 1997
VII. MVRDV, The Regionmaker, Stadt Baukultur NRW
VIII. MVRDV, Metacity data town, 010 Publishers, Rotterdam 1999
IX. Sutherland, Lyall Designing the new landscape, Thames & Hudson London 1991
X. Edge Publishing, The culture of landscape architecture, Dept of Planning & policy, Australia 1994
XI. Appleyard, Donald Liveable Streets, University Press 1983
XII. Freestone, Robert Spiritied Cities, Federation Press 1981
XIII. Mumford, Lewis The city in history, Penguin Books 1973
XIV. Editorial Lotus, Temporary #122, Lotus Books, 2004
XV. Raxworthy, Julian & Blood, Jessica The Mesh Book, RMIT University Press Melbourne 2004
XVI. Kirkwood, Niall The weathering + durability of landscape architecture, Wiley, New Jersey 2004
XVII. Berrizbeitia + Pollack inside/outside, Rockport 1999, New Jersey 2004
XVIII. Hugget, Frank The land in Question, Thames & Hudson, London 1975
XIX. Pierluigi & Repists, Dictionary of today’s landscape designers, Skira, Milano 2003
XX. Schroder, Thies Changes in Scenery, Birkhauser Switzerland 2002
XXII. Academy Editions Landscape Transformed, Academy Group London 1996
XXIII. Izembert & Le Boudec Waterscapes, Landscape series Spain 2003
XXX http://www.dse.vic.gov.au/DSE/nrenpl.nsf/LinkView/C2EDFA104704258CA256DC007C86B6871613792EC652A9CA2572CF007B8197