



MACE RANCH INNOVATION CENTER Sustainability Framework

Davis, California

SUSTAINABILITY FRAMEWORK

Measurement & Verification

To achieve sustainability goals, MRIC is committing to sustainability measures that are impactful, achievable, and verifiable. These measures are intended to inform and evolve, providing a platform for research, experimentation, and the advancement of long term sustainability goals that can be scaled citywide.

Sustainability measures include:

- Green Building: Adherence to the California Green Building Standards - Cal Green Tier 1, adopted by the City of Davis, has been assessed widely and considered equal to LEED™ Silver rating system
- Higher standards where possible, utilizing metrics from additional rating systems
- Project specific metrics that address the long term goals of the City of Davis
- A “district” infrastructure system that radically improves resource sustainability for the site and potentially beyond
- Innovative transportation infrastructure that prioritizes bicycle, pedestrian, and low carbon
- A Low Carbon District at the heart of the project
- Zero Carbon Energy at full build out
- 70% potable water reduction vs. conventional
- Integrated ecology and enhanced nature access
- Functional agricultural uses within the project

These commitments are described in the main body of the Sustainability Framework and quantified in the appendices. Together these form the basis for sustainability targets, and are accompanied by a strategy for monitoring and verification as development is implemented.

In addition, Four Initiatives are put forward for partnership to catalyze long term community benefit off site, and the Six Elements create the narrative and critical drivers of a Sustainability Framework that will enable on-site targets and goals to be met.

4 COMMUNITY BENEFIT INITIATIVES

1. Energy Infrastructure

Utilizing a district microgrid approach to energy leverages co-optimization of energy efficiency, battery storage, renewable on-site energy generation, grid and CCA integration, and technology applications. A Smart-Grid software platform ensures high performance and captures data to measure performance and support research efforts. Energy efficiency within both public and private spaces reduce demand by 40% over Title 24 requirements(2008). 14MW of solar PV generates at least 50% of power on site at any given time, with a target of 100% carbon-free energy by 2050. Thermal exchange, digesters, waste recovery and other systems are supported, providing unique and efficient access to waste-to-energy research facilities.

2. Water Infrastructure

As with energy, reducing demand is the first critical step to sustainable water management. Rather than pursuing on-site water neutrality, MRIC will reduce potable water demand by 70%, utilizing groundwater wells and/or recycled water. This will not only enable the project to eliminate the use of potable water for non-potable demands, but potentially provide that capacity to adjacent neighborhoods as well. This includes working with the City to bring a municipal recycled water line to East Davis; MRIC is offering more than a mile of municipal scale recycled water supply line for this effort.

3. Low Carbon District

Proposed is a “Low Carbon District” that explores scalable strategies for achieving Davis’ goal of being Carbon Zero by 2050. This district within MRIC highlights limited accessibility for internal combustion vehicles and features a bicycle, pedestrian, and electric vehicle gateway at Mace Blvd and Alhambra Drive. The ability to limit vehicles with carbon emissions is dependent on minimum electric vehicle trips, and is only possible within the constraints of the transportation and congestion management plan. All parking will be e-ready and an electric shuttle bus will provide internal transit. Buildings within this district will be incentivized to have low energy consumption and strive for ways to demonstrate Zero Carbon operations.

4. Ecology & Bikeway Connection

Proposed is a new riparian corridor and east-west bikeway that incorporates storm drainage and Swainson’s Hawk nesting habitat as part of a regional blue-greenway. Through partnership with community stakeholders, an alternative safe route and recreational opportunity can be created to connect Davis to West Sacramento, the Yolo Bypass and adjacent recreation destinations via MRIC. This proposed riparian corridor also creates a habitat link that runs through the core of the MRIC, bringing opportunities for passive recreation, biodiversity, and sense of place within the Ecology Axis.

SUSTAINABILITY FRAMEWORK

An “Eco-Innovation” District

In response to aspirations set forth by the City of Davis and feedback provided by the collective Davis community, Mace Ranch Innovation Center intends to create an ambitious business environment that captures the unique opportunities that Davis is known for -- community engagement, environmental engineering, civic planning, agriculture, sciences, transportation, and rigorous environmental ethics.

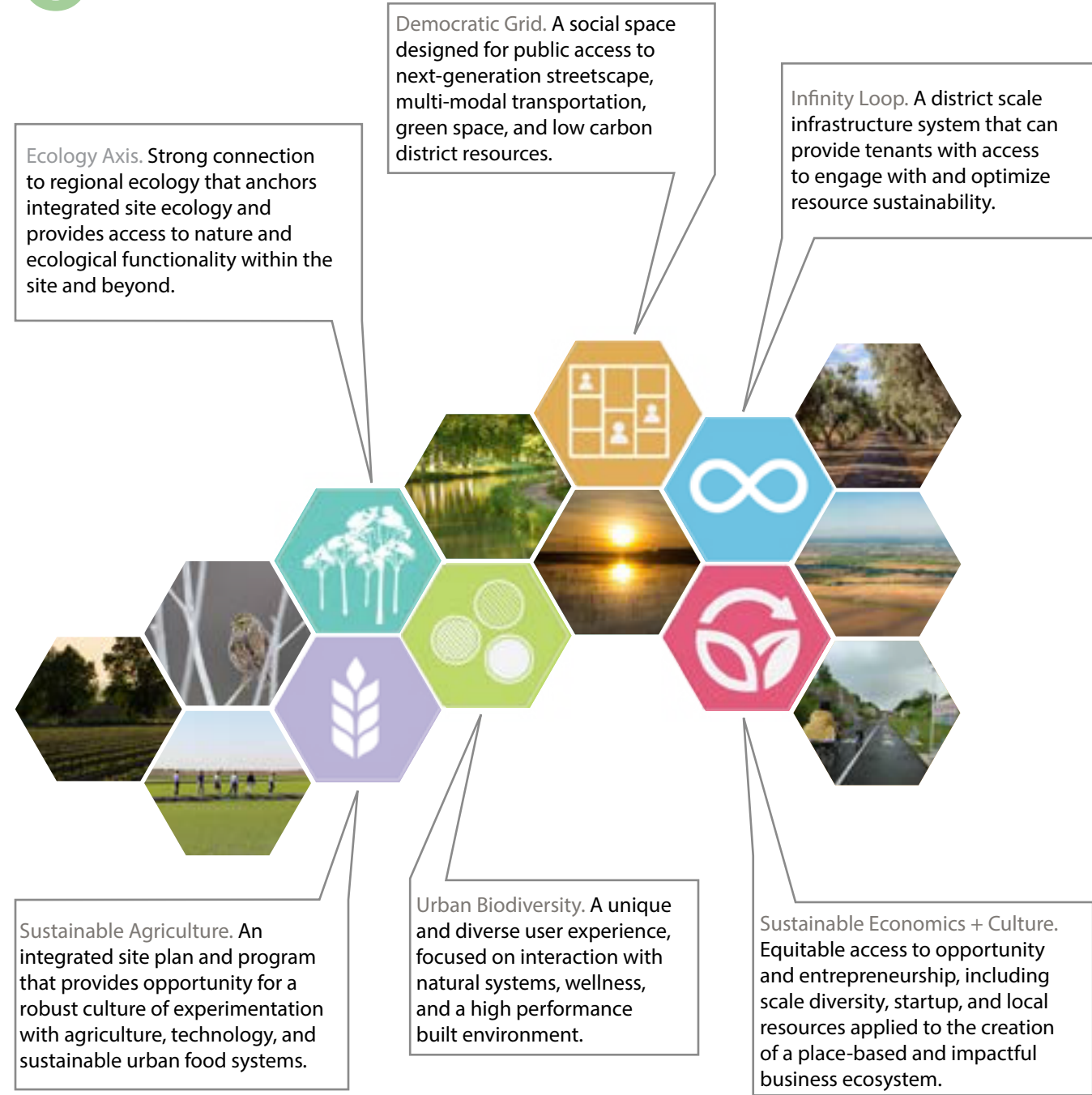
A true Innovation District is more than a place of business, it is hub of cultural and intellectual exchange, where ideas and dreams become the future and tomorrow’s ideas are cultivated. Many of the problems facing the modern world stem from impacts to our climate and are associated with the built environment. Davis has long been a leader in addressing these issues.

For this reason, the place in which innovation occurs will be a part of the opportunity and an invitation to the Davis community and larger business community to participate in the creation of something lasting and truly transformative.

Envisioned is a “sandbox” for sustainable built environment and infrastructure innovation: a multi-phase project that strives to improve upon itself through collaboration with tenants, local businesses, agencies, and innovators; an adaptable platform for research, evaluation, and iterative innovation with aggressive sustainability goals, relevant metrics, and a commitment to leadership in sustainability.

To achieve this, the framework contains 6 driving Elements that define the sociocultural, economic, and ecological values and goals of the project, backed by verifiable commitments to sustainable design and construction. These are augmented by 4 major Community Benefit Initiatives, ambitious goals requiring partnership with the community to accomplish.

6 ELEMENTS



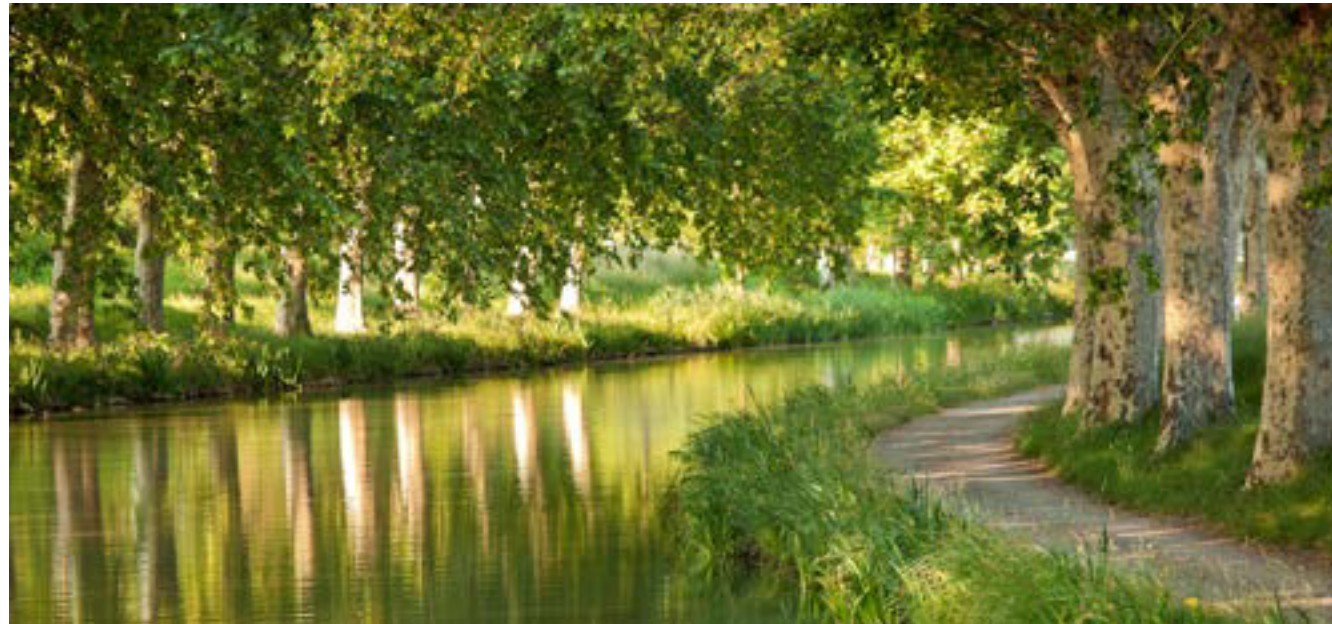


ECOLOGY AXIS

50%
of public landscape
plants native

Woven into the heart of the proposed MRIC plan is an axis of native vegetation including a new riparian corridor along the existing drainage-way. This feature coincides with and experientially anchors a proposed low-carbon district at the center of the site. The drainage currently receives stormwater from approximately 700 acres of upstream development to the west.

The feature will be engineered for peak stormwater flows and envisioned as an amenity. Providing storage for non-potable water reuse, the system will minimize stormwater during peak storms. As currently occurs, these high water



0 GAL
potable water for
ornamental irrigation

events flow east to the Yolo Bypass stormwater system, 2.5 miles to the east.

On site public landscape spaces will feature 90% native and/or drought tolerant plants, with a focus on agriculturally supportive Integrated Pest Management (IPM) practices. Over 3,000 trees will be planted on site, ensuring at least 50% of hard surfaces are shaded. Using Davis downtown as a successful example of urban raptor habitat, a minimum of 25% of street trees will be habitat oriented.

Integrated Pest Management (IPM) practices



will be used to manage landscape areas for biodiversity, to minimize the use of pesticides, and to support farm activities throughout MRIC.

Significant Swainson's Hawk habitat will be created off-site, in response to potential impacts to existing forage lands.

There is an aspirational notion to re-envision storm drainage and associated riparian habitat connection to Yolo Bypass open space. Such a corridor might simultaneously provide an opportunity to create improved bicycle access to the Bypass and West Sacramento.

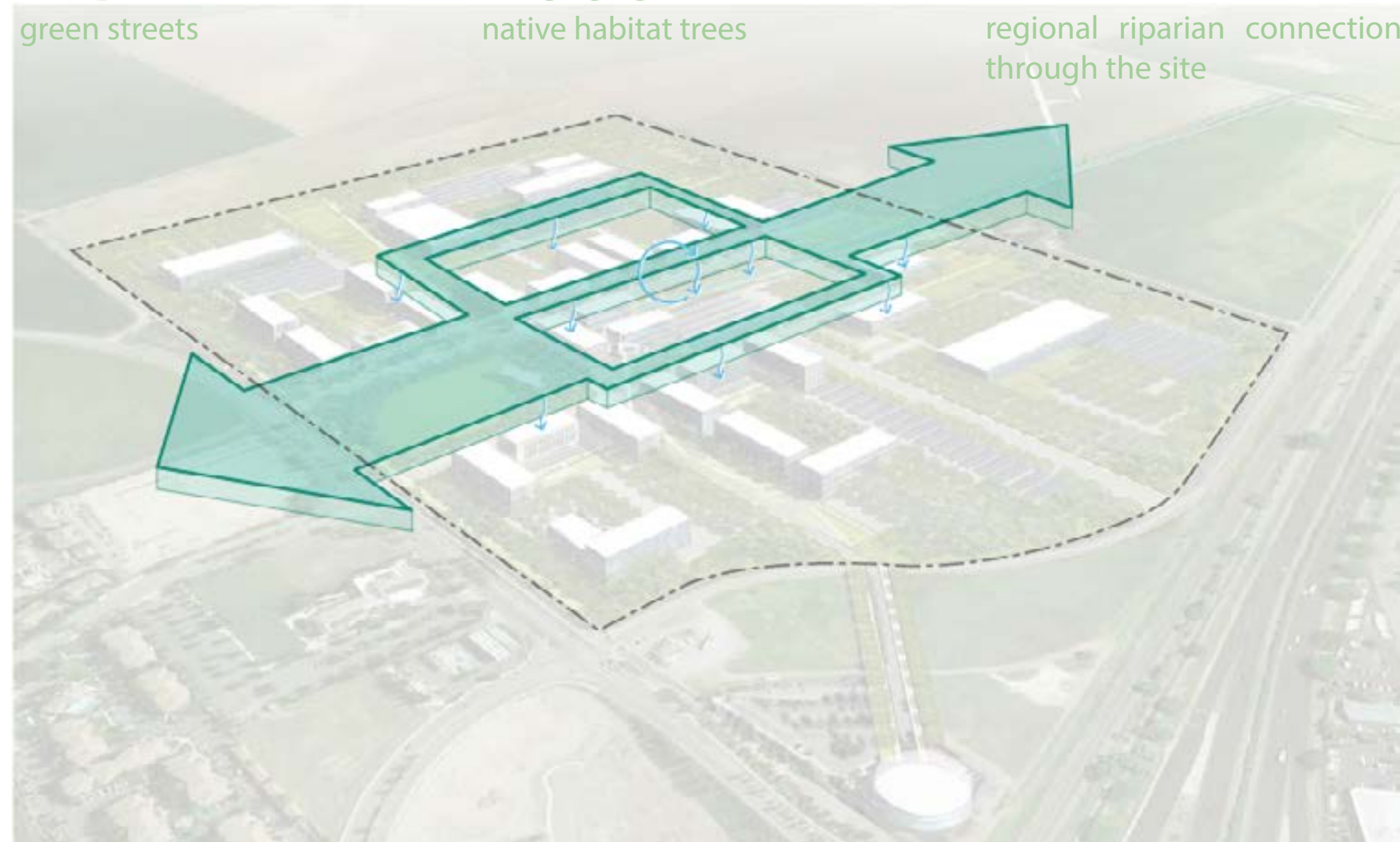


ECOLOGY AXIS

LID
green streets

1000
native habitat trees

1
regional riparian connection
through the site





SUSTAINABLE AGRICULTURE

Situated in the bread basket California Central Valley and home to the top agriculture research university in the world, Davis is a well established R+D leader in the industry. This and the location of the site in relation to the agriculturally productive, globally significant Central Valley provides an opportunity for leadership in agricultural thought leadership. Technology integration, sustainability, development of scalable urban agriculture innovations, and startup incubation define the proposed Mace Ranch Innovation Center.

MRIC provides a platform to address challenges facing global agriculture and food production through the collaboration of academia, technology, startup and large businesses, and working agricultural landscapes throughout the site and region.

These efforts might vary from small experimental applications in public spaces to large operations scaling for the global economy.

Buffer areas at the perimeter of the site and a variety of interstitial and public spaces are dedicated to agriculture production and supporting landscapes. These buffer areas integrate with surrounding lands, reduce wind impacts, provide beneficial native habitat, and

help to maintain the agricultural vernacular that so many enjoy about Davis.

Community gardening opportunities will be provided within the public landscapes of the district, and additional opportunities will be provided for the exploration and prototyping of scalable urban agricultural applications.



SUSTAINABLE AGRICULTURE

20.12 acres
of on-site agriculture



Open Space Legend	
	Areas designated for Agriculture
	Site Boundary

The development fabric of the site is designed to enable buildings to achieve aspirational sustainability performance. Buildings are proposed to be compliant with CalGreen Tier 1 as per City of Davis. Energy targets achieve 40% better efficiency than Title 24(2008).

All appliances will be Energy Star rated, and buildings will be equipped with capacity to utilize non-potable water resources provided by the Infinity Loop district infrastructure system.

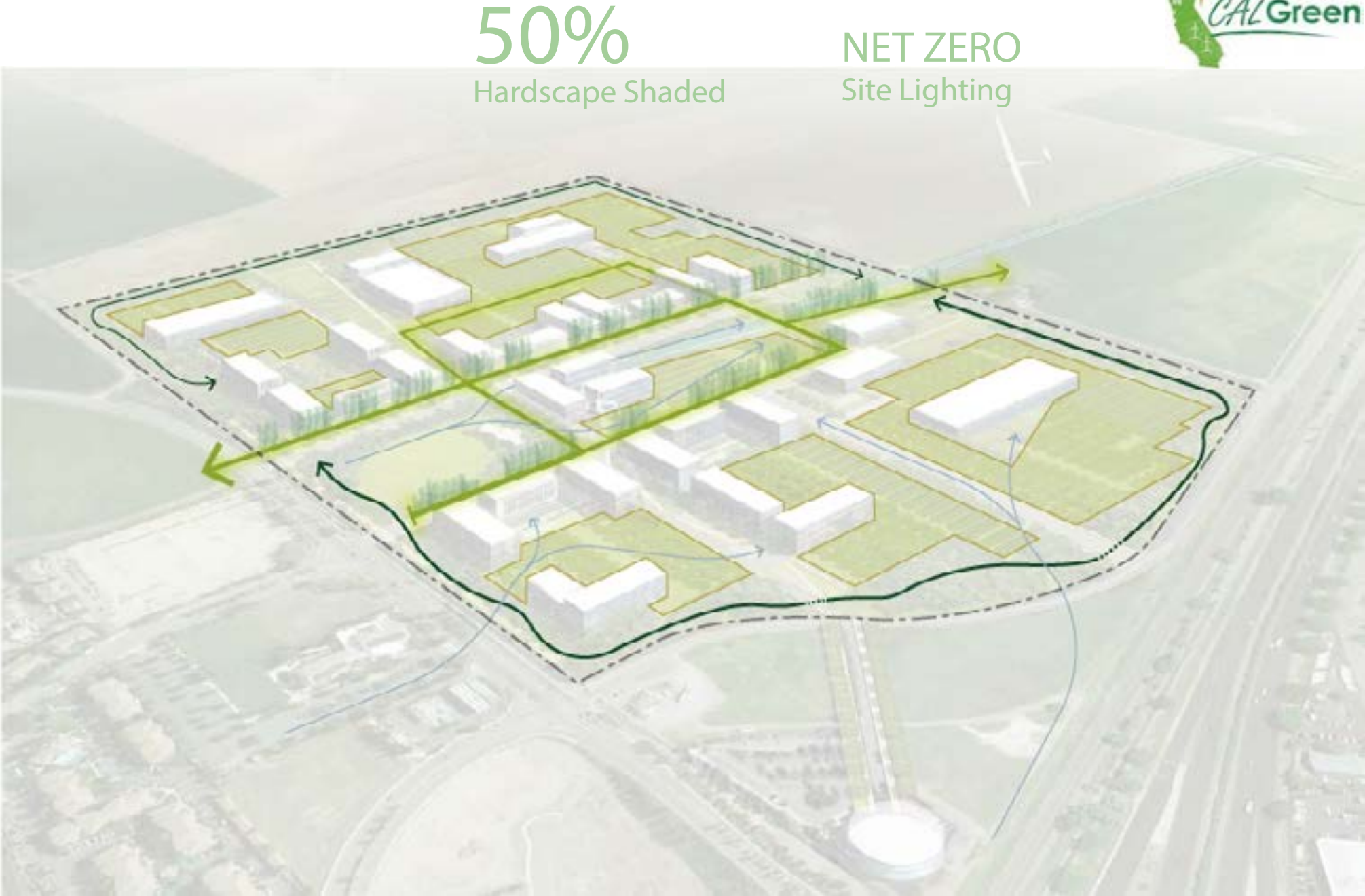
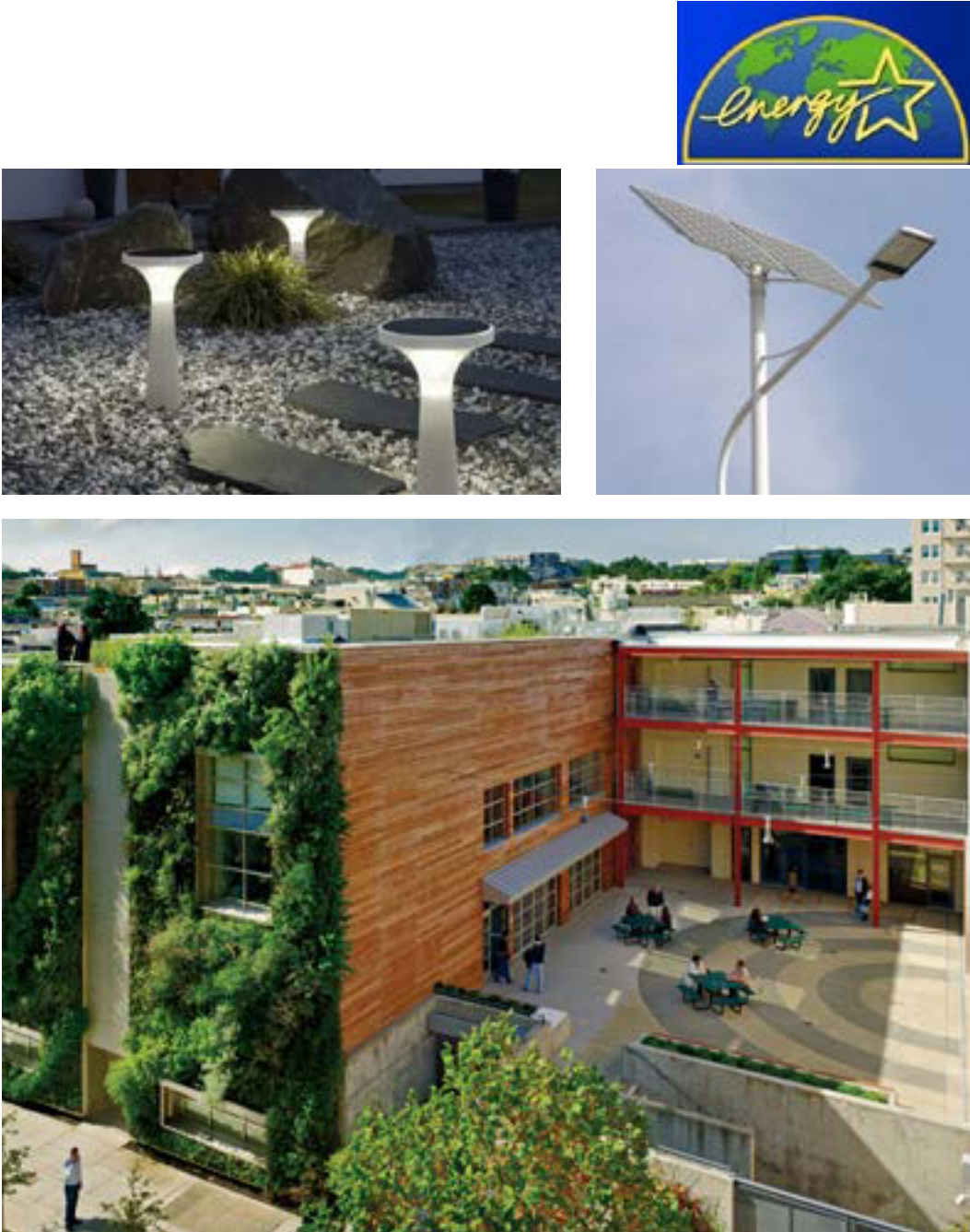
Public lighting will be Zero Net Energy, and designed to accommodate future innovation for leadership toward long term goals and targets set by the City of Davis.

Narrow streets and enhanced pedestrian and bicycle pathways allow a variety of transportation modes, focusing on ease of movement for pedestrians, bicycle use, and a new public transit hub.

A Low Carbon District features electric car chargers, enhanced pedestrian and bicycle access, space for non-traditional zero-carbon vehicles, and a commercial district incentivized for demonstration of scalable applications for meeting City of Davis carbon neutrality by 2050.

The landscape creates shade and microclimate pockets, improving comfort and reducing cooling demands. Low Impact Development (LID) practices including green infrastructure provides stormwater treatment while reducing the urban heat island effect and associated cooling loads.

All hardscape surfaces will be shaded at least 50% and vegetative spaces engineered for high performance will help manage temperature and water throughout the site.





The Project’s proposed circulation network provides a hierarchy of streets, bicycle paths, trails, transit, and pedestrian promenades designed to support a wide range of uses and activities. The network fosters easy connectivity and looks for ways to reduce the needs for automobile travel within the Project Area and the larger community/City.

A transit hub provides access to and from the site, reducing the need for automobile trips, with the intention of developing new transit alternatives for linking the MRIC to the town.

A “Low Carbon District” provides a core area for prototyping Zero Carbon solutions that can help the City of Davis achieve 2050 goals. This district incentivizes the use of electric vehicles, low emission vehicles, and bicycles and provides ample capacity for recharging vehicles on site.

Car and bike share programs reduce the need for single car ownership. Access, storage, and shower facilities will encourage bicycle use.

Reduced width streets encourage pedestrian safety and limit the use of paving materials, of recycled origin wherever possible.

A Transportation Management Plan (TDM) will be approved as part of the Project Entitlements and will include extensive monitoring provisions.



Accessible & Open
to the Public

4.5 Miles Bicycle Paths

1 New Transit Hub



Infrastructure innovation represents one of the most important and exciting pathways to a sustainable future. Emerging approaches to energy, water, technology, and waste promise scalable solutions toward a future green economy that integrates well with UCD's demonstrated leadership in this area of research.

To serve the community and provide a platform for scalable infrastructure innovation, MRIC intends to implement a district infrastructure chassis for the exchange of resources and access to technology and communication. This chassis includes Energy, Water, Waste, and high speed broadband communication capacity.

This district approach allows resource sharing within the MRIC and a robust platform for innovation in sustainable resource management. Managed via district managed right-of-way, tenants can have tailored access to unique assets for research and business development.

The Infinity Loop is an adaptable, future-ready and interconnected infrastructure system that allows innovations to pilot, iterate, and scale within the district. This provides a realistic approach to meet City of Davis goals such as Carbon-Neutrality by 2050, and leverages UCD areas of leadership such as waste-to-energy resource recovery systems.

The IL also allows engagement with resource networks that may not be possible with a conventional utility-managed system, such as software integration and emerging technology.

ENERGY

Energy generation occurs via solar arrays, and the IL microgrid approach allows sharing of energy, including battery storage, time of use, and load management capabilities.

These unique assets allow MRIC to provide clean, consistent, sustainable energy that is resilient against failure, provides unique energy access, and encourages on-site production of energy.

Advanced and unique energy capability will attract innovation companies interested in research that requires access to a private grid.

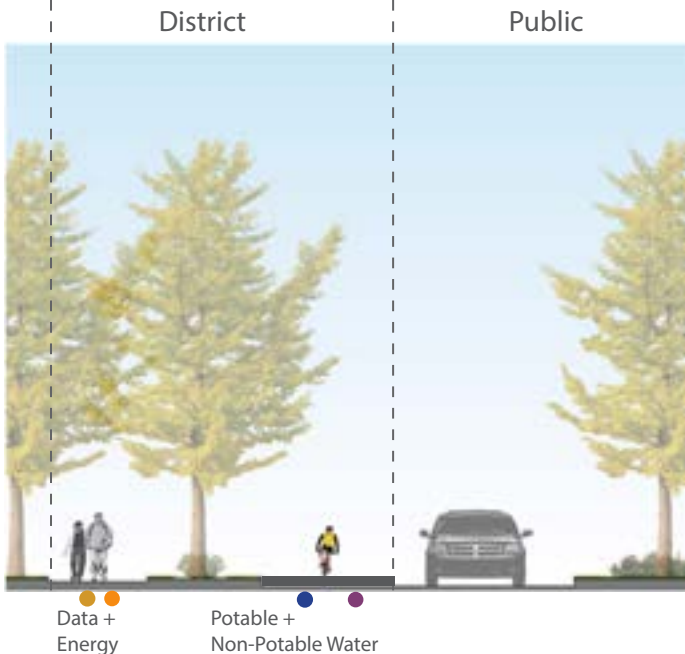
WATER

High efficiency water fixtures and advanced cooling and irrigation systems minimize water demand. The use of site derived water further conserves precious drinking water sources.

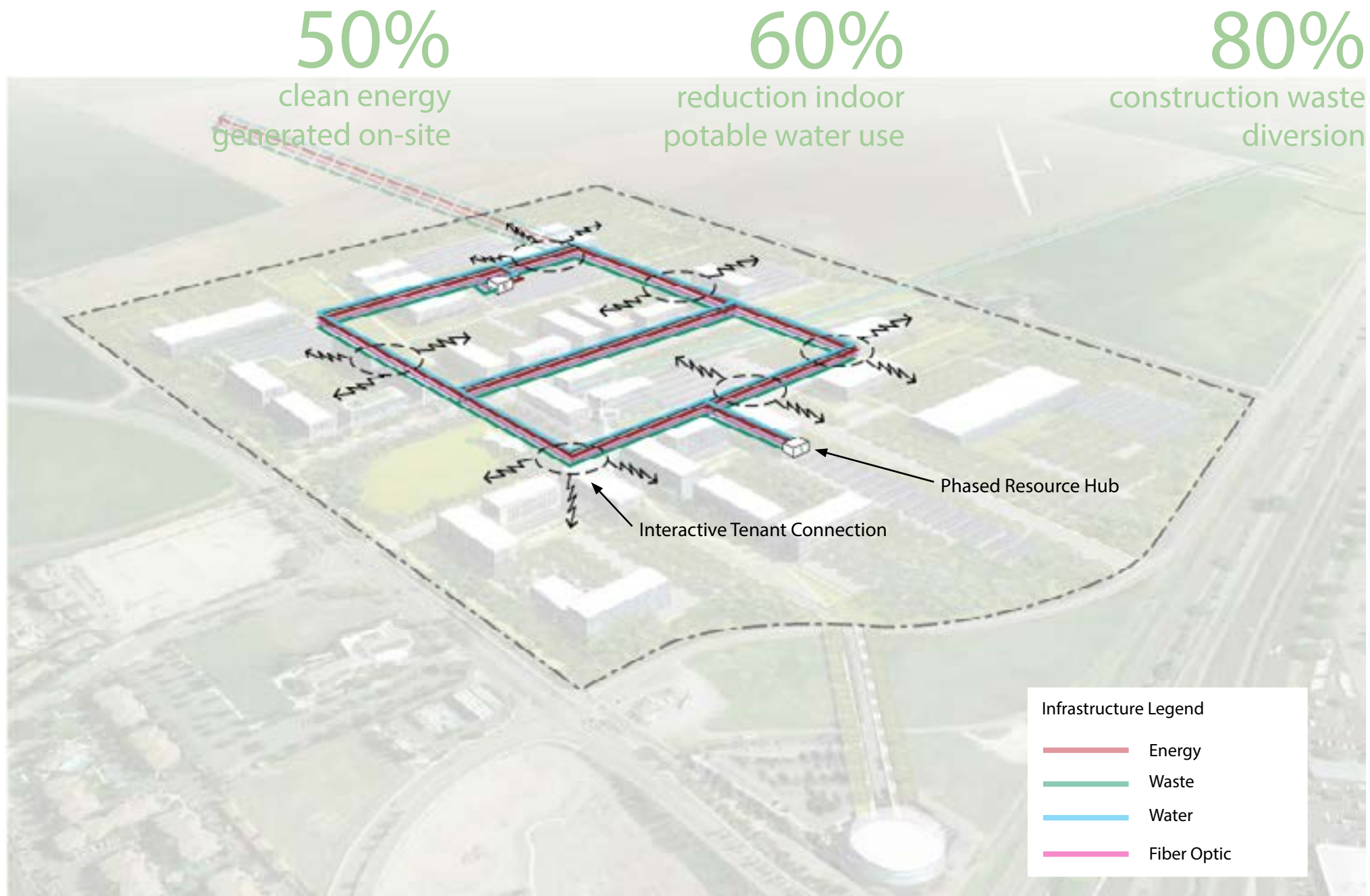
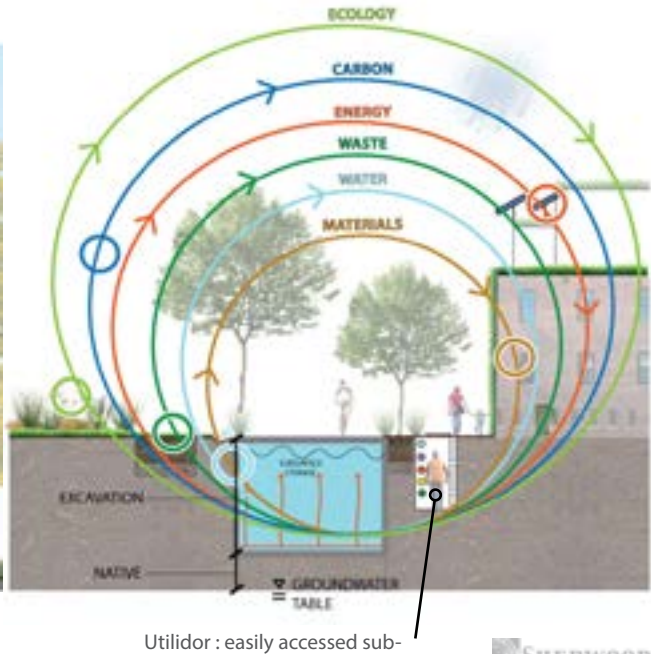
In lieu of seeking "Net Zero Water" within the site, MRIC catalyzes a recycled water connection, bringing municipal recycled water nearly a mile closer to East Davis.

A Low Impact Development (LID) approach reuses stormwater, showcasing a technology approach to Integrated Water Management.

A private network of on-site resource distribution supplements public infrastructure to serve the tailored needs of tenant innovation research.



Integration of material and energy flows through the built environment.



Infrastructure Legend	
—	Energy
—	Waste
—	Water
—	Fiber Optic



MRIC is envisioned as a cutting edge innovation site that combines ecological design, agriculture, engineering, and technology. MRIC is designed to facilitate vertical integration from start-up and collaboratory work spaces through to R&D and manufacturing, all in a space that feels like part of town. The center provides for research to be carried through to market in a variety of sectors. Vertical integration allows for innovation from UC-Davis and the greater region to merge with established businesses.

Over time, the site is intended to serve as an anchor for the City of Davis to retain and amplify its intellectual capital within the agricultural and academic communities that have served the city and bioregion well to date.

Activities within the site promote economic growth across all scales, including both maker space startups and established multinational companies. MRIC is designed to allow collaboration amongst various sized companies

and provide unique resources to attract relevant commercial and research tenants to Davis.

Collaborative platforms such as tech-shop and co-working facilities allow for unusual interaction opportunities. This mix allows for a vibrant addition that meets the live-work-play goals of the City, elevating the capacity for Davis to leverage its unique assets for innovation in the global business community.



Local Scale
Opportunity

Low Carbon
District

Start-Up
Collaboratory



Low Carbon District Legend

	Low Carbon District Zone
	Gateway marker

SUSTAINABILITY CERTIFICATION

The following rating systems were analysed to assess relevance and utility most appropriate for MRIC and the unique Davis Innovation District goals and objectives:

- LEED (ND, Core/Shell, Silver)
- Envision
- One Planet Living
- Living Building/ Community Challege

The results of this assessment suggested the following conclusions:

- MRIC’s vision to integrate agriculture, ecology, habitat, manufacturing and R&D within a business park creates unique conditions that are not best described using existing third party frameworks.
- While each rating system has strengths and appropriate applications, none was found to address all aspects of the MRIC site as effectively as appropriate site-based design.
- Existing CalGreen Tier 1 requirements in the Davis Building Code produce a level of commitment roughly equivalent to LEED Silver.
- If third party certification is sought, LEED Core & Shell is the likely most relevant framework to a multi-use Innovation District with this program.
- LEED for Neighborhood Development and Living Community Challenge would be difficult to accomplish without a housing component.

It is the goal of the project to address the metrics associated with all of the rating systems evaluated, producing a project that is compliant with City goals, consistent with local objectives, and surpasses the value of third party frameworks.

The following Rating Systems Summary provides brief summary information about the four rating systems assessed, including an overall description, themes covered by each system’s targets, and the certification process.

The MRIC Comparison Matrix that follows is an effort to convey the strengths and weaknesses of each rating system across common categories. These categories were derived by aggregating the themes of the four existing certification standards together.

This process indicates the strangths of the proposed MRIC plan across all categories, creating a broader framework than any of the systems alone.

While developing the MRIC Sustainability Framework, the intention was to address all categories. The Sustainability Framework goes farther to address the specific cultural and infrastructure conditions, sustainable development targets, and future goals of Yolo County, the City of Davis, and the State of California.

LEED

(United States Green Council)

The United States Green Building Council has developed a variety of tools, tailored to different types of development, ranging from Neighborhood Development to Building Design & Construction.

Each of these categories is based upon a point system, in which increasing points achieve higher levels of certification including Certification, Silver, Gold, and Platinum.

MRIC is challenging to categorize due to the unique program and unknown tenant population who will build to suit and occupy over a period of 2 decades. Changes to the rating system, unknown new building applications, and unkown tenant improvements/needs contribute to variables associated with potential manufacturing uses.

The likely most relevant LEED option is the Core & Shell certification system, which recognizes the unique nature of the speculative development market and the lack of control over all aspects of the construction process.

This rating system is common for commercial or medical office buildings, retail centers, warehouses, and lab facilities. Additional targets could potentially be required of tenants, including LEED Interiors. However, it may become cumbersome to apply more than one rating system to a single building or project.

ENVISION

(Institute for Sustainable Infrastructure)

Envision is a holistic sustainability rating system for all types and sizes of civil infrastructure including the roads, bridges, pipelines, railways, airports, dams, levees, landfills, water treatment systems, and other components that make up civil works. Envision is not intended to evaluate human-occupied, interior, conditioned buildings, but can be used in conjunction with building rating systems. Envision® has 60 sustainability criteria, called credits, divided into five sections:

- 1. Quality of Life
- 2. Leadership
- 3. Resource Allocation
- 4. Natural World
- 5. Climate and Risk

Within the credits there are 6 levels of achievement: Conventional, Improved, Enhanced, Superior, Conserving and Restorative. Based on the points offered and achieved in each category there are 4 award levels: Bronze, Silver, Gold and Platinum.

Envision is highly aspirational, but is intended for a project that is primarily focused on infrastructure. Because of the innovative infrastructure elements proposed, there may be value in achieving certification in concert with a separate evaluation of building and site performance.

ONE PLANET LIVING

(Bioregional / World Wildlife Fund)

One Planet Living uses ecological footprinting and carbon footprinting as its headline indicators. Each project creates a public “Action Plan” based on ten guiding principles of sustainability as a framework. These principles are:

- 1. Zero Carbon
- 2. Zero Waste
- 3. Sustainable Transport
- 4. Local & Sustainable Materials
- 5. Local & Sustainable Food
- 6. Sustainable Water System
- 7. Land Use & Wildlife
- 8. Culture & Community
- 9. Equity & Local Economy
- 10. Health & Happiness

The Action Plan outlines the strategies, actions and targets to achieve OPL goals. It provides a route map which can be monitored and adapted over time. The Action Plan is made public so everyone can see the commitments being made. As well as an Action Plan, every project reports annually on progress and publishes their results.

OPL comes with the endorsement and credibility of World Wildlife Fund and provides a framework that is broad in application, rigorous in its targets, and customizable to meet the specific needs of a place in time.

OPL is aspirational and iterative; however, the targets are not rigid and may not meet the need for strict adherence to vetted standards. A negotiated plan such as proposed herein may provide a basis for such an approach.

LIVING BUILDING CHALLENGE

(International Living Futures Institute)

The Living Building / Living Community Challenge is a philosophical and advocacy tool and a certification program that evaluates communities and masterplans at all scales and is a unified tool for transformative design.

The Living Building Challenge provides a framework for masterplanning, design and construction that is compromised of seven performance areas or Petals:

- 1. Place
- 2. Water
- 3. Energy
- 4. Health & Happiness
- 5. Materials
- 6. Equity
- 7. Beauty

Petals are subdivided into twenty Imperatives. Projects earn Living Certification by achieving all Imperatives. Petal Certification is achieved by satisfying the requirements of at least three Petals (at least one of which must be either Water, Energy or Materials).

Certification is based on actual performance, rather than modeled or anticipated outcomes. Therefore, projects must be operational for at least twelve consecutive months prior to evaluation.

This approach is highly aspirational and requires significant validation and verification processes that may be complicated in the context of a 20 year buildout with the proposed business-focused program.

MRIC COMPARISON

Four leading certification systems compared with the MRIC framework. A local and tailored approach captures site-specific opportunities, reaches across all categories, and focuses on long term community goals tailored to the unique culture and assets of Davis.

		Building + Infrastructure (Physical Systems)					Site + Ecosystem (Living Systems)					
		CARBON	WATER	ENERGY	WASTE	BUILDING PERFORMANCE	RESILIENCY	OPEN SPACE	ECOLOGICAL INFRASTRUCTURE	LOCAL FOOD	CONSERVATION	ECOLOGICAL RESTORATION
RATING SYSTEM	LEED SILVER											
	ENVISION											
	LIVING BUILDING CHALLENGE											
	ONE PLANET LIVING											
MRIC SUSTAINABILITY FRAMEWORK	ECOLOGY AXIS											
	SUSTAINABLE AGRICULTURE URBAN BIODIVERSITY											
	DEMOCRATIC GRID											
	INFINITY LOOP											
	ECONOMICS & CULTURE											
	MRIC TOTAL											

ASPIRATIONAL

SUSTAINABLE

GREEN

N/A

CODE

The City of Davis building code, adopted as Cal Green Tier 1, is widely considered to be substantially equivalent to LEED Silver certification. Additional community partnership proposals customize value and provide contextual site integration.

MRIC COMPARISON

		User Experience / Sense of Place						Economics + Culture + Leadership				
		CONNECTIVITY TRANSPORTATION	WELLNESS	BIOPHILIA	ACCESSIBILITY	URBAN DESIGN	BEAUTY	CULTURE	LOCAL ECONOMY	COLLABORATION	PLANNING	EQUITY
RATING SYSTEM	LEED SILVER											
	ENVISION											
	LIVING BUILDING CHALLENGE											
	ONE PLANET LIVING											
MRIC SUSTAINABILITY FRAMEWORK	ECOLOGY AXIS											
	SUSTAINABLE AGRICULTURE URBAN BIODIVERSITY											
	DEMOCRATIC GRID											
	INFINITY LOOP											
	ECONOMICS & CULTURE											
	MRIC TOTAL											