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### Volume 2: Market Study & Cost Analysis

Separate Document
Chapter 1: Introduction

Vision
The University of Delaware (UD) has taken remarkable steps in charting a course toward academic distinction as a world-class research institution and setting an objective for environmental sustainability. This vision will be supported in the implementation of the new Science and Technology Campus (STC). Consisting of 272 acres adjacent to the South Campus, the new campus accounts for 22 percent of the University’s land holdings. This campus will be a destination where the University will formulate partnerships that will include research and development laboratories in energy, the environment, national security and defense, among other areas, health and life sciences space, and mixed-use land uses, which may include retail and housing, as well as a new Amtrak train station. At the same time, this new campus will lessen the impact of development on the environment by implementing best practices for storm water and building design. Adjacent natural areas and open spaces will be connected together by the extensive open space network of this new campus.

Vision Statement:
The University of Delaware Science and Technology Campus will be the place to embark on a new future for the University, and will become a catalyst for jobs for the State of Delaware and the surrounding area.

The University’s “Path to Prominence™” strategic plan is guiding UD toward achieving distinction as a world-class research institution. The acquisition of the former Chrysler assembly plant in Newark, Delaware supports this vision by providing a large area of land adjacent to the Main Campus.
Comparative Size of UD Main Campus to the Science and Technology Campus
where the University can build for the future. Over time, the completion of this campus will provide the University, the City of Newark and the State of Delaware with vibrant open spaces, richly detailed buildings and an infrastructure to support both cutting edge research and the creation of jobs.

PARTNERSHIPS
The University will leverage its knowledge-based assets and future development of the STC to create new partnerships focusing on innovation and entrepreneurship. The Cooperative Research and Development Agreement (CRADA), which was signed in January 2010 with the U.S. Army, will enable UD and the Army to work together on research projects focused on national security and defense, both at Aberdeen, Maryland and at the Science and Technology Campus. Several other prospective partnerships with the University are expected to emerge. The University has long been a leader in chemical engineering, composites, and alternative energy research, including solar and battery technology. The Center for Composite Materials and the UD Energy Institute are particularly well positioned to receive federal funds.

HEALTH AND LIFE SCIENCES
The University is poised to establish a new comprehensive biomedical and clinical research and education complex on this property located in what is already one of the nation’s leading life science regions. Plans for the site include space for translational initiatives developed through the Delaware Health Sciences Alliance founding members: Thomas Jefferson University, Alfred I. duPont Hospital for Children/Nemours, the Christiana Health Care System and the University of Delaware; as well as the Delaware Rehabilitation Institute and other collaborative centers.

The UD College of Health Sciences’ vision is to establish a vibrant community on the site, where health is not only the topic of research, education, and clinical programs but also a way...
of life. Fitness facilities, walking and biking trails, and healthy eating options will be available on site to facilitate wellness in this living, breathing 24/7 community.

The site will include space for inter-professional education programs for healthcare students, housing for students completing residencies and preceptorships, facilities for interdisciplinary research institutes and centers, and space for biomedical and biotechnology companies, as well as on-site clinics providing convenient and comprehensive healthcare and health-related services.

SUSTAINABILITY

Just as jobs are an important focus for the creation of the STC, an equally important consideration is the development of a framework for the campus’ relationship to the environment. The vision of the University is to develop this campus and build a framework for the future while minimizing impacts to the environment.
The goal for development of the STC is organized around the University’s definition of environmental sustainability. The Science and Technology Campus will employ state-of-the-art building practices to minimize energy use, cleanse stormwater, and create ecological connections across the site.

Process

- December 2008: Chrysler Corporation shuttered its 272-acre assembly plant in Newark, Delaware, resulting in the loss of approximately 6,000 jobs.

- October 2009: UD signs purchase agreement for the Science and Technology Campus property.

- November 2010: Demolition and decommissioning of existing building begins.

The planning process for the University of Delaware Science and Technology Campus began in 2009 when a series of “Core Values” was established to guide the future direction for the campus plan. In the fall of 2010 the master planning process began in earnest. The master plan built upon the Core Values and establishes a consensus for the physical plan of the campus among University stakeholders. The Illustrative Concept Plan in this book is the result of the master plan process. Design Guidelines will follow the Master Plan to establish the look and feel of the open spaces and buildings on the campus as well as to focus on the implementation of a Phase 1 for the campus. A Regulating Plan will be created to designate locations of buildings and open spaces.

Context

The Science and Technology Campus is located along two of the most important transit corridors on the East Coast, providing easy access to some of the largest business,
manufacturing and technological centers in the United States. Within three miles from the site, one can access I-95 by two interchanges, which allows easy access to Baltimore (60 miles to the south), Wilmington (14 miles to the northeast) and Philadelphia (40 miles to the northeast).

The site is also close to two out of the 12 deep-water ports off the Atlantic Ocean, located in Wilmington, DE and Baltimore, MD.

A Wilmington Area Planning Council (WILMAPCO) study identifies the STC as one of the largest parcels of land adjacent to a train station in the entire Northeast Rail Corridor. Amtrak stops at the site four times a day and SEPTA stops there eight times during weekdays. Its future as a transportation hub will be further bolstered when the Maryland Transit Administration’s Maryland Area Rail Commuter (MARC) train line connects to the Southeastern Pennsylvania Transportation Authority (SEPTA) train line at this location.
The physical proximity of UD to other centers of research in the region has already led to strategic alliances that will have major impacts on the STC. A natural alignment is being developed between UD and Aberdeen Proving Ground (APG) based on its core research direction. APG has the potential to become one of the leading science and technology centers in the United States as the Base Relocation and Closure (BRAC) program is planning to add an additional 8,000 jobs to the existing 16,000 jobs. Additionally, UD is the closest Category 1 research facility to APG. The University of Delaware and the U.S. Army Research, Development and Engineering Command joined together in a Cooperative Research and Development Agreement (CRADA) that creates a research partnership between UD and APG. The University and APG will share personnel, laboratories, other facilities and equipment. The University will also benefit from this collaboration by providing much sought-after high-tech graduates to APG, as well as providing a place for employees of...
APG to continue their education. President Harker has said that this agreement will be an important influence on the development of the STC as a site for innovation and an incubator for entrepreneurial businesses.

Its location immediately adjacent to many University resources ensures that the Science and Technology Campus will develop as a natural extension of the institution. The College of Agriculture and Natural Resources and the University’s Athletics Facilities are situated just across South College Avenue from the STC, and the campus is within easy walking distance to the Main Campus along South College Avenue toward the north.
Chapter 2: Core Values

The Science and Technology Campus will support the mission of the University of Delaware by:

**Campus Experience**
Extending the richness of the undergraduate and graduate experience through a close-knit mix of academic and student life activities that foster collaborative ideas and research, and provide places that foster cross-cultural exchanges and celebrate the growing diversity of the faculty, staff and student body.

**Community Engagement**
Partnership opportunities with local, regional and state organizations and investment in campus growth that is mutually beneficial to the University and to the larger community of which it is an integral part.

**ECONOMIC DEVELOPMENT**
Providing service to the State through economic development and job creation.

**STRATEGIC PARTNERSHIPS**
Creating and strengthening strategic relationships outside the University.

“I believe this will have far-reaching consequences not only for my alma mater, but for the State of Delaware. The hallmark of any great university is to be able to look to the future and lead us in a way to adapt and enhance our position... This will be a cutting-edge center for the next generation of thinkers, nurturing ideas and innovation, the seeds of which will allow this economy to grow.”

— U.S. Vice President Joe Biden
RESEARCH AND INNOVATION
Providing research opportunities for partnerships in interdisciplinary science and engineering, alternative energy technologies, health alliances, and translational medicine.

Campus Connectivity
Creating a cohesive and aesthetically pleasing campus by evolving from an automobile-oriented campus to a more balanced, well-connected one and by creating places that facilitate interaction.

TRANSIT-ORIENTED DEVELOPMENT (TOD)
Encouraging the use of alternative transportation within the site and to the surrounding community by way of connecting networks of biking and walking paths, access to high quality transit services, and compact mixed use development.

RAIL SYSTEMS
Maximizing regional passenger rail connections through a readily accessible station, ample parking, site amenities and residential development.

INTERMODAL TRANSPORTATION SYSTEMS
Providing opportunities for integrated operations, scheduling, convenient transfers, and increased usage of Amtrak, regional trains, DART and University bus systems.

Sustainable Growth
Developing the campus in an environmentally responsible way through sustainable and efficient use of University buildings and natural systems and seeking opportunities to increase and reclaim open space and to protect the quality of the campus environment as UD expands to meet the needs of its educational mission.
EFFICIENCY
Identifying opportunities for reuse of existing structures and construction of high performance facilities in support of the University’s Climate Action Plan.

ENVIRONMENTAL RESTORATION
Repairing the land and natural features lost through prior development via remediation and reduction of impervious areas and restoration of ecological corridors.

ECOLOGICAL NETWORKS
Providing a variety of open and networked green spaces and integrating solutions for storm water and wastewater management, shallow groundwater recharge, native plant communities, native habitat for targeted species and ecological research.

Campus Architecture and Capacity
Maintaining a compact and collegial campus through strategic application of height and density to avoid sprawl.

SITE ORGANIZATION
Capitalizing on existing site conditions (e.g., rail lines, road connections, proximity to South and Main Campuses) and providing expanded parking resources for both commuters and site tenants, centralized retail amenities and pathway connections.

Locating specific zones of activity such as mixed-use development near the train station, and health-related resources close to the College of Health Sciences and the Delaware Rehabilitation Institute.
SITE CIRCULATION
Aligning the gridded plan, major entries and multiple circulation options within the site to access points east of South College Avenue and reinforcing pedestrian walkways to the train station.

SITE ACCESS
Providing opportunities for open, secure, and dedicated entry points to respond to a variety of program needs.

Providing opportunities for views deep into the Science and Technology Campus similar to the views of The Green from Main Street, Newark.

SITE DENSITY
Relating the edges of the site to its surrounding context while maintaining flexibility at the center of the site to accommodate a variety of structures.

OPEN SPACE CONNECTIONS
Providing opportunities for open space through ecological restoration and potential trail connections between Phillips Park to the north and Rittenhouse State Park and the Christiana Greenway to the south.

INCREMENTAL DEVELOPMENT
Presenting phasing scenarios that establish an initial site purpose and identity to be developed over time.
Chapter 3: Assessment

Site Analysis

From 1951 to 2008, this site served the local community as an employment center. The transformation of the former Chrysler plant to the Science and Technology Campus represents a unique opportunity to repurpose a large, recently unproductive site into a contributing asset for the University, Newark, the State of Delaware and the region. With the revitalization of the site, there is a chance to reinvent the campus not only as an entrepreneurial and employment center but also as a center for housing, retail, and community amenities—all focused around an established transportation network. In addition, UD’s Land-Grant mission to develop new ideas, technologies and processes that benefit the population will be embodied on this campus by the establishment of partnerships with business, government and other institutions to create additional jobs and by the campus’ role as a center for green technology and green industries.

The site is adjacent to significant UD resources, such as the College of Agriculture and Natural Resources, and the University’s Athletics facilities, which are situated directly east of the new campus across South College Avenue. The site is bounded to the north by the Norfolk Southern and Amtrak train lines, to the east by South College Avenue and the south by Route 4. The western end of the site is a point where Route 4 and the train lines come together. Today, Silver Brook Stream crosses the campus in an underground culvert. The stream enters the culvert on the north side of the railway and continues south toward Route 4, where it is resurfaces.

“The state was a proud partner in the University’s effort to assume ownership of the former Chrysler plant. One of the keys to our state’s long-term economic recovery must be our ability to come together and respond quickly to economic development opportunities like this. This transfer makes it possible for the University to put people to work on a site that could eventually expand Delaware’s reputation as a center for innovation and excellence.”

— Delaware Governor Jack Markell
SILVER BROOK STREAM
Silver Brook Stream crosses the site in an underground culvert. The stream enters the 84” culvert on the north side of the railway and continues south toward Route 4 where it resurfaces. Stormwater from the site is directly discharged into the stream. Ongoing demolition and future redevelopment will impact the condition of the culvert and the stream’s role in stormwater management. Further study will be required to determine how to best use this natural resource in the future.

INFRASTRUCTURE AND UTILITIES
The STC will have to provide all the necessary infrastructure including roads, water, sewer and thermal utilities. Worrilow Hall, which lies across from the campus on the east side of South College Avenue, has some extra capacity for thermal utilities and space for expansion, which can help alleviate the initial demand during the early stages of campus development. The train track spur that enters the site from the north...
holds the potential for importing biomass to be used in a new utility plant on the campus that could provide renewable power to not only the site but to other adjacent parts of the University as well.

**Sanitary Sewer**

The STC has access to the existing Cool Run Sanitary Sewer Interceptor (a.k.a. the New Castle County Sewer Interceptor). The sanitary sewer interceptor is controlled and operated by the City of Newark while it is within the City limits. The City pays for usage based on a meter at the County/City line to the west.

**Potable Water**

The STC is bounded on all sides by waterline infrastructure and has water rights with two providers: United Water and the City of Newark. United Water serves approximately 262 acres of the site; the City of Newark has water rights to the 10-acre parcel fronting South College Avenue, formerly known as the Mopar site.

**Existing Power Utilities**

There are two existing thermal and power related site utilities on the existing campus: natural gas and high voltage power. Both the existing gas and power services are owned by Delmarva.

The existing high-pressure (approx. 500 psig) natural gas enters on the east side of the STC, and there is a 50’x 50’ pressure reducing station located along South College Avenue. This station served the last operating Chrysler facilities. Because the pressure reducing station is located at a planned main entrance to the STC, there is interest in relocating the station.

Existing high voltage overhead transmission lines enter at the northeast corner of the Science and Technology Campus and currently serve two existing substations that are planned to be decommissioned over time and replaced with a new substation that will serve STC facilities.
Site Analysis Diagram

- Water Tower
- Culvert for Silver Brook Stream
- Willow Oaks to be preserved
- James F. Hall Trail
- Train Station and Parking
- Christiana River
- Smokestack
- Berms
- Drainage Area
- Existing Trails
- Substation
- CSX Railway
- Spur Line
- Property Boundary
- Existing Trails

Signalized Intersection
Entrance

Site Analysis Diagram
Site Access

TRAIN STATION

One of the most important features of the STC is the existing Amtrak/SEPTA rail service provided to the station at South College Avenue in the northeast corner of the site. Plans to construct new platforms, a pedestrian connection across the rail tracks, and move the train station closer to the center of the STC make the train station a vital component of overall connectivity. At a minimum, the train station will provide convenient access to regional destinations like Wilmington and Philadelphia. Possible future extension of MARC rail service, on the Perryville line, could also open rail access to Baltimore and Washington. Ultimately, the rail links will become a vital connection for various academic, research and business uses to cities along the Northeast Corridor (NEC) passenger rail line and will help establish transit as an ordinary and reasonable commute option. With access to major airports along the NEC, users of the STC will be able to reach international destinations with both rail and air infrastructure.

The existing Amtrak rail yard access is provided via the Amtrak/SEPTA Park & Ride driveway, which intersects South College Avenue at Mopar Drive. The eventual construction of the new Amtrak/SEPTA train station and development in the northeast corner of the site is likely to eliminate this rail yard access.

STREETS

Access to the existing site is provided at two signalized intersections and one unsignalized intersection on South College Avenue and one signalized and one unsignalized intersection on Route 4. The existing signalized intersections on South College Avenue also provide access to existing UD Athletics facilities and College of Agriculture and Natural Resources buildings on the east side of the roadway.

TRAILS

Like many college towns, Newark has established or constructed a number of bicycle facilities, including bike lanes, paved or unpaved off-
street bike paths, and roads shared with other vehicles. Near the site, bike paths are found along Route 4 to the south and on the James F. Hall Trail towards the north, directly across the train tracks from the Science and Technology Campus. Bike lanes are provided intermittently on South College Avenue and new bike lanes will be provided on Route 2, both north of the train tracks. Crossing the train tracks is a considerable challenge for connecting the STC to the main campus. The closest bicycle track crossings exist at South College Avenue and at Marrows Road.

The Natural Environment

TOPOGRAPHY
The site is generally flat with some swales and berms along Route 4

VEGETATION
Large Willow Oaks populate the area in front of the Administration Building on the South College Avenue side of the site. There are some trees along the Route 4 area of the site and a wooded area where Silver Brook Stream emerges from its culvert.

WATERSHEDS
The Silver Brook Stream watershed is approximately 600 acres, draining over 300 acres of residential development to the north of the site and approximately 250 acres of the STC. The STC is the most densely developed portion of the watershed, and includes approximately 14 acres of woodlands, 18 acres of grass and scrub growth and 240 acres of impervious surfaces.

Silver Brook Stream is the key natural resource on the STC. The stream is currently piped through a portion of the residential area upstream of the STC and is contained underground within an 84-inch culvert for the majority of its length on the STC. It emerges from the culvert approximately 1,200 feet prior to entering another culvert that flows under Route 4 and discharges into the Christina River.
CHRISTINA RIVER

The Christina River Basin lies within the greater Delaware River Basin. The Christina River Basin consists of the Brandywine Creek, the White Clay Creek, the Red Clay Creek, and the Christina River watersheds. Silver Brook Stream flows from the Science and Technology Campus into the Christina River below Route 4.
Bird's Eye View of Chrysler Assembly Plant Looking West
Chapter 4: Sustainability

Vision for Sustainability
The University of Delaware has committed to undertaking sustainable initiatives to maintain a green campus. The University’s dedication to pursuing carbon neutrality and reducing greenhouse gas emissions is reflected in the Climate Action Plan and in President Harker’s signing of the American College and University President’s Climate Commitment. As the University develops the Science and Technology Campus, UD has a significant opportunity to lessen its impact on the environment by restoring ecological corridors and habitats, improving water quality, and minimizing energy demand. Potential sustainable development methods that can be used on the STC are discussed in the sections that follow.

Environmental Site Design
Sustainable site design creates a built environment that maximizes the comfort of its occupants while respecting the natural systems within which it exists. Moreover, it complements efforts to accommodate a wide range of transportation alternatives. While these strategies may present challenges, they offer environmental, economic and social benefits to both present and future generations.

STORMWATER
Alternative stormwater management strategies seek to improve and protect the quality of water resources in ways that comply with or exceed the State of Delaware's stormwater regulations. By thinking comprehensively about how water flows throughout the site, opportunities to capture,
store and treat stormwater outside of a piping system can be identified. These strategies may include landscape features, such as bioswales or building features, including green roofs.

Green spaces strategically placed throughout the Framework Plan represent potential areas of stormwater collection. Other areas of collection and treatment will be incorporated adjacent to buildings, along roadways and within parking areas. Capturing stormwater for the purposes of reuse, possibly for irrigation, may be achieved through the placement of appropriately placed subsurface cisterns.

ECOLOGICAL DESIGN
One of the most unique and exciting aspects of the transformation of the previous Chrysler assembly plant to a STC for the University of Delaware is the potential to restore an important...
natural feature, and directly improve the surrounding and downstream environments for the betterment of the entire community. If Silver Brook Stream can again flow through this site, accessing adjacent floodplains during high flows to provide a variety of aquatic and terrestrial habitats, it would create a natural treasure for UD, exemplifying the institution’s commitment to the environment, research, education and to the community. If Silver Brook Stream were to remain in its culvert, an ecological corridor could still be created from north to south linking existing wooded areas on the north and south sides of the campus.

The organization of development on the site can accommodate ecological connections:

» Selecting native plant materials will improve ecological function campus-wide.
» Establishing an “ecological corridor” that connects existing forested areas provides enhanced wildlife habitat.
» Integrating stormwater facilities with natural areas provides additional opportunities for habitat creation.

LIGHT POLLUTION
Any night sky glow created by artificial sources qualifies as light pollution. The term also refers to adverse impacts of light spillover from one property to another. Light pollution has adverse effects on human health and disrupts natural ecosystems in addition to obscuring views of the night sky. For this reason, development review should consider light levels and encourage use of technologies that minimize light escape.

TRANSPORTATION
Existing Amtrak and SEPTA access to the site offers many benefits. Creating a comprehensive
alternative transportation network that connects the site to other parts of the University and the City of Newark will build on this asset and encourage the use of alternative transportation. Important considerations include:

» Providing attractive, convenient and safe pedestrian and bicycle infrastructure, linking to off-site facilities.

» Upgrading existing public transit and shuttle systems to ensure appropriate routes and frequencies to new destinations.

» Focusing density and mixed-use developments around the train station and other academic and employment destinations.

» Employing travel demand management (TDM) strategies to encourage students and employees to make fewer automobile trips.

» Supporting bike sharing, ride sharing and car sharing programs to provide additional flexibility.

Sustainable Building Systems

Green building techniques, as described by the U.S. Green Building Council and similar organizations, create healthy environments for a buildings’ users and minimize detrimental environmental impacts. New buildings should incorporate the latest environmental technologies and strategies as they become available. Areas of consideration include:

WATER CONSERVATION

» Reduce the use of potable water by using efficient plumbing features and reusing greywater to meet non-potable water needs.
» Encourage on-site wastewater treatment.

ENERGY
» Use passive strategies such as orientation, insulation and shading to minimize energy demand.
» Promote on-site renewable energy from sources such as biomass and solar power to meet energy demand.
» Optimize buildings’ energy performance by using efficient mechanical and electrical systems.

AIR QUALITY
» Use low VOC (volatile organic compound) and non-toxic products instead of paints and cleaning products that diminish air quality.

Sustainable Infrastructure
In terms of infrastructure development, the STC offers a clean slate. While campus facilities will minimize water and energy demand, infrastructure development also provides opportunities to realize efficiencies.

POWER
All of the power and thermal utility systems need to be planned to adapt to the rapid changes and new technologies being developed in response to growing resource scarcity and environmental concerns. To address this reality, the systems that are planned for the Science and Technology Campus will be modular in nature and permit the best new technologies to be integrated as they emerge:
» Highly efficient central utility plants (CUPs) to serve all facilities including implementation of Combined Heat and
Power (CHP) when the campus loads will support it.

» Incorporate the use of renewable energy sources (solar, waste heat recovery and landscape features to minimize environmental impacts while maximizing maintenance access).

» Geothermal, bio-fuels, biomass, etc. wherever practical at the CUP’s and in the connected facilities.

EFFICIENT THERMAL UTILITIES

Thermal utilities infrastructure should evolve as the campus develops, incorporating the most efficient available technologies.

» Cogen (combined heat and power, CHP) engines generate electricity while collecting ancillary heat that can be used to heat campus buildings.

» Thermal energy storage allows energy generated in an off-peak time to be stored for use during a later peak time.

» Traditionally, chillers in the central plant remove heat collected from buildings by the district chilled water loop and release it to the atmosphere through a cooling tower. Heat recovery chillers reuse the heat collected by the district cooling loop and the electric heat energy used to operate the chiller. Very high system efficiencies, emissions reductions and water savings can result if there are significant amounts of simultaneous heating and cooling needed.

» The STC will likely need large-size central emergency generators (1 MW and higher). Locating them in the Central Utility Plant will allow them to function for both
emergency generation and cogeneration capacity.
» The existing Worrilow Hall regional plant can serve the early phases of the STC development, minimizing costs by maximizing the use of existing facilities. Preliminary studies show that, with expansion, this plant can serve approximately 1.6 MM GSF of space.

Buildings
Building orientation impacts performance characteristics, and should be integrated into the overall form and design aesthetic. For example, sun shading and screening respond to the angle and direction of the sun, resulting in distinct elevations with consistent elements to unify design. Building orientation should also address other aspects of performance, such as incorporating daylight into the interior lighting plan.

Transportation
The Science and Technology Campus will rely on multi-modal transportation systems and comprehensive transportation demand management programs to develop a sustainable transportation paradigm. Construction of new pedestrian and bicycle pathway connections, comprehensive transit services, and innovative technologies will reduce single-occupant travel to the site and minimize the fossil fuel consumption and emissions associated with commuting to many large employment centers.
Chapter 5: Campus Master Plan

Development Framework

Due to the size and scope of the opportunity, the development of the Science and Technology Campus will likely take multiple generations and will occur in incremental phases. This Master Plan is designed to provide broad planning guidance that will shape development and help the University navigate the development challenges in the years to come. This Master Plan outlines the development principles that set the agenda for future development. The illustrative site plan suggests potential ways of developing the campus that embody the guidance and principles articulated throughout this document. The Science and Technology Campus Master Plan provides the opportunity to shape growth so that this campus becomes a center for innovation, jobs and sustainability, a location that is rich in amenities for students, faculty and staff of the campus and the larger community of Newark.

The framework plan and core values are exemplified in the illustrated plan and include the following design features:

PHYSICAL PLAN

Grid of Streets

A regular pattern to the street grid promotes efficient use of land. The grid enables incremental development of complete blocks in an inherently flexible system that allows for different combinations of blocks sized to accommodate a diversity of uses. The grid is oriented along the same axis as South...
Illustrative Concept of the Science and Technology Campus
College Avenue, which reflects the orientation of other street grids closer to the main campus.

The underground utilities will also follow the street grid. The basic distribution concept provides the thermal and power site utilities along with the other civil site utilities under many of the major roads. All these systems will be expanded over time to connect all the central utility plants to all the STC buildings and could include a series of strategic cross connections, or loops, to create a common and reliable distribution network. Phasing and building system needs will play a large role in the placement of the lines as the development progresses, but it is anticipated that the network will originate at the Worrilow Hall regional plant and be extended to and throughout the campus.
**Connected Open Spaces**

A linear progression of open spaces moves east-west through the site, linking significant University resources and on-site landmarks, such as the existing water tower.

**Connections to Adjacent UD Resources**

The Science and Technology Campus on the west side of South College Avenue complements the existing UD property on the east side. The development potential on both sides of the avenue essentially creates an opportunity to provide a new gateway to the University as one drives north along South College Avenue toward the main campus. Proposed development along South College Avenue creates an arrival sequence and will set the initial impression of the University of Delaware to visitors.

The proposed quad on the STC sits across South College Avenue from Townsend Hall linking the two green spaces. The gridded street network of the framework plan is coordinated with the location of existing drives on the east side of South College Avenue to create regular intersections between both sides of the avenue. This will facilitate easier movement from one side of South College Avenue to the other. Pedestrian connections along the gridded street network provide a direct link from the University of Delaware Stadium to the proposed train station.

**Transportation**

The STC enjoys proximity to I-95, and several arterial roadways link the campus with the interstate freeway. Signal improvements near the STC will promote efficient site access and improve overall progression of traffic on the
The Framework Plan is designed to make efficient use of multiple forms of transit. New University of Delaware shuttle routes will connect the STC to the main campus and existing Unicity and DART systems will serve the campus. Commuter parking structures are planned close to the train station to encourage maximum use of this resource. Other University parking resources will be located on this campus to alleviate parking pressure on other parts of the University, and the campus-wide parking shuttle service will be expanded to the STC.

The regional multi-use trails will also be connected to this campus with additional bike lanes on the streets and a possible multi-use trail along the proposed ecological corridor, which runs north-south on the site. New and improved pedestrian and bicycle bridges over adjacent roadways.
the railroad tracks will better integrate the STC pathway network with the neighborhoods to the north. The STC sidewalk network will direct pedestrians to intersection crossings on South College Avenue and Route 4, where intersection treatments, such as high-visibility crosswalks and countdown pedestrian signals, will promote safe crossing opportunities.

Development Program
PROGRAMS AND PARTNERSHIPS

College of Health Sciences
The College of Health Sciences, currently located on the Main Campus, comprises the departments of Behavioral Health and Nutrition; Kinesiology and Applied Physiology; Medical Technology; and Physical Therapy, as well as the School of Nursing.

Delaware Rehabilitation Institute
Exciting new College programs, affiliations and partnerships are being developed in the College, including the Delaware Rehabilitation Institute, which will integrate state-of-the-art rehabilitation related research, training and practice through physical therapy, exercise science, mechanical engineering, biomedical engineering and nursing faculty and resources. Recently the College and its programs and faculty have figured prominently in the development of the Delaware Health Sciences Alliance. Relocating the College to the STC will encourage and foster new opportunities for partnerships and alliances.

Delaware Health Sciences Alliance
The Delaware Health Sciences Alliance is a coalition of leading education, health care and medical research institutions that has created a
collaborative framework to deliver world-class health care education, conduct interdisciplinary “bench-to-bedside” research, and provide better quality and delivery of health care while improving economic development in the State of Delaware. The Alliance builds on the strength of its member institutions (Christiana Health Care System, Alfred I. duPont Hospital for Children/Nemours, University of Delaware and Thomas Jefferson University) through partnerships in the areas of research, learning and clinical studies. Vital to this endeavor is the construction of the Jefferson Campus for Healthcare Education, which will consist of a series of separate, yet linked facilities, comprising classrooms, study halls, and a residential facility for up to 50 medical, pharmacy, nursing, occupational and physical therapy students. The campus will also include the Clinical Research Facility (CRF), which will focus on outpatient research programs associated with aging, rehabilitation, disabilities and chronic care. The proximity of the College of Health Sciences to the clinical setting allows for the rapid development and delivery of research discoveries from bench to bedside, which in turn will foster entrepreneurial partnerships and positively impact the quality of regional and national health care.

**BRAC – U.S. Army Partnership**

The U.S. Army is in the process of consolidating its Research Development and Engineering Command (RDECOM) operations at the Aberdeen Proving Ground in Aberdeen, MD, as part of the BRAC (Base Realignment and Closure) initiative. CERDEC (Communications, Electronics Research, Development & Engineering Center), at Fort Monmouth, NJ, is one of the units relocating to the Aberdeen Proving Ground (APG). The University of Delaware is the closest
Mixed-Use Development Example, Bethesda, MD

Mixed-Use Area Located Near Train Station
- Mixed-use zone
Consistent with the concept for this area to be a vibrant pedestrian area, the transportation hub will be surrounded by a lining of retail shops taking full advantage of the high-volume of foot traffic. The provision of street level retail will raise the quality of these transit options, having a positive feedback loop to encourage more use. The land use strategy for this campus will further reduce dependence on automobiles by locating many uses together and encouraging a “park once” strategy to accomplish many errands.

The mixed-use program will be supported by a proposed hotel and conference center, to be located within walking distance to the train station.
Proposed Open Space Concept
Open Spaces

The Master Plan envisions a diverse, vibrant and pedestrian-friendly public realm, with well-defined streets and high-quality open spaces. The public realm within this new campus will consist of two principal elements: the street network and public open spaces, such as quads, squares and parks. Both elements are defined and framed by the building façades along their edges. The plan calls for the creation of a linear network of open spaces that traverses the site in an east-west fashion and terminates at Townsend Hall. The open space network is connected visually through preserved landmarks of the former Chrysler facility, such as the water tower.

The Master Plan’s recommended public open space network includes street-facing parks and plazas that are fully public and accessible to all. As the Master plan is implemented, the design of the proposed landscapes will be further refined with continued planning and management efforts in order to better define their program and potential.
THE QUAD
Establishing a Quad on the Science and Technology Campus will define its place in a university setting. The Master Plan calls for a new quadrangle opposite Townsend Hall on South College Avenue. A long vista between Townsend Hall and a new landmark building to the west will reach across an open lawn punctuated by occasional specimen trees and small groves. The space will be framed by formal tree rows on the northern and southern edges. Paths crossing the Quad at key locations will maximize the expanses of lawn while at the same time respecting desire lines and supporting connectivity.
A. A continuous planting of shade trees along the north and south edges of the Quad provides both spatial definition and ecological connectivity for edge species.

B. The Quad accommodates a range of activities including quiet gathering, informal active sports like frisbee and formal campus events like commencement.

C. The soil biology throughout holds great importance to fostering successful plantings as well as brownfield capping strategies.

D. A filter strip collects surface runoff. The plants within these strips remove pollutants and infiltrate the water more quickly than grass alone.
THE PARK
As the STC develops, a distributed network of parks will help to create a meaningful breakdown of this very large site into smaller, palatable precincts — each with ample opportunity for recreation. Some parks may accommodate formal sports fields, while others will preserve the openness of lawn areas for informal play, outdoor gathering and picnicking. Due to the gridded organization of the campus, the majority of park sites will be rectangular and framed by buildings and rows of street trees.
A. Wherever possible, campus streetscapes will include stormwater management facilities that serve both to enhance the pedestrian experience with attractive plantings and to slow and filter stormwater runoff through a matrix of soil and plant roots.

B. Pedestrian paths and walkways will be situated to maximize the amount of open space that is available for active and passive recreation. Turf areas will be established using a drought-tolerant mix of species and maintained according to sustainable best practices.

C. Planted corridors and tree rows will make use of native species and select adapted, non-invasive exotics. In conjunction with a broader strategy for promoting habitat and ecological corridors for wildlife on and through the campus, planted corridors will be horizontally continuous and designed for vertical connectivity with a stratified approach to planting. Individual species will provide food and cover for desired bird, insect and mammal populations.
THE PLAZA

Successful plazas are typically flanked by buildings with important first floor functions, such as retail or performance spaces. Plazas in the Science and Technology Campus will be important gathering spaces and serve as places to see and be seen.
A. Active outdoor gathering spaces are created by the design and placement of tables, chairs and other seating elements.

B. A mix of hardscape and softscape allows micro-bioretention areas that accommodate and filter surface runoff. A strong tree canopy creates shade to activate outdoor space during the summer months.

C. Wherever possible, campus streetscapes will include stormwater management facilities that enhance the pedestrian experience with attractive plantings and slow and filter stormwater runoff through a matrix of soil and plant roots.
THE GREEN

The Greens at the STC are located where important cross streets come together to link the campus to the larger region — at the train station and at a future avenue which could lead toward Delaware Stadium. The space will be primarily open lawn to accommodate various functions, and the perimeter will be defined by street trees and sidewalks. Benches can also be located along the periphery. Elements such as fountains or kiosks can be positioned inside the Green to provide a focal point.
A. A continuous planting of shade trees along the edges will provide both spatial definition and a certain level of ecological connectivity for edge species.

B. The passive green space, defined by the perimeter walks and trees, includes a focal point creating a more formal green space on campus.
THE PASEO

The Paseo provides an alternative to sidewalks along streets for pedestrian movement. The Paseo will also be used to gather and convey stormwater through the site. Water will be collected during rain events and incorporated into the plan to be used as an amenity.

A. Intimate outdoor gathering spaces along the central path. Lighting and native canopy trees create an inviting warm ambiance.

B. A meandering constructed swale filters rainwater from adjacent rooftops and directs it to other stormwater features on-site.

Illustrated Concept

Key Map

Typical Paseo Section

Oregon Health Sciences University, Portland, OR

Dell Childrens Medical Center of Central Texas, Austin, TX
COURT-YARDS

Courtyards can be more than interstitial spaces between buildings, they can also serve as part of the general open space plan. Courtyards can be designed with pleasing plantings and site furniture and provide a place for outdoor classrooms, eating meals and relaxation. Solar studies of each courtyard will be conducted to determine areas of prolonged shade and to identify sunny areas.

A. Tree pits and patches of green within the courtyards collect and infiltrate surface runoff. The use of native trees, grasses, and perennials help to promote a sustainable lifestyle.

B. Tables and chairs as well as other seating elements encourage quiet gathering adjacent to buildings.

Typical Courtyard Section

University Square, Beersheba, Israel

50 Avenue Montaigne, Paris, France
STREAM RESTORATION/ECOLOGICAL CORRIDOR
Currently, the Silver Brook Stream runs through the site in an 84-inch underground culvert that has been in place for 50 to 60 years. Stormwater runoff flows directly from the expansive impervious surfaces throughout the STC into the culvert without being treated. The aging infrastructure and large-scale site redevelopment presents an opportunity to reconsider this condition.

The Framework Plan allows for the stream to flow freely through the site, accessing adjacent floodplains during high flows, providing a variety of aquatic and terrestrial habitats in the surrounding corridor, and creating an exciting and significant asset for the University. This organizing feature of the plan exemplifies UD’s commitment to the environment and offers many benefits, including:

» Improvements in water and aquatic habitat quality by increasing water capacity,

» Decreasing flows in combined sewer systems and reducing erosion.

» New riparian corridors for wildlife.

» Opportunities for ecological education and research.

» Enhanced recreational facilities for members of the University and Newark communities.

» Increased community involvement in natural resource management.

» Avoiding costs of culvert repair or replacement.
A. The ecosystems within the vegetated buffers mitigate non-point source pollution, provide food and habitat for animals and plants and accommodate bird and insect migration.

B. Boardwalk paths and interpretative signage through the floodplains educate users about natural environments and link into a network of trails throughout a community.

C. Sufficient shading over the stream channel helps to control the stream temperature. About 50% of direct sunlight and the rest dappled shade is preferable.

D. Adequate floodplains ensure healthy, stable streams. A floodplain is most effective when it consists of a strong herbaceous layer, a dense understory and a full tree canopy.

E. Landforms created using the soil extracted while daylighting the stream can display soil remediation practices. These mounds can be planted with appropriate pollutant leaching species or left as a pure lawn form.
A. Boardwalk paths quietly meander throughout the lowland in order to not interfere with the natural habitat of plant and wildlife species.

B. Providing a narrow channel for water to flow is adequate during dry periods. The surrounding topography provides sufficient capacity for flooding.

C. The lowland areas are comprised of a wetland plant community. These species are tolerable of both periods of drought and flooding.
As daylighting streams is a relatively new and innovative undertaking, the process can meet challenges related to:

» Legal and management issues.
» A fear of the unknown.
» Technical needs of highly urban environments.

The Master Plan illustrates the ecological corridor tightly integrated into the proposed open space and development networks. Views into the space, paths, program elements, and adjacent uses work to ensure that it will achieve a balance of ecological functionality and activation as an amenity.

Stream restoration will play a large role in the STC’s stormwater management strategy, further emphasizing the need to integrate the stream restoration corridor with the rest of the development. Due to the age of the existing piping, new stormwater outfalls that tie into the new channel and surrounding floodplain may need to be installed.

A. The upper terrace meets with existing grade consisting of adjacent built features such as roadways and buildings.

B. Plants are used for cleansing the water by removing debris and other pollutants. Coir logs are installed as a retaining device between the stream and vegetated shelf.

C. Planted with a riparian community and habitable by humans through a trail system, the intermediate ledge is designed to provide vertical space for flooding.
Streets and Sidewalks

The configuration of travel lanes, parking, sidewalks, outdoor spaces and buildings defines the character of a place. Wide travel lanes with little separation between pedestrians and cars and few destinations encourage cars to travel at high speeds and create unpleasant and unsafe walking and biking environments. By contrast, smaller scale streets that incorporate on-street parking, street trees, and active building frontages balance the needs of the full range of users and provide spaces for everyone to enjoy.

Streets within the STC will accommodate pedestrians, bicyclists and drivers comfortably and safely. The character of the public realm will be predominately urban and walkable,
with consistent building frontage on both sides, generous sidewalks and shared travel lanes for bicycles and cars. Select streets will incorporate bike lanes, rows of street trees, and integrated stormwater management facilities, such as planted filter strips, to improve the quality of runoff from sidewalks. Consistent standards for paving materials, site lighting and streetscape furnishings help to convey a sense of place in this urban, collegiate environment. The street grid is a fundamental organizing principle of the Science and Technology Campus. Its network of streets extends across the site, providing access for vehicles, bicycles and pedestrians and provides the framework within which development will occur. The grid will respond to varying traffic volumes across the site, establishing a hierarchy among the individual streets. This hierarchy of streets helps to organize the campus and reinforce the prominence of key spaces as shown in the Street Hierarchy diagram.

To facilitate pedestrian access onto the site from the heavily trafficked surrounding roads, all signalized campus gateways on South College Avenue and Route 4 will incorporate appropriate pedestrian safety features. These include high-visibility crosswalk treatments, countdown pedestrian signals, wheelchair ramps, pedestrian landings at intersection corners, and protected pedestrian refuge within the median on South College Avenue.

The following pages go into greater detail of the retail street and a typical “campus” street (which represents the Primary, Secondary and Tertiary Streets). The layout and dimensions of these streets will be outlined in the Design Guidelines.
**A.** Consistent build-to lines, standardized building heights and targeted development densities will promote an urbane streetscape character, especially on important corridors within the campus.

**B.** Wherever possible, campus streetscapes will include stormwater management facilities that enhance the pedestrian experience with attractive plantings and slow/filter stormwater runoff through a matrix of soil and plant roots.

**C.** Generous sidewalks, especially along retail frontage, will provide the forum for campus activity and pedestrian interaction. Lighting and other site furnishings, such as benches and café seating, will make the street environment comfortable and secure.

**D.** Tree rows along select routes will underscore the role of the street network as part of a larger open space system organizing and giving character to the STC.
CHAPTER FIVE: CAMPUS MASTER PLAN

Sidewalk Enlargement Detail – Retail Street

Mixed-Use Sidewalk Precedent, Bethesda, MD
A. Consistent build-to lines, standardized building heights and targeted development densities will promote an urbane streetscape character, especially on important corridors within the campus.

B. Wherever possible, campus streetscapes will include stormwater management facilities that serve both to enhance the pedestrian experience with attractive plantings and to slow/filter stormwater runoff through a matrix of soil and plant roots.

C. Generous sidewalks, especially along retail frontage, will provide the forum for campus activity and pedestrian interaction. Lighting and other site furnishings, such as benches and café seating, will make the street environment comfortable and secure.

D. Tree rows along select routes will underscore the role of the street network as part of a larger open space system organizing and giving character to the STC.
CHAPTER FIVE : CAMPUS MASTER PLAN

Sidewalk Enlargement Detail – Secondary Street

Garden Spaces Along Sidewalk – Glenwood Park, Atlanta, GA
Infrastructure

The design, maintenance and operations of the water, sanitary sewer and stormwater infrastructure serving the STC will impact on the environmental quality as well as the quality of life of the campus community. The complete redevelopment of this campus “from scratch” provides a unique opportunity to develop a holistic system and plan for innovation and efficiency.

WATER SYSTEM INFRASTRUCTURE

By and large, the initial phases of development can use existing waterline infrastructure surrounding the site. The proposed grid structure of the campus will support a logical and efficient water distribution network. Blocks can be looped to support fire flow and an expandable system.

To support sustainability goals, buildings will use efficient fixtures to minimize water demand. Sustainable design features that allow capture and reuse of rainwater and greywater can further reduce consumption of potable water. Initial phases of development could install a redundant pipe system in the road grid to more efficiently convey reclaimed water to buildings for use as cooling tower make-up water, in fire protection or in irrigation.

SANITARY SERVICE

While the various uses proposed for the site have different demands, the planning process assumes a maximum development of 10 MSF with an average demand of 50 GPD/1000SF. Therefore the maximum average demand would be 0.5 MGD. In this case, the capacity of the applicable sewer interceptor is sufficient to handle these conditions.

The planned street grid supports an efficient sanitary sewer conveyance system. Generally, sanitary sewer collector lines run from the north to the south underneath streets, using gravity to collect flows from surrounding development.
Following these best practices will ensure the system functions smoothly and can expand incrementally as the campus grows.

The sanitary sewer system provides a unique option for sustainability in the future. Projections show that at full build out, a large percentage of the water demand will come from operational needs and not domestic uses. These demands include cooling tower make-up, irrigation and fire, which can all be met with non-potable water provided by an on-site wastewater treatment and reclamation facility. The facility will charge the water tower to provide volume and pressure for the fire protection system. If located near the existing interceptor line, it would have the ability to harvest existing flow when on-site flows need to be supplemented. Ultimately, this strategy will reduce water demands and sanitary waste discharge and provide additional capacity to the existing sanitary sewer main.

**POWER INFRASTRUCTURE**

*Planning Goals*

Highly reliable, efficient and maintainable central utility systems for all buildings will serve as an important asset to the STC. All power and thermal utility systems will be flexible to adapt to the rapidly evolving technologies addressing resource scarcity. By planning modular infrastructure systems that are installed in phases, the STC can employ the best available technology in each phase.

**THERMAL UTILITIES**

*Future Capacity*

As the STC grows and expands beyond the capacity of the Worrilow plant, one or both of the planned central utility plants (CUPs) will be developed and interconnected with the Worrilow plant. This will serve the STC’s demand and backfeed some of the more significant users on the South Campus east of South College Avenue.
Proposed Primary Utility Plan

- Existing Sewer
- New Sewer
- Existing Water
- New Water
- New Power
- Existing Stream Culvert
- Central Utility Sites

- Proposed Sub Station and CUP Site
- Proposed United water connection
- Proposed Go-Gen Plant and CUP Site
- Proposed Newark water connection
- Future water connection
The plan accommodates two CUP sites along the north side of the campus. To provide long-term flexibility, both sites have been sized to handle the full campus loads for the planned 8–9 MM GSF.

The first site sits closer to phase one development on the east side of the existing stream culvert. It will be equipped with high efficiency heating and cooling systems and could potentially accommodate small scale combined heat and power (CHP). The first plant is likely to be co-located with a new substation serving the STC.

The second plant site is sized to incorporate a full scale CHP facility. The plan accommodates this larger facility on the west side of the stream with other long-term development. Its location also allows for the delivery of solid fuels, such as biomass, by railroad.

UTILITY DISTRIBUTION
Utility infrastructure plays a critical role in achieving sustainable growth in dense urban areas. The project’s goals for land use, development patterns, transportation, and energy efficiency all factor into the utility distribution strategy. On the STC, thermal, power and civil site utilities will be provided in the public right-of-way under many of the major roads. The systems will be expanded incrementally as development progresses, connecting the central utility plants to each building. They will include a series of strategic cross connections, or loops, to create a common and reliable distribution network.

Specific development needs will drive detailed phasing plans, but the general network plan will originate at the Worrilow Hall regional plant and extend throughout the STC.

For life cycle cost reasons, the majority of the chilled water and hot water piping distribution systems will be installed with direct buried
materials while power and telecommunications conduits will be encased in concrete duct banks. In areas where the utility corridors are narrow or maintenance access is difficult, accessible tunnels will be considered.

**Transit**

While the STC will have a unique character, it will still be a part of the cohesive, over arching campus identity of the University of Delaware. Local transit systems will play an important role in linking the STC with the rest of the University and other destinations in Newark. Although the University transit system currently operates shuttles to the Athletics facilities and College of Agriculture and Natural Resources on the South Campus, development of the STC will require additional shuttle service.

To maximize access and minimize delays for shuttle riders, the University will add two routes with service along South College Avenue between the Main Campus, downtown Newark, and the STC site. The shuttle routes will serve independent but complementary purposes. The first route will serve the area generally defined as phase one, including the College of Health Sciences, the proposed Thomas Jefferson Education building site, the train station and its associated park and ride lots. The second route will travel the major east-west corridors to provide shuttle access within a five-minute walk from anywhere on the STC.

Additionally, as the STC grows and structured parking is shifted toward the perimeter of the campus, an internal circulator shuttle may prove beneficial. This circulator would run frequently, particularly in peak hours, traveling along primary streets and stopping at major parking facilities, the train station, and remote buildings.

The current UD shuttle schedule, which operates between 4:30 AM and 6:30 PM, will serve the site’s university users well. Significant private
enterprise on the STC may justify extending service by about two hours on weekday evenings. Frequent headways of 20 minutes or less are important to establish the service as a viable mode of transportation.

The Unicity bus routes N1 and N2 also serve South College Avenue along the STC site frontage. The University may consider coordinating with the City of Newark to adjust these routes based on STC destinations. Any improvements to the South College Avenue streetscape should accommodate recessed bus pull-outs at bus stops to better serve these routes.

PEDESTRIAN AND BICYCLE FACILITIES
By considering the needs of pedestrians and bicyclists in the planning process, the groundwork has been laid to establish walking and bicycling as a popular mode choice for commuters. To develop significant pedestrian and bicycle mode share for the STC, the plan:

» Provides a comprehensive network of pedestrian and bicycle facilities and accommodations on the site.
» Provides convenient links to off-site facilities.

The STC site is bordered by two dedicated pedestrian/bicycle facilities: the James F. Hall trail north of the railroad tracks and a multi-use trail along the south side of Route 4. By connecting to these existing facilities, the STC pedestrian and bike network will connect the site to regional pathway and trail systems throughout the Newark area.

The following new or improved pedestrian and bicycle facilities will enhance STC connectivity:
» Sidewalks along all roadways.
» Pedestrian safety oriented intersection treatments at all internal intersections and along South College Avenue and Route 4.
» Site design features to direct pedestrians to primary crossings at the campus edges.
» Multiuse pathways in open spaces.
» Bicycle lanes on primary streets to provide a continuous connection between off-site bicycle facilities and major on-site destinations.
» Sheltered bicycle parking and shower and changing facilities in or near most buildings.
» New pedestrian and bicycle connections across the railroad tracks in proximity to the train station, connecting the STC to the James F. Hall trail on the north side of the railroad.
» Improvement of the pedestrian bridge along South College Avenue to better accommodate both pedestrians and bicycles.

PARkING MANAGEMENT

The Science and Technology Campus represents a significant parking resource for the University of Delaware. The site provides the opportunity to address parking for the STC, Athletics events, and Main Campus overflow through multi-modal transportation systems.

The STC will locate new parking lots and structures to serve zones of need and support future expansion, generally toward campus periphery and along transit routes. Initially, parking is likely to be clustered in proximity to the train station and south of the proposed College of Health Sciences building. As the site develops, locations near Route 4 should be prioritized to encourage vehicular access from Route 4 and reduce vehicle travel in the campus core. Park & Ride facilities, intended to serve overflow parking from the main campus or Athletics facilities, will be located on primary streets and along campus shuttle routes.
Development Guidelines

Development guidelines will be created to sustain the vision set forth in this Master Plan. Coupled with the upcoming zoning ordinance specifically created for the Science and Technology Campus, the guidelines will:

» Create predictability and common expectations for the outcome of the campus.
» Set quality assurance to the stakeholders, the University and the larger community.
» Create a process for design review and approval.

Development Review Process

The Master Plan, Guidelines, and Zoning Ordinance created for the Science and Technology Campus will guide third-party developers.

Phasing

The development of the Science and Technology Campus will likely take multiple generations to fulfill the vision set forth in this Master Plan. The Master Plan is designed to provide broad planning guidance to specific development projects when opportunities arise.
PHASE 1A

Development Program

- Phase 1A: 72,000 sf
  - 32,000 sf
  - 104,000 sf

Parking Needed: 416 spaces
Site Area: Approx. 15 acres

The renovated administration building is self-sufficient in terms of thermal utilities and does not need to rely on Worriow until its systems need to be replaced.

Thermal Utility and Power

- Relocate PRV station east or utilize Worriow or other location along the underground gas line: $500,000
- No Worriow upgrades needed

Streets

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PHASE 1A ALTERNATIVE (EXISTING HIGHBAY SPACE)

Development Program

Phase 1A: 72,000 sf

100,000 sf

172,000 sf

Parking Needed: 688 spaces

Site Area: Approx. 15 acres

The renovated administration building is self-sufficient in terms of thermal utilities and does not need to rely on Worrilow until its systems need to be replaced.

Thermal Utility and Power

» Relocate PRV station east or utilize Worrilow or other location along the underground gas line: $500,000

» No Worrilow upgrades needed

Streets

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Total: $830,961.90
PHASE 1B

*Development Program*

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Parking Needed: 2,168 spaces  
Site Area: Approx. 32 acres

Renovated administration building is self-sufficient with thermal utilities and does not need to rely on Worrilow until its systems need to be replaced.

*Thermal Utility and Power*

- **Worrilow Utility Plant**
  - Add 1500 ton chiller, 1500 ton tower: $3,000,000
  - No new boiler needed (Worrilow extra capacity can accommodate up to 400,000 sf development in phase one)
  - Add steam converter: $500,000
  - Worrilow building expansion: $1,530,000
  - Upgrade steam boiler deaerator and chemical treatment system: $1,000,000

- **South College Avenue bore and jack**: $650,000

- Distribution from Worrilow to new buildings (excludes existing administration building): $5,130,000

*New Streets*

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Acknowledgements

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Glossary

The definitions listed below are intended to serve as supporting information for this planning document. (Some of the definitions are adapted from the Smart Code by Duany Plater-Zyberk and Company).

**Block:**
The aggregate of private lots, passages, rear lanes and alleys, circumscribed by thoroughfare rights-of-way.

**Block Face:**
The aggregate of all the building façades on one side of a block. The Block Face provides the context for establishing spatial clarity and architectural harmony along the course of a thoroughfare.

**Buildable Area:**
The area of a lot within which a structure can be placed after the minimum yard and open space requirements of the Zoning Ordinance have been met, less any area needed to meet the minimum requirements for streets, sidewalks, or other similar public improvements.

**Building Footprint:**
The area of a two-dimensional plane circumscribing the perimeter of a building as it engages the ground plane or another designated plane.

**Building Configuration:**
The form of a building, based on its massing, private frontage and height.

**Building Type:**
A structure category determined by function, uses, disposition, and configuration, including frontage and height.

**Build-To Line:**
A line established along a street or open space frontage extending the full width of the lot, that defines the block face and establishes building placement. Lines established between public open spaces and street rights-of-way represent the approximate demarcation between the public open space and sidewalk.

**Central Utility Plant (CUP):**
Central power and thermal utility used to diversify loads and share redundancy to increase efficiency.

**Class One Bike Lane:**
Bike lanes that are physically separated from motor vehicle and pedestrian traffic.

**Class Two Bike Lane:**
On-street bike lanes defined by a painted stripe.

**Class Three Bike Lane:**
Bike routes represented only by posted route signs.

**Cogeneration (Combined Heat and Power, CHP):**
The use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

**Complete Streets:**
A multi-modal design configuration for streets that accommodate all users, including pedestrians, bicyclists, bus riders, transit users and motorists.

**Context:**
Surrounding built environment, principally defined by the massing, frontage, and architectural character of buildings, as well as the elements, character, and quality of the public realm.

**Density:**
A measure of the number of people occupying a standard measure of land area. By assigning increments of building area or dwelling units to each person, density can be expressed either as: 1) the gross floor area of all buildings on a lot (in square feet) occupying a lot; 2) the gross floor area of all buildings on a lot divided by the lot area, usually expressed as a Floor-Area Ratio; or 3) the number of dwelling units within a standard measure of land area, usually given as units per acre.

**Design Guidelines:**
More detailed development recommendations.

**Easement:**
A right granted to one property owner (often a public entity) to make use of the land of another property owner for a limited purpose, such as a Right-Of-Way or Public-Use Easement. Easements may be...
specified for a fixed period of time, a fixed but renewable duration, or be set in perpetuity.

**Elevation:**
An exterior wall of a building not along a Frontage Line. See: Façade

**Encroachment:**
Projection, extension, or placement of building elements beyond a regulating line controlling building disposition.

**Façade:**
The exterior wall of a building that is set along a Frontage, typically a Build-To Line (see Elevation; Frontage).

**FAR (Floor Area Ratio):**
The gross floor area of all buildings on a lot divided by the lot area.

**Framework Plan:**
A diagrammatic plan that expresses the essential planning principles and core values to create a “framework” of basic organizational elements such as street, open space and building locations.

**Frontage:**
All the property fronting on one side of a street between the two nearest intersecting streets, or other natural barriers. Also, for the purposes of this plan, the frontage comprises the zone between the facade of a building and the curb of the street on which the building fronts. Frontage typically includes street elements such as sidewalks, street trees, cafe seating, and similar elements. Frontage also includes elements of the building façade that directly impact the pedestrian experience.

**Frontage Line:**
those block or lot lines that coincide with a public frontage, right-of-way, and/or Build-To-Line.

**Frontage Occupancy:**
Minimum percentage of the linear length of a building’s façade that must engage the Build-To-Line.

**Greywater:**
Wastewater generated from domestic activities such as laundry, dishwashing, and bathing, which can be recycled on-site for uses such as landscape irrigation.

**Illustrative Concept Plan:**
A plan drawing illustrating in comprehensive form the primary conceptual ideas of a Framework Plan and Design Guidelines. Such a plan only conveys a general intent and does not specify precise design outcomes for individual building sites.

**Lot Line:**
A line of record bounding a lot which divides one (1) lot from another lot or forms a public or private street or any other public or private space.

**Major Street:**
For the purposes of this plan, a street with a Right-of-Way greater than 80 feet in width.

**Massing:**
A term used to describe the physical volume, shape, or bulk of a building.

**Master Plan:**
A comprehensive planning instrument that describes with narrative, policies, illustrations and maps an overall development concept for a new or revitalized neighborhood or city.

**Minor Street:**
For the purposes of this plan, a street with a Right-of-Way 80 feet or less in width.

**Mixed Use:**
Multiple functions within the same building through superimposition or adjacency, or in multiple buildings within the same area by adjacency. Mixed use is one of the principles of Traditional Neighborhood Development (TND) from which many of its benefits are derived, including compactness, pedestrian activity and parking space reduction.

**Multi modal Transportation:**
Transportation that includes more than one type of travel method, such as walking and bicycling.

**PRV:**
Natural gas pressure reducing station.

**Public Realm:**
That area of the built environment dedicated to public accessibility and use, commonly composed of streets, sidewalks and public open spaces such as parks, squares and plazas. The public realm is spatially defined by the buildings, both public and private, fronting its edges.

**Retail Frontage:**
Frontage that require the provision of shop fronts, causing the ground level of buildings to be available for retail use.

**Right-of-Way:**
A designation on the Build-To-Lines Map assigning a dimension, measured from Build-To-Line to Build-To-Line, that will delineate the course and width of a street, inclusive of all travel lanes, parking lanes and sidewalks. More generally, a public use easement, usually for a strip of land.
that provides a path or route for public access or infrastructure.

**Sense of Place:**
The experiential quality of an urban setting that fosters a sense of authentic human attachment and belonging, making one feel that a place is special and unique.

**Setback:**
The distance which a building is required to be “set back” from a lot line or from the nearest building or structure.

**Sidewalk Clear Zone:**
The portion of the public sidewalk space provided expressly for accessible pedestrian mobility. It is usually located between the “landscape & utility” zone and the building shy or “café” zone. This space is unobstructed and is constructed of materials and patterns that provide a relatively smooth surface that complies with ADA accessibility standards.

**Sidewalk Shy Zone:**
A subzone of public and private frontage between the building façade and the sidewalk throughway furnished according to the public frontage program. For commercial frontages, it is usually paved and may include such elements as café seating or outdoor retail displays. On residential frontages, it may include landscaping elements such as a door yard, raised planters or seating areas.

**Sidewalk Street Tree Zone:**
A subzone of the sidewalk between the street curb and the sidewalk throughway, principally occupied by tree pits and street trees.

**Street:**
For purposes of this plan, a public thoroughfare defined by a right-of-way as delineated in the Build-To-Lines Map.

**Streetscape:**
The urban element that establishes the major part of the public realm. The streetscape is composed of thoroughfares (travel lanes for vehicles and bicycles, parking lanes for cars), public frontage (sidewalks, shy zones) as well as the visible private frontages (building façades and elevations, yards, fences, awnings, etc.), and the amenities of the public frontages (street trees and plantings, benches, streetlights, etc.).

**Structured Parking:**
A means of providing parking above grade in building podiums containing two or more stories of parking.

**Traffic Circle:**
A road configuration at a street intersection that channels intersecting traffic around a circular open space. The direction of traffic flow is one-way, with traffic entering the circle yielding to traffic in the circle. A traffic circle may be signalized or not; if not, it is often referred to as a Roundabout.

**Trail:**
A separated path used for either recreation or transportation by pedestrians and, in some cases, bicyclists. Trails often travel through natural areas.

**Transit:**
Any type of local public transportation (i.e., bus system, passenger rail, shuttle services, etc.).

**VOC (Volatile Organic Compounds):**
Gases emitted from certain solids or liquids that include a variety of chemicals, some of which may have short- and long-term adverse health effects.
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