UNIVERSITY OF DELAWARE

SCIENCE & TECHNOLOGY CAMPUS

DEVELOPMENT GUIDELINES

August 2011

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Properties of the University of Delaware

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Chapter 1: Introduction

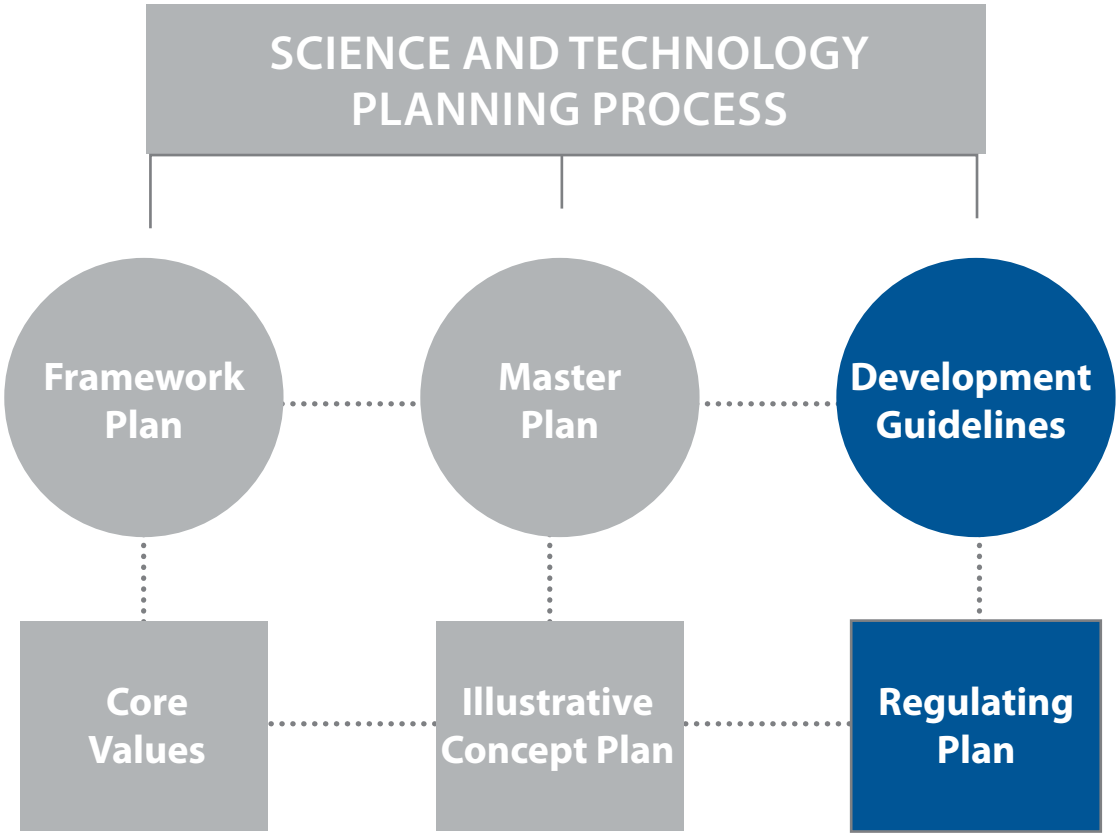
Background

Around the time of the Korean War, Chrysler began to assemble tanks on a 272 acre parcel just south of the University of Delaware's main campus. The plant continued to serve as a major employment center for the region until its closure in 2008. The University recognized that a large site immediately adjacent to its campus with easy access to Interstate 95 and an Amtrak station offers significant opportunities to advance its mission and chose to acquire the site.

The University of Delaware's "Path to Prominence™" sets a course of action to distinguish the University as a world-class research institution committed to environmental sustainability. The site provides ample space for growth in pursuit of this vision. Building upon its technology-related partnership with the Aberdeen Proving Ground, the University plans to redevelop the plant into its Science and Technology Campus (STC). It will house research laboratories and life and health sciences space that will restore the site as an employment center. Incorporating retail and housing will ensure the campus functions as a vibrant, active district. Through landscape and building best practices, development will lessen the site's impact on the environment and enhance the open space and transportation networks of the campus and the city.

Process

Three documents will guide the University in this undertaking. The initial Capacity Study sets forth Core Values. The Master Plan documents the bold vision for the site, including an Illustrative Concept



Plan that portrays one possible physical manifestation of these values. By contrast, the Development Guidelines detail the Regulating Plan, which reduces the vision to its most fundamental elements.

The Development Guidelines contained in this document communicate general objectives relating to preferred streetscape, building, and open space design. Their purpose is to point a direction and inform the response to specific development proposals. They offer flexibility, recognize economic and programmatic forces that influence the realization of the Master Plan, and acknowledge that the vision can be achieved through a variety of means and methods. Should certain elements of the guidelines prove infeasible or undesirable as the development of the campus advances through stages of design review and more specificity, projects should consider alternative strategies that achieve the main objective outlined in these guidelines.

CORE VALUES

The following Core Values are fully expressed in the Master Plan document:

- Campus Experience – Extend the richness of the undergraduate and graduate student 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 – Partner with local, regional and state organizations and invest in campus growth that is mutually beneficial to the University and to the larger community of which it is an integral part.
- Campus Connectivity – Create a cohesive and aesthetically pleasing campus by evolving from an automobile-oriented community to a more balanced, well-connected one and by creating places that facilitate interaction.
- Sustainable Growth – Develop the campus in an environmentally responsible way through sustainable and efficient use of University buildings and natural systems. Seek opportunities to increase and reclaim open space and to protect the quality of the campus environment as the University of Delaware expands to meet the needs of its educational mission.
- Campus Architecture and Capacity – Maintain a compact and collegial campus through strategic application of height and density to avoid sprawl.

THE ILLUSTRATIVE CONCEPT PLAN

The Illustrative Concept Plan shows a potential future for the Science and Technology Campus. The plan incorporates key urban elements and design strategies to create a world-class research campus. Principal among these elements are a legible framework of streets,

Illustrative Concept Plan for the Science and Technology Campus

blocks, and open spaces. The illustrative properties can be developed in accordance with the recommendations, and the exact location, scale and design character will ultimately vary in detail but should be consistent with the spirit of this plan.

The Illustrative Concept Plan embodies primary urban design objectives and features including park and plaza locations, building heights, building massing, and street configuration. It does not specify a particular building plan for any given site, but rather communicates an acceptable direction and level of development consistent with the stated goals, objectives and core values of the Master Plan. Third-party developers should gain a clear understanding of the University of Delaware (UD)'s expectations for support and approval.

Master Plan Key Features

The plan includes a number of design features that implement the Core Values:

- Grid of Streets – The grid aligns with South College Avenue, reflecting the historical grid of Newark. Blocks can be combined to accommodate a diversity of uses and sizes when appropriate.
- Connected Open Spaces – A linear progression of open spaces across the campus links significant UD resources and prominent campus landmarks.
- Connections to other UD Resources – The open space network and proposed street grid on the STC complement UD property east of South College Avenue to facilitate easy movement between the two sides as well as between the Athletics facilities and the train station.
- Transportation – Improved multimodal transportation systems and comprehensive transportation demand management develop a sustainable transportation paradigm.
- Sustainability – The plan incorporates many sustainable features, including

a comprehensive stormwater plan integrated with the open space network and a potential ecological corridor linking existing wooded areas. Modular on-site energy production permits use of the latest technological capabilities as they emerge. Finally, buildings will be oriented and designed to take advantage of passive heating and cooling.

The introduction of these features within the plan will be phased and coordinated on an ongoing basis. As market conditions and partnership opportunities arise to support specific building projects, the plan will provide guidance for coordinating the construction of new streets, open spaces and other amenities.

The Regulating Plan

The Development Guidelines establish a grid that will accommodate development, set aside significant open spaces that will define the character of the campus, and locate infrastructure that will serve the site's occupants. Additionally, the Guidelines set standards and preferences for key features of building and landscape projects. These are intended to establish consistency, quality, and character throughout the site while maintaining flexibility to accommodate changing economic and programmatic drivers. Guidelines ensure that development upholds the core values .

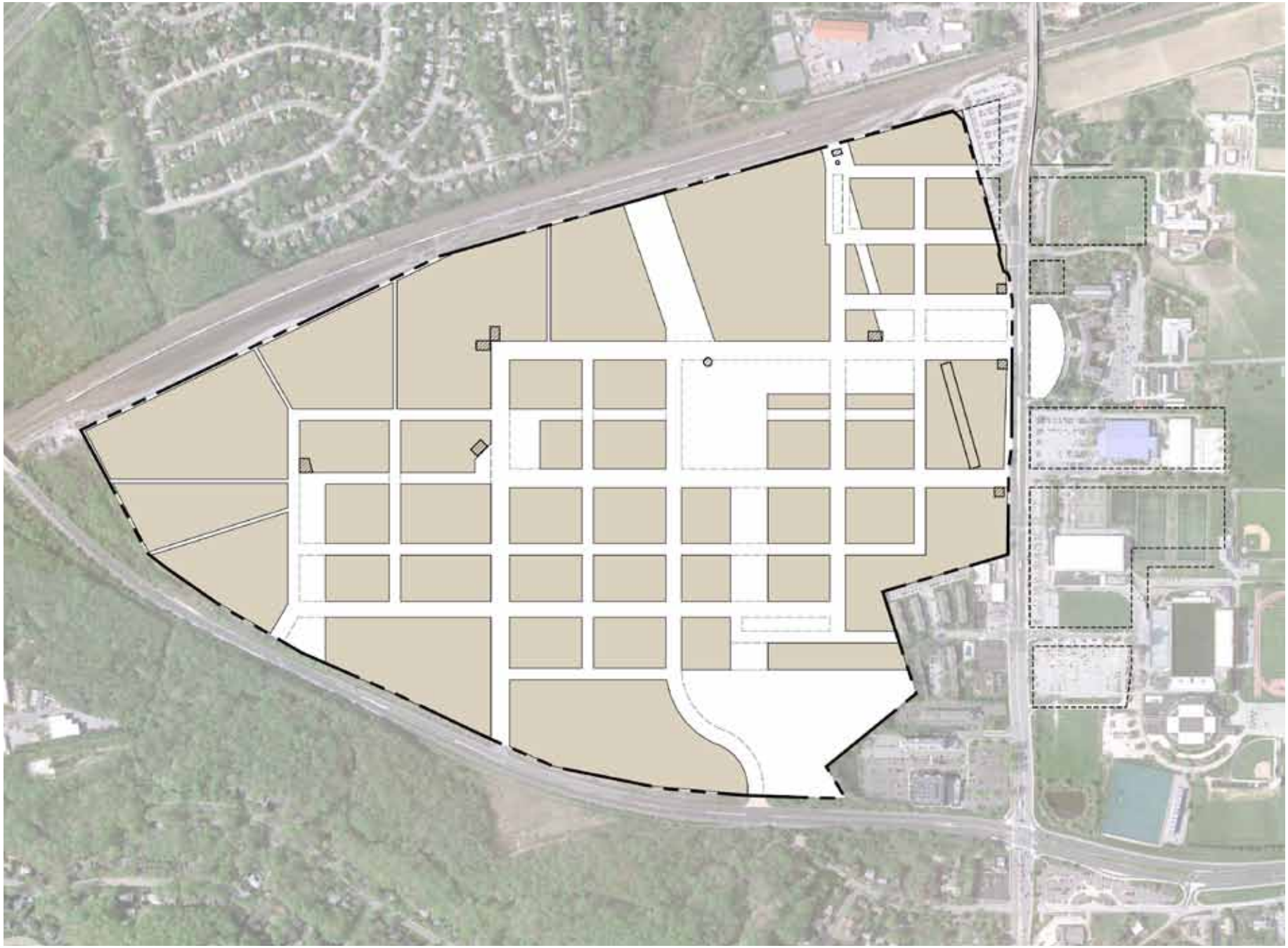
RELATIONSHIP TO OTHER DOCUMENTS

The Development Guidelines will function alongside other documents to shape the implementation of the Science and Technology Campus. These documents include:

» Future Standing Ground Lease

» Proposed Zoning District

» Subdivision Process, as appropriate



Regulating Plan for the Science and Technology Campus

Development Guidelines Organization

The Guidelines are organized into the following chapters:

» Chapter 2: Site Development – This chapter summarizes the building and landscape elements that make up the Illustrative Concept Plan and Master Plan.

» Chapter 3: Landscape and Streetscape Design – These standards establish dimensional requirements of travel lanes, tree planting strips, and sidewalks, as well as street tree and light placement. It also identifies each open space type and further describes the characteristics and design intent for each. General landscape standards for furnishings are also included.

» Chapter 4: Architecture – These architectural standards apply to all buildings. The scope of this chapter includes general composition such as building organization, massing and orientation. It also includes standards for ground floor retail and mixed-use buildings.

» Chapter 5: Parking, Access and Utilities – This section establishes parking standards and requirements for loading configurations.

» Chapter 6: Infrastructure – This chapter will address performance standards for water, sewer, power, and thermal infrastructure.

» Chapter 7: Site Signage – These standards address campus branding and identity as well as wayfinding.

Chapter 2: Site Development

Summary of the Framework Plan

The plan calls for the creation of a linear network of open spaces that traverse the site in an east-west fashion, terminating at Townsend Hall. Preserved landmarks of the former Chrysler facility, like the water tower, visually connect the open space network. The recommended public open space network includes street-facing parks and plazas that are fully public and accessible to all. The vision for open spaces will guide the establishment of a cohesive system of high-quality open spaces across the site. As the University implements the vision, continued planning and management efforts will further refine the proposed landscapes in order to better define their program and potential.

STREETSCAPE DESIGN

Streets are a major contributing element of the public realm, which will be predominately urban and walkable. To support this vision, streets will have building frontage on both sides, generous sidewalks, and shared travel lanes for bicycles and cars. Select streets shall incorporate bike lanes, tree rows, 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 will help to convey a sense of place in this urban, collegiate environment.

ARCHITECTURAL DESIGN

A key feature any vision should explore is how to use proposed buildings to better frame and give definition to streets and public spaces as places of shared civic use. A first priority is to create active

Stormwater management features serve as an amenity in a park built on a reclaimed brownfield site. Tanner Springs Park, Portland, Oregon.

streetscapes that promote pedestrian use, foster increased retail activity and growth, and generally create a "sense of place" in an urban setting.

PARKING AND ACCESS

The Science and Technology Campus (STC) has the potential to function as a significant parking resource for the University of Delaware. The size of the site provides the opportunity to address parking for the STC, nearby Athletics events, and main campus overflow through multi-modal transportation systems. The University will coordinate land use and parking management for the STC by reviewing its campus parking supply holistically rather than attempting to increase supply for each new use.

INFRASTRUCTURE

Environmental quality is a critical element of the overall quality of life and an important pillar for the development of the STC. A variety of man-made and natural factors can contribute to the campus' environmental quality and shape the future development of the campus. The design, maintenance and operations of the water, sanitary sewer, and stormwater serving the STC will have a significant impact on the environmental quality. The unique opportunity given at the outset of developing this project, essentially as a blank slate, will provide the opportunity to improve the quality of the environment of the campus and its surrounding area. A modular and sustainable site strategy for power generation and provision of thermal utilities allows the campus to easily adopt new technologies as they become feasible.

SITE SIGNAGE

Provides general recommendations for sign

locations and messages to help people navigate through the environment. The signage system is designed to address image, brand and messaging needs. Signage design is successful when it carefully balances these aesthetic (image) and informational (message) needs. Signage performs both directional and identification functions. Directional signs provide navigational guidance and identification signs label destinations.

Low Impact Development

The University of Delaware has firmly committed to being a leader in sustainability and maintaining a green campus. The University's Climate Action Plan and President Harker's signing of the American College and University President's Climate Commitment, dedicates UD to pursue carbon neutrality and reduce

Water Flow Diagram shows how Open Spaces will Receive Stormwater from Developed Areas Providing Bio-remediation Opportunities.

Interactive Stormwater Incorporated in Urban Street

greenhouse gas emissions. The development of the STC site presents an opportunity to embody UD's commitment to lessening the impacts of development on the environment by restoring ecological connections, treating stormwater in a more environmental way, and constructing buildings that use materials and energy more efficiently.

Common Low Impact Development (LID) design practices include:

- Tree & native vegetation preservation
- Grassed swales/biofilters
- Wet or "Rain" Gardens – "Biofiltration Areas"
- Permeable pavers /pavement
- Shared driveways, smaller roads, no sidewalks
- Rooftop gardens
- Dry wells for roof drains
- Infiltration Systems

Incorporation of some of these practices into the landscape design of a site can result in more sustainable landscaping, and may include:

- Native Species
- Draught tolerant Species
- Integrated Pest Management
- Shade Trees
- Low maintenance
- No irrigation requirements

The potential benefits of this type of stormwater management design includes the opportunity to use conveyance channels or swales as an amenity. Rather than using traditional rip rap or concrete lined channels, stable conveyance can be achieved through the construction of "dry creek beds" or step-pool systems, depending on slope requirements, that consider specific flow regimes during storm events, include the

use of natural materials, and are aesthetically pleasing. These can be placed within green corridors or "fingers" throughout the site to allow for conveyance of stormwater at grade rather than being piped, and this provides opportunity for treatment and infiltration as the runoff travels through these systems towards to receiving watercourse.

One LID practice that may be particularly suitable to the STC is the use of rain gardens. These bioretention areas can be used in soils with limited infiltration rates and/or contamination through the incorporation of under drains.

LIGHT POLLUTION

Light pollution is defined as light that causes a glow in the night sky from artificial sources, such as street lights from commercial uses and light from residential sources. Light pollution also includes light spill-over when one property is more brightly lit than an adjacent one.

» Encourage the use of lighting technologies that reduce light intrusion on adjacent properties so that safe and even light levels are maintained.

» Require the use of full cut-off optic light fixtures to eliminate light pollution.

» As new and redevelopment proposals are evaluated, light levels should be considered and overall lighting should be minimized and properly directed and a detailed lighting plan should be submitted.

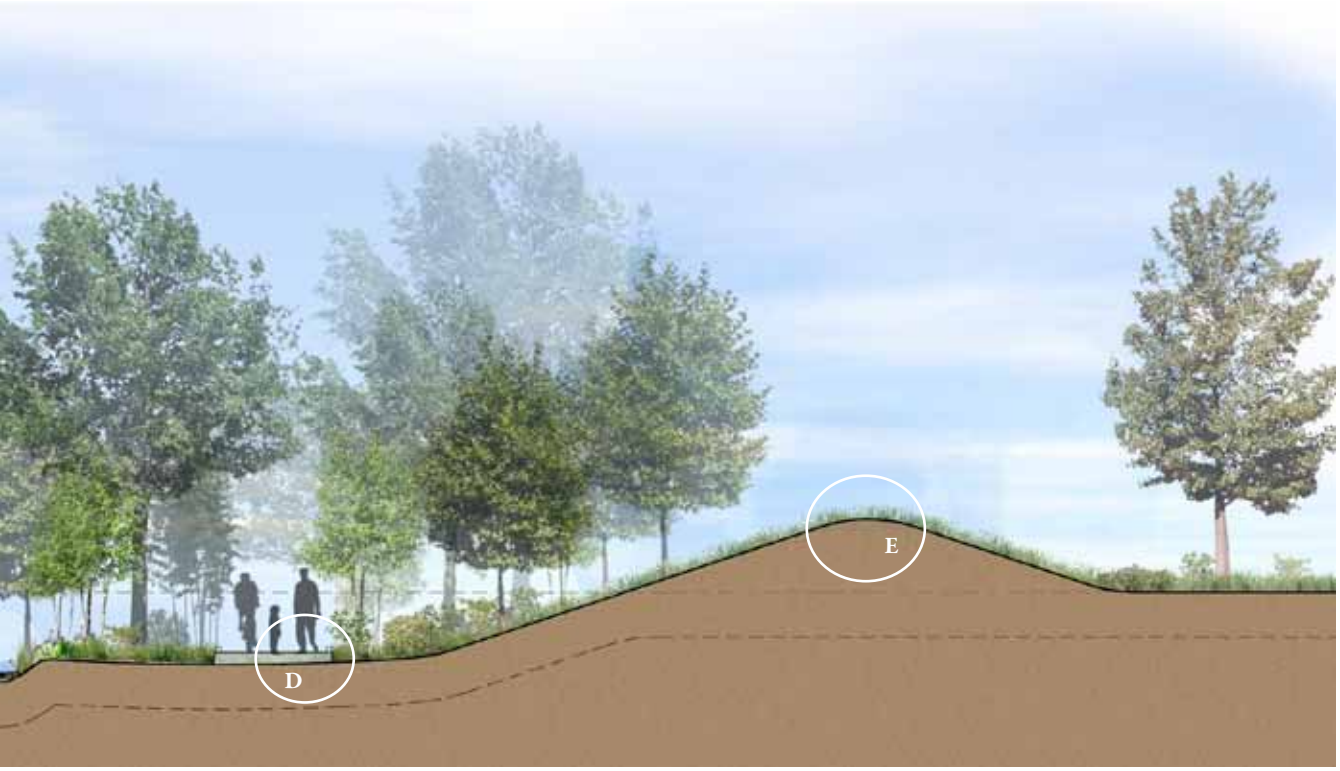
Ecological Corridor

Ecological connections will be reestablished throughout the development of the Science and Technology Campus by proving for a

Habitable green roof on Toronto's City Hall.

Restored Stream Example

Proposed Stream Section with a Covered, Broad Flood Zone



A. The complex ecosystems within the vegetated buffers not only help mitigate non-point source pollution, but provide food and habitat for animal and plant species. These zones are also paramount for bird and insect migration.

B. Adequate floodplains are essential to stream health and stabilization. A floodplain is most effective when it consists of a strong herbaceous layer, a dense understory and a full tree canopy.

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. Boardwalk paths and interpretative signage through the floodplains can help educate the users about the natural environment. These paths can also link into a network of trials throughout a community.

E. Soil remediation practices can be displayed through the use of landforms. The landform is created using the contaminated soil extracted when daylighting the stream. These mounds can be planted with appropriate pollutant leaching species or left as a pure lawn form.

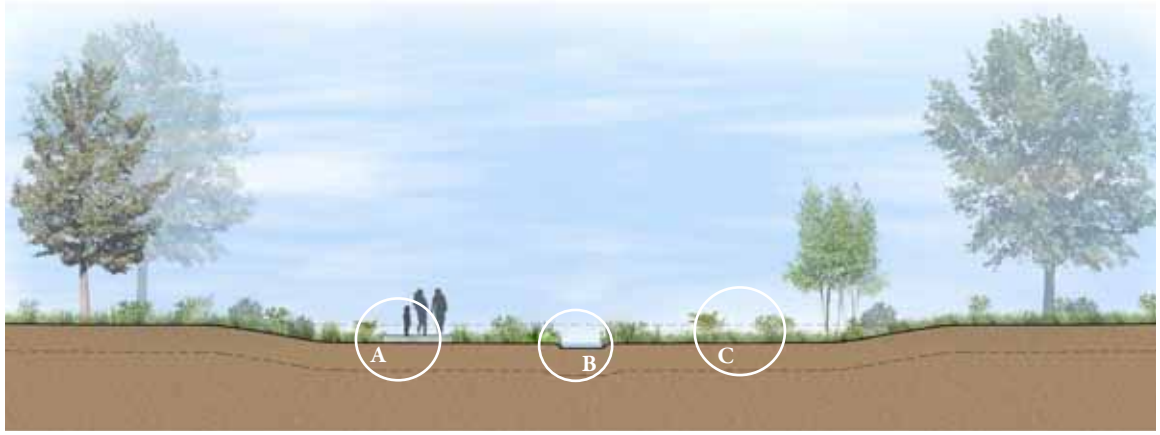
Shallow Stream Precedent, Shaw Nature Preserve, MO

Restored Stream One Year after Restoration, Linville, NC

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.



Proposed Stream Section with Open, Shallow Flood Zone

north-south "ecological corridor" which will approximately follow the historic location of the Silverbrook Stream. This corridor will physically connect the patches of forested areas which are located to the north and south of the site. A second corridor established along the souther edge of the campus, along Route 4, will also connect two large forested areas south of the parkway and to the west of the campus.

Also important is the role stream restoration may play in the stormwater aspect of the Master Plan. Much of the stormwater generated on-site is currently piped to Silver Brook Stream as it flows through the culvert. This infrastructure is 50–60 years old, as determined by the dates of site development, and has potentially reached its expected structural lifespan. Whatever underground stormwater piping is required as the site re-develops should be newly installed. If the stream is removed from the culvert and

Proposed Channelized Stream Section

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.

Channelized Stream Precedent, Waller Creek, Austin, TX

Existing Ecological Areas and Proposed Ecological Corridors

a new floodplain is created, the stormwater outfalls will tie into this new floodplain and channel in a stable manner.

Site Remediation

This section conveys planning considerations for managing environmental conditions associated with past industrial use of the property. In the broadest sense, hazardous substance issues at the property are being managed through the State of Delaware Brownfield Program, which is a derivative of the State of Delaware Hazardous Substance Cleanup Act (HSCA or State Superfund). Under the Brownfield Program, all decisions regarding management of site conditions are subject to the concurrence and approval of the Department of Natural Resources and Environmental Control – Site Investigation and Restoration Branch.

Hazardous Substance management planning falls into two basic categories – current actions and future actions. Current actions include enlisting the property in the Brownfield Program and maintaining the existing ground covering (pavements and former building floor slabs). The decision to keep pavements and slabs in-place limits human contact with subsurface conditions and limit changes to the physical environment that might adversely change substance migration characteristics. This general action should continue until subsurface conditions are assessed and decisions regarding future use of the property are made. Current planning also is directing action toward remedying environmental conditions to comply with regulatory mandates, such as the removal of free phase liquids that may be present in the groundwater table.

Future actions should be based on specific future use of the property (area by area or lot by lot) and the specific conditions of concern are identified by the Brownfield Investigations (BFI). These future actions should seek to minimize potential human health and environmental risks at the least achievable cost. The following matrix offers a snap-shot of the types of future actions that may be viable, based on current technology and redevelopment of the property for institutional or research oriented uses. Other options likely will develop within the probable redevelopment time frame of the property. Many of the same technologies could also be used to prepare portions of the property for residential or recreational uses. However, the cleanup goals would be more stringent than those for institutional or research uses and the level of effort and capital required to achieve those goals typically would be greater.

Active Phytoremediation using Poplar and Willow Trees at Aircraft Repair and Supply Center, Elizabeth City, NC

Piping for dual-phase extraction technology

Shallow soil excavation activities

Installation of engineered barrier

Injection of bioremediation amendment in source area

Brownfields Treatment Legend:

- Treatment Present Challenges
- Potential Challenges
- Relative Ease

Media	Remedial Action Alternatives	Comment	Redevelopment Flexibility	Financial Implications	Stakeholder / Public Perception	Time / Schedule	Regulatory Acceptance	Ease of Implementation	Certainty
Soil	Removal (e.g. Dig and Haul)	Pros: Complete removal of contaminants maximizes redevelopment potential, most palatable to stakeholder Cons: Can be very expensive, challenging to implement.	🟢	🔴	🟢	🟢	🟢	🟢 🔴	🟢
	Containment (e.g capping, in-situ stabilization)	Pros: Can be cost effective, existing slabs align with this approach. Cons: Public perception, geotechnical and infrastructure constructability challenging	🔴	🟡	🔴	🟢	🟡	🟡	🟡
	On-Site Consolidation / Re-Use	Pros: cost effective, can be aligned with certain land uses (e.g. parking, renewable set asides), creating more development flexibility elsewhere Cons: Not applicable to gross contamination, public perception	🟡	🟢	🔴	🟢	🔴	🟢	🟢
	In-situ Treatment (e.g. Thermal, Chemical oxidation, or biological)	Pros: more cost effective than removal, can be very effective in certain settings, with certain materials Cons: Schedule implications due to set up and operating time, effectiveness uncertainty in certain settings, with certain materials, constructability challenges	🟡	🟡	🟡	🔴	🟡	🟡	🔴
Groundwater	Active Containment (e.g. pump and treat)	Pros: Potential groundwater reuse for irrigation, cooling tower make up, and geothermal Cons: high Life cycle costs	🟡	🔴	🟡	🔴	🟢	🟢	🟢
	Passive containment (e.g. slurry wall, reactive barrier)	Pros: No O&M costs Cons: need right conditions to be effective	🟡	🟡	🟡	🟡	🟡	🟡	🟡
	Treatment – Site wide (air sparging, bioremediation, phytoremediation)	Pros: Shortens life span of remedy Cons: Less applicable on large scale; certain technology have significant infrastructure needs	🟡	🟡	🟡	🟡	🟡	🟡	🟡
	Treatment – Source Area (chemical oxidation)	Pros: Reduces high concentration in source area, shortens life cycle of containment Cons: need right conditions to be effective; and still needs to be combined with containment	🟢	🟡	🟢	🟢	🟢	🟡	🟡
Vapor	Building Vapor Controls (vapor barrier, sub-venting)	Pros: Can be addressed through engineering (use of slabs, vented below grade space) Con: Not applicable to gross contamination,	🟢	🟢	🟡	🟢	🟡	🟢	🟡
	Administrative Controls (deed restriction, building and land- use restrictions)	Pros: cheap, easy Cons: public perception, long-term risk	🔴	🟢	🔴	🟢	🟡	🟢	🟡
Floating Product (e.g. gasoline or oil)	Extraction	Impt consideration: If product is present, slab removal can mobilize product.	🟡	🟡	🟡	🟡	🟢	🟢	🟡
	Containment	See GW containment							

The matrix is set-up based on two broad categories – In-Situ Technologies and Ex-Situ Technologies. In-Situ Technologies are suitable for addressing environmental conditions in the place where they are found. Ex-Situ Technologies are applied to impacted soil or water after moving those materials to the treatment or disposal site.

REDEVELOPMENT – INTEGRATING REMEDIAL STRATEGY WITH DEVELOPMENT PLANNING

The environmental assessment and remediation of a Brownfield can challenge the planner/redeveloper with a nearly infinite array of highly technical and confusing options. If planner/redevelopers combine land use and remedial strategy considerations early in the process, the array of options for both land use and remedy can become more focused and effective. The vision for the future campus and land use should be the starting point from which all other decisions flow. Certain remedial strategies can be quickly excluded from detailed consideration. For example, if a residential use is planned, volatile chemicals would have to be remediated to a lower concentration than

would be needed for a parking lot. Additionally, certain environmental conditions, such as the presence of a hazardous material like floating gasoline, could severely limit future use options. Early integration can allow for more flexible land use and redevelopment potential, facilitate timely regulatory approval, apply innovative integration of remedy with construction (e.g. reuse groundwater from a treatment system for irrigation or cooling tower makeup water) reduce overall cost and schedule impacts. When redevelopment planning and remediation alternative assessment proceeds independently, many options can be pursued that must ultimately be abandoned when the larger interplay is considered. This typically wastes time and resources.

The matrix on page 21 presents a high-level summary of remediation approaches that are typically considered at former automotive assembly plants.

Proposed Open Space Concept

Chapter 3: Landscape & Streetscape

Goals

- Use landscape and streetscape character to establish an identity for the Science and Technology Campus.
- Ensure safety for pedestrians and bicyclists as well as drivers.
- Encourage the use of alternative modes of transportation within a transit-oriented development (TOD).
- Limit the amount of stormwater runoff that enters municipal systems.
- Provide corridors that will function as a native habitat for local flora and fauna.
- Create a meaningful network of public open space that define individual precincts and neighborhoods.

Landscape Design

In order to establish a distinct identity for the Science and Technology Campus, the Master Plan proposes a contiguous network of pedestrian spaces as an alternative to the surrounding grid of vehicular traffic. This pedestrian landscape is composed of a hierarchy of open spaces, linked together by passageways that structure pedestrian movement through the campus. Each type of open space on campus is distinguished by a specific landscape strategy, and is differentiated by materials, paving patterns, and planting themes. This establishes a unique sense of place on campus

Ginkgo biloba

Quercus phellos

and contributes to the richness of the overall context.

URBAN TREE CANOPY

The several categories that constitute urban tree canopy include individual trees along a neighborhood street, small groups of trees in parks, and forests or woodlands on public or private property. Even as communities grow and change, it is important to maintain at least minimum thresholds of urban tree canopy in order to preserve environmental quality. If urban tree canopy, functioning as green infrastructure, can help to manage air and water quality, then it can minimize the necessity and cost of building infrastructure to that end. Local tree cover as part of the ecosystem provides environmental and economic value to urban areas. In addition to beautifying and providing balance to the built environment, it reduces the overall temperature of built spaces, provides oxygen, and removes pollutants from the air and water.

TREE SPACING

The following plans and sections describing the site design are purely illustrative and conceptual in nature. The actual spacing of trees will be dependent upon the species selected during the final design of the campus streetscape; however, it is the intention of the Master Plan that trees be placed no less than 35 feet apart across pedestrian street view corridors. Final tree spacing should also take into account the anticipated growth of a species such that canopies do not overlap one another at maturity. Keeping trees free and clear from each other, exterior lighting and building facades will reduce maintenance concerns and enhance emergency access and security. In addition, an attention to the specific spacing of a species will ensure the preservation of the view corridors over time.

Planting Principles

While being located on the borders of the Piedmont and Coastal regions, Delaware has a particularly interesting and rich native plant palette. To keep within the native habitat, well-adapted native plants will primarily be used for the University's Science and Technology Campus. The proximity of the future STC to the existing College of Agriculture and Natural Resources lends an opportunity for a strong horticultural connection. The campus will be used as a showcase environment for integrating plants into the built environment. In addition to the street planting typology, taking from the Master Plan Landscape Typologies, each landscape type has its own planting definition.

PREFERRED STREET TREES

Street trees are very important in the urban context, to not only provide shade and reduce urban heat islands, but provide an aesthetic function to the neighborhood and street. Depending on the character of the street, i.e. primary secondary, tertiary, the tree species selected will help define that street and overall landscape character of the space created.

The following are a few examples of street trees approved by the Delaware Center for Horticulture:

Botanical Name	Common Name
Carpinus betulus 'Fastigiata'	European Hornbeam
Ginkgo biloba	Ginkgo
Gleditsia triacanthos 'inermis'	Thornless Honey Locust
Nyssa sylvatica	Black Gum
Quercus bicolor	Swamp White Oak
Quercus phellos	Willow Oak
Ulmus americana hybrids	American Elm cultivars
Ulmus parvifolia	Lacebark Elm

Reference: Delaware Center for Horticulture, Tree Program. Recommended Urban Trees, Wilmington, DE Area. www.dehort.org

Gleditsia triacanthos 'inermis'

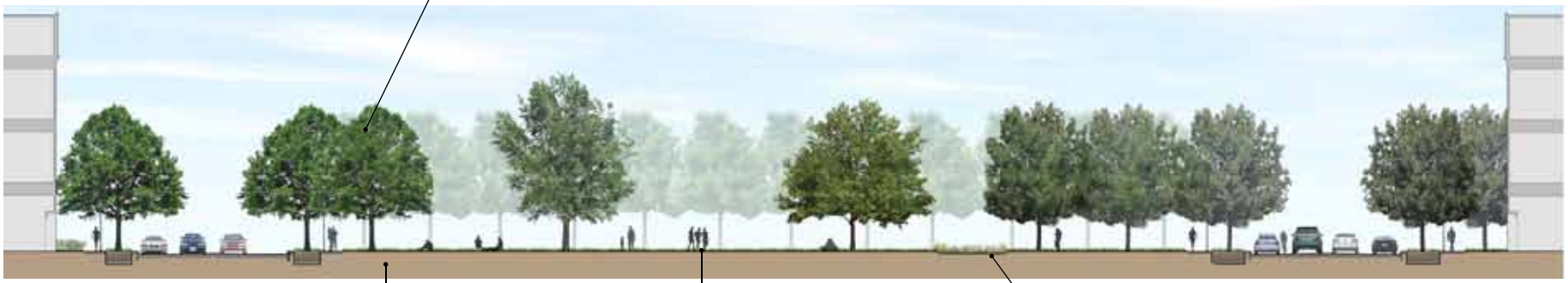
Ulmus parvifolia

QUAD PLANTING STRATEGY

Quadrangle planting is traditionally defined by large canopy trees along its perimeters. The proposed Quadrangle at the STC is framed by formal tree rows on the northern and southern edges as indicated in the section below. Tree species recommended for the tree rows can be described as large canopy trees with space defining qualities.

Quad Tree Planting Precedent – University of Virginia, Charlottsville, VA

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.



Quad Section

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

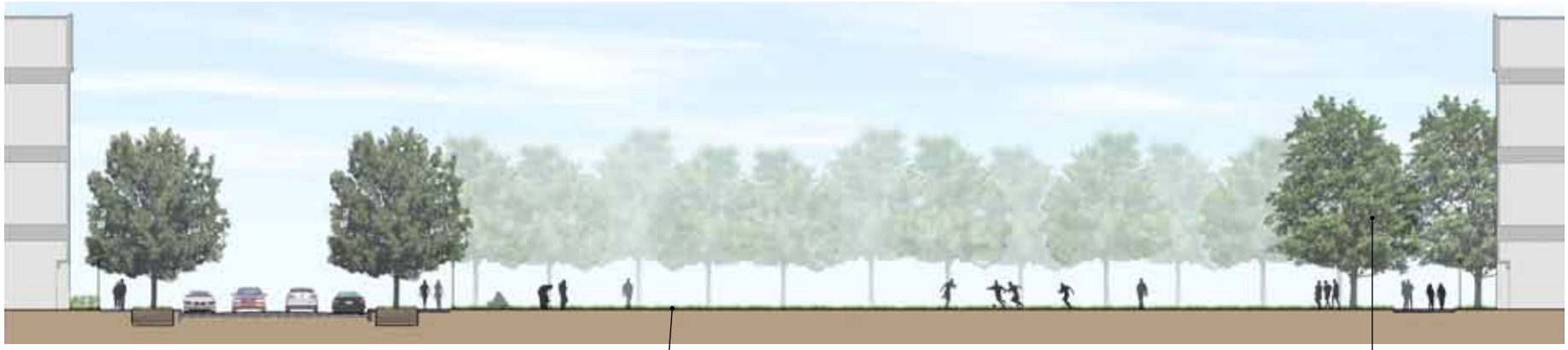
For the central lawn space, a turf-type tall fescue that is drought tolerant is recommended.

A filter strip collects surface runoff. The plants within them remove pollutants and infiltrate the water more quickly than grass alone can. Plant species are recommended to be drought tolerant as well as tolerate inundation. Native species such as: *Juncus effusus, Iris versicolor,* and *Carex muskingumensis,* to name a few are good candidates for a filter strip.

PARK PLANTING STRATEGY

A park within the STC is defined as an open lawn space that can be lined with trees similar to the character of a quad. 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 shall be rectangular and framed by buildings and rows of street trees. The space defining trees should be large canopy trees that will not only create an edge, but provide shade for those using the park.

Space defining plantings at perimeter – Prospect Park, Brooklyn, NY



Typical Park Section

Turf areas shall be established using a drought-tolerant mix of species and maintained according to sustainable best practices.

Planted corridors and tree rows shall 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 shall be horizontally continuous and designed for vertical connectivity with a stratified approach to planting. Individual species shall provide food and cover for desired bird, insect and mammal populations.

PLAZA PLANTING STRATEGY

Plazas within the STC will not only be defined by the surrounding buildings and built infrastructure, but by its softscape characteristics as well. The tree planting in a plaza setting should be part of the overall aesthetic of the space. Trees with a strong canopy are preferred to provide shade to the large expanses of paving and help create gathering spaces for outdoor activities such as performances, or cafe space. Depending on the individual design of the space, there could be bioretention areas that are recommended to be planted with native shrubs, grasses and perennials that provide full season interest and can tolerate drought as well as periods of inundation.

Plaza Planting Precedent – Federal Courthouse, Seattle, WA

Typical Plaza Section

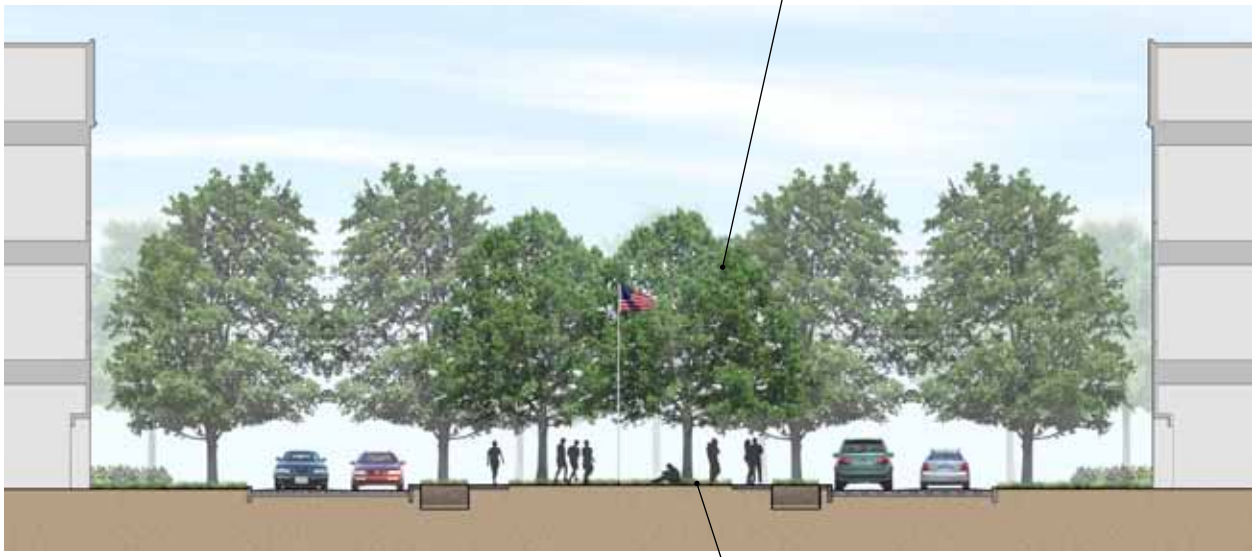
A mix of hardscape and softscape allows micro-bioretention areas that accommodate and filter surface runoff. A strong tree canopy creates shade to activate outdoor space during the summer months.

THE GREEN PLANTING STRATEGY

The campus green should be a space that is primarily open lawn to accommodate various functions. The perimeter should be defined by street trees with occasional perennial and shrub plantings in the tree pits.

Formal Green – Lake Forest, IL

A continuous planting of shade trees along the edges shall provide both spatial definition and a certain level of ecological connectivity for edge species.



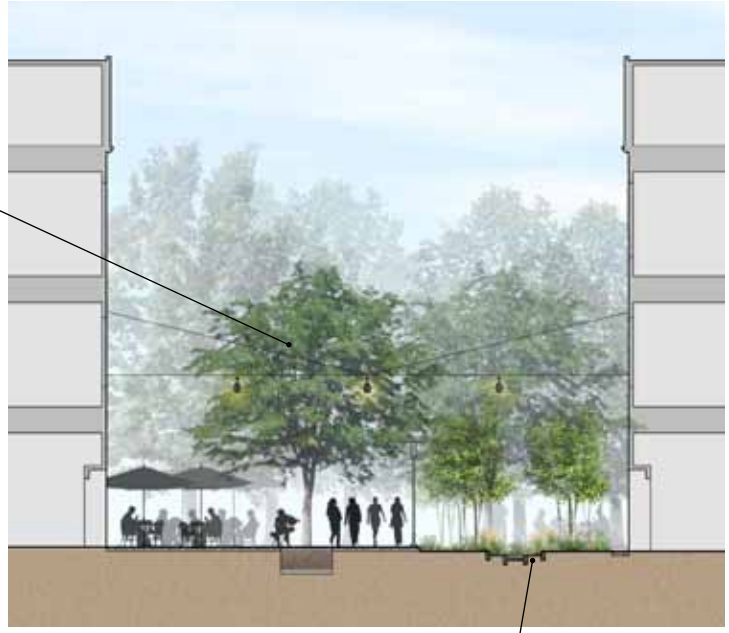
Typical Green Section

For the central lawn space, a turf-type tall fescue that is drought tolerant is recommended.

PASEO PLANTING STRATEGY

The Paseo is a continuous walkway defined by buildings on either side. This space is used for passive gathering as well as a means to get from point A to point B. A major component to the linear paseo, is a route to convey stormwater through the site. Water will be collected during rain events from adjacent rooftops and pavements and incorporated into the plan to be used as an amenity and educational tool. This space will not only use large trees to create shade, but incorporate an array of native bioretention plantings that will help showcase the meandering constructed swale.

Large canopy trees with a moderate canopy such as, Gleditsia triacanthos inermis, is preferred. This tree species will allow for dappled sunlight to project through its canopy, yet still provide adequate shade for those hot summer days.



Typical Paseo Section

Oregon Health Sciences University, Portland, OR

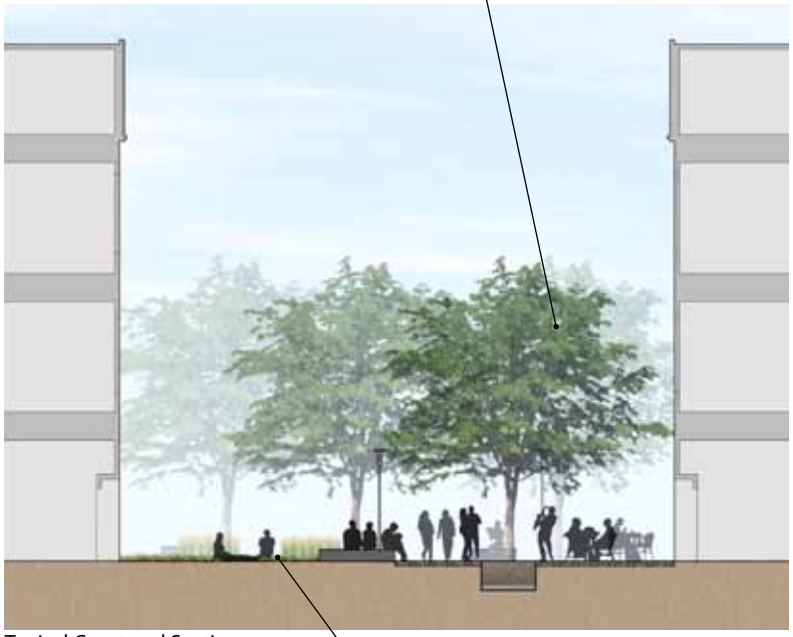
The meandering constructed swale is comprised of drought tolerant species as well as those that can handle periodic inundation. Species that have full season interest are recommended.

COURTYARD PLANTING STRATEGY

Courtyards are generally enclosed by buildings on all sides, or most sides, thus being shady by nature. The planting strategy for a courtyard may be similar to the paseo. The individual design for the space should drive the planting design. As a simple rule, light shade provided by the tree canopy is preferable, intermittent perennial and shrub plantings with full season interest along with dapples of lawn for a soft gathering space is recommended. The section below provides an example of what a courtyard planting character may feel like.

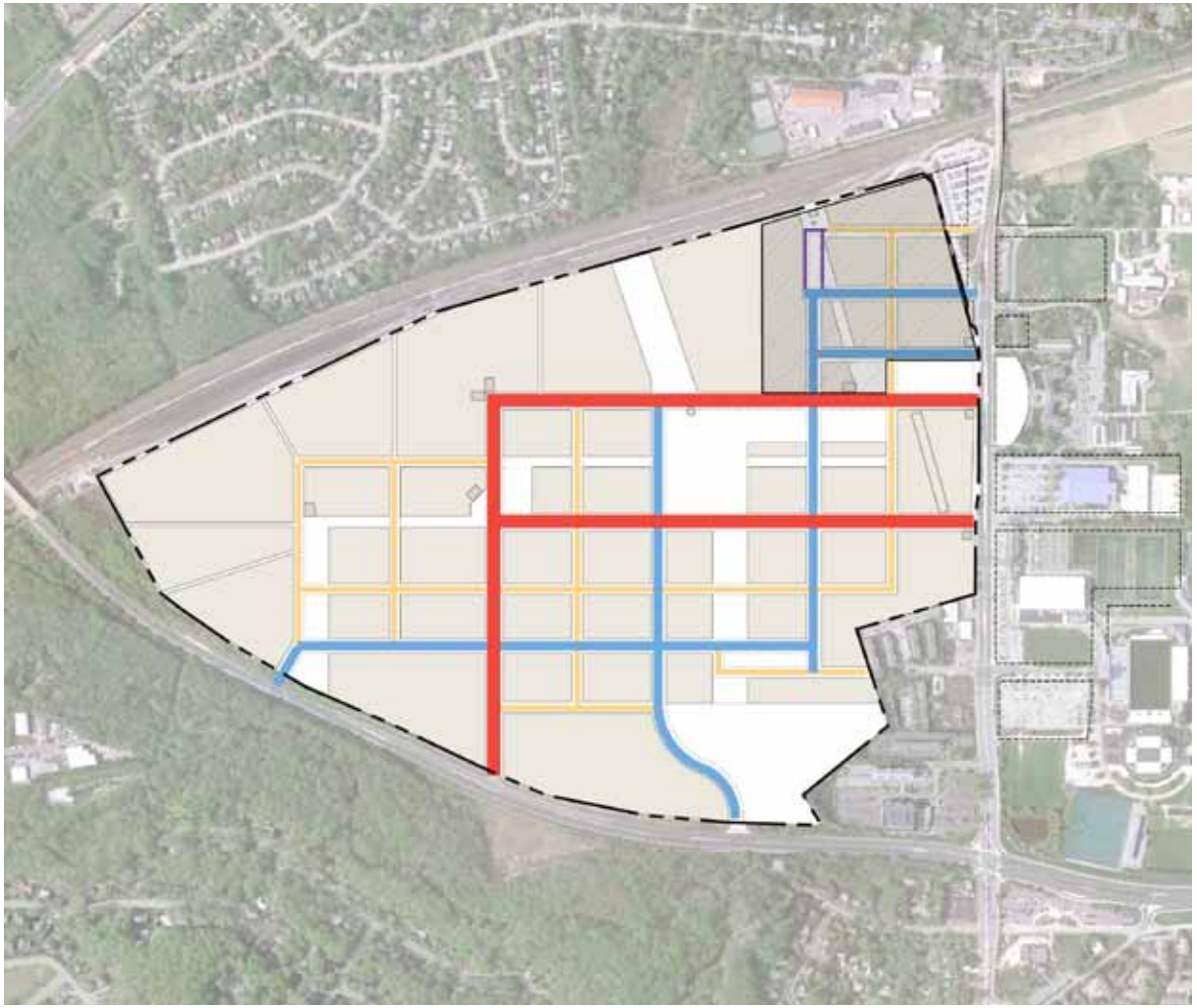
50 Avenue Montaigne, Paris, France

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.



Typical Courtyard Section

Turf areas shall be established using a drought-tolerant mix of species and maintained according to sustainable best practices. A shade tolerant mix may also be preferable.



Proposed Street Hierarchy

- Primary
- Secondary
- Tertiary
- One-way pair
- Retail Street to be located in the mixed-use zone around the train station

Streets

The diagrams provided in this section illustrate how the various components that comprise a street can typically be accommodated within the build-to lines. The dimensions for street elements shown in the street section diagrams represent a typical condition selected along a street's course and give guidance on the design intent for that street. The conditions shown in these sections should be understood as general guidelines for typical conditions, which are subject to further refinement.

PLANNED ROADWAY HIERARCHY

Primary streets will provide access to the STC from the external roadway network, provide a connection between major destinations within the site, and connect to roadways with lower functional classification. Primary streets will generally provide less access to individual

development parcels within the site. As defined on the STC roadway cross-sections, primary streets should include 11-foot wide travel lanes, on-street bicycle lanes, on-street parking on both sides of the roadway, and sidewalks that are a minimum of six feet wide.

Secondary streets will provide a connection between different parts of the STC, a connection to one or more higher classification streets, and may provide a secondary connection to the external roadway network. Secondary streets will provide greater access to individual parcels than primary streets, but less access than Tertiary streets. As defined on the STC roadway cross-sections, secondary streets should include 11-foot wide travel lanes, on-street parking on both sides of the roadway, and sidewalks that are a minimum of six feet wide.

Tertiary streets are intended to abut individual development parcels for the purpose of providing direct access to building sites, parking lots or structures, pick-up/drop-off areas, and other STC destinations. As defined on the STC roadway cross-sections, tertiary streets should include 10-foot wide travel lanes, on-street parking on both sides of the roadway, and sidewalks that are a minimum of five feet wide.

Retail streets will abut and provide access to commercial retail properties within the STC site. As defined on the STC roadway cross-sections, retail streets should include 11-foot wide travel lanes, on-street parking on both sides of the roadway, and sidewalks that are a minimum of 12 feet wide.

Different Pavements Denote Areas on Sidewalk – Mayfair, Wilmington, NC

SIDEWALK AND PAVEMENT

The public realm of the street resides within rights-of-way framed by the urban block. The pedestrian experience is completely shaped by the character and program of the streetscape. The zone between the roadway curb and the building face, called frontage, will include a number of program elements which vary based on the building frontage types. In the Master Plan, frontage types fall into the basic categories of retail, commercial, civic, and residential. The preferred urban frontage types are retail or residential uses, and since their respective characters are easily contrasted, a clear character may emerge for each street type. Retail streetscapes typically have wide sidewalks with retail displays and signage. Street trees line the curb and typically utilize tree pits with decorative metal fences or grates. Additional spaces can be provided for café seating, retail display, or benches.

Residential streets, on the other hand, typically are lower intensity environments, with landscaping often between the sidewalk and the building face. Non-retail commercial frontage is generally similar to retail frontage, but lacks the vitality and character of an active retail frontage. Civic frontage can be similar to commercial frontage, but with landscaped areas and plazas that create engaging places for people to gather.

In the Master Plan, all streets will be fully landscaped and furnished to enhance the pedestrian experience. The area dedicated to active landscaped streetscapes and sidewalks will increase from 3.9 acres to over 22 acres through plan build-out, a substantial increase. Landscaped street setbacks will

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 shall

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 facades 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, consist of 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.

PUBLIC SIDEWALK FRONTAGE

Public sidewalk frontage describes the configuration of the sidewalk, landscaping, and street furnishings in the area between the street curb and the build-to line.

The components of the public sidewalk frontages are labeled on the following page:

Sidewalk Clear Zone: Intended to provide unobstructed passage for pedestrians along the course of a sidewalk. A range of dimensions are provided based on the overall sidewalk width and the frontage type.

Street Tree and Furnishing Zone: This zone is immediately adjacent to the curb and is defined primarily by street trees contained either in tree pits or planting strips; this zone may include furnishings such as lampposts, benches, trash receptacles, planters, and similar street furnishings. On some commercial frontages, this zone may be integrated with a café zone, described below.

Café/Shy Zone: This zone only occurs on retail frontages. In addition to café seating in front of restaurants and cafés, this zone can be used for outdoor retail display and other retail related

Garden Spaces Along Sidewalk - Glenwood Park, Atlanta, GA

STREET FRONTAGE CONDITIONS

	Primary Streets	Secondary Streets	Tertiary Streets	Retail Main Street
Sidewalk Width	6′	6′	5′	18′
Sidewalk Clear Zone	NA	NA	NA	6′
Street Tree and Furnishing Zone	NA	NA	NA	6′
Cafe/Shy Zone	NA	NA	NA	6′
Paving Materials	Pavers/Concrete	Concrete	Concrete	Pavers
Tree Pit Size	NA	NA	NA	5′x8′
Tree Treatment	Planting Strip	Planting Strip	Planting Strip	Planting Pit
Tree Pit Landscaping	Grass	Grass	Grass	Plantings
Tree Spacing	40′	40′	40′	40′
Storm Water Strategy	Bioretention plantings or Swale	Bioretention plantings or Swale	Bioretention plantings or Swale	Bioretention plantings

activities. In the absence of such uses, the zone can be furnished with benches, planters, and other items consistent with a retail environment. This zone may be located either adjacent to the building frontage or integrated with the Street Tree and Furnishing Zone, in which case the zone should be no less than the required width of the Street Tree and Furnishing Zone. The position of the Café/Shy Zone should be the same for all businesses along a block frontage.

Non-Retail Street Shy Zone: This zone only occurs on frontages for non-retail streets and is intended primarily as a landscape buffer between the building face and the sidewalk. Landscaping elements may include hardscaped areas in front of entrances, raised planters, and other continuous planting beds.

Paving Materials: Paved surfaces may consist of special paving, including brick paving, untreated poured concrete, or some combination of these surfaces. However, for the portion of the sidewalk comprising the Clear Zone, the treatment shall be concrete or stamped concrete. Additionally, choice and installation of paving materials must be ADA compliant,.

Tree Pits: Tree pits should be large enough to allow water and air to enter the root zone of the tree. It is important to restrict pedestrian foot traffic from compacting the soil around the tree. Tree pits can be protected with either low fencing which surrounds the perimeter of the tree pit, or a grate which covers the tree pit. Tree pit fencing is preferred and in general, grates should be employed on retail streets only where heavier pedestrian traffic is expected.

Tree Pit Landscaping: May include flowering plants and shrubs, however, no plants with thorns or other sharp protrusions should be used, and these plants should be maintained below a height of 42 inches.

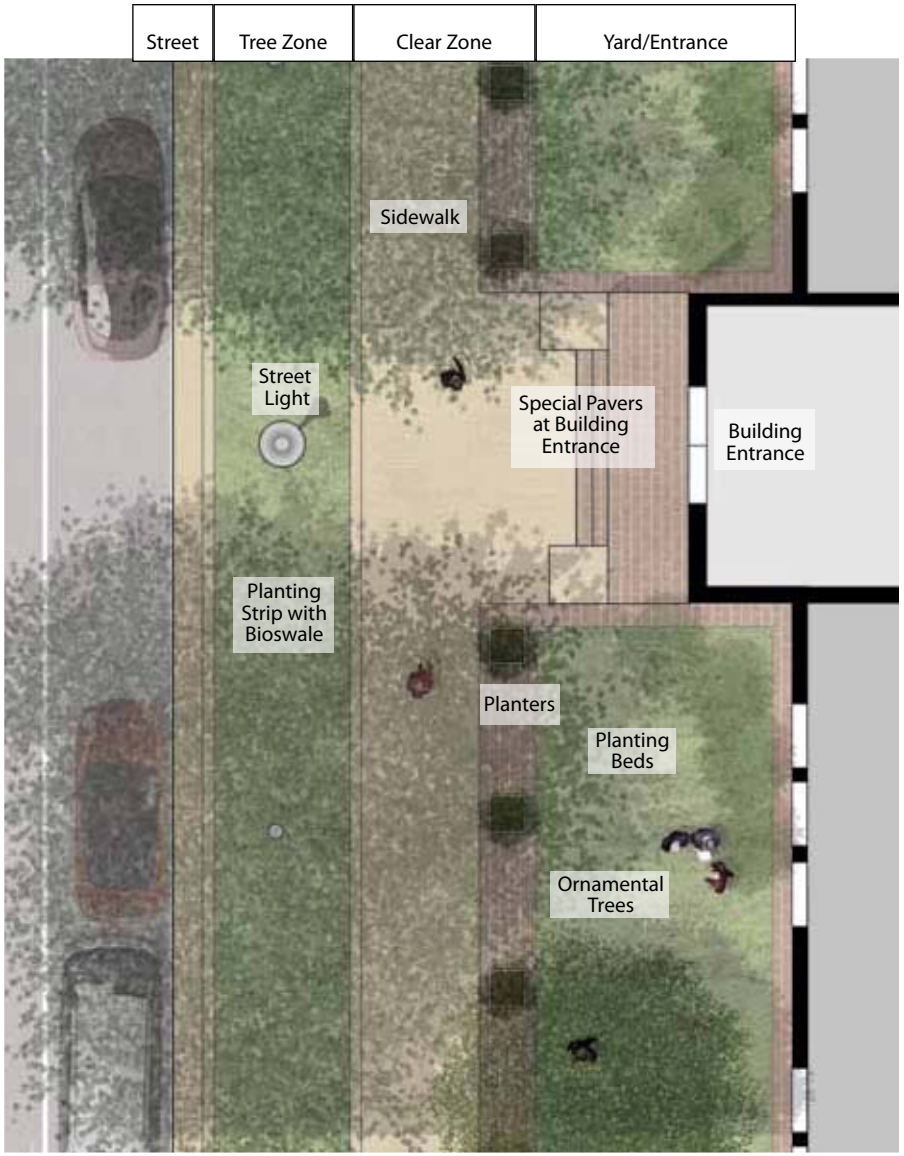
Continuous Planting Strip: Should be used on frontages with lower intensity of uses and where there is no adjacent on-street parking. Other components of the public sidewalk frontage that are the same regardless of sidewalk width or frontage type are:

Tree Spacing: 40 feet on center typical.

Light Fixture Type: Refer to "Site Funishings" section of this chapter.

Light Fixture Spacing: University of Delaware specifications and standards.

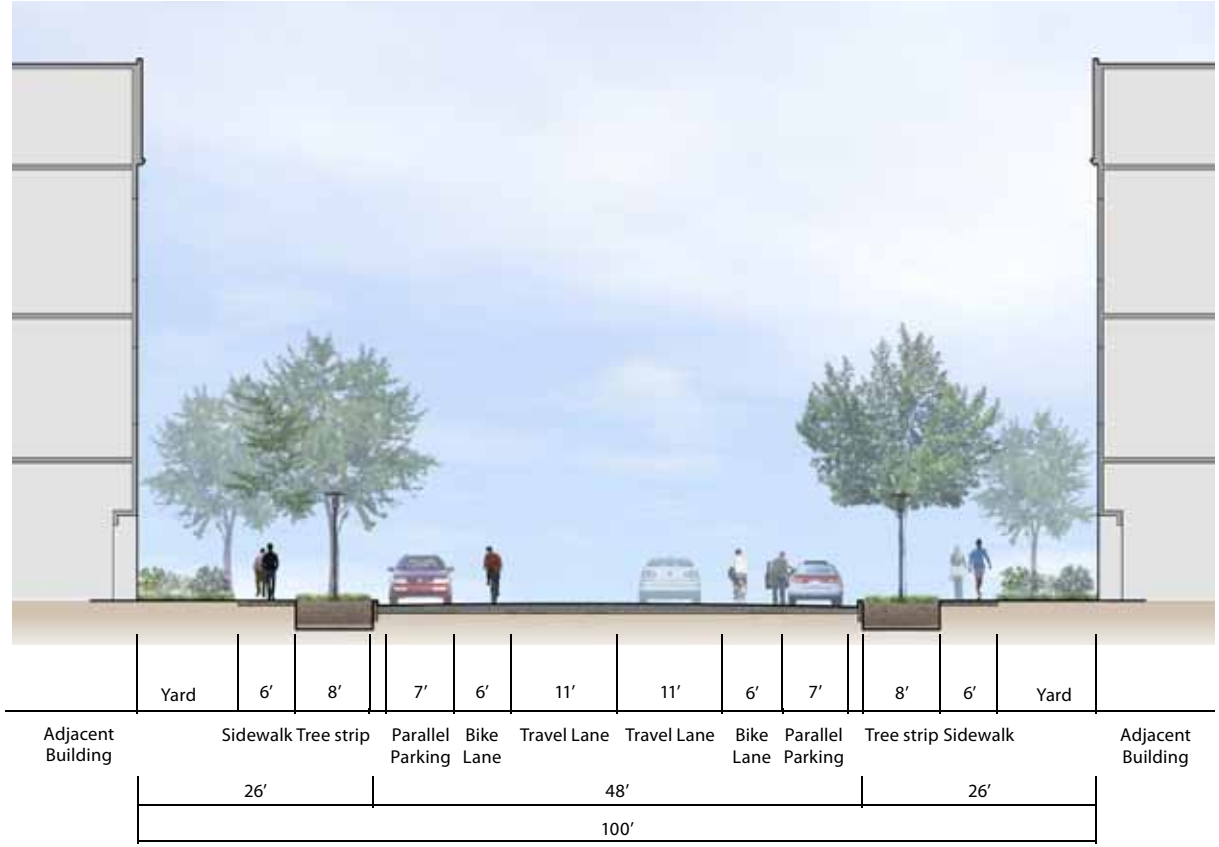
PRIMARY FRONTAGE



Sidewalk Enlargement Detail – Primary Street

Primary Street Location

PRIMARY STREET SECTION



Curb radius 20′

Street tree placement 40′ spacing

Street tree location: centered in planting strip

Street light location: per lighting engineer's recommendation or DELDOT standards

Street light placement: centered between street trees

Travel lanes should be 11′

On-street parking should be provided on both sides of the street

Striped crosswalks at every intersection

Bike lane class - 2

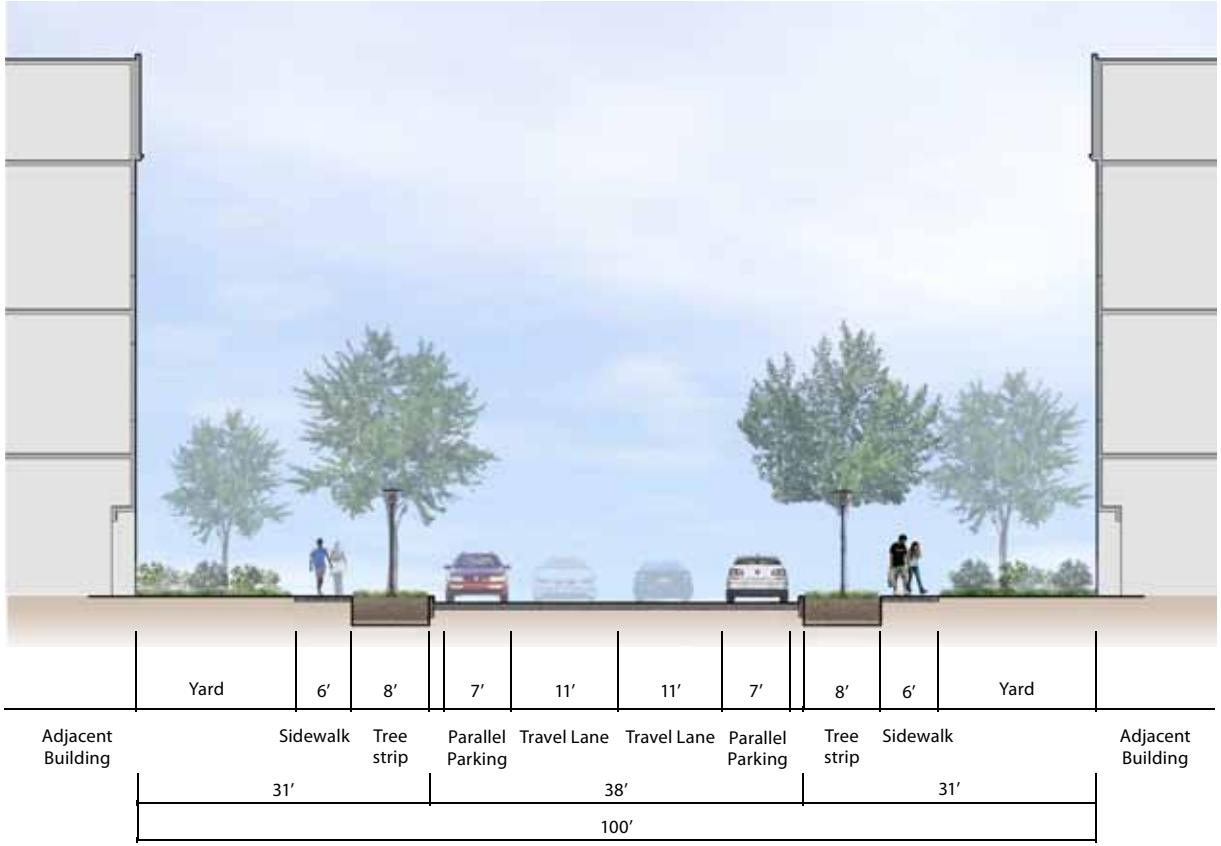
Stormwater will be collected in tree planting strip

SECONDARY FRONTAGE

Sidewalk Enlargement Detail – Secondary Street

Secondary Street Location

SECONDARY STREET SECTION



Curb radius 20′

Street tree placement 40′ spacing

Street tree location: centered in planting strip

Street light location: per lighting engineer's recommendation or DELDOT standards

Street light placement: centered between street trees

Travel lanes should be 11′

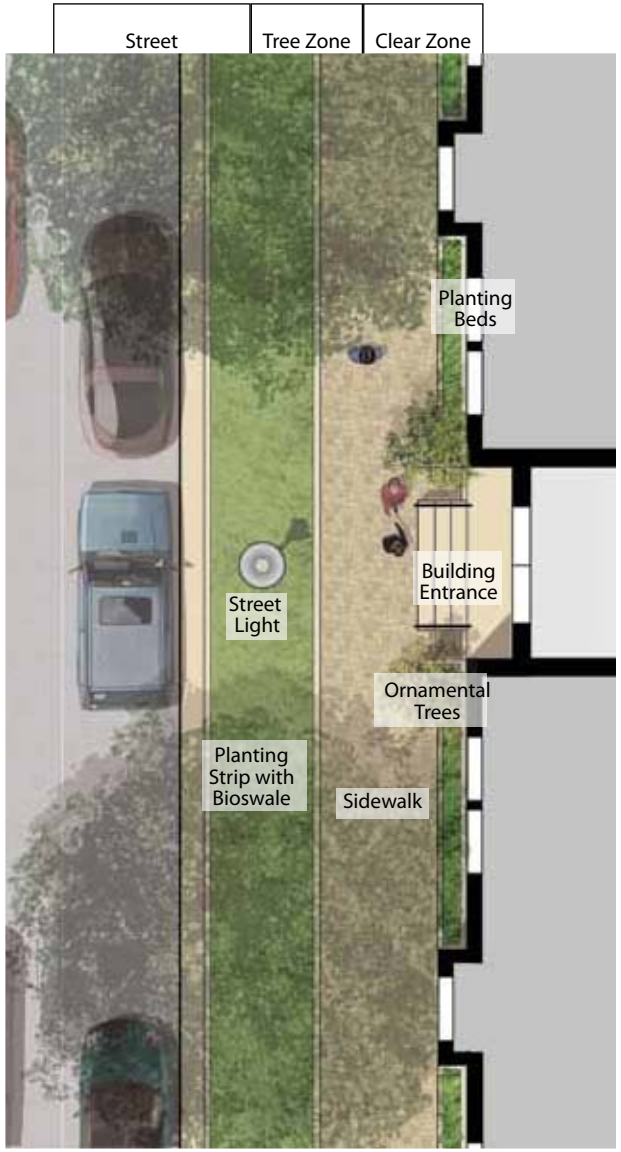
On-street parking should be provided on both sides of the street

Striped crosswalks at every intersection

Bike lane class - 3

Stormwater will be collected in tree planting strip

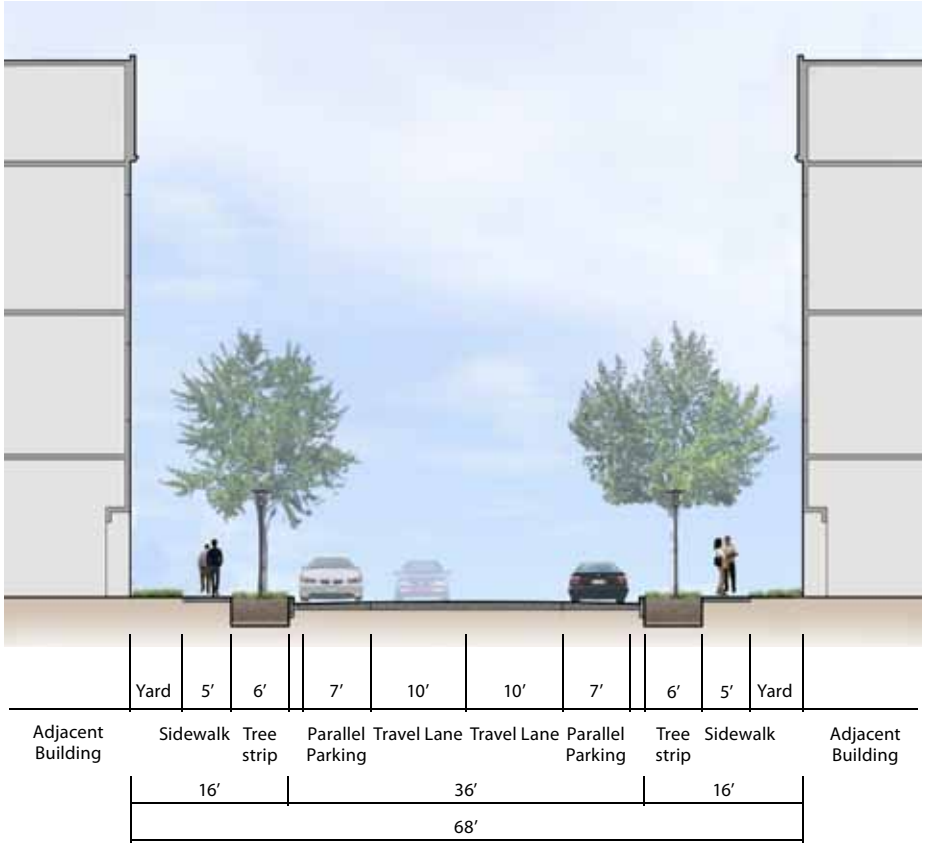
TERTIARY FRONTAGE



Sidewalk Enlargement Detail – Tertiary Street

Tertiary Street Location

TERTIARY STREET SECTION



Curb radius 20′

Street tree placement 40′ spacing

Street tree location: centered in planting strip

Street light location: per lighting engineer's recommendation or DELDOT standards

Street light placement: centered between street trees

Travel lane should be 10′

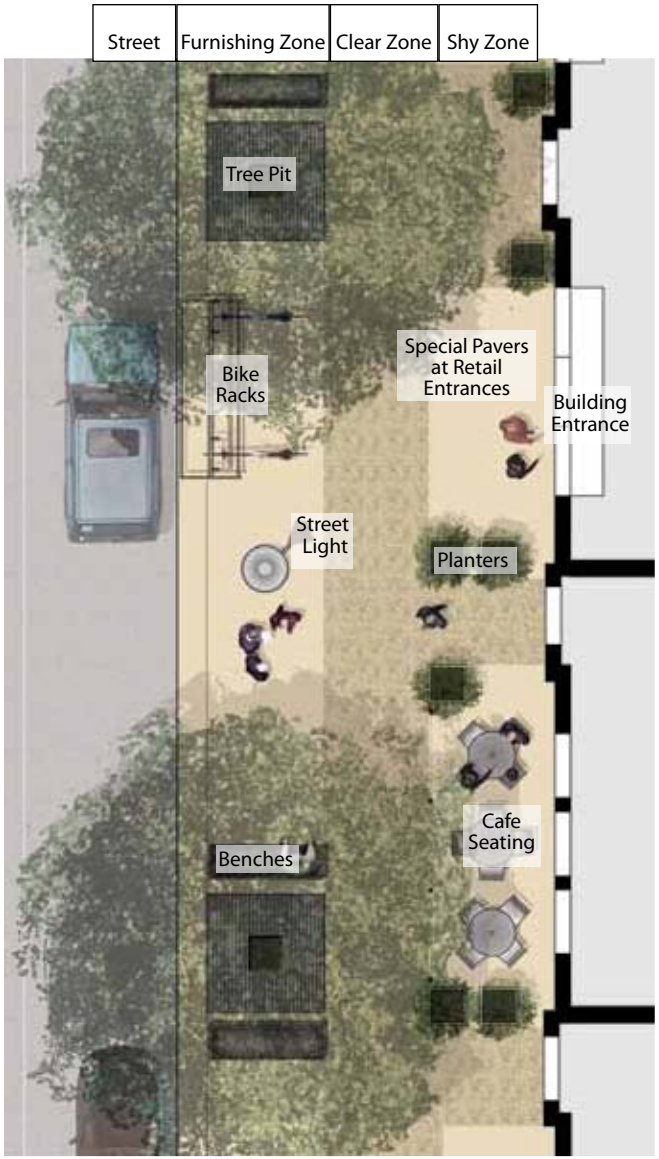
On-street parking should be provided on both sides of the street

Striped crosswalks at every intersection

Bike lane class - 3

Stormwater will be collected in tree planting strip

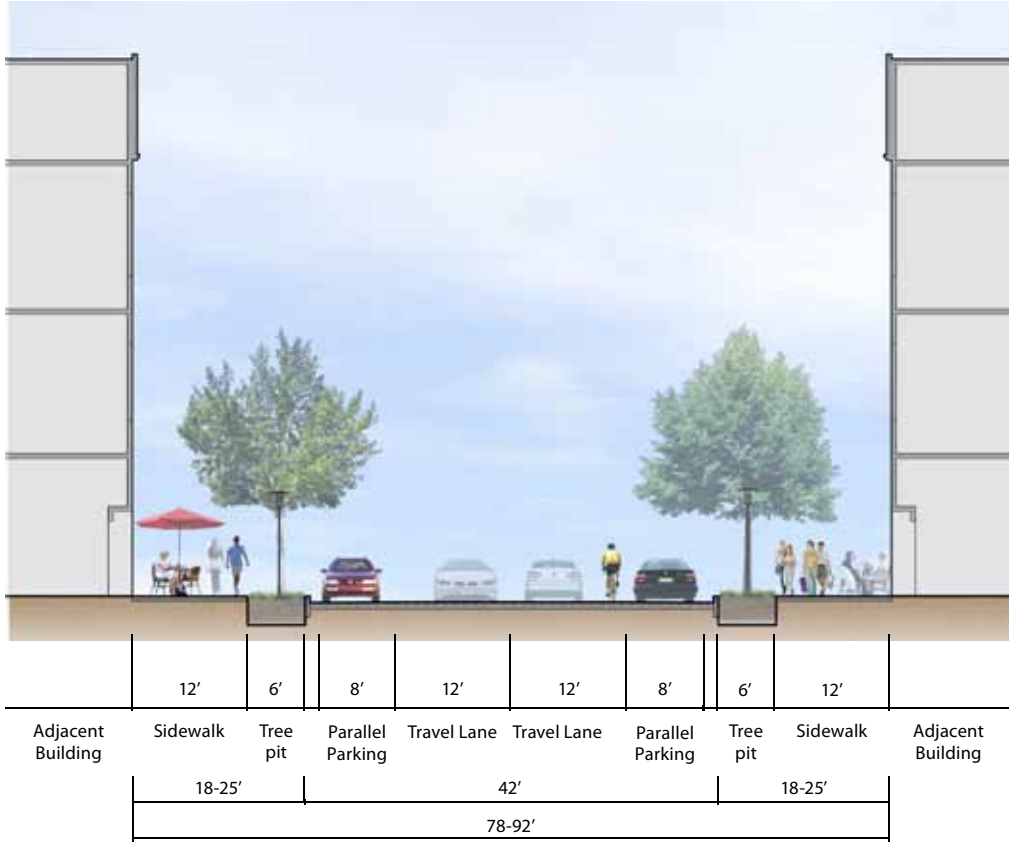
RETAIL STREET FRONTAGE



Sidewalk Enlargement Detail – Retail Street

Retail Street Location

RETAIL STREET SECTION



Curb radius 25′

Street tree placement 40′ spacing

Street tree location: in tree grates

Street light location: per lighting engineer's recommendation or DELDOT standards

Street light placement: centered between street trees

Travel lane should be 12′

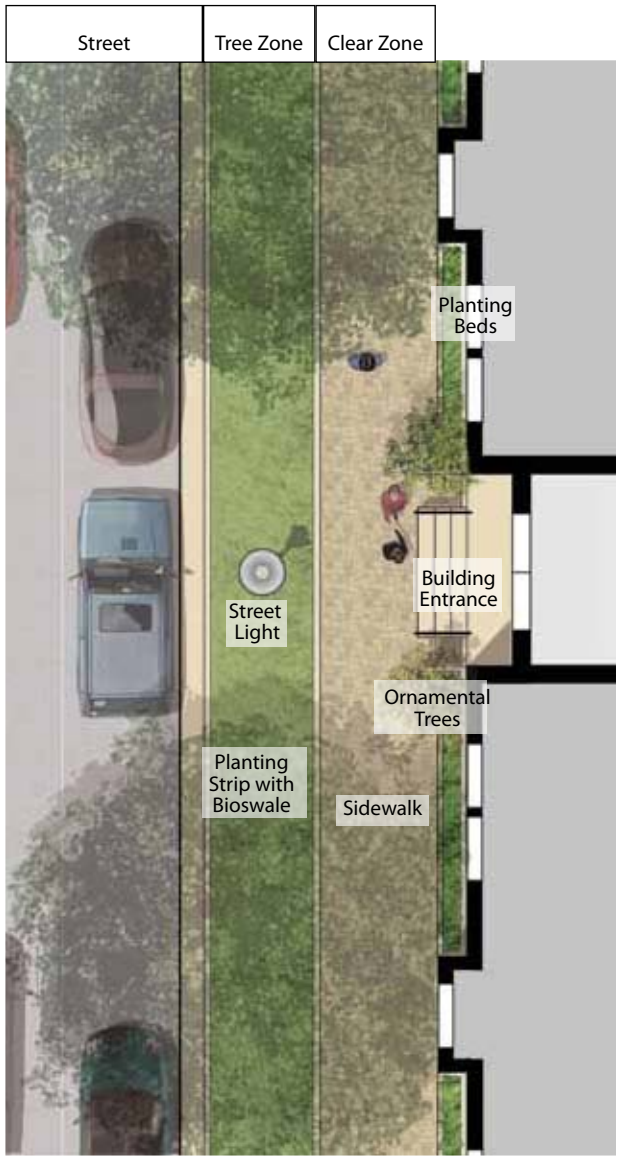
On-street parking should be provided on both sides of the street

Striped crosswalks at every intersection

Bike lane class - 3

Stormwater will be collected in tree pits

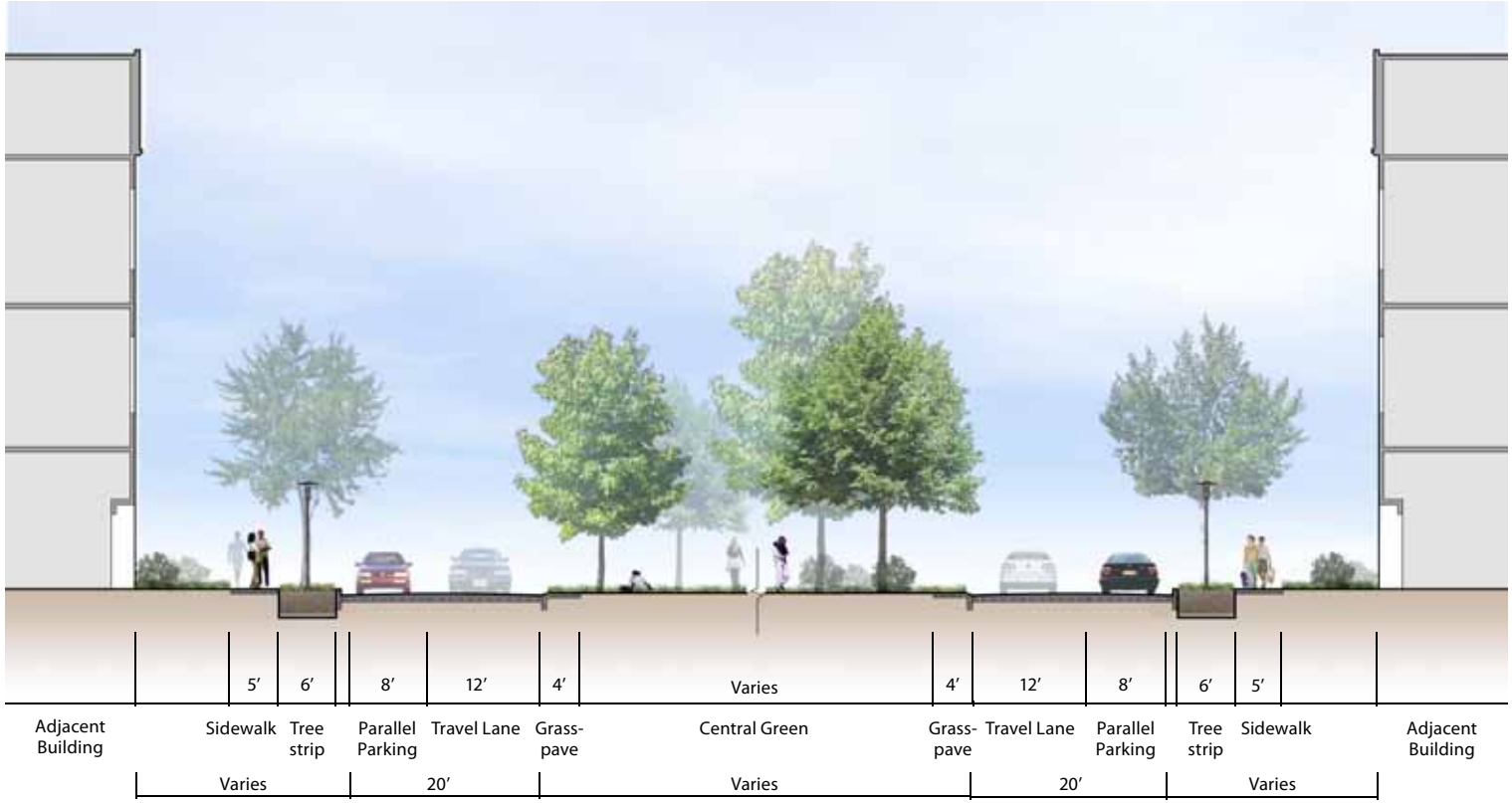
ONE-WAY FRONTAGE



Sidewalk Enlargement Detail – One-Way Pair

One-Way Street Location

ONE-WAY STREET SECTION



Curb radius 20′

Street tree placement 40′ spacing

Street tree location: centered in planting strip

Street light location: per lighting engineer's recommendation or DELDOT standards

Street light placement: centered between street trees

Travel lane should be 12′

On-street parking should be provided on the outside of the street

Striped crosswalks at every intersection

Bike lane class - 3

Stormwater will be collected in tree planting strip

Site Furnishings

PATHWAYS

Pathways help people navigate throughout the campus. Acceptable materials include poured in place concrete or pressed concrete pavers outside the Clear Zone, in a warm grey range of color. Pressed concrete paver shapes should be limited to square or rectangular forms and patterns should have no more than three colors of pavers. Sidewalk pavements must be ADA compliant, and should reference the most current standards from the University of Delaware and City of Newark.

Traditional Primary Walkway Paving Example

Contemporary Paving Example

BENCHES

Benches should be provided throughout the streetscape for the comfort and convenience of pedestrians. Benches should be contemporary in character and made of sustainably harvested wood, steel, or a combination of the two materials. Lengths may vary from four feet to eight feet in length. Benches with backs and armrests are preferred over backless benches for user comfort.

Traditional Bench

Contemporary Bench

PLANTERS

Freestanding planter pots can add to the color and texture of the streetscape. These should be provided within the shy zone or other furnishing zones, since any such planters would be furnished, installed, and maintained by the adjoining building owner or tenant. Planters should be simple in profile, contemporary in form, and precast concrete or cast stone in material. These should be a minimum of three feet square or round and a maximum of six feet square or round.

Traditional Planter, example

Contemporary Planters

GATES

Gates provide a point of threshold to a campus. They celebrate arrival and transitions to the world of academia. Often the result of an individual or a class gift, gates help create an identity as they are the first element to be seen on the campus.

Small Gate

Large Gate

Traditional Receptacle

Contemporary Receptacles

Traditional Bike Rack

RECEPTACLES

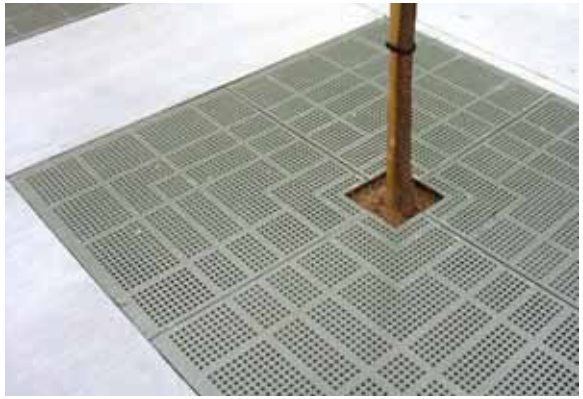
A single type of trash receptacle is recommended for unity and recognition by users. The preferred trash receptacle should be steel in material, with a removable lid or a side panel for ease of collection. A top compartment for recycling of cans and bottles is recommended. If these criteria cannot be met, then each trash receptacle should be partnered with one that is exclusively for recycled cans and bottles. One trash receptacle per 100 linear feet of streetscape is recommended for South College Avenue and the retail main street.

BICYCLE RACKS

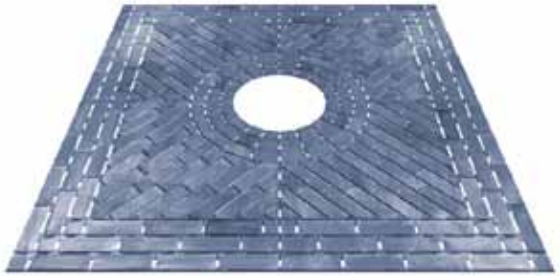
A single type of bicycle rack is recommended for unity and recognition by users. Primary factors influencing the selection and installation of bicycle racks include functionality and adaptability/ flexibility to different settings and clearances. The availability of bicycle parking should be coordinated with the University of Delaware's standards.

TREE GRATES

Tree grates are an elegant solution to the accommodation of a tree pit within a narrow sidewalk, as they allow pedestrians to walk over the tree pit, avoid trip hazards, and prevent trampling of the tree's roots. Tree grates should be composed of durable materials, preferably steel, and simple in form. All tree grates should have breakaway frames that allow for the growth of the tree trunk over time.



Contemporary Tree Grate



Contemporary Tree Grate

TREE PITS AND FENCING

These open tree pits should be surrounded by a low steel fence or edge that defines the opening, protects the tree, and prevents trampling of roots and groundcover. Such fencing should be 6 to 12 inches in height. When such tree pit fencing is provided, each tree within a block or building front should receive the fencing, for a uniform appearance.

Traditional Tree Pit Fencing

Alternate Tree Pit Fencing

SEATING

Seating includes chairs, seat walls, and any element that provides a place to rest. These designs assume a variety of forms, materials and styles, and often harmonize with the overall campus feel.

For sidewalk cafés and other purposes, recommended materials include steel, aluminum, and sustainably harvested wood. Well-designed and durable furnishings made from recycled plastics are also encouraged. Many tables have central openings to accommodate umbrella shading, which extends the useful season for outdoor seating and is strongly encouraged.

The use of Adirondack chairs within open lawn spaces, such the quad, provide an inviting yet timeless approach to a more formal moveable chair.

Traditional Cafe Tables and Chairs

Contemporary Seating Slab

Adirondack Chairs

Contemporary Cafe Table

LIGHTING

Lighting should be placed along all streetscapes and pedestrian pathways. The light fixture chosen should accentuate cohesion with all other site furnishings placed throughout the STC. Light fixtures shall also be efficient and minimize light pollution.

The height of light pole should fit in with the scale of the surroundings, but be cognizant of the pedestrian. The spacing between poles shall rely on photometric studies determining the level of light output from the source.

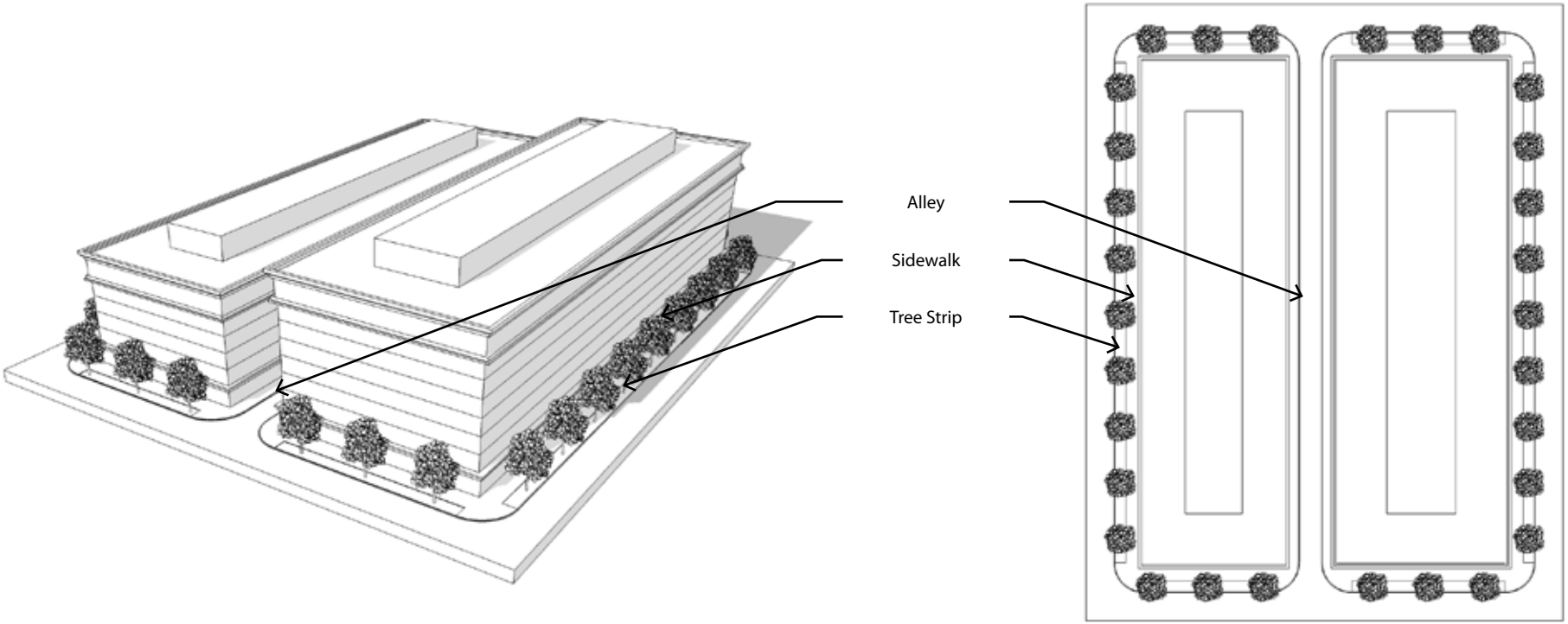
Traditional Light

SITE WALLS

Site walls are built for a variety of reasons, including seating, spatial enclosure and helping with a topography transition. Walls can help unify the campus through materials similar to those used in nearby buildings and landscapes.

Traditional Brick Site Wall

Stone Site Wall Example



Typical Block Structure

Chapter 4: Architecture

Goals

The purpose for the architectural guidelines for the Science and Technology Campus is to maintain a high level of architectural quality for the campus.

These design guidelines communicate general objectives relating to building design and massing characteristics of the Science and Technology Campus. The purpose of the guidelines is to point a direction and to inform the response to specific development proposals. These guidelines are intended to be flexible, to recognize the economic and program forces that influence the form of buildings and development, and to acknowledge that the vision for this campus can be achieved by a variety of means and methods. Should certain elements of the guidelines prove infeasible or undesirable as a project advances through stages of increasing design detail, projects should consider alternative strategies that achieve the main objectives outlined below.

Building Heights

Building height at the Science and Technology Campus will range from four stories to eight stories. The height of buildings will be the result of many factors including intended program, site capacity as well as sensitivity to adjacent buildings on campus as well as buildings on adjacent properties. It is encouraged to cluster taller buildings around the proposed train station in order to provide a greater level of activity and provide a greater opportunity for the campus community to take

Landmark Corner Buildings – Arlington, VA

Symmetrical Facades Framing an Open Space – University of Rochester, NY

advantage of alternative transit options.

LANDMARKS

Landmarks are prominent objects in the landscape, and can assist in navigation and orientation. An important objective of the Master Plan is the creation of landmark architectural features at signature sites that establish a distinct identity of place, symbolically mark gateways and significant points of interest, and contribute to the visual and architectural character of the campus.

Massing

A building's massing is derived from it's size and shape. The mass of a building, whether it has a flat facade or is stepped will affect how it feels adjacent to an open space or street edge.

PROPORTIONS

All buildings shall be compositional organized to have a base, a shaft, and a roof line. This will help the building be perceived to comfortably sit on the ground and helps to establish a "human scale" at the street level. The base shall extend from the exterior grade to the top of the first floor. Two story buildings are exempt from this requirement. The base shall be clearly articulated and shall be a different material, color, or pattern than the shaft primary surface material.

The buildings on campus will have a variety of roof forms wether they be pitched or flat. Smaller buildings with small footprints or few stories are most appropriate to have pitched roofs while larger, taller buildings are more apt to have flat roofs.

Landmark
Significant build-to lines

Landmark and Key Building Frontage Diagram

1. The corners of these buildings should be identical.
2. Shall include a tower element.
3. Train station should be designed as a prominent structure or relocated historic train station.
4. Existing water tower, possibly accommodating a band stand underneath.
5. Corner buildings shall be designed with a prominent architectural element terminating the streets.
6. Shall have a prominent facade at a 45 degree angle.
7. Shall be designed as a prominent element to terminate the open space.

Tower Element at Corner – Santana Row, San Jose, CA

A building's roof line helps to proved a visual termination to an elevation and further helps control its overall perceived scale. Buildings should incorporate clearly articulated eaves, cornices or parapets into their design.

COMPOSITION

To accommodate program demands, many of the buildings at the Science and Technology Campus will be tall in height, large in footprint, and consequently, large in scale. The scale of these buildings can be controlled with thoughtful composition and proportions.

Well designed elevations have hierarchical patterns and rhythms that are visually stimulating and contribute to the liveliness of a street or open space. Openings (doors, windows, loggia) can help to reduce the perceived scale of a building by dividing a continuous wall surface into smaller, more comprehensible parts.

Program needs and design and operations performance should be integrated into building design but never at the expense of beauty. Proportion of the overall building, the elevation, or an individual component such as a sunscreen, window, door, or cornice, should be fully integrated.

Component elements of building elevations should be legible. Building elements should balance innovation and function. Building efficiency or style should not be achieved at the expense of practical concerns such as maintenance and renovation.

Entries will be clearly expressed and created by a hierarchy of openings. Terraces, porches, and other transitional devices should be considered.

Main entrances will be proportional to the entire elevation. Consideration should be given to shade and overhead cover. Buildings may have multiple primary entries; primary entries must accommodate universal access. Doors should be wood or metal with glazing.

Windows should be operable where technically feasible and integrated into the building's energy strategy. Window frames should be wood or metal, colored to be compatible with other exterior materials. Clear glass will be preferred; any use of colored glass should be subtle. No reflective glass should be used.

Colors and Materials

COLORS

» Colors shall be consistent with the style.

» Garish, Neon, or otherwise "Loud" colors shall not be used, except for trim or accent.

» A variety of material colors shall be used throughout the Campus. Façade colors shall be used strategically to create a sense of diversity (while maintaining harmony), and to reinforce the urban design gestures.

MATERIALS

» Natural materials are permitted on all façades of buildings. Natural materials are brick, stone, stucco, EIFS and wood siding. All materials on Primary façades shall be natural materials, fiber cement siding (such as HardiPlank, HardiShingle, and HardiTrim), or artificial stone that accurately mimics natural stone shall also

Prominent Building at Termination Point – Memorial Hall – University of Delaware

be permitted on Primary façades.

- Wood, EIFS, Synthetic Board (synthetic wood product), fiber cement trim material, extruded polyurethane (such as Fypon), and cellular PVC shall be permitted as trim material.
- Metal columns shall not be permitted.
- Exterior light fixtures shall match the architectural style of the building.

Loading, Service and Storage

It is the intent of the Design Guidelines to limit the visibility of loading facilities, service entrances, and garage doors on or from the street. Ideally, these functions would be located on alleys or on other centralized courts or areas within the block where consolidated service and loading could occur to service a building or multiple buildings. When located on a street frontage, the width of the access point should be minimized, and architectural treatments such as specialty doors and gates should be utilized to mitigate the visual impact. Access points requiring a curb cut should be located a sufficient distance from any street intersection so as not to disrupt traffic flow, and other actions should be taken to minimize potential conflict with other transportation network users.

BUILDING EQUIPMENT

HVAC equipment, utility meters, satellite dishes, permanent grills, and other mechanical equipment should be located so as not to be visible from the street. They should be located to the interior of the block or on roofs and shall not be visible from the street. Mechanical equipment shall not vent to the street side of the building. Window air conditioning units are not permitted.

Chapter 5: Transit and Parking

Campus Connections

The potential for connectivity to the other areas of the University of Delaware and to the City of Newark is one of this campus' most important assets. Essentially, this campus will function as a gateway to the immediate region because of the new train station.

Consistent with the concept for this area to be a vibrant pedestrian area, the transportation plan is surrounded by a lining of retail shops taking full advantage of the high-volume of pedestrian foot traffic that will occur. The provision of street level retail will raise the experiential quality of using these transit options, thus 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 encouraging a "park once" strategy to accomplish many errands.

TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

The University of Delaware will implement a number of transportation demand management (TDM) strategies to reduce single-occupant vehicle usage on the STC. Some of the strategies described in this section are already incorporated in the STC plan under other sections of the design guidelines.

» The plan employs an attractive and convenient pedestrian and bicycle network, linking to off-site facilities. A convenient pedestrian and bicycle network is essential to encouraging students and employees to use these modes instead of commuting by automobile.

- Public transportation is incorporated as a central feature of the project. The existing and planned train station, and associated Amtrak and SEPTA service, will reduce long-distance single-occupant commuting. Frequent local bus and shuttle service to the site will reduce short-distance driver commuting.

- The plan is zoned to encourage housing available for professionals and students. On-campus housing is proximate to academic and employment destination, reduces single-occupant commuting, and can bolster campus transit ridership. The STC plan currently contemplates some graduate student housing.

- Establish ridesharing services (i.e., carpool) for the University of Delaware.

- The University currently contracts with Zipcar to provide a number of car-sharing vehicles on the main campus, which will be expanded to the STC site.

- The University will use all means of the latest IT to help advertise and manage state of the art TDM practices on the STC site.

OVERALL STC ACCESS DESIGN

Access to the STC site will be provided via a number of roadway connections on South College Avenue and Route 4. Access to the existing site is provided at two signalized intersections and one unsignalized intersection on South College Avenue and one signalized intersections on Route 4. The existing signalized intersections and one unsignalized intersection on South College Avenue also provide access to existing UD Athletics facilities and College

of Agriculture and Natural Resources (CANR) buildings on the east side of the roadway.

The preferred access treatments for the STC site include the improvement or construction of a total of three traffic signals on South College Avenue and three traffic signals on Route 4, which will function as the primary campus gateways. Signal spacing, particularly on South College Avenue, will comply with DelDOT signal spacing requirements. The preferred traffic signal spacing will maintain relatively equal distances between all three traffic signals on both roadways, using existing signal locations when possible. To efficiently accommodate access and minimize turning movement conflicts, the locations of future signalized intersections providing access to the STC on South College Avenue coordinate with primary access locations for the Athletics and CANR facilities on the opposite side of street. To maintain the median and necessary vehicle storage on South College Avenue, other STC roadway connections to South College Avenue may function only as right-in/right-out access to the site.

The built character of the roadways bordering the site is likely to differ significantly after development of the STC. As STC development (and possible redevelopment of Athletics facilities) is completed, South College Avenue is likely to become more urban in character, with shorter building setbacks and greater pedestrian activity. Because little or no development is planned on the south side of Route 4, the character of the roadway is likely to remain similar to the existing multi-lane arterial highway designed primarily for vehicle progression.

Framework Plan Showing Transit Connections

- Proposed Shuttle Bus Route 1 (Train Station)
- Proposed Shuttle Bus Route 2 (Full Site)
- Proposed Trails
- Proposed Bike Lane Treatments
- Existing Trails
- Sidewalks
- Pedestrian Paths
- High-visibility Crossing Treatments

All signalized campus gateways, on South College Avenue and Route 4, will include and prioritize pedestrian safety features. Appropriate pedestrian safety features for signalized intersections include the following treatments:

» High-visibility crosswalk treatments (i.e., diagonal or ladder-bar markings).

» Countdown pedestrian signals with push-button activation and audible crossing indications.

» ADA-compliant wheelchair ramps with tactile warning surfaces.

» Ample pedestrian landings at intersection corners.

» Accessible and protected pedestrian refuge on South College Avenue (i.e., landings within raised medians).

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. Alternative access to the rail yard will be provided via the internal STC roadway network.

STC TRANSIT SYSTEMS AND OPERATIONS

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 to the STC. At a minimum, the train station will provide convenient access to region 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 help become a vital connection for the various STC academic, research and business uses to cities along the Northeast Corridor passenger rail line and will help to 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 via two transportation modes in many cases.

While the STC will in many ways differ from

High Visibility Pedestrian Crossings, University of North Carolina – Greensboro

other parts of the University of Delaware, it will be important to develop a sense of cohesiveness between the STC and the rest of the University. Local transit systems are an important component to linking the STC with both the rest of the University and other destinations in Newark. The University currently operates one shuttle to the Athletics facilities and CANR on the South Campus. The STC will be served by multiple new shuttle routes, within the University of Delaware shuttle system.

To maximize access while minimizing delays for shuttle riders, the University will add two routes with service along South College Avenue between the main University of Delaware 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 1, including the College of Health Sciences buildings, other potential users, park & ride lots within the STC, and the future train station. The second route will traverse the major east-west corridors to ensure that shuttle access is provided within a five minute walk from any building or area of the STC site.

Additionally, as the STC grows and structured parking is further removed from some of the main destinations, an internal circulator shuttle may be employed. This shuttle would generally travel along the primary streets, with stops at all major parking facilities, the train station, and remote buildings. The frequency of service for the circulator would be coordinated with the peak periods of arrival for commuters, generally maintaining headways of 10 minutes or less during peak periods.

Shuttle service to the STC site will be provided on a similar schedule to other UD shuttle routes, with an overall service schedule from approximately 4:30 AM to 6:30 PM. Given the potential for significant presence of private enterprise on the STC, the University will consider extending service by one or two hours on weekday evenings. Service headways of 20 minutes or less are important to maximize ridership and develop an expectation of reliability in the shuttle as a viable transportation option for STC users. The first proposed shuttle route can be operated using one vehicle during most of the day and two vehicles to reduce headways during peak periods. Based on the total travel distance for the second route, two vehicles will be utilized to maintain appropriate headways.

The Unicity bus routes N1 and N2 also serve South College Avenue along the STC site frontage. The University will coordinate with the City of Newark to divert these routes to the STC. Any improvements to the South College Avenue streetscape should incorporate recessed bus pull-outs at bus stops to highlight the transit system and reduce traffic progression impacts on South College Avenue.

PEDESTRIAN AND BICYCLE FACILITIES

One of the University of Delaware's goals for the STC is to establish walking and bicycling as a popular mode choice for commuters. STC will follow two principal design strategies:

» Provide a comprehensive network of pedestrian/bicycle facilities and accommodations on the site.

» Provide convenient links to off-site facilities.

Multiple Pavement Types Designate Travel Types, University of Colorado, Boulder, CO

The STC site is bordered by two dedicated pedestrian/bicycle facilities, including the James F. Hall trail on the north side of the railroad tracks and a multi-use trail along the south side of Route 4. The internal STC pedestrian and bicycle network will connect to these facilities and, by extension, to regional pathway and trail systems throughout the Newark area. The following is a summary of the new or improved pedestrian and bicycle facilities that are incorporated into the STC site:

- Sidewalks along all roadways.
- Intersection treatments designed to maximize pedestrian safety at all internal intersections and along South College Avenue and Route 4.
- Primary pedestrian crossing locations, along the site's boundaries, at signalized intersections, using site design to direct pedestrians to these locations.
- Multiuse pathways in open spaces such as parks and the potential stream corridor.
- Bicycle lanes on Primary Streets to provide a continuous connection between off-site bicycle facilities and major on-site destinations.
- Sheltered bicycle parking in or proximate to most buildings.
- Shower and changing facilities in most buildings.
- A future pedestrian connection across the railroad tracks at the train station,

connecting the STC to the James F. Hall trail on the north side of the railroad.

Parking

GOALS

Consolidate parking areas on campus to make both developable land and parking areas more efficient and to enhance the pedestrian quality of the overall campus. Relegating cars to limited designated locations will reduce traffic on campus and allow for more uninterrupted pedestrian connections within and beyond the University.

While this provides an excellent opportunity to capitalize on this important resource, it will be important to plan for a mix of uses and for the location of parking so that foot traffic can support the businesses. All efforts will be made to put in structured parking decks in order to maintain high levels of commuters and development density in a focused area to support retail and lessen walking distances from parking to the station. Although surface parking around the train station is expected in the initial phases of development, structured parking is the long-term strategy.

STC PARKING MANAGEMENT

The STC site represents a significant parking resource for the University of Delaware. The site provides the opportunity to address parking for the STC, nearby Athletics events and main campus overflow through multi-modal transportation systems. The University will coordinate land use and parking management for the STC by reviewing the University's campus parking holistically.

The STC plans 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. Park & Ride lots or garages, intended to serve overflow parking from the main campus or Athletics facilities, will be located on primary streets and along campus shuttle routes, to promote convenience.

It is not possible to quantify overall parking supply needs for the STC campus until more detail regarding final land uses and tenants is established. To the greatest extent possible, the STC site plan will identify opportunities to take advantage of shared parking compatibility between neighboring land uses (i.e., office parking during daytime and residential parking at night). A comprehensive transportation demand management program will be implemented to reduce overall travel and parking demands on the site.

SURFACE PARKING

Interim Strategy

The short term strategy may employ surface parking. The surface parking will be located along the edges of the campus in order to create the central network of open spaces.

Landscaping

Parking lot landscape recommendations (for permanent and temporary parking areas) are a minimum of one shade tree per twenty spaces with a minimum of one landscaped island for every ten spaces.

STRUCTURED PARKING

Structured parking will be lined with actively programmed space or an enhanced architectural façade, depending on its location and relationship to streets and open spaces. Generally, active liners are preferred along major streets and public open spaces, and are a lesser priority along minor streets or alleys. All ground floor structured parking fronting streets and public open spaces should have a podium liner, except for garage entry doors not to exceed 25 feet in width.

» Shall have a maximum height of five stories (six levels) when wrapped by 4-story buildings all with pitched roofs and four stories (5 levels) when wrapped by any buildings with flat roofs and a 4-foot minimum parapet.

Illustrative Concept Plan with Temporary Surface Parking Strategy

Solar Panels can be installed over parking areas to shade cars and provide on-site energy such as this one installed by the company Envision Solar.

» No portion of the structured parking shall be visible from the street, except at the actual vehicular entry point.

» Shall not exceed in height the shortest building on the block by more than one story when a pitched roof is used.

» Shall not exceed in height the shortest building on the block when a flat roof is present on any building on the block.

PHOTOVOLTAICS

Large areas of surface parking as well as structured parking are convenient areas to install solar panels. These panels not only create renewable energy but make the lots cooler and more comfortable.

Chapter 6: Infrastructure

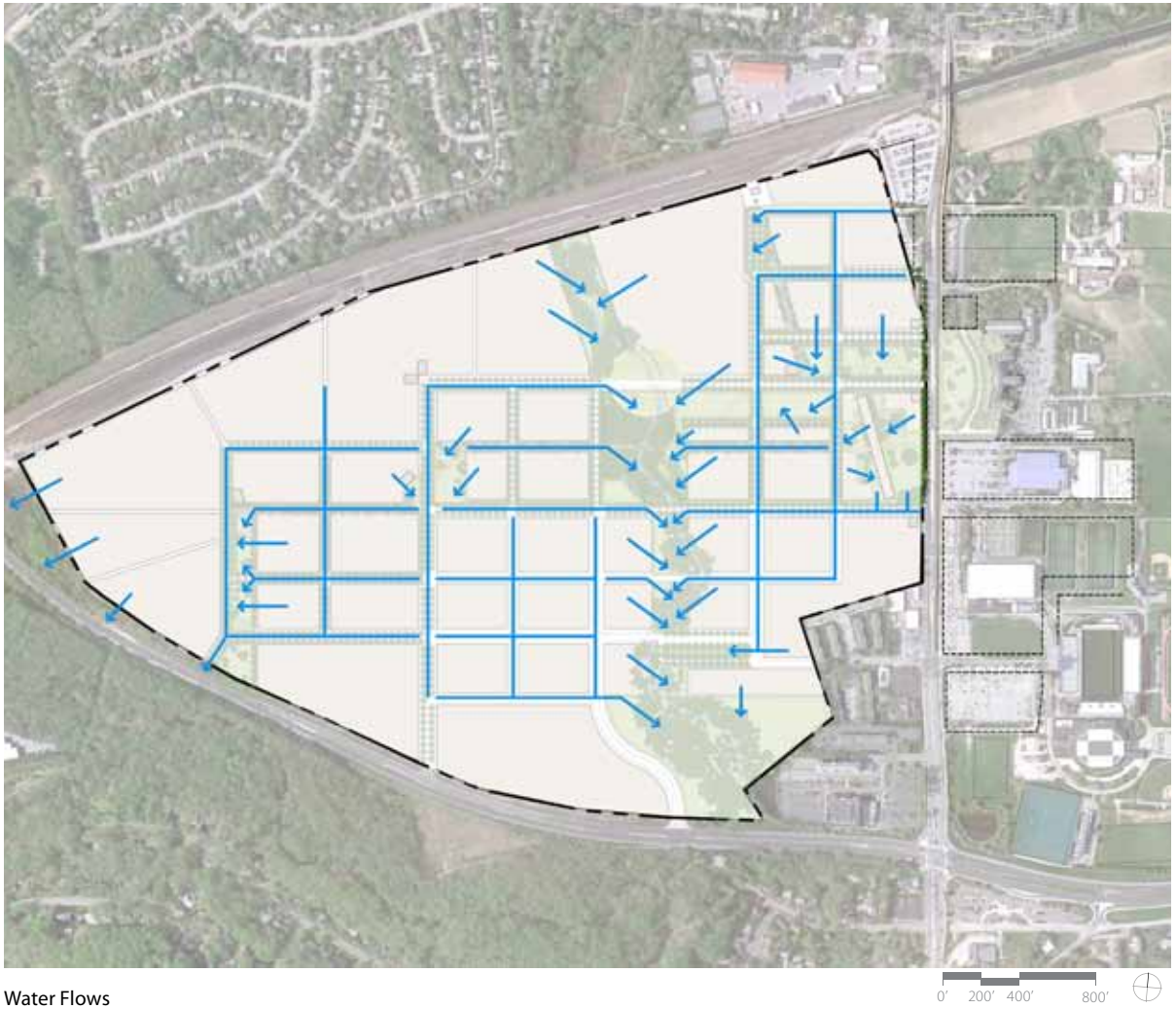
Goals

The design, maintenance and operations of the water, sanitary sewer and stormwater infrastructure serving the Science and Technology Campus will impact on the environmental quality and 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.

Storm Water Infrastructure

It is estimated that approximately 15% of the land area that is impervious will need to be set aside for stormwater treatment. Incorporating innovative "low impact development" (LID) stormwater management practices may allow for this percentage of land area to be lower, but at a minimum, allows for treatment and detention to be achieved throughout the site (incorporated into the site design/landscape) rather than a set aside of a large land area for centralized stormwater management. Also, the 85% impervious coverage proposed does not include the daylighting of Silver Brook Stream, which if constructed, could greatly increase the green space acreage and reduce the percentage of land area contributing to stormwater runoff.

The creation of this new campus is the perfect opportunity for the use of alternative stormwater management technology that enhances, restores, and protects the quality of water resources. This new stormwater strategy will comply with or exceed impending stormwater regulations from the



Water Flows

State of Delaware. Environmental site design controls erosion and sedimentation during construction and throughout the site's useful life.

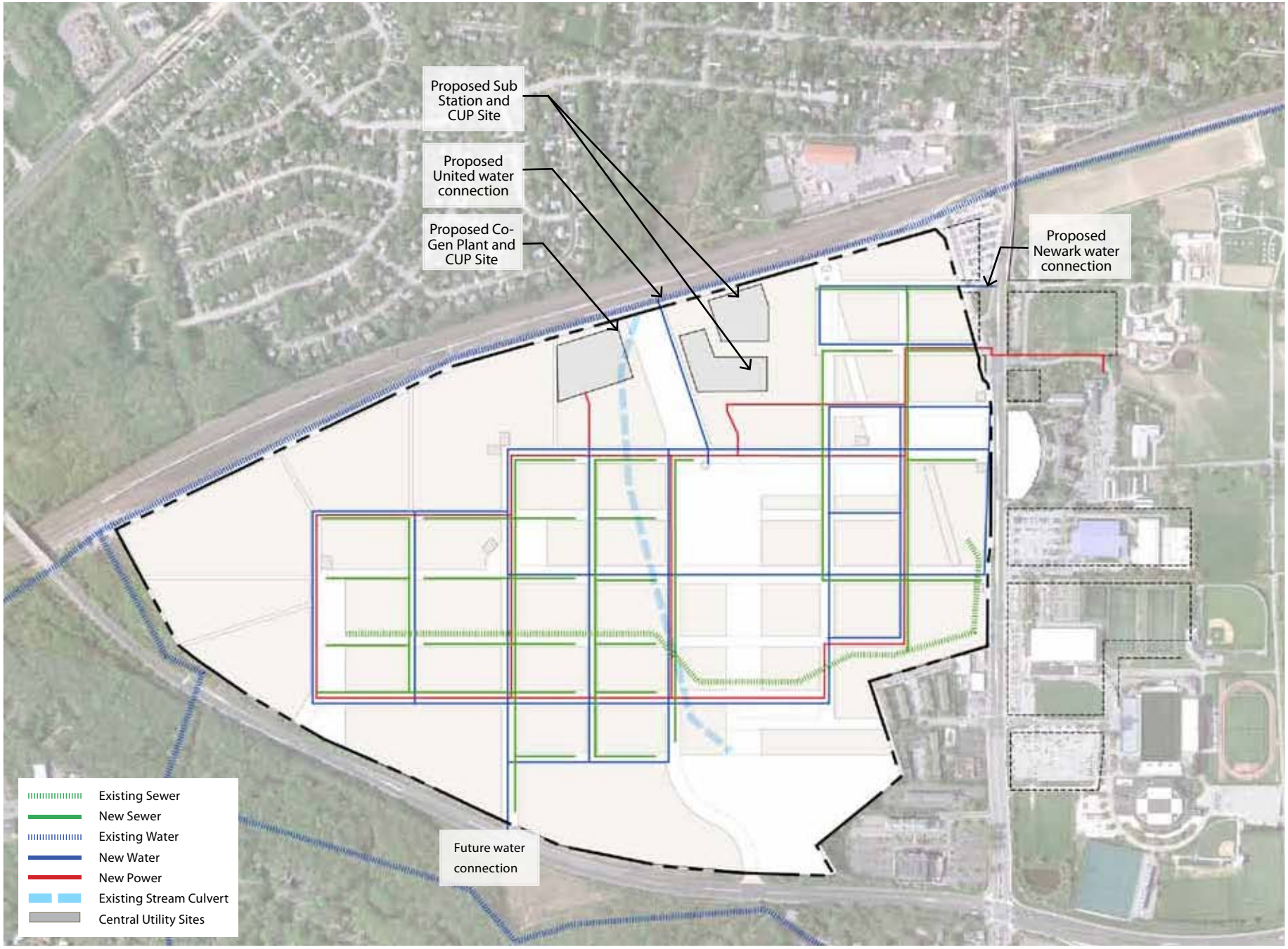
An important component of site development or redevelopment is the management of the stormwater runoff generated by flows across impervious surfaces. The conversion of this site from a car manufacturing facility to a campus will not greatly alter the amount of impervious surfaces. From a water quality and quantity perspective, all runoff should be treated. The method of treatment is driven by the existing state and local regulations, which will likely change over time as the site develops. In that light, the exact criteria for the Best Management Practices (BMPs) will evolve and will be verified during each future phase of development.

The STC's stormwater management approach will incorporate phased development in a decentralized manner. This entails capture, treatment, detention and potential reuse of runoff as close to the source as possible. This type of management is used in LID and site plans practicing Environmental Site Design (ESD) principles, although each of these methodologies employs many more factors than simply locations of BMPs. As each Phase is developed throughout the STC, infrastructure will be included to collect the treated stormwater and overflow, and to convey it to the receiving watercourse, which for much of the STC will be Silver Brook Stream. In the western portion of the property, treated stormwater will be conveyed to drainages to the south and west due to the topography and distance to Silver Brook Stream. Green spaces strategically placed throughout the Framework Plan represent potential areas of stormwater collection in a manner that is fitting with the landscape and hardscape design parameters. Other areas of collection and treatment will be incorporated adjacent to buildings, along roadways, and within parking areas. Stormwater captured for the purposes of reuse, possibly for irrigation, may be achieved through the placement of appropriately placed subsurface cisterns.

STORMWATER RECOMMENDATIONS

The overriding stormwater and drainage strategy for the STC will be to manage the rainfall from the 2-year storm event which accounts for 98% of the annual rainfall runoff volume through disconnection and runoff volume mitigating LID BMPs at the impervious source. The goal is to mimic pre-development hydrology and reduce or eliminate the need for large detention facilities to address peak rate and volume control

Channelized Stream Example



Proposed Primary Utility Plan

0' 200' 400' 800'

requirements. If designed properly, detention requirements should be solely a function of adequate conveyance from one phase to another and then ultimately to the receiving watercourse, in this case Silver Brook Stream.

Although 98% of the annual rainfall can be managed through disconnection and volume mitigating LID BMPs, the conveyance of rainfall from the higher intensity, less frequent events needs consideration at the earliest stages of plan development. The natural areas (green fingers/corridors) will be used to address adequate conveyance from the higher density areas to the receiving watercourse. If detention storage is required to meet the conveyance requirements, off-line detention in the form of natural or overflow storage practices similar to floodplains are preferred in lieu of traditional on-line storage structures. This will be incorporated into the larger green spaces that are proposed.

Greater flexibility regarding the utilization of stormwater practices close to the source will be considered permitting the connection of downspouts to dry-wells, rain barrels, planter boxes and rain gardens. The interception and retention of rainfall runoff from rooftops and associated impervious surfaces within parcel boundaries is the best opportunity to mimic pre-developed hydrology and reduce stormwater infrastructure costs.

Emphasis will be strongly placed on making community design features multi-functional such as:

» Parking lot islands that are bio-retention cells connected to underground infiltration systems.

» Rooftops that are green and collect overflow for flushing of toilets or irrigation.

» Landscaping adjacent to buildings, incorporated into community open areas or required for buffering that filters and retains rainfall runoff.

» Passive open space areas designed for flood water storage and passive infiltration.

» Sidewalks, driveways, parking lots and alley-ways that are permeable.

» Grassed areas and open conveyance systems designed to filter pollutants.

Water System Infrastructure

The Science and Technology Campus 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 260 acres of the site; while the City of Newark has water rights to the 10-acre parcel fronting on South College Avenue known as the Mopar site.

The initial phases of development will use the existing waterline infrastructure surrounding the site for the most part. As additional phases and density several considerations will be addressed:

» The existing 16" waterline along the north boundary which serves as the only point of connection may need to be replaced or increased. Use of the existing water tower

for fire protection or individual fire pumps in buildings will be the standard for the STC.

» The STC will work with Newark to ensure the efficacy of the 12" line that serves the Mopar parcel.

» As the site experiences development in the southeastern quadrant or square footages increase over one million, the STC will seek to ensure redundancy of service.

The proposed block 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. The waterline distribution system will build from a 12" main in the primary street with 8" branches on secondary and tertiary streets. Future buildings within the Mopar parcel will continue to be served by the City of Newark but the on-site distribution should follow the street grid in a similar manner.

In keeping with the idea of a sustainable and efficient campus, the site will take advantage of water efficient fixtures and sustainable construction practices including water reuse and reclamation. Initial phases of development will consider installing a redundant pipe system in the road grid that would be used in the future to convey reclaimed water to buildings for cooling tower make-up water, fire protection or irrigation. These strategies will reduce the campus' water use and support sustainability as the campus develops without a significant capital cost in the future.

Sanitary Sewer

The Science and Technology Campus has access to the existing Cool Run Sanitary Sewer Interceptor (a.k.a. the New Castle County Sewer Interceptor). The sanitary sewer interceptor frequently referred to as the New Castle County 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.

While the various proposed site uses of the master plan have different demands, assuming a maximum development of 10 MSF with an average demand of 50 GPD/1000SF the maximum average demand would be 0.5 MGD.

The planned layout of the street grid supports an efficient sanitary sewer conveyance system. Generally, the sanitary sewer collector lines will run from the north to the south, using gravity to collect flows from the blocks. This will result in an expandable and well planned system. Sanitary sewer will be built in roads as they are constructed to limit the need to install these systems after the campus is operational.

Power Infrastructure

EXISTING UTILITIES

There are two existing thermal and power related site utilities on the existing campus; natural gas and high voltage. 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. Because the pressure reducing station is located at a

planned main entrance to the STC property, the station will be relocated.

Existing high voltage overhead transmission lines enter at the northeast corner of the STC and currently serve two existing substations that are planned to be decommissioned over time and replaced with a new substation that will serve the STC facilities and possibly backfeed the other UD buildings on the east side of South College Avenue. This new substation will be owned by the City of Newark and will be fed primary power from the existing Delmarva high voltage lines located along the north side of the property. It is anticipated that the new substation will be co-located on the eastern central utility plant site along the northern edge of the campus and east of the existing stream culvert so that it will be centrally located and more readily accessible to serve the initial STC development.

Development Phase	STC Buildings (GSF)	Average Cooling Load (SF/Ton)	Average Heating Load (MBtu/SF)	Cooling Diversified Load (Tons)	Heating Diversified Load (MBtu/SF)
Initial Build	542,000	400	0.030	1,100	16,000
Phase 1	1,000,000	400	0.030	2,000	24,000
Worrilow Plant Capacity (Max.)	1,600,000	400	0.030	3,200	38,000
Ultimate (Min.)	5,775,000	400	0.030	11,600	140,000
Ultimate (Max.)	9,500,000	400	0.030	19,000	228,000

Load Projections

POWER PLANNING GOALS

The thermal and power utilities planning effort for the STC has recognized the importance of providing highly reliable, efficient and maintainable central utility systems for all buildings. In addition, 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. This development will be occurring on a parallel timeline with the build-out of the STC. To address this reality, the systems that are planned for the STC will be modular in nature and permit the best new technologies to be integrated as they emerge.

With the above in mind, the following planning principles developed for the STC thermal and power utility systems are:

- To take advantage of the opportunity to diversify loads and share redundancy, utilize highly efficient central utility plants (CUP's) to serve all facilities including implementation of Combined Heat and Power (CHP) when the campus loads will support it.

- Optimize CUP capacity requirements by accounting for highly efficient facility loads that will be governed by campus sustainable design standards.

- Incorporate the use of renewable energy sources (solar, waste heat recovery, geothermal, bio-fuels, biomass, etc.) wherever practical at the CUP's and in the connected facilities.

- Locate the new utility plants and substation

in a manner that meets the planning goals for the campus development.

» Integrate of the utility distribution systems with the transit corridors and landscape features to minimize environmental impacts while maximizing maintenance access.

LOAD PROJECTIONS

Based on the land use planning provided with this effort, the campus development is anticipated to occur in several phases over an undefined period of time. As such the central utility systems must be planned to be phased as well, but with the "right sized" capacity to provide reliable (with N+1 redundancy) service to all connected facilities. Planning discussions have suggested that the STC would initially be started with 400,000 GSF of new space, with subsequent steps to 1.0 MM GSF, 1.6 MM GSF with a maximum between 5.7 MM GSF to 9.5MM GSF. Using historic load factors that have been adjusted for current sustainable design standards for the types of facilities being planned for the STC, the following load projections were developed (see Load Projections chart, page 83) to aid in sizing the thermal and power systems that may be required to support the STC.

The above load projections suggest that the ultimate design loads for the STC should be approximately 19,000 Tons of cooling and 228,000 MBtu of heating which would includes some allowances for back-feeding the existing UD South Campus and Athletic facilities on the east side of South College Avenue.

Thermal Utilities

Thermal utilities infrastructure will be adaptable such that it can evolve over time as the campus develops incorporating the best available technologies to provide highly efficient and maintainable systems. The ability to provide reliable (N+1 redundancy) operation of these systems, will require a careful balance between proven commercially available equipment and new innovative equipment. Some of the currently available systems and equipment that will be considered for the initial phased of development include the following:

» Combined Heat and Power – Combined Heat and Power (CHP) can produce useful heat and electricity at an overall system efficiency in excess of 70%. This compares very favorably with separate electric generation at 33-40% efficiency and separate heat production at 85% efficiency.

» Condensing Boilers – Condensing boilers offer combustion efficiencies approaching 95% versus 83% for more traditional non-condensing gas fired boilers. These boilers are typically smaller in size and will be considered along with the centralized low temperature heating hot water systems being proposed for the STC.

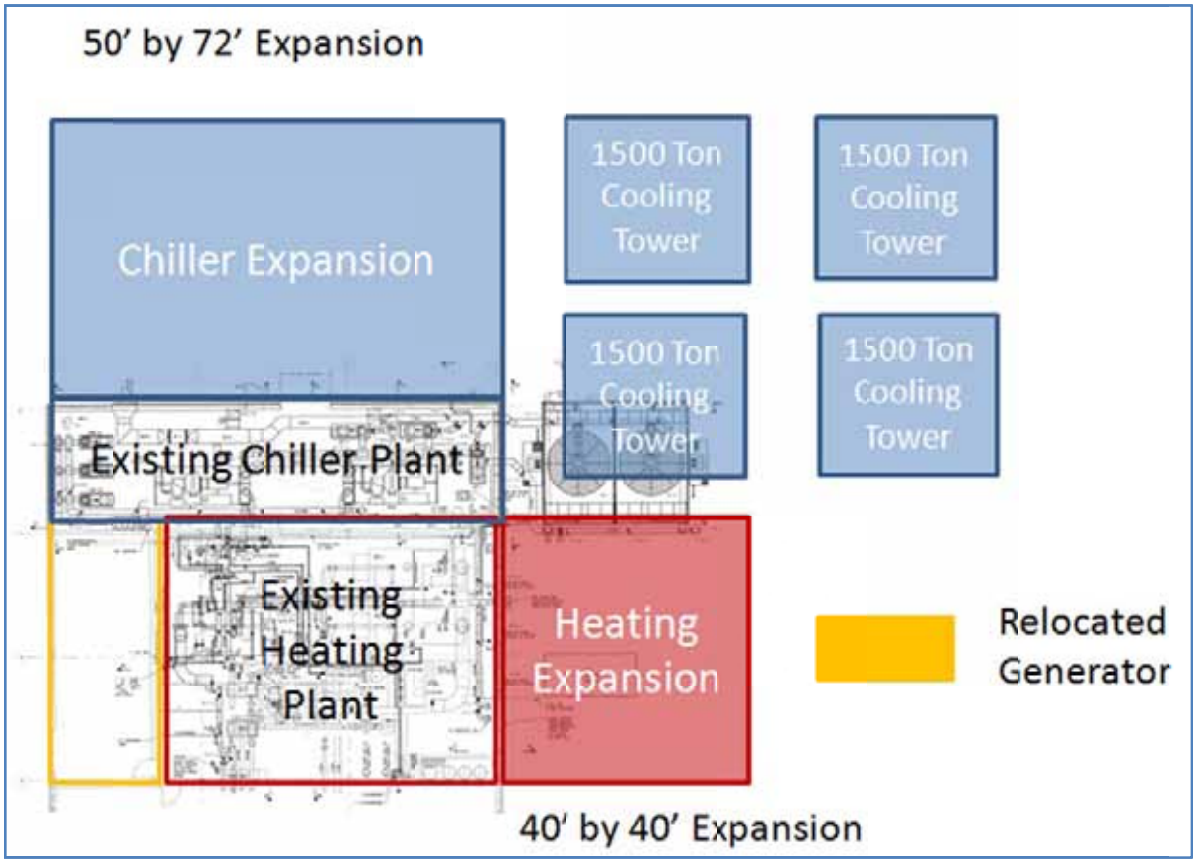
» Electric Chillers – All variable speed chiller plants including chillers are now commonplace in large tonnage sizes suitable for district cooling systems and UD currently employs them. Annual average system efficiencies of 0.55 kW electric input per ton of cooling are readily achievable with today's technologies. This compares favorably with 1.0 kW/ton and

0.75 kW/ton which are typical for building air conditioners and traditional central chilled water plants respectively. Chilled water production for STC is planned to have an annual average efficiency of 0.55 kW/ton or better for cooling only systems. If heat recovery chillers are able to be implemented based on the building typology, annual energy rates will be higher, but overall heating-cooling system efficiencies will improve.

» Thermal Energy Storage – Thermal energy storage allows produced energy to be stored for later use; whether it be chilled water produced at night during off-peak electrical rate hours to be used in the day, or hot water produced from the heat removed from the buildings during the day to be used to heat the buildings at night.

» Heat Recovery Chillers – Traditionally, the heat collected from the buildings by the district chilled water loop is removed by chillers in the central plant and rejected to the atmosphere through a cooling tower. In addition to losing the collected heat, the cooling towers also consume large amounts of water and chemicals to accomplish the heat rejection. Heat recovery chillers are electric centrifugal chillers that can produce chilled water for district cooling and reject their heat to a district hot water system instead of cooling towers. These machines will allow beneficial reuse of the heat collected from campus by the district cooling loop plus all the electric heat energy used to operate the chiller.

» Central Emergency Generators – Large size emergency generators (1 MW and higher)



Worrilow Plant Expansion – Serves Up to 1.6 MM GSF

are anticipated to be required for many of the facilities on the STC. These emergency generators will be centralized in the CUP and utilized as both emergency generation capacity and cogeneration capacity. Waste heat from the engines will be collected and used for district heating. The generators will be operated for emergency power generation and for highly efficient cogeneration when electric prices or campus heat load warrants. Typically when emergency generators are used in a fully loaded cogeneration mode more regularly, their reliability will be greatly enhanced and the overall economics of energy supply to the STC will be improved.

To take advantage of existing equipment assets and to minimize first costs, the early phases of the STC development will be served from

the existing regional plant located in Worrilow Hall. Based on preliminary investigations it is believed that this plant can be expanded to serve up to approximately 1.6 MM GSF of space. The phased expansions of the Worrilow plant are summarized and illustrated below.

Worrilow Plant Expansion – Serves Up To 400K GSF:

» The plant (50'x72') will be expanded to allow for additional chilled water production.

» A new 1,500 ton chiller with auxiliaries in the plant expansion.

» New steam to water heat exchangers will be installed to create hot water with the existing steam boilers for the STC facilities.

Street Section with Underground Utilities – Utility spacing may necessitate placing utility lines under sidewalks or yards.

- Non-potable water
- Chilled water
- Domestic water
- Storm drain
- Sanitary sewer
- Electric
- Steam
- Telecom
- Hot water

» The existing steam boiler dearator and chemical treatment systems will be upgraded.

» Chilled water and heating hot water distribution piping will be extended from Worrilow across South College Avenue to the STC. Parallel to the new hot water and chilled water piping, a combined power and telcom ductbank across South College Avenue will be installed for the future.

» All of the above distribution systems shall be sized to allow for the full export of the ultimate Worrilow plant capacity to the STC.

Worrilow Plant Expansion – Serves Up To 1.0 MM GSF:

» A second new 1,500 ton chiller increment with auxiliaries will be installed in the plant expansion.

» The plant (40'x40') will be expanded for additional heating steam/hot water production.

» Two new 500 BHP boilers will be installed in the plant expansion.

» New electrical service will be provided to the Worrilow plant from the new STC substation.

Worrilow Plant Expansion – Serves Up To 1.6 MM GSF:

» The existing 400 ton chillers will be replaced with new 1,500 ton chiller and auxiliaries.

» The three existing 250 BHP boilers will be replaced with two new 500 BHP boilers.

» Additional hot water heat exchangers will be installed.

As the STC grows and expands beyond the firm capacity of the Worrilow plant, one or both of the planned STC CUP's will be developed and be interconnected with the Worrilow plan to jointly serve the STC and to backfeed the more significant buildings on the UD South campus on the east side of South College Avenue.

The two future STC central utility plant sites have been planned along the north side of the campus. The first will be closer to the initial buildings on the east side of the existing stream culvert and would be equipped with high efficiency heating and cooling systems and potentially be able to accommodate small scale combined heat and power (CHP). It is anticipated that the first plant site will be co-located with the new substation that will serve the STC. The second plant site is located on the west side of the stream culvert and is larger in size with the intention of supporting a full scale CHP facility. This second plant site should also be located to allow for the delivery of solid fuels (i.e. biomass) by railroad. To provide long term flexibility, both sites are planned to provide enough capacity for up to 9MM GSF of development.

Utility Distribution

The utility infrastructure is key to achieving sustainable growth in a dense urban pattern. Integration of the project's goals for land use, land pattern development, transportation, and energy efficiency all factor into the utility distribution. 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 of these systems would be expanded over time to connect all the central utility plants to all the STC buildings and 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 builds out, but is anticipated that the network would originate at the Worrilow Hall regional plant and be extended to and throughout the STC as shown on the Proposed Primary Utility Plan diagram on page 78.

It is anticipated that 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 ductbanks. In areas where the utility corridors are narrow or future maintenance access will be difficult, accessible tunnels may be considered.

Chapter 7: Site Signage

Goals

The uniform family of exterior signs developed in the Signage and Wayfinding Master Plan convey clear directional messages to users and reinforce the institutional brand. The following hierarchy of sign types helps guide visitors to their final destination on campus. Each sign type serves a unique function and is an important part of this journey.

Each sign type combines aesthetic and informational elements. The appearance, shape, and size are designed to accommodate the required types and quantity of information at an appropriate scale.

A Signage and Wayfinding Plan should:

» Reinforce the University of Delaware Science and Technology brand

» Strengthen the sense of place

» Contribute to a more welcoming campus

» Add to the visitor experience

» Provide clear directions and destinations

» Connote image of quality

» Accommodate day and evening campus populations

» Improve special event wayfinding by improving general wayfinding throughout campus

» Accommodate persons with disabilities (ADA compliant)

Sign Kiosk Example

AUDIENCE AND IMPRESSIONS

The Signage and Wayfinding Master Plan will enhance visitors' impressions of STC. These impressions include those that occur the first time a guest visits, and those that occur every time someone arrives on campus. There are three key audiences – first-time visitors, initiated users and the residents in the neighboring community.

First-time visitors

Whether prospective students, parents, researchers, patients, conference attendees, or community event participants – are the most dependent on signage to guide them. Their initial impression is an introduction to the physical surroundings. A simple and straightforward message system will direct them to destinations, minimize confusion, and make them feel welcome on campus.

Initiated Users

This group includes current students, faculty, staff, patients, and others who regularly spend time on campus. These users rely less on the navigational aspects; their relationship with signage is more about "place making."

Community

The third audience group is the residents in the neighboring community. This group will be positively affected by clear and intuitive signage and wayfinding. The system will promote campus identity while integrating with the scale and aesthetic of the surrounding areas.

Wayfinding

Signage and wayfinding not only provide direction and orientation, but can brand a campus identity through consistent use

of colors, fonts and style. The intent of the Science and Technology Campus Signage and Wayfinding strategy is to provide a hierarchy of signs that will welcome, inform and enhance the visitor experience. Visitor impressions and clarity of direction as well as reducing sign clutter by implementing a clear, cohesive signage system should be the key goals of the signage program.

Proposed signage to be coordinated with style and content should include:

- Vehicular Directional Signs
- Parking Lot Identification
- Pedestrian Directional Signs
- Map Kiosks
- Freestanding Building Identification Signs
- Building Mounted Identification and Address Signs
- Traffic Regulatory Signs
- Accessibility Markers
- Temporary Signs

Wayfinding Sign

Sign Example

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Chapter 8: Process

They University will maintain its established review process for all development occurring on the Science and Technology Campus.

The design process which will lead towards a finished building or open space should follow the vision set forth in the Master Plan and Guidelines a well as consider the best practices of the University of Delaware. Items that will be considered will be the building massing, architectural character, pedestrian and transportation connections, infrastructure and sustainable building practices.

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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.

Culvert:
A covered channel or pipe that carries water under a road, rail line or built feature.

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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Appendices

Low Impact Development

Sustainable site design and building techniques create a built environment that aims to protect natural resources and maximizes human comfort and well-being. The environmental, economic, and social benefits of "green building" far outweigh the challenges inherent in building to a higher standard for the benefit of present and future generations. Environmental site design also encourages the employment of planning strategies that will encourage the use of alternative transportation modes.

The concept of Low Impact Development (LID) design has its basis in the fundamental idea of sustainable stormwater management. Some of the overriding goals of LID are to maintain the hydrologic budget as close to "pre-development" as possible, design the management strategy on a watershed and site-by-site basis, and to have a holistic approach to stormwater management.

Stream Restoration

One of the most unique and exciting aspects of the transformation of the pervious Chrysler factory to a Science and Technology Campus 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. Silver Brook Stream flows north to south through the proposed STC, and is carried two-thirds of this length in an 84 inch culvert, below parking lots,

building slabs, and the like. While the isolation of this watercourse from its open environment is a negative condition in itself, the additional assaults on this stream include the input of stormwater runoff directly from the impervious surfaces throughout the STC property, preventing the potential for any treatment or reduction in the time of concentration once the rain begins to fall. Silver Brook Stream can be removed from this subterranean placement and allowed to again flow freely through this site, accessing adjacent floodplains during high flows, providing a variety of aquatic and terrestrial habitats, and creating a natural treasure, exemplifying UD's commitment to the environment, research, education, and to the community. Similar projects have been completed on smaller scales and have met great success in their goals of ecological restoration as well as improving the awareness of adjacent communities relative to their natural environment and the implications of their everyday actions on the ecosystems around us.

Daylighting of streams provides numerous benefits, including but not limited to:

- Improvement to functional values of waterways/urban stormwater systems
  - Increased hydraulic capacity for floodways
  - Lowering of water velocities
  - Reduction in downstream erosion
  - Removal of water from combined sewers
  - Water quality improvements
- Improve aquatic habitat
- Provide new riparian corridors for wildlife
- Revitalize neighborhoods, increase property values, benefit nearby businesses
- Possibly cost effective compared to culvert repair/replacement
- Provides a "living classroom" for research and study by educational institutions
- Foster stewardship of natural resources and energize local communities

The benefits of collecting on-site stormwater in these corridors and creating additional habitats will also provide a valuable learning experience and a demonstration project which the University could align academic programs with real-world implementation. The educational goals of the University will be enhanced through an interpretive signage that will reveal reasons why it is important to connect natural areas together.

Coupled with the natural corridor, on-site planning decisions will also be explained through interpretive signs that explain the Campus' role in the larger ecological environment.

An important consideration related to the location of the STC is its inclusion within the Christina River watershed. As mentioned previously, this river system includes the only trout streams within the state, recreational uses, and is a drinking water source for Newark. This watershed contains critical habitat and supports the human population of the adjacent developed areas. Silver Brook Stream is an important tributary to the River and the restoration of this corridor will provide considerable improvements to the water quality entering the Christina at the confluence of the two water courses. Education of the residents in the upper portion of the Silver Brook Stream drainage, north of the STC, will bring to light their actions that can harm or improve habitat and water quality. A concerted effort by the University to address this perennial stream that is currently trapped below the surface and receives considerable amounts of unmitigated stormwater during every storm event, will also aid in showing the community that UD is committed to restoring the natural environment, protecting habitat and improving water quality. The additional potential for the corridor to serve educational as well as other purposes elevates the goal of daylighting Silver Brook Stream to beyond improved aesthetics or a "green" measure, to that of serving the

whole community and providing considerable opportunities for research and discovery.

Silver Brook Stream can be removed from its current subterranean placement and allowed to again flow freely through this site, accessing adjacent floodplains during high flows, providing a variety of aquatic and terrestrial habitats, and creating a natural treasure for UD, exemplifying the institution's commitment to the environment, research, education, and to the community. Similar projects have been completed on smaller scales and have met with great success in their goals of ecological restoration as well as improving the awareness of adjacent communities about the natural environment and the implications of their everyday actions on the ecosystems around us.

Watersheds

The Silver Brook Stream watershed is approximately 600 acres, draining over 300 acres of residential development to the north of the project site and approximately 250 acres of the STC. The area of the proposed 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 238 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 property. It emerges from the culvert approximately twelve hundred (1,200) feet prior to entering another culvert that flows under Route 4 and discharges into the Christina River.

According to the Newark, Delaware Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) (Delaware DataMIL, New Castle County GIS ArcIMS Server) the portion of Silver Brook Stream that is not

contained within the culvert on the south end of the STC is not currently located within the mapped 100-year flood plain.

SOILS

According to the soils data available from the 1970 NRCS Soil Survey, prior to development of the Chrysler plant in 1951, the site was predominately comprised of Matapeake Silt Loam (2-5% slopes) and Keyport Silt Loam (2-5% slopes). These soil types are described as prime farmland in Delaware and are poor to moderately well-drained. Hydric soils on site included: Mixed Alluvial Land, Elkton Silt Loam (2-5% slopes), and Elkton Silt Loam (0-2% slopes). Throughout the development of this property there has been extensive manipulation of the existing soils, including filling of the Silver Brook Stream floodplain with coal slag and subsurface contamination from various sources over the past 60 years.

A goal of the stormwater management program for the redevelopment project would be to restore the hydrology of the site to the maximum extent practical while managing the stormwater runoff for quality and quantity control. Stormwater practices that pre-treat and then infiltrate runoff (recharge groundwater) are often selected as they typically maximize these goals given the right conditions.

The STC implement various methods of storm water management BMP's such as vegetated filtering practices incorporated into biofilters, swales, raingardens that will include a liner and an under-drain. Once the site constraints and soils characteristics are determined, the stormwater BMP design selection process can be refined to incorporate the additional goals beyond the strictly stormwater management functions, such as aesthetic, landscaping, integration and incorporation with an overall master planning effort for the design of the site.

Stormwater Regulations and Permitting

Stormwater management at the Science & Technology Campus will be regulated by the Delaware Sediment and Stormwater Regulations. Given the Brownfield designation of the site, the agency delegated for the stormwater and erosion & sediment control reviews will likely be a combination of the Delaware Department of Natural Resources and Environmental Control (DNREC) and the City of Newark.

The following guidelines have been developed based upon current regulations, but may need to be modified once revisions related to the Redevelopment and Brownfield regulations become available:

- Given the highly impervious nature of the existing site, and the anticipation that the redevelopment effort will result in an overall decrease in the impervious cover on the site, quantity management of stormwater should not be required.
- Quality management of all site stormwater will be required. This management should provide 80% removal of the average annual load of Total Suspended Solids (TSS) as modeled by the Delaware Urban Runoff Management Model (DURMM).
- The stormwater quality management plan will likely be comprised of a variety of stormwater best management practices (BMPs) including filter strips, biofiltration swales, bio-retention areas, and isolator rows within subsurface containment facilities.
- The site may be required to reduce stormwater Total Maximum Daily Loads (TMDL's) in accordance with the Christina River Basin Pollution Control Strategy (PCS) and/or the City of Newark – University of Delaware Joint Municipal Separate Storm Sewer System (MS4) permit. While neither the PCS for the Christina River Basin nor

the Newark-UD MS4 permit has yet been finalized, they are being formulated and may be in place prior to the build-out of the Science & Technology Campus.

» Erosion and sediment controls must be provided to prevent impacts during construction and land disturbing activities. These practices should be in accordance with the Delaware Sediment and Stormwater Regulations and the Delaware Erosion and Sediment Control Handbook.

» All stormwater management systems should have an operation and maintenance plan to address the long term functionality of the stormwater management components, as well as the overall plan.

Existing Infrastructure

WATER SYSTEM

The Science and Technology Campus 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 260 acres of the site; while the City of Newark has water rights to the 10-acre parcel fronting on South College Avenue known as the Mopar site.

The existing waterline to the north, along the railroad, is a 16" cast iron water pipe line. According to United Water officials, this line was built in the 1950's primarily to serve the Chrysler site. United Water reported that the normal pressure is approximately 60 pounds per square inch (psi) and can be increased to 80 psi if boosters are running. The 16" cast iron watermain connects to a 20" waterline east of the South College Avenue bridge. The 20" main serves as the connection directly to the Stanton Treatment Plant.

The campus is fed from a 6" connection to the 16" waterline at a point east of the existing Mopar building and has a 6-inch meter.

The 6" connection to the northern United Water service serves as the main water feed to the campus and connects to an interior 400,000 gallon elevated water tank.

A second United Water line exists on the south side of Route 4, Christina Parkway. This 12" line connects to the Chestnut Hill Treatment Plant with a capacity of 3 million gallons per day (MGD). There is currently no connection from the campus to this waterline.

To the east, a 6" City of Newark waterline is located along South College Avenue adjacent to the campus. According to City of Newark records, the 6" waterline connects to a 12" waterline on the eastside of South College Avenue. June 2010, flow tests in the area reveal a 60psi pressure with a hydraulic head of 254'; a fire flow of 2000 GPM at 20psi was reported at the Bob Carpenter Center.

SANITARY SEWER INFRASTRUCTURE

The Science and Technology Campus has access to the existing Cool Run Sanitary Sewer Interceptor (a.k.a. the New Castle County Sewer Interceptor). The sanitary sewer interceptor frequently referred to as the New Castle County 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.

The Interceptor, built in 1985 to replace a 24-inch system, is 36-inch Class 55 Ductile Iron pipe. The system is a gravity sewer running east to west across the southern portion of the site generally parallel to Route 4; it has a capacity of approximately ten million gallons per day (10 MGD). The system was installed at a depth of twenty feet in most locations with slopes of approximately 0.1 ft/ft.

According to City of Newark records, Chrysler had an agreement with the City of Newark

to discharge 5.86 MGD. The current flow in the system includes 2 MGD from New Castle County and 2 MGD from the City of Newark measured at metering station and downstream connection point to New Castle County. According to City of Newark there is 5.86 MGD of capacity in the interceptor. New Castle County Department of Special Services stated that the interceptor downstream of the City of Newark has no capacity issues and the Wilmington treatment plant has 20 MGD capacity with no issues. Furthermore, there are no planned improvements to the interceptor or to the treatment plant downstream.

PRV Relocation

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 (PRV) located along South College Avenue. This station serves the existing Chrysler facilities on the STC campus. Because the pressure reducing station is located at a planned main entrance to the STC property, the station will be relocated. Delmarva has reported that the station can be relocated at UD's request elsewhere on the property.

New Substation

Existing high voltage overhead transmission lines enter at the northeast corner of the STC and currently serve two existing substations that are planned to be decommissioned over time and replaced with a new substation that will serve the STC facilities and possibly backfeed the other UD buildings on the east side of South College Avenue. This new substation will be owned by the City of Newark and will be fed primary power from the existing Delmarva high voltage lines located along the north side of the property. It is anticipated that the new substation will be co-located on the eastern central utility plant site along the northern edge of the campus and east of the existing

stream culvert so that it will be centrally located and more readily accessible to serve the initial STC development.

As part of their initial discussions with the city, UD has made the following requests which would take effect after the Delmarva service to the existing site is due to be discontinued in October of 2011:

- The City agrees to serve the University of Delaware's Science and Technology Campus (formerly known as the "Chrysler Site) at 135 kV with automatic switching capability.
- The City agrees to serve the University from a substation located on Chrysler site at a location of the University's choosing. The City would be responsible for any costs associated with constructing or moving a substation and the substation must include a capacitor bank.
- The City would be able to serve additional customers with excess capacity beyond the needs of the Science and Technology campus.
- The City will develop an initial cost estimate associated with serving the University as detailed in the items above as well as the costs associated with moving the existing substation. This figure would be included in its 2010-2015 Capital Plan.

In addition to these initial basic agreement terms, the following target principles were developed by the STC planning team to further define UD's expectations for the new substation and power service that would be provided by the City of Newark:

City Will:

- Construct new substation on site chosen by University
- Complete build-out capacity by 2015
- Relocate transmission line

» Provide reliable, quality power as defined by IEEE and DPSC
» Remove old substation and equipment
» Underground all distribution lines within the campus
» Eliminate the aerial electric distribution lines along Route 896 by 2025.

City Will Not:

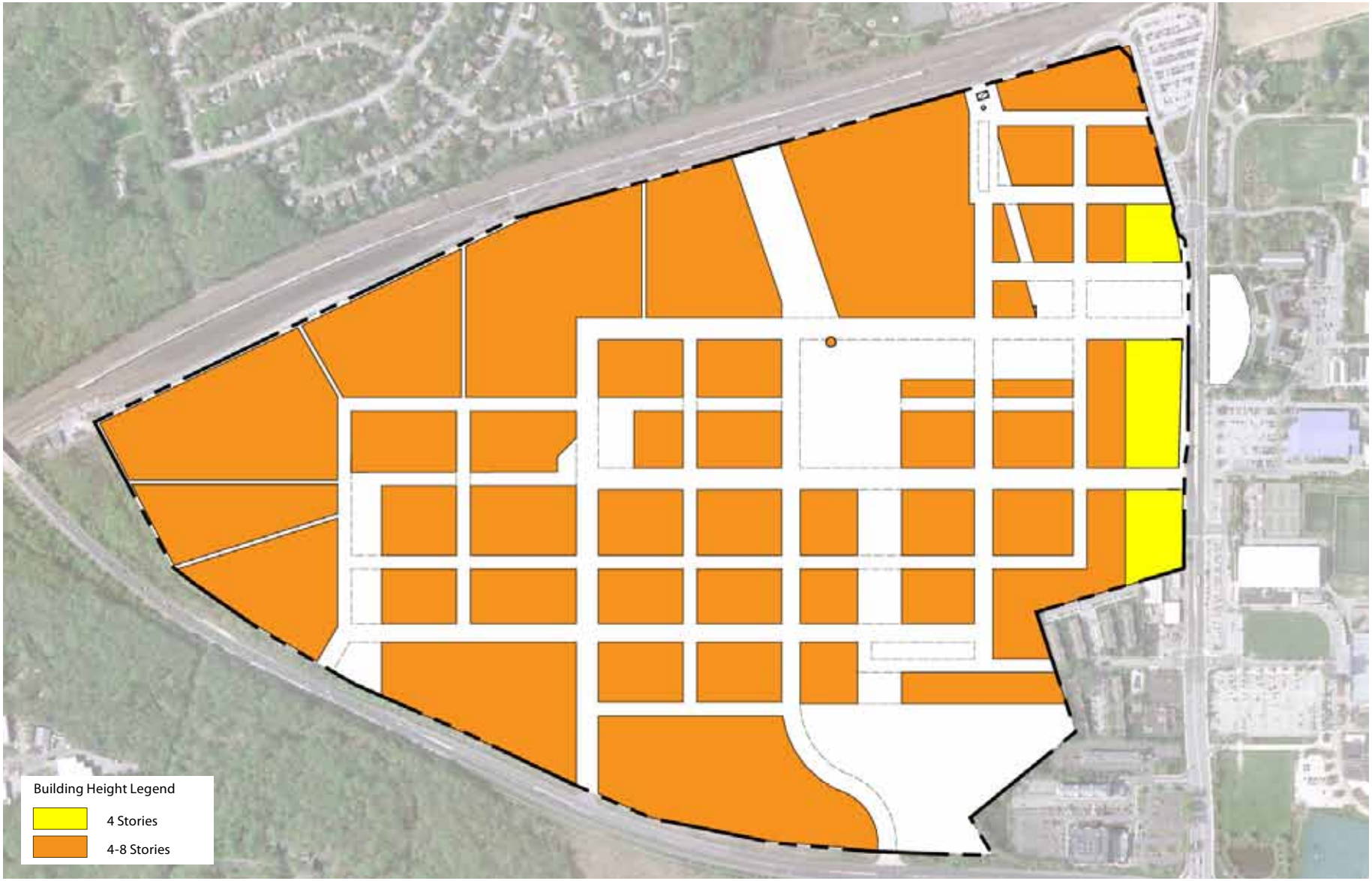
» Install any aerial distribution facilities within the Science and Technology Campus or along South College Avenue.
» Install new, modify or access underground facilities by way of excavation within a completed area of development for 10 years after its completion except for repair due to damage caused by others, natural event or system failure.
» Install new aerial facilities along South College Avenue and Route 4 (Christina Parkway).

University Will:

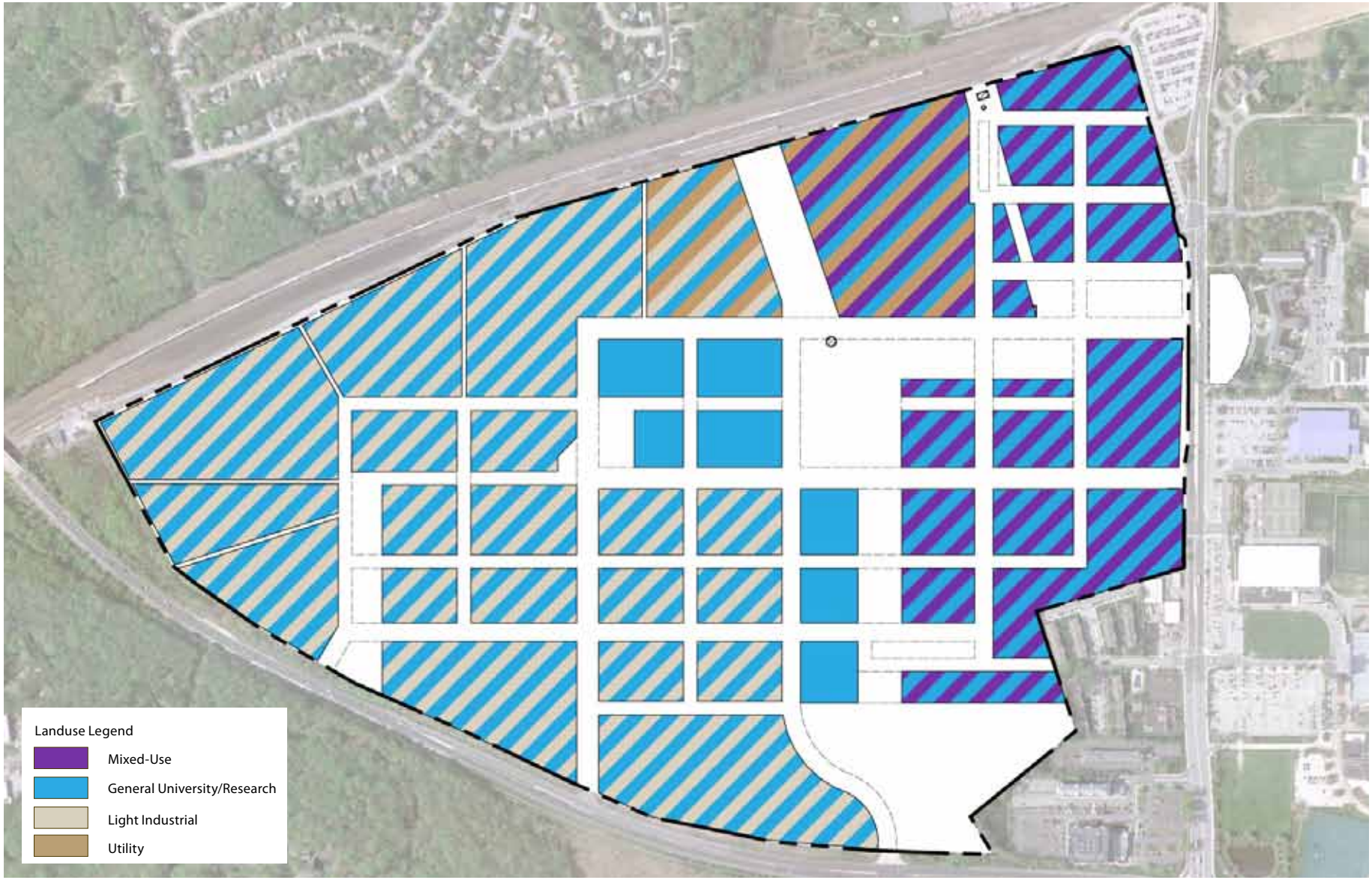
» Provide a long term, lease agreement for the construction, maintenance and distribution of power through one, 2 acre substation, a single aerial transmission pole line, and the associated distribution lines.
» Provide a dedicated access to the substation and transmission lines for installation, maintenance and emergency service.
» Provide specifications for substation location, aesthetic requirements and development load and quality requirements.

Campus Blocks

These blocks define development areas and building sites.



Building Height Diagram



Blocks Landuse Diagram

Campus Blocks Diagram

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
A	3.1 ac	4-8 stories	• Mixed use, including retail and housing • General university/research	• Proximity to Amtrak station • Future redevelopment of parking lots adjacent to Route 896
B	2.1 ac	4-8 stories	• Mixed use, including retail and housing • General university/research	• Proximity to Amtrak station • Future redevelopment of parking lots adjacent to Route 896
C	2.6 ac	4 stories along S. Colleg Ave 4-8 stories other areas	• Mixed use, including retail and housing • General university/research	• Adjacent to the Quad with defining building element along Route 896
D	5.7 ac	4 stories along S. Colleg Ave 4-8 stories other areas	• General university/research (College of Health Sciences) • Mixed use, including retail and housing	• Existing administration building to be redeveloped • Significant Route 896 frontage • Adjacent to the Quad with defining building element along Route 896
E	7.1 ac	4 stories along S. Colleg Ave 4-8 stories other areas	• General university/research • Mixed use, including retail and housing	• Route 896 frontage • Property line to south of the block
F	1.9 ac	4-8 stories	• Mixed use, including retail and housing • General university/research	• Proximity to Amtrak station • Frontage along Paseo and the Town Green
G	1.3 ac	4-8 stories	• Mixed use, including retail and housing/hotel • General university/research	• Proximity to Amtrak station • Frontage along Paseo and the Quad
H	0.5 ac	4-8 stories	• Mixed use, including retail and housing • General university/research	• Proximity to Amtrak station • Frontage along Paseo and the Town Green

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
I	0.7 ac	4-8 stories	• Mixed use, including retail and housing • General university/research	• Direct access to the Quad • Defining building element creating an axis with the Agriculture School facility
J	0.7 ac	4-8 stories	• General university/research	• Direct access to park and paseo on either side • Must be serviced from north-south streets to the east and west
K	2.2 ac	4-8 stories	• General university/research • Mixed use, including retail and housing	• Direct access to paseo
L	2.5 ac	4-8 stories	• General university/research	
M	15.4 ac	4-8 stories	• Mixed use, including retail and housing • Utility (northwest portion) • General university/research	• Frontage along the park and the Town Green • Direct access to the ecological corridor • Rail line forms northern boundary • Small contaminant hot spot located in the north part of the block • Additional contaminant hot spot located on the west side of the site
N	0.6 ac	4-8 stories	• General university/research	• Direct access to park and paseo on either side • Must be serviced from north-south street on the east
O	2.0 ac	4-8 stories	• General university/research	• Direct access to paseo
P	2.3 ac	4-8 stories	• General university/research	• Direct access to ecological corridor

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
Q	1.9 ac	4-8 stories	• General university/research	• Direct access to ecological corridor • Frontage along southern green • Majority of the property located on a hot spot contaminant site
R	4.7 ac	4-8 stories	• General university/research	• Frontage along southern green • Direct access to ecological corridor
S	1.8 ac	4-8 stories	• General university/research	• Frontage along park • Direct access to ecological corridor
T	1.5 ac	4-8 stories	• General university/research	• Direct access to ecological corridor
U	7.1 ac	4-8 stories	• Light industrial • Utility (north portion) • General university/research	• Direct access to ecological corridor • Rail line forms northern boundary
V	2.3 ac	4-8 stories	• General university/research	• Frontage along park • Eastern portion of the site has been identified as a contaminant hot spot
W	2.3 ac	4-8 stories	• General university/research	• Frontage along park • Small portion of the northeastern corner has been identified as a contaminant hot spot
X	2.6 ac	4-8 stories	• Light industrial • General university/research	

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
Y	2.2 ac	4-8 stories	• Light industrial • General university/research	
Z	2.4 ac	4-8 stories	• Light industrial • General university/research	
AA	2.3 ac	4-8 stories	• General university/research	• Direct access to park and paseo
BB	1.3 ac	4-8 stories	• General university/research	• Direct access to park and paseo
CC	2.6	4-8 stories	• Light industrial • General university/research	• Frontage along park
DD	2.2 ac	4-8 stories	• Light industrial • General university/research	
EE	2.4 ac	4-8 stories	• Light industrial • General university/research	
FF	12. 3 ac	4-8 stories	• Light industrial • General university/research	• Significant frontage along Route 4 • Entry from Route 4 at either end of the site

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
GG	13.1 ac	4-8 stories	• Light industrial • General university/research	• Landmark building elements at the termini of two of the campus' primary streets • Rail line defines northern boundary
HH	2.7 ac	4-8 stories	• Light industrial • General university/research	• Frontage along park • Landmark building element along park • Small area in the northwest corner of the bock has been identified as a contaminant hot spot
II	3.3 ac	4-8 stories	• Light industrial • General university/research	
JJ	2.7 ac	4-8 stories	• Light industrial • General university/research	
KK	9.0 ac	4-8 stories	• Light industrial • General university/research	• Significant frontage along Route 4 • Direct access to western park • Contaminant hot spot has been located in the center of the block
LL	7.6	4-8 stories	• Light industrial • General university/research	• Rail line defines northern boundary • Large contaminant hot spot area has been identified in the southeast corner of the block
MM	2.8 ac	4-8 stories	• Light industrial • General university/research	• Direct access to western park and paseo • Landmark building element at the end of the western park
NN	2.3 ac	4-8 stories	• Light industrial • General university/research	• Direct access to western park and paseo

BLOCK ID	ACRES	BUILDING HEIGHT RANGE	POTENTIAL LAND USES	SITE OPPORTUNITIES AND CHALLENGES
OO	1.9 ac	4-8 stories	• Light industrial • General university/research	• Direct access to western park
PP	11.7 ac	4-8 stories	• Light industrial • General university/research	• Rail line defines northern and western boundary
QQ	5.1 ac	4-8 stories	• Light industrial • General university/research	• Rail line defines western boundary
RR	5.9 ac	4-8 stories	• Light industrial • General university/research	• Rail line defines western boundary

Appendices

Low Impact Development

Sustainable site design and building techniques create a built environment that aims to protect natural resources and maximizes human comfort and well-being. The environmental, economic, and social benefits of "green building" far outweigh the challenges inherent in building to a higher standard for the benefit of present and future generations. Environmental site design also encourages the employment of planning strategies that will encourage the use of alternative transportation modes.

The concept of Low Impact Development (LID) design has its basis in the fundamental idea of sustainable stormwater management. Some of the overriding goals of LID are to maintain the hydrologic budget as close to "pre-development" as possible, design the management strategy on a watershed and site-by-site basis, and to have a holistic approach to stormwater management.

Stream Restoration

One of the most unique and exciting aspects of the transformation of the pervious Chrysler factory to a Science and Technology Campus 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. Silver Brook Stream flows north to south through the proposed STC, and is carried two-thirds of this length in an 84 inch culvert, below parking lots,

building slabs, and the like. While the isolation of this watercourse from its open environment is a negative condition in itself, the additional assaults on this stream include the input of stormwater runoff directly from the impervious surfaces throughout the STC property, preventing the potential for any treatment or reduction in the time of concentration once the rain begins to fall. Silver Brook Stream can be removed from this subterranean placement and allowed to again flow freely through this site, accessing adjacent floodplains during high flows, providing a variety of aquatic and terrestrial habitats, and creating a natural treasure, exemplifying UD's commitment to the environment, research, education, and to the community. Similar projects have been completed on smaller scales and have met great success in their goals of ecological restoration as well as improving the awareness of adjacent communities relative to their natural environment and the implications of their everyday actions on the ecosystems around us.

Daylighting of streams provides numerous benefits, including but not limited to:

- Improvement to functional values of waterways/urban stormwater systems
  - Increased hydraulic capacity for floodways
  - Lowering of water velocities
  - Reduction in downstream erosion
  - Removal of water from combined sewers
  - Water quality improvements
- Improve aquatic habitat
- Provide new riparian corridors for wildlife
- Revitalize neighborhoods, increase property values, benefit nearby businesses
- Possibly cost effective compared to culvert repair/replacement
- Provides a "living classroom" for research and study by educational institutions
- Foster stewardship of natural resources and energize local communities

The benefits of collecting on-site stormwater in these corridors and creating additional habitats will also provide a valuable learning experience and a demonstration project which the University could align academic programs with real-world implementation. The educational goals of the University will be enhanced through an interpretive signage that will reveal reasons why it is important to connect natural areas together.

Coupled with the natural corridor, on-site planning decisions will also be explained through interpretive signs that explain the Campus' role in the larger ecological environment.

An important consideration related to the location of the STC is its inclusion within the Christina River watershed. As mentioned previously, this river system includes the only trout streams within the state, recreational uses, and is a drinking water source for Newark. This watershed contains critical habitat and supports the human population of the adjacent developed areas. Silver Brook Stream is an important tributary to the River and the restoration of this corridor will provide considerable improvements to the water quality entering the Christina at the confluence of the two water courses. Education of the residents in the upper portion of the Silver Brook Stream drainage, north of the STC, will bring to light their actions that can harm or improve habitat and water quality. A concerted effort by the University to address this perennial stream that is currently trapped below the surface and receives considerable amounts of unmitigated stormwater during every storm event, will also aid in showing the community that UD is committed to restoring the natural environment, protecting habitat and improving water quality. The additional potential for the corridor to serve educational as well as other purposes elevates the goal of daylighting Silver Brook Stream to beyond improved aesthetics or a "green" measure, to that of serving the

whole community and providing considerable opportunities for research and discovery.

Silver Brook Stream can be removed from its current subterranean placement and allowed to again flow freely through this site, accessing adjacent floodplains during high flows, providing a variety of aquatic and terrestrial habitats, and creating a natural treasure for UD, exemplifying the institution's commitment to the environment, research, education, and to the community. Similar projects have been completed on smaller scales and have met with great success in their goals of ecological restoration as well as improving the awareness of adjacent communities about the natural environment and the implications of their everyday actions on the ecosystems around us.

Watersheds

The Silver Brook Stream watershed is approximately 600 acres, draining over 300 acres of residential development to the north of the project site and approximately 250 acres of the STC. The area of the proposed 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 238 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 property. It emerges from the culvert approximately twelve hundred (1,200) feet prior to entering another culvert that flows under Route 4 and discharges into the Christina River.

According to the Newark, Delaware Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) (Delaware DataMIL, New Castle County GIS ArcIMS Server) the portion of Silver Brook Stream that is not

contained within the culvert on the south end of the STC is not currently located within the mapped 100-year flood plain.

SOILS

According to the soils data available from the 1970 NRCS Soil Survey, prior to development of the Chrysler plant in 1951, the site was predominately comprised of Matapeake Silt Loam (2-5% slopes) and Keyport Silt Loam (2-5% slopes). These soil types are described as prime farmland in Delaware and are poor to moderately well-drained. Hydric soils on site included: Mixed Alluvial Land, Elkton Silt Loam (2-5% slopes), and Elkton Silt Loam (0-2% slopes). Throughout the development of this property there has been extensive manipulation of the existing soils, including filling of the Silver Brook Stream floodplain with coal slag and subsurface contamination from various sources over the past 60 years.

A goal of the stormwater management program for the redevelopment project would be to restore the hydrology of the site to the maximum extent practical while managing the stormwater runoff for quality and quantity control. Stormwater practices that pre-treat and then infiltrate runoff (recharge groundwater) are often selected as they typically maximize these goals given the right conditions.

The STC implement various methods of storm water management BMP's such as vegetated filtering practices incorporated into biofilters, swales, raingardens that will include a liner and an under-drain. Once the site constraints and soils characteristics are determined, the stormwater BMP design selection process can be refined to incorporate the additional goals beyond the strictly stormwater management functions, such as aesthetic, landscaping, integration and incorporation with an overall master planning effort for the design of the site.

Stormwater Regulations and Permitting

Stormwater management at the Science & Technology Campus will be regulated by the Delaware Sediment and Stormwater Regulations. Given the Brownfield designation of the site, the agency delegated for the stormwater and erosion & sediment control reviews will likely be a combination of the Delaware Department of Natural Resources and Environmental Control (DNREC) and the City of Newark.

The following guidelines have been developed based upon current regulations, but may need to be modified once revisions related to the Redevelopment and Brownfield regulations become available:

- Given the highly impervious nature of the existing site, and the anticipation that the redevelopment effort will result in an overall decrease in the impervious cover on the site, quantity management of stormwater should not be required.
- Quality management of all site stormwater will be required. This management should provide 80% removal of the average annual load of Total Suspended Solids (TSS) as modeled by the Delaware Urban Runoff Management Model (DURMM).
- The stormwater quality management plan will likely be comprised of a variety of stormwater best management practices (BMPs) including filter strips, biofiltration swales, bio-retention areas, and isolator rows within subsurface containment facilities.
- The site may be required to reduce stormwater Total Maximum Daily Loads (TMDL's) in accordance with the Christina River Basin Pollution Control Strategy (PCS) and/or the City of Newark – University of Delaware Joint Municipal Separate Storm Sewer System (MS4) permit. While neither the PCS for the Christina River Basin nor

the Newark-UD MS4 permit has yet been finalized, they are being formulated and may be in place prior to the build-out of the Science & Technology Campus.

» Erosion and sediment controls must be provided to prevent impacts during construction and land disturbing activities. These practices should be in accordance with the Delaware Sediment and Stormwater Regulations and the Delaware Erosion and Sediment Control Handbook.

» All stormwater management systems should have an operation and maintenance plan to address the long term functionality of the stormwater management components, as well as the overall plan.

Existing Infrastructure

WATER SYSTEM

The Science and Technology Campus 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 260 acres of the site; while the City of Newark has water rights to the 10-acre parcel fronting on South College Avenue known as the Mopar site.

The existing waterline to the north, along the railroad, is a 16" cast iron water pipe line. According to United Water officials, this line was built in the 1950's primarily to serve the Chrysler site. United Water reported that the normal pressure is approximately 60 pounds per square inch (psi) and can be increased to 80 psi if boosters are running. The 16" cast iron watermain connects to a 20" waterline east of the South College Avenue bridge. The 20" main serves as the connection directly to the Stanton Treatment Plant.

The campus is fed from a 6" connection to the 16" waterline at a point east of the existing Mopar building and has a 6-inch meter.

The 6" connection to the northern United Water service serves as the main water feed to the campus and connects to an interior 400,000 gallon elevated water tank.

A second United Water line exists on the south side of Route 4, Christina Parkway. This 12" line connects to the Chestnut Hill Treatment Plant with a capacity of 3 million gallons per day (MGD). There is currently no connection from the campus to this waterline.

To the east, a 6" City of Newark waterline is located along South College Avenue adjacent to the campus. According to City of Newark records, the 6" waterline connects to a 12" waterline on the eastside of South College Avenue. June 2010, flow tests in the area reveal a 60psi pressure with a hydraulic head of 254'; a fire flow of 2000 GPM at 20psi was reported at the Bob Carpenter Center.

SANITARY SEWER INFRASTRUCTURE

The Science and Technology Campus has access to the existing Cool Run Sanitary Sewer Interceptor (a.k.a. the New Castle County Sewer Interceptor). The sanitary sewer interceptor frequently referred to as the New Castle County 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.

The Interceptor, built in 1985 to replace a 24-inch system, is 36-inch Class 55 Ductile Iron pipe. The system is a gravity sewer running east to west across the southern portion of the site generally parallel to Route 4; it has a capacity of approximately ten million gallons per day (10 MGD). The system was installed at a depth of twenty feet in most locations with slopes of approximately 0.1 ft/ft.

According to City of Newark records, Chrysler had an agreement with the City of Newark

to discharge 5.86 MGD. The current flow in the system includes 2 MGD from New Castle County and 2 MGD from the City of Newark measured at metering station and downstream connection point to New Castle County. According to City of Newark there is 5.86 MGD of capacity in the interceptor. New Castle County Department of Special Services stated that the interceptor downstream of the City of Newark has no capacity issues and the Wilmington treatment plant has 20 MGD capacity with no issues. Furthermore, there are no planned improvements to the interceptor or to the treatment plant downstream.

PRV Relocation

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 (PRV) located along South College Avenue. This station serves the existing Chrysler facilities on the STC campus. Because the pressure reducing station is located at a planned main entrance to the STC property, the station will be relocated. Delmarva has reported that the station can be relocated at UD's request elsewhere on the property.

New Substation

Existing high voltage overhead transmission lines enter at the northeast corner of the STC and currently serve two existing substations that are planned to be decommissioned over time and replaced with a new substation that will serve the STC facilities and possibly backfeed the other UD buildings on the east side of South College Avenue. This new substation will be owned by the City of Newark and will be fed primary power from the existing Delmarva high voltage lines located along the north side of the property. It is anticipated that the new substation will be co-located on the eastern central utility plant site along the northern edge of the campus and east of the existing

stream culvert so that it will be centrally located and more readily accessible to serve the initial STC development.

As part of their initial discussions with the city, UD has made the following requests which would take effect after the Delmarva service to the existing site is due to be discontinued in October of 2011:

- The City agrees to serve the University of Delaware's Science and Technology Campus (formerly known as the "Chrysler Site) at 135 kV with automatic switching capability.
- The City agrees to serve the University from a substation located on Chrysler site at a location of the University's choosing. The City would be responsible for any costs associated with constructing or moving a substation and the substation must include a capacitor bank.
- The City would be able to serve additional customers with excess capacity beyond the needs of the Science and Technology campus.
- The City will develop an initial cost estimate associated with serving the University as detailed in the items above as well as the costs associated with moving the existing substation. This figure would be included in its 2010-2015 Capital Plan.

In addition to these initial basic agreement terms, the following target principles were developed by the STC planning team to further define UD's expectations for the new substation and power service that would be provided by the City of Newark:

City Will:

- Construct new substation on site chosen by University
- Complete build-out capacity by 2015
- Relocate transmission line

» Provide reliable, quality power as defined by IEEE and DPSC
» Remove old substation and equipment
» Underground all distribution lines within the campus
» Eliminate the aerial electric distribution lines along Route 896 by 2025.

City Will Not:

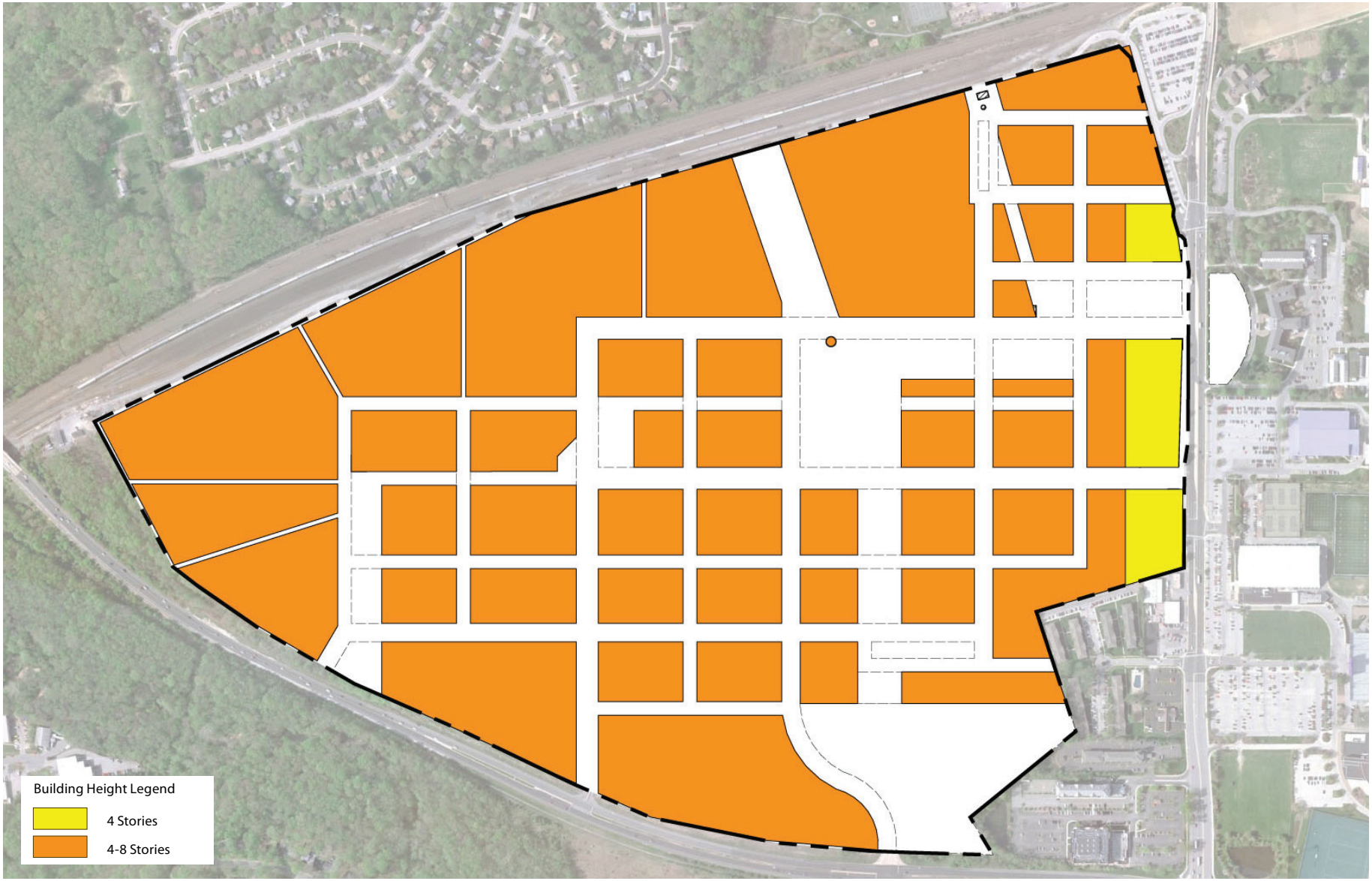
» Install any aerial distribution facilities within the Science and Technology Campus or along South College Avenue.
» Install new, modify or access underground facilities by way of excavation within a completed area of development for 10 years after its completion except for repair due to damage caused by others, natural event or system failure.
» Install new aerial facilities along South College Avenue and Route 4 (Christina Parkway).

University Will:

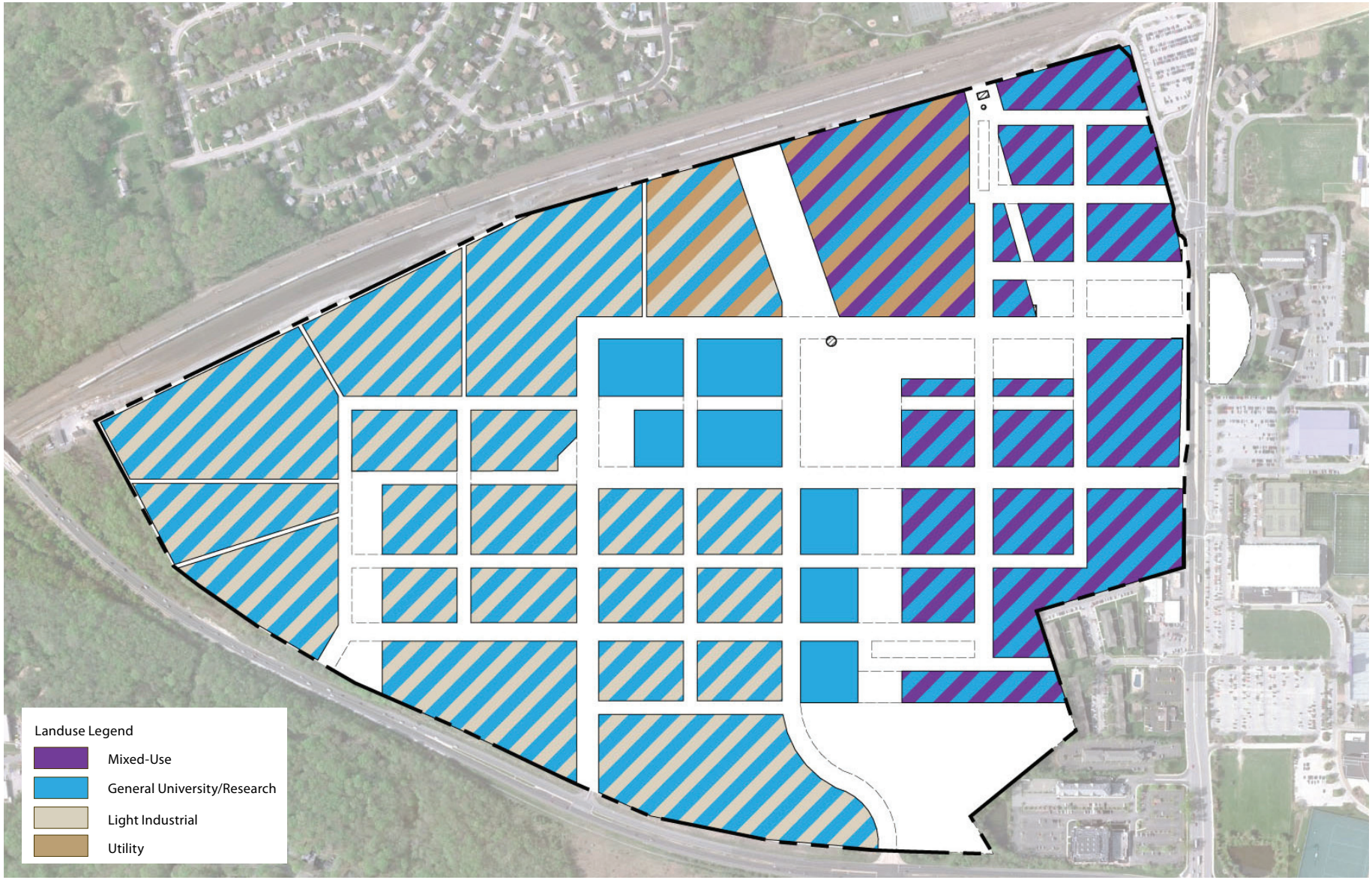
» Provide a long term, lease agreement for the construction, maintenance and distribution of power through one, 2 acre substation, a single aerial transmission pole line, and the associated distribution lines.
» Provide a dedicated access to the substation and transmission lines for installation, maintenance and emergency service.
» Provide specifications for substation location, aesthetic requirements and development load and quality requirements.

Campus Blocks

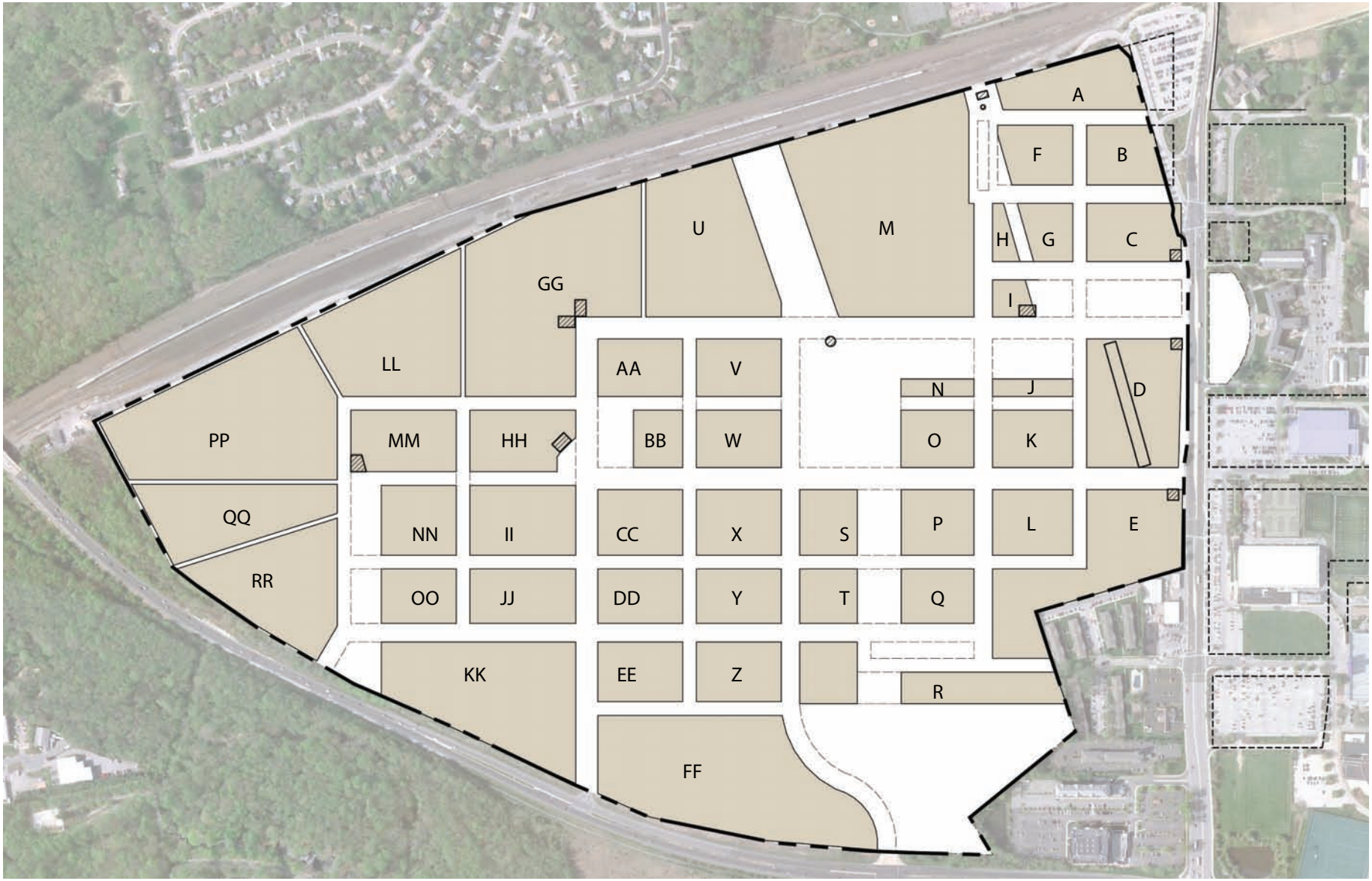
These blocks define development areas and building sites.



Building Height Diagram



Blocks Landuse Diagram



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LL	7.6	4-8 stories	• Light industrial • General university/research	• Rail line defines northern boundary • Large contaminant hot spot area has been identified in the southeast corner of the block
MM	2.8 ac	4-8 stories	• Light industrial • General university/research	• Direct access to western park and paseo • Landmark building element at the end of the western park
NN	2.3 ac	4-8 stories	• Light industrial • General university/research	• Direct access to western park and paseo

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BILL NO. 12-07
1st Reading _____
2nd Reading _____

CITY OF NEWARK
DELAWARE

ORDINANCE NO. 12 -___

An Ordinance Amending Chapter 32, Zoning, Code of the City of Newark, Delaware, By Establishing a New Zoning Category to be Designated as STC (Science and Technology Campus District) and By Deleting Limited Commercial Laboratory Districts

THE COUNCIL OF THE CITY OF NEWARK HEREBY ORDAINS:

WHEREAS, the University of Delaware's acquisition of the old Chrysler Corporation automatable assembly plant property provides significant economic development opportunities for Newark and the University; and

WHEREAS, the City and the University are desirous of establishing a new zoning category to foster economic development through the establishment of a Science and Technology Zoning District; and

WHEREAS, the City and the University are desirous of establishing a Science and Technology Zoning District that takes into account the City's traditional land use authority and the University's Delaware Code based *zoning exemption;*

NOW, THEREFORE, THE COUNCIL OF THE CITY OF NEWARK HEREBY ORDAINS:

That Chapter 32, Zoning, Code of the City of Newark, Delaware, be hereby amended in the following respect:

AMENDMENT 1. Delete ARTICLE VII-B. USE REGULATIONS FOR LIMITED COMMERCIAL LABORATORY DISTRICTS, which reads as follows:

"ARTICLE VII-B. USE REGULATIONS FOR LIMITED COMMERCIAL LABORATORY DISTRICTS

Sec. 32-23.1 Uses permitted in limited commercial laboratory districts.

Limited commercial laboratory (chemical, engineering, clinical, dental, and pharmaceutical) not involving noxious odors or danger from fire and explosives. Use to be permitted when authorized by the board of adjustment, after a public hearing, subject to the following requirements:

(1) Provision for off-street parking is made, which in no event shall be less than required in Article XIV, Off Street Parking and Loading Requirements.

(2) Certification that said use complies with all sanitary, plumbing, fire and pollution regulations of the city, county and/or state.
(3) Establishment of allowed maximum amount of related processing to be restricted to laboratory equipment (bench scale) with maximum number of employees permitted at any one time limited to three."

AMENDMENT 2. Amend ARTICLE VII-A. USE AND AREA REGULATIONS FOR MANUFACTURING OFFICE RESEARCH DISTRICTS, by adding a new Sec.32-23.1, Uses Permitted in the STC (Science and Technology Campus) District, to read as follows:

"Sec. 32-23.1, Uses Permitted in the STC (Science and Technology Campus) District:

(a) In an STC district, no building or premises shall be used and no building shall be erected or altered which is arranged, intended, or designed to be used except for one or more of the following uses:

(1) Any process involving cleaning, manufacture, processing, production or testing, except for the following:

a. Manufacture of corrosive acids, gelatin, paint, oils, fertilizer, linoleum, cork products, alcohol, bleaching compounds or soap; tanning or curing of hides; crude oil refining; rubber treatment or manufacture; ore smelting; blast furnace, garbage of offal reduction or dumping; asphalt manufacture or refining; abattoir; junk storage; automobile wrecking; animal rendering; oil storage; except for the exclusion of distribution or warehouse operations, unless such operations are incidental to and intended primarily to serve uses permitted in this District.

(2) Laboratories and related facilities for research, basic and applied.

(3) Hospitals and medical clinics.

(4) Offices for professional services and administrative activities, including but not limited to such uses as conference and corporate training centers, financial institutions and banks, personal services, and supply and storage facilities.

(5) Technologically dependent or computer based facilities that are dedicated to the processing of data or the analysis of information.

(6) Daycare centers with the following special requirements:

a. At least 100 sq. ft. of outdoor play space per child shall be provided.

b. Outdoor play space shall be fenced or otherwise enclosed on all sides and shall not include driveways, parking areas, or lands unsuited by other usage or natural features for children's active play space, fencing or other enclosures shall be a minimum height of 4 feet.

c. 35 sq. ft. of indoor area shall be provided per child, not including toilet rooms, kitchens, offices, storage spaces, hallways, and mechanical rooms, and other areas not used by children for sleep or play on a

routine basis; the minimum lot area for such uses shall not be less than 10,000 sq. feet.

d. This use shall be primarily intended to serve the uses permitted in this District.

(7) Restaurants, including restaurants, cafeteria style and delicatessens; incidental to and intended primarily to serve uses in this District.

(8) Recreation facilities, indoor and outdoor, incidental to and intended primarily to serve uses permitted in this District.

(9) Hotels and motels, with conference facilities.

(10) Utility distribution and transmission lines, substation, electric, gas and telephone central office.

(11) Public transportation facilities, including bus or transit stops for the loading and unloading of passengers; stations and depots.

(12) Parking, off-street.

(13) Accessory uses and accessory buildings.

(14) All residential uses, as defined in this chapter, shall be permitted.

(15) Retail and retail food stores up to 75,000 square feet in maximum floor area.

(b) The following uses require special use permits as provided in Article XX, Section 32-78 of this chapter.

(1) Tower, broadcasting and telecommunications, subject to the following special requirements:

a. Tower applications shall be accompanied by a professional engineer's report containing the following:

1. A technical evaluation of the utilization of existing towers for telecommunications or other equipment intended for the installation on the proposed tower.
2. A technical evaluation of the feasibility of attaching the tower or antenna to existing buildings.
3. Written certification of compliance with Federal Communications Commission Safety Standards for exposure to nonionizing electromagnetic radiation.
4. Copies of all applicable state and federal permits.

b. Any principal part of the tower, excluding guy cables, shall be set back from the nearest property line of a church, library, school, nursing home, hospital, or lot zoned residential (RH, RT, RS, RD, RM, RR, AC) not less than three times the height of the tower or 350 feet, whichever

is greater. The setback shall be measured from the nearest point of the base of the tower to the nearest point of the property line of the protected use.

c. No artificial light shall be installed upon any such tower unless required by the Federal Aviation Administration. If such light is required, it shall be screened so as not to project its light below the horizontal plane in which it is located.

d. Towers over 200 feet in height shall be guyed and not self-supporting nor consisting of lattice type structures, unless the applicant demonstrates that a guyed tower shall have a greater negative visual impact than a self-supporting tower.

e. Towers located on existing buildings or structures shall not extend beyond 22 feet above the highest point of the building or structure. Accessory buildings or facilities for towers located on existing buildings or structures shall be located either in or on top of such buildings or structures.

f. Landscaping shall be provided around the base of the tower and adjacent to a required security fence that shall be at least 10 feet high. The landscaping shall consist of a minimum 25 foot wide planting strip with ground cover and/or grass, including at least one row of six foot high evergreen trees providing a solid screen adjacent or proximate to the fence, and 15 foot high, two inch caliper deciduous trees, interspersed within the buffer area and no more than 20 feet apart. Applicants may substitute alternative landscape plans that meet the purposes of this subsection to limit the visual impact of the lower portion of the tower and adjoining accessory facilities. Camouflaged towers designed to look like trees may be exempt from this subsection, subject to Council approval. Towers located on top of buildings three stories or more in height and telecommunication antennas located on existing buildings shall be exempt from this subsection, except that a six foot high solid evergreen screen shall be required between any telecommunications antenna or tower accessory building and adjoining properties. A ten foot high security fence and an adjoining six foot high solid evergreen screen adjacent or proximate to the fence shall be provided around the anchoring facilities for guy wires for guyed towers.

g. No outdoor storage shall be permitted at the tower site.

h. Unless otherwise required by the Federal Communications Commission or the Federal Aviation Administration, towers shall be light gray in color. Camouflaged towers designed to look like trees may be exempt from this subsection, subject to council approval. Telecommunication antennas with colors designed to match buildings or structures to which they are attached shall be exempt from this subsection.

i. A tower shall be located so as not to encroach into any established public or private airport approach as established by the Federal Aviation Administration.

j. Towers higher than 100 feet must be a minimum of 500 feet from the nearest similar tower, measured from the base of the towers.

k. New telecommunication facilities may be attached to an approved tower without applying for an additional special use permit so long as the new facility is in compliance with the requirements and standards of this section.

l. No interference with existing television, cable television, radio signals, or other electronic devices shall be permitted from the tower. If interference occurs, it shall be immediately remedied by the operators of the tower.

m. If a tower is abandoned, unused for two years, or no longer operable, it shall be removed within six months of its abandonment. If a tower is not dismantled as specified in this subsection, the city shall arrange to have the facility dismantled and will assess the landowner all costs associated with the removal of the tower. If the full amount due the city is not paid by the owner, or person in control of the property, or his or her agent, within 90 days of receipt of a bill from the city, the city finance director shall cause a special assessment to be recorded in the municipal lien docket. The recordation of such special assessment shall constitute a lien on the property and shall remain in full force and effect for the amount due in principal and interest until final payment has been made.

n. That the owner of such tower shall provide proof to the city that the tower has undergone a triennial inspection for structural integrity. Said inspection is to be performed by a certified engineer, or other qualified professional, at the expense of the owner of the tower. If structural deterioration is found to be present, and such deterioration affects the physical stability or aesthetic integrity of the tower, the owner shall be required to correct such deterioration within a time limit to be established by the building department.

In addition, the operator of such tower shall provide annual proof to the city that the tower has undergone field measurements to ensure compliance with all applicable Federal Communication Commission safety standards for exposure to nonionizing electromagnetic radiation. Such field measurements, and submission of the results to the city, shall be conducted upon start up of the facility and annually thereafter; except that every third year, such proof of compliance shall be submitted on behalf of the operator by an independent nonionizing electromagnetic radiation evaluator. All such field measurements, and submission of the results, are to be performed by a certified engineer, or other qualified professional, at the expense of the operator. If such field measurements demonstrate noncompliance with Federal

Communication Commission safety standards specified in this section, transmission at the facility shall be suspended until such time as full Federal Communication Commission safety standards compliance is demonstrated to the satisfaction of the city.

o. The owner of such tower shall give proof to the city that any damages which may occur to surrounding properties or injury which may occur to persons, which damages or injuries are caused by a failure of the tower and/or its associated structural supports, regardless of whether such failure is a result of human error or an act of God, shall be paid by the owner of the tower and/or insurers of the tower.

(2) Restaurant with alcoholic beverages, incidental to and intended primarily to serve uses permitted in this District, except such uses, including accessory parking, shall not be permitted within 100 feet of perimeter streets as defined in subsection 2 above.

(3) Fast food restaurants, incidental to and intended primarily to serve uses permitted in this District, subject to the following special requirements:

a. Minimum lot size shall be one acre.

b. Minimum lot width shall be 200 feet.

c. Minimum depth of lot on one side shall be 218 feet.

d. Minimum setback from all perimeter street lines shall be 75 feet.

e. Minimum distance from all property lines other than perimeter street lines shall be 50 feet.

f. Parking requirements shall be subject to the requirements listed in Article XIV.

g. Exterior lighting shall be shielded so that it is deflected away from adjacent properties and from passing motorists.

h. A solid fence or wall and/or a landscape screen of a minimum of six feet in height shall be erected along all property lines separating the site from lots zoned residential or any lot developed or approved for development for residential use, in accordance with Article XXV of this chapter.

(4) Commercial indoor recreation and indoor theaters.

(c) *Area regulations and other special requirements*.

(1) *Height of buildings*. In no case shall building height exceed 10 stories or 150 feet.

(2) *Building setback lines*. Except as otherwise specified herein, each story or part of a building, exclusive of cornices and uncovered steps and uncovered porches, shall be set back from the line of perimeter streets on which the building fronts a minimum distance of 50 feet. Perimeter streets for purposes of this subsection shall be defined as South College Avenue between the Northeast Corridor Railroad right of way and the Christina Parkway (Route 4).

(3) *Parking*. Off-street parking spaces shall be provided at locations and the number of spaces to be determined by the University.

(4) *Building Design*. Regarding building design, the following standards shall apply:

a. Detailed elevation drawings of all proposed buildings shall be submitted including all signage; building materials; building height; the location, height and material of landscaping and screening walls and fences; outdoor trash and recyclable material storage areas; and electrical, mechanical and gas metering equipment.

b. To maintain a high standard of construction and appearance and to provide architectural unified and interesting design, the exterior walls of each building are to be constructed of durable, permanent materials, (including appropriately selected brick, treated concrete, glass, and other architectural panels). Buildings should complement and harmonize with the overall design of the STC District.

c. Signage, intended to guide motorists and pedestrians from perimeter streets, shall correspond to the overall design, color and finishing of the buildings upon which they are displayed; that is, signage shall be designed as integral architectural elements of proposed architecture.

(5) *Site Design*. Regarding site design, except as otherwise specified herein, the following special regulations shall apply:

a. Sidewalk and pathways shall be installed and designed to enhance the pedestrian experience; off road bicycle circulation paths shall be designed to complement pedestrian ways.

b. Building sites and roadways shall be designed to facilitate way finding through the District.

c. Exterior and interior lighting features shall be integrated to help provide visual understanding of the building's composition and function based on the following guidelines:

1. Use lighting fixtures primarily for important building elements such as entries.
2. Favor the use of defused lighting system over those generating a strong point source of lighting.

3. Enhance the visibility of interior building lighting to the exterior giving a sense of light emanating from the building.
4. Avoid dramatic changes of illumination levels which can produce glare and disorientation.
5. Enhance the illumination, where appropriate, of landscape features.
6. Lighting shall be designed to limit impact on adjacent properties.

d. Landscaping or screening shall be installed to screen parking areas, mechanical equipment, refuse storage areas and related appurtenances and to enhance the visual appeal of the buildings and facilities in the district.

e. Utility lines and related appurtenances shall be installed underground or otherwise screened from public ways, insofar as possible.

(6) Review of plans to determine compliance with the provisions of subsection (c) herein shall be performed by the Planning and Development Department, which shall issue approvals upon satisfaction that all such provisions have been met. Applications for Administrative Subdivisions for the purposes of establishing lot and/or lease lines for real estate taxation and related purposes shall be subject to the procedural requirements of Chapter 27, Subdivision and development Regulations of this Code. Otherwise, all permitted uses in the District shall be subject to all other applicable Municipal Code requirements, standards and procedural requirements, except as modified herein.

MOTION for Acceptance as First Reading on _____, 2012,

By Council Member _____.

Second Reading and Final Passage on _____, 2012.

VOTE: _____ to _____.

_____
Mayor

Attest:

_____
City Secretary

Approved as to Legality & Form:

_____
City Solicitor

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AYERS
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