3.1.3 CAMPUS SITEWORK

References:

- Refer to Section 3.4.4 – Sustainable Sites in the Design Manual for additional information regarding sustainable site development.
- VDOT Manuals and Guides: http://www.virginiadot.org/business/manuals-default.asp
- MUTCD: http://www.virginiadot.org/business/manuals-default.asp
- Virginia Supplement (2011 or current version): http://www.virginiadot.org/business/virginia_mutcd_supplement.asp

3.1.3.1 Site Improvements

3.1.3.1.1 Roadways

3.1.3.1.1.1 Vehicular

The Design Team shall consult all pertinent Campus Master Plans to determine whether major vehicular travel ways are included within the limits of the project, and which roads are to be improved or constructed. Roadways shall be designed in accordance with all VDOT requirements, unless amended by the Facilities. Where such roads are onsite roadways maintained by Mason, they shall additionally meet the design criteria outlined below.

Except where further supplemented herein, the design of vehicular roadways must meet VDOT standards.

George Mason University aims to achieve several main objectives in its system of vehicular roadways: mobility, compatibility and orientation. The goal of mobility refers to the maintenance of a connected network, with congestion minimized to the greatest extent possible. To achieve compatibility, the over-building of campus roadways should be avoided and vehicular roadways should maintain an appropriate scale for the campus context. This also contributes to orientation, or the visitors' ability to navigate the campus through road design and wayfinding.

Campus roadways are classified as Primary Streets/Drives/Lanes; Secondary Streets/Drives/Lanes and Tertiary Drives/Lanes. The typical sections for these roadways can be found in Chapter 5:

- Primary – refer to detail 3.1-1.
- Secondary – refer to detail 3.1-2.
- Tertiary – refer to detail 3.1-3.

Specific design criteria for vehicular roadways are described below:

- Travel ways must be constructed of flexible pavement meeting VDOT pavement design criteria.
- Drainage shall be designed in accordance with the VDOT Drainage Manual.

- Striping and signage shall be in accordance with the current edition MUTCD and 2011 Virginia Supplement or newer version.
- Street lighting shall utilize campus standards for fixtures, poles, bases and controls.
- Fire lanes shall conform to local (first responders) requirements for size, signage, striping, and surfacing.
- Truck turning movements must be verified at all proposed intersections or entrances to roads. WB-50 trucks must not enter opposing traffic lane on campus roads.
- Reduce the perceived width of roads with granite cobble or concrete paver borders. Highlights for traffic calming are encouraged.
- Refer to the Transportation Master Plan for minimum road cross sections.
- For signage and markings at vehicular intersections, refer to details 3.1-5 and 3.1-6. Refer to detail 3.1-7 for major mid-block and closely spaced mid-block crossings.

3.1.3.1.1.2 Shuttles and Transit

It is the goal of George Mason University to provide a convenient shuttle and transit system that provides service to all desired destinations, with useful stops and a reasonable schedule. In addition to connectivity and availability, it is a priority for Mason's shuttle and transit systems to provide safe and reliable service. Any addition to the existing shuttle and transit system shall be designed to maximize the benefit of the existing locations of transit stops.

3.1.3.1.1.3 Bicycle Routes

It is the goal of George Mason University to provide a network of bicycle paths on the campus, supported by amenities such as secure storage and shower facilities, with connections to surrounding bicycle infrastructure (refer to VDOT for Bike Lanes on Public Roads and to the Fairfax Country Trails Map for county trails). New routes shall be established to meet the demand, providing options for both commuting and recreation. It is important that bicycle routes are designed to minimize conflicts with pedestrians and motorized vehicles.

Off-road bicycle paths are shared with pedestrians, and for this reason they must also meet the design standards for the pedestrian system as described in this manual, as appropriate.

- Separate bicycle paths shall be 8' wide. Refer to detail 3.1-4 – Shared Use Trails.
- Additional paved width for bicycle routes is required for primary roadways in accordance with MUTCD. Lanes must be well-marked and safely separated from vehicular and pedestrian traffic where possible.

3.1.3.1.2 Parking Lots

The following parking design guidelines refer to both surface lots and parking garage facilities. For additional information regarding campus parking systems, refer to the George Mason University Transportation Master Plan. For accessibility guidelines related to parking, refer to Section 3.6 in the Design Manual.

George Mason University follows two main guiding principles in regard to its Campus parking system:

- Design facilities consistent with the Campus Master Plan's safety, ecological, and aesthetic goals.
    - Provide safe and convenient entrance/exit points.
    - Minimize traffic, pedestrian and bicycle conflicts.
    - Respect and preserve aesthetic and ecological resources.
    - Develop facility scale and appearance consistent with campus architectural aesthetic
    - Maximize opportunities to share parking resources among various users (employees, residents, visitors and event attendees).
    - Proposed parking equipment shall be compatible with existing system or replace existing system to make compatible.
- Use innovative parking management and policies to reduce demand and improve operations.
    - Deploy management systems to track facility use.
    - Install modern and innovative signage to manage traffic flow and wayfinding.
    - Use information technology to advise drivers regarding facility use and alternative options.

In addition to these guiding principles, sustainability is a high priority for George Mason University; all new parking areas and facilities shall be designed to minimize their financial and environmental impact. It is also important that parking facilities are both flexible and efficient, serving as many users as possible through aggressive parking management measures. Refer to Section 3.4.4 – Sustainable Sites in the Design Manual for additional information regarding sustainability guidelines.

The following standards apply to the design of new parking areas on any George Mason University Campus:

- The number of parking spaces to be provided within the project is to be determined in consultation with Mason's Facilities Office.
- Typical perpendicular parking space shall be 8.5' x 18'. Any space less than a minimum width of 8'-0" will be considered a compact space. Compact spaces shall represent no more than 20% of any designated parking area. Compact spaces must be marked with signage and have a painted end line. The only allowable encroachment into this space is a light pole base at front corner of space.
- Avoid angled parking spaces; when necessary, angle = 60 degrees.
- Service Vehicles: Provide a parking space of 9'-0"x 18'-0" minimum for service vehicles. Parking for service vehicles must be considered, reviewed, and approved by Mason for all building projects.
- Parking Garage: To create better sightlines, all end spaces in a parking garage must be dedicated compact parking spaces. Provide a minimum 7'-6" overhead garage clearance for non-ADA spaces and routes. Provide a minimum 20'-0" aisle width in parking garages.
- Surface Lots: Construct surface parking lots using flexible pavement. The maximum slope in any direction in a parking lot shall be 5%. Surface parking lots shall have minimum 22'-0" travel isles

- Loading Areas: All projects must review the loading area with Mason's Recycling and Waste Management Team. Delivery truck loading spaces shall be minimum 12'-0" wide. Truck routes to a loading dock must be confirmed using WB-50 truck turning templates or computer software. List types and sizes of waste and recycling receptacles (compactors – with or without sanitizers; co-minglers for recycling; typical trash receptacles – steel fluted 30 gal; typical 48 gal recycling bins).

- Landscaping within the project limits shall consider and avoid conflicts with vehicle overhangs, mirror overhangs and snow plowing and removal requirements.

- Consider medians and parking spaces of concrete pavers to reduce large expanses of asphalt.

- Use granite cobbles or cobble-like concrete pavers in contrasting gray or tan tones for edges of parking spaces and parking space delineators.

- Refer to detail 3.1-18, Parking Bay/Travel Way.

3.1.3.1.3 Pedestrian System

The pedestrian system throughout Mason's campuses is comprised of walkways, trails and foot bridges. It is the goal of George Mason University for its pedestrian system to improve orientation on the campus, improve accessibility, address conflicts with other modes of transportation (cars, service vehicles, and bicycles), and connect campus neighborhoods with transit services and parking facilities. There should be a clear hierarchy within the pedestrian system, helping to create a legible and identifiable means of travel on and around the campus.

Each Mason campus has its own unique character, which is reflected not only in their physical facilities but also in the material and texture of the landscape. Concrete paving on the Fairfax, Prince William and Arlington campuses shall have the following characteristics:

- Fairfax Campus: Specify naturally buff-colored concrete, or include a color admixture, avoiding cool-gray toned concrete.

- Prince William Campus: Intermix concrete and unit pavers, incorporating the same tones as indicated above for pavers on this campus. Avoid strong yellow or brown tones.

- Arlington Campus: Specify concrete with tan or beige tones.

Sustainability is an important priority for George Mason University and the Design Team shall apply sustainable strategies in the development of the landscape. Refer to Section 3.4.4 – Sustainable Sites for additional information regarding permeable surfaces and stormwater management.

For information regarding accessibility for pedestrian walkways, refer to Section 3.6 – Accessibility Standards in the Design Manual. For product and construction information, refer to Chapter 4, Division 32 – Exterior Improvements.

Sidewalk widths (included below) are measured as clear widths.

3.1.3.1.3.1 Pedestrian System Appurtenances

- If benches are provided along walks, refer to detail TBD.

- If trash and/or recycling receptacles are provided along walks, refer to detail TBD.

- Where railings are necessary, they shall be provided and shall meet detail TBD.
- All walkway plans must include a lighting and signage plan. Consult with the Mason Facilities Planning Office for specific requirements of these plans.

3.1.3.1.3.2 Primary Walkways

Primary walks are those that comprise the major corridors of pedestrian movement within a campus at George Mason University. For the location and orientation of the primary walks, refer to the Transportation Master Plan. Primary walks have the following characteristics:

- Primary walkways shall be 12 feet wide. Refer to details 3.1-8, Secondary Walk Section and Plan and 3.1-12, Typical Primary Walk Paver Dimensions. For a detailed section of typical a typical sidewalk, refer to detail 4.3-14.
- At the intersection of primary walks with each other a patterned paver and concrete pattern as shown in detail 3.1-12 shall be used.
- Utilize borders along the outer edges of walkways to reduce the perceived width. Apply border material to special landings, intersections and crossings.

For additional information regarding paving materials and construction, refer to Chapter 4, Division 32 – Exterior Improvements.

3.1.3.1.3.3 Secondary Walkways

Secondary walks fall directly below primary walks in the hierarchy of the campus pedestrian system. For the location and orientation of secondary walks, refer to the Transportation Master Plan.

- Secondary walkways shall be 8 to10 feet wide. Refer to details 3.1-10, Secondary Sidewalk Section and Plan and 3.1-14, Secondary Walk Paver Dimensions.

3.1.3.1.3.4 Tertiary Walkways

Tertiary walkways are any smaller, supplemental walks that fall below primary walkways in the hierarchy of the pedestrian system.

- Tertiary walkways shall be 6 feet wide. Refer to detail 3.1-11, Tertiary Sidewalk Section and Plan.

3.1.3.1.3.5 Crosswalks

- Provide curb cut ramps wherever a walkway intersects a raised curb or enters a vehicular travel way. Refer to details 3.5-3, 3.5-4, 3.5-5 and 3.5-6.
- At street intersections, these ramps will be provided at each curb return.
- Street crossings shall be designed to be perpendicular to the street and the ramps positioned appropriately.
- Crosswalks of streets from 0-10% may be approved by the Office of Campus Planning.
- Pave crosswalks with granite colored brick or cobble-shaped smooth concrete pavers.

- Pave crosswalk borders and areas between crosswalks at intersections with large granite cobbles or cobble-like, granite-colored concrete pavers for traffic calming and to provide a finished look.

- Consider raised crosswalks when pedestrian traffic is high. Refer to details 3.1-15 and 3.1-16.

3.1.3.1.3.6 Trails

For trail cross-section detail, refer to detail 3.1-17.

3.1.3.1.3.7 Foot Bridges

Foot bridges should be designed in a clean, modern style decked with pressure-treated lumber or, if possible, sustainably harvested wood for longevity. The railings should be steel or wood with steel cable slats. The structure of the bridge can be steel or sustainably harvested treated yellow pine stained to match the wood. Piers and decks can be wood with concrete piers.

3.1.3.1.3.8 Plazas and Stairs

- For large areas of paving, provide a mixture of paving colors, textures, patterns and materials to create a lively, attractive space. Granite colored concrete pavers, local granite cobbles, or brick must be used for plazas and terraces. For materials, refer to Chapter 4, Division 32 – Exterior Improvements. Refer to detail 4.3-13 for a typical brick paver detail (plan and sections).

- Use gray cobble pavers to highlight or border brick plazas. Use light gray, granite colored concrete pavers in simple shapes for plaza paving. Important plazas may utilize gray granite paving in bands. Gray concrete pavers in a running bond brick pattern may be used in prominent plazas as a contrast to granite.

- For stairs, use light colored concrete. In special areas, where budget allows, use light gray granite.

3.1.3.1.4 Site Development

3.1.3.1.4.1 Site Furnishings

For specific product information regarding site furnishings, refer to Chapter 4, Division 12 – Site Furnishings.

It is the goal of George Mason University to achieve consistency among all campuses in the materiality and aesthetic of its site furnishings, while at the same time reducing materials cost. Furnishings have been selected based on affordability, low maintenance, sustainable principles and aesthetic appearance. A single palette of site amenities is recommended for all campuses; within each campus, however, furnishings and materials are specific to the corresponding landscape character zone. For a description of landscape character zones, refer to Section 3.1.3.1.5 – Landscaping .

The Mason offices of Campus Planning, Facilities Management and Parking and Transportation will have input in the final selections and location of site furnishings.

- Provide ash urns near designated seating areas and outdoor smoking areas.

- Lighting styles must be consistent within each landscape character zone. For lighting recommendations, refer to Chapter 4, Division 26 – Electrical.

- Install roadway bollards whenever the need exists to prevent non-university vehicles from entering authorized areas or to prevent vehicular traffic onto sidewalks while still maintaining service and emergency access. When roadways need to be separated from normal vehicular traffic, use a collapsible traffic bollard operated by a standard hydrant wrench.

3.1.3.1.4.2 Fences and Gates

- Fencing, where required, shall conform to Mason's standards. Uncoated chain link, wood and PVC shall not be used. Permitted fencing is limited to five general types, to be applied per the chart below.

	Arch. Metal Fence	Split Rail Fence	Coated Chain Link Fence	Low Stone Wall	Pest Control Fence
Academic Zone	X			X	X
Athletic Zone			X		X
Campus Entryway				X	
Maintenance Zone			X		
Natural Zone		X			
Parking Zone		X			
Residential Zone				X	X

3.1.3.1.4.3 Exterior Signage

- All transportation-related signage shall conform to the MUTCD and Virginia Supplement: http://www.virginiadot.org/business/manuals-default.asp.

- All signage must comply with the Mason Signage Master Plan. Contact Mason's Environmental Graphics Designer to coordinate signage.

3.1.3.1.4.4 Retaining Walls

- Retaining walls, when constructed as an extension of the building, must use masonry facing to match the building. Other retaining walls shall be modular stacking.

- Design site walls to fit within the context of nearby structures and the environment.

- Timber retaining walls are not permitted unless Mason grants specific authorization.

- Concrete retaining walls require prior Mason approval, especially as it relates to color pattern and overall design. Form liners shall be required at a minimum.

3.1.3.1.5 Landscaping

The following goals and objectives will be considered in the design of open space on any George Mason University campus:

- Use open space to help link the campuses with a consistent visual character

- Enhance the appearance of the campus through the selection of consistent, aesthetically-pleasing, affordable and low-maintenance plantings, hardscape and site furnishings

- Enable planners and facilities management personnel to quickly select from a range of materials known to be compatible with the campus landscape
- Refer to character zones to determine the placement of specific groups of materials
- Apply principles of sustainability to the selection of materials

While elements of the landscape should have aesthetic continuity with regard to the style of paving, materials, street furniture and plantings, the design shall also be tailored to its specific zone of use. The majority of space within the George Mason University campus system falls within one of four landscape character zones, or a combination of character zones, described below. For the location of landscape character zones on Mason's Fairfax campus, refer to the Landscape Character Zones Map, 3.1-18. Specific planting guidelines for each zone are included in 3.1.3.1.5.2 Plantings.

Academic Zone

The academic zones contain all educational buildings, as well as the cultural, recreational, and administration facilities. Landscapes within the academic zone tend to be formal and geometric. Plantings are typically used as accents for the buildings and hardscape as opposed to stand-alone designs. Because these landscapes represent the "face" of the university, it stands to reason that this zone should receive the most maintenance and exhibit a formal character.

Residential Zone

The Residential Zones contain vegetation patterns that are looser in their organization due to the fact that the building geometries and placements are not as rigid. However, the larger-scale and newer dormitories have begun to take on the feel of academic buildings. The Prince William has a very limited residential component and Arlington Campuses do not contain residential zones.

Natural Zone (Mason Pond, RPAs, and Woodland Clusters)

Both the Fairfax and Prince William Campuses have Natural Zones, which are overlays of woodland vegetation on top of the Academic and Residential Zones. They exist as small clumps of trees, riparian corridors, RPA's or woodland edges. The primary defining characteristic of natural areas is that they contain more undisturbed vegetation than built features.

Parking Zone

Parking zones exist solely for the purposes of parking vehicles.

3.1.3.1.5.1 Irrigation Systems

Irrigation is generally avoided on George Mason University campuses. The planting guidelines, which call for hardy and drought-resistant species, are intended to reduce reliance on irrigation. When irrigation is necessary, sustainable practices such as rainwater cisterns or stormwater ponds are preferred. Refer to Section 3.4 – Environmental Standards for additional information regarding irrigation and stormwater management.

For guidelines related to new and replacement irrigation systems, refer to Chapter 4, Division 32 – Exterior Improvements.

3.1.3.1.5.2 Plantings

- New plantings must be selected from the Required Plant Materials Table. Plants on this list meet at least one, if not all, of the following criteria:
    - Aesthetic quality consistent with the delineated campus character zones
    - Native to the Virginia Coastal physiographic region
    - Hardy and drought-resistant
    - Limited fruit litter
    - Available in local or regional nurseries
- The majority of new plants must be native or cultivars of native plants. No more than 10% of new plants may be non-invasive exotics that are hardy, drought-tolerant and suitable for their specific site conditions. If non-native species are installed, ensure that they are non-invasive and hardy to the Fairfax USDA Hardiness Zone and can tolerate dry soil conditions.
- Minimize traditional turf lawn; use only as necessary for public gathering and recreation spaces.
- Consider permeable paving where pedestrians will utilize the area, or converting the area into a planting bed that is self-sustaining or requires minimal maintenance.
- Consider alternatives to traditional turf lawn, such as no-mow or low-growing turf.
- Utilize thick plantings of low shrubs, possibly supplemented with small protective fences, to encourage pedestrians to stay on the sidewalks.
- Ensure variety in plantings (textures, colors and scents). Avoid using the same species of plant in multiple locations to enhance visual interest and limit species-specific diseases.
- Avoid locating highly-scented trees or shrubs near seating areas as they may attract bees and insects.
- When new buildings are designed, retain as much natural vegetation and woodland as possible. Integrate wooded areas in between the buildings.
- Avoid placing plantings that are salt-sensitive adjacent to streets and sidewalks.

Academic Zone Planting Guidelines

- New plantings shall respond to the shape and form of adjacent buildings, retaining the formal geometries present in the zone.
- Accent plantings not associated with buildings shall be formal in arrangement and utilize rectilinear, radial, triangular, or other formal patterns.

Residential Zone Planting Guidelines

- Use plantings to make residential areas welcoming to students. Naturalistic, radial, curvilinear, and “organic” designs tend to be more peaceful and relaxing than geometric patterns. Group plants in threes or fours, but in no particular arrangement.

- Use a hierarchy of vegetation to reduce the scale of larger dormitory buildings. Begin with a tall shade tree, and then layer ornamental trees and shrubs to avoid students feeling as though the buildings were over-powering them. Avoid installing only low shrubs next to multi-story buildings.

- Provide shaded areas for students to utilize as outdoor studying, eating, or relaxing space. In these areas, avoid installing plants that have thorns or high levels of fruit litter (e.g. acorns or large seed pods) that would make sitting on the ground or a blanket uncomfortable.

Natural Zone Planting Guidelines

- Small clumps of woodland vegetation and "leftover" spaces adjacent to wooded areas can serve as seating or outdoor classroom areas. Install a limited number of benches or tables, or leave grassy spaces open for picnicking.

- Retain all existing natural zone plantings unless the stand of vegetation is threatened by disease or a large number of plants are dead or dying.

- Consider creating new natural zones on campus in open spaces that are not regularly used by students, faculty, staff, or visitors. In addition to creating more tree canopy for environmental and aesthetic reasons, new natural areas could present donor opportunities (e.g. named groves, listings of tree donors in University publications, Master Gardener community service hours for installation, etc.).

Parking Zone Planting Guidelines

- Refer to the Parking Lot I/Student Parking for an excellent example of integrating parking into a natural landscape.

- Install trees that are known to work well in urban situations. Refer to the Virginia Cooperative Extension publication Trees for Problem Landscape Sites: Trees for Parking Lots and Paved Areas (http://pubs.ext.vt.edu/430/430-028/430-028.html) for assistance in selecting trees. An additional resources is the Virginia Tech website "Urban Street Tree Selector" found at http://www.cnr.vt.edu/dendro/treeselector/index.cfm.

- Ensure that new tree installations will not interfere with existing lighting.

- Avoid overplanting shrubs on planting islands and medians so that grounds crews will have a place to pile plowed snow. Design parking lot planting so that open ground remains to accept snow piles.

- Use evergreen plantings or densely-planted deciduous trees to screen parking lots from view. Stagger two planting rows for maximum screening.

- Ensure that new parking lots have interior planting islands and medians in which to plant trees. A standard practice is to have no more than ten or twenty spaces in a row without a planted island.

- While it is the goal of the university to achieve visual consistency among all campuses, the landscape design must be sensitive to its unique context. The difference in physical size may be the most obvious distinction, but other qualities set the campuses apart as well.

3.1.3.1.5.3 Fairfax Campus

Because the Fairfax campus is the most developed and largest of the three campuses, it has the most diverse spaces and vegetation. There are greater opportunities for a variety of formal planting arrangements, naturalistic groupings, and simple designs:

- Consider portions of the campus as arboretum-like spaces. Designate the Mason Pond area as a place to receive unique and memorial plantings. The space need not be a strict catalog of plants, but can serve as an attractive collection of interesting vegetation.
- Promote sculpture zones, where pieces of art from the Hirschhorn sculpture program or other collections could be displayed. These could be the arboretum-like spaces with interpretive signage or themed botanic gardens.

3.1.3.1.5.4 Prince William Campus

The most notable landscape feature of the Prince William Campus is the presence of woods and a wetland to the north of the campus, and it is the Mason's intent to preserve and showcase these natural features. To this end, in addition to the general planting guidelines, the following strategies apply:

- Keep plantings around drainages and waterways naturalistic and informal.
- Make use of the wetland and woods as a planting design concept. Have the woodland plants and natural aesthetic flow into the campus and then become more formal around the buildings. An alternate option is to keep plantings in the "front" of the buildings (along George Mason Circle) formal and urban, while the rear of the buildings has a more natural aesthetic that blends with the woods and wetland.

3.1.3.1.5.5 Arlington Campus

The Arlington Campus has a unique urban character compared with the Fairfax and Prince William Campuses, so a somewhat different approach to landscape design is appropriate:

- Native plant selections are not as important on this campus.
- Select plant species that will grow in urban conditions (i.e. compacted, poor-quality soil and small spaces).
- Consider utilizing moveable planters to hold annuals, perennials or shrubs.

3.1.3.1.5.6 Landscape Buffers

The following buffer classifications are to be used to establish or supplement landscape buffers. Buffers are to be established at Mason Fairfax at the perimeters of the campus to screen adjacent uses and roads and within the Academic Zones on campus near university buildings to establish a forest ecosystem (i.e. limited reforestation). Buffers are to be provided at Mason Prince William for both forest establishment and forest supplementation specific for their soil and microclimate. These buffers will provide a range of species composition, growth rate and succession for a typical native Virginia forest aesthetic. All buffers shall require little or no maintenance, and shall not require permanent irrigation (except as needed during initial planting seasons to establish plant material). All existing dead or hazardous trees shall be removed prior to planting in order to preserve the existing vegetation that will remain.

The *Buffer Descriptions* section below defines more specifically each buffer type. The *Minimum Requirements* section succeeds and lists the composition and notes for each buffer type. It is the intent that the buffer compositions shall contain the total amount listed, choosing from the species on the Buffer Plant List; however, the amount or variety may vary depending on site conditions.

Buffer Descriptions

Buffer Type A – Perimeter Woodland Cluster Buffer

This buffer retains existing forest areas (overstory/understory/shrubs/groundcover/organic leaf litter) and is supplemented with vegetation that offers screening with evergreen trees and shrubs for an immediate screening effect. The supplemental plantings shall be a mixture of smaller deciduous and evergreen shrubs, seedlings and groundcovers that will fill in over time. This buffer type will occur most often along property perimeters and adjacent to existing residential properties and roadways.

Buffer Type B – Academic Zone Buffer

This is a reforestation that uses a variety of native species to establish a forest ecosystem where no existing vegetation exists. The landscaping shall be planted with a variety of sizes to offer a natural forest effect, including overstory, understory, shrubs, groundcover and seedlings. This buffer acts predominantly as a reforestation effort rather than a dense evergreen screening effect.

Buffer Type C – Mason Prince William Buffer

This is a general landscape buffer for the soils and microclimate for overall campus wide use at Mason Prince William. This buffer is for the campus perimeters and reforestation efforts in the Academic Zones. This can be either infill, as in Buffer Type A, or re-establishment, as in Buffer Type B, but with a different range of species.

Minimum Requirements

Buffer Type A – Perimeter Woodland Cluster (Refer to detail 3.1-19, Landscape Buffer A)

Composition:

- Evergreen Trees: 5 trees per 100 linear feet, planted 6’ tall minimum.
- Evergreen Shrubs: 5 shrubs per 100 linear feet, planted 18” tall minimum.
- Understory Deciduous Trees: 3 trees per 100 linear feet, planted 1” caliper minimum.
- Deciduous Shrubs: 2 shrubs per 100 linear feet, planted 12” tall minimum.
- Overstory Seedlings Species: 5 seedlings per 100 linear feet, planted in protective tubing.

Notes

- Infill evergreen trees and shrubs along existing forest edges.
- Infill seedlings in center of existing forest for future urban forest succession.
- See Exhibit C: Buffer Plant List for recommended species and spacing.

- Depending on site conditions, the planting scheme may require an adjusted ratio from the composition specified above. Where possible, group evergreen trees and shrubs in groups of 3 or 5.

Buffer Type B – Academic Zone (Refer to 3.1-20, Landscape Buffer B)

For a typical 30' wide planting area use the following composition:

- Evergreen Trees: 5 trees per 100 linear feet, planted 6' tall minimum.
- Evergreen Shrubs: 6 shrubs per 100 linear feet, planted 24" tall minimum.
- Overstory Deciduous Trees: 6 trees per 100 linear feet, planted 2" caliper minimum.
- Understory Deciduous Trees: 5 trees per 100 linear feet, planted 1" caliper minimum.
- Deciduous Shrubs: 9 shrubs per 100 linear feet, planted 10" tall minimum.
- Overstory Seedlings Species: 10 seedlings per 100 linear feet, planted in protective tubing.
- Groundcover: woody seed mix, 15 lb. per acre, 300 sf.
- Scarify soil prior to planting trees, shrubs or seedlings, so groundcover can have seed to soil contact.
- After planting trees, shrubs and seedlings, hand seed, broadcast or hydroseed groundcover seed mix. Apply light mulch or hydromulch (±1" thick) over seed bed to protect seeds until germination and to provide moisture and nutrients to newly planted trees, shrubs and seedlings.
- See the Buffer Plant List for recommended species and spacing.
- Use as a guide only; field adjustments may be necessary.

Buffer Type C – Mason Prince William

Composition:

The Type A Perimeter Woodland Cluster Buffer composition shall be used for infill and the Type B Academic Zone Buffer composition shall be used for reforestation, however, the species to be used are those options as specified in the "Buffer Zone" column on the Buffer Plant List.

General Buffer Type Planting Notes

- This document shall be used as a guide only. Field adjustments may be necessary.
- Since sites differ in existing density, composition, slope and aspect, etc., all ratios listed above shall be distributed as necessary in the field and verified by a certified arborist or landscape architect prior to planting.
- If the density of the site allows for more or less plantings that differ from the compositions listed above, the composition can be adjusted as necessary.
- Shrubs should be planted staggered in groups of 3's or 5's.

- Planting shall primarily be done during spring (March 15-June 15) or autumn (September 15-November 15). Planting done outside these windows requires extraordinary protective and establishment measures, thus are highly discouraged.

- Irrigation shall be provided 3-4 times per week during the first month and regularly during the first year to establish vegetation and shall be continued well into the second year to maintain growth, but this will vary depending on annual weather conditions.

- During the first year, container grown plants should be watered every other day during summer, weekly in the spring and autumn and as needed during the winter. Balled and burlapped trees should be watered weekly during summer, biweekly in the spring and autumn and as needed during the winter. Watering can be adjusted for the site's aspect: if sunnier, water more frequently, if shadier water less frequently, as needed.

- See detail 4.3-4, Tree, Shrub and Perennial Planting Details.

3.1.3.2 Site Civil/Mechanical Utilities

The Design Team is responsible for coordinating with utility providers. Utility design, unless specifically addressed here, will conform to the design requirements of the utility that will ultimately have maintenance responsibility for that utility.

3.1.3.2.1 Water

3.1.3.2.1.1 Water Services - All Campuses

All domestic water services, including fire hydrants, shall conform to the local water supply agency. Below are the links to appropriate supplier/utility. It is the responsibility of the designer to notify Mason Land Development if the link does not work.

3.1.3.2.1.2 Arlington Campus: www.arlingtonva.us/departments/environmentalservices/projectsandplanning/environmentalservicesspecs.aspx

3.1.3.2.1.3 Fairfax Campus: www.fairfaxva.gov/publicworks/pfm.asp

3.1.3.2.1.4 Loudoun Campus: www.loudounwater.org/developers-and-new-construction/engineering-design-manual

3.1.3.2.1.5 Prince William Campus: http://www.pwcsa.com/index.php?option=com_content&view=category&layout=blog&id=8&Itemid=7

3.1.3.2.2 Sanitary Sewer

3.1.3.2.2.1 Sanitary Sewer - All Campuses

- All Sanitary Sewer mains 8" and larger shall conform to the local sewer collection agency. Below are the links to appropriate agencies. It is the responsibility of the designer to notify Mason Land Development if the link does not work.

- Sanitary Sewer laterals shall be in conformance with local requirements and VUSBC.

- Sewer laterals shall include a detectable marking tape if not laid in a straight line from cleanout at the building to the sewer manhole.
- The building cleanout shall be located outside of the building, approximately 5' from the outside wall, but in conformance with the Plumbing Code.
- Cleanout shall not be located within a sidewalk or within 5' of a building entrance or exit.
- All cleanouts shall be made of brass, set flush with the surface, in a concrete ring. Refer to detail 4.3-8, Downspout Cleanout.

3.1.3.2.2.2 Arlington Campus: www.arlingtonva.us/departments/environmentalservices/projectsandplanning/environmentalservicesspecs.aspx

3.1.3.2.2.3 Fairfax Campus: www.fairfaxcounty.gov/dpwes/publications/pfm/

3.1.3.2.2.4 Loudoun Campus: www.loudounwater.org/developers-and-new-construction/engineering-design-manual

3.1.3.2.2.5 Prince William Campus: http://www.pwcsa.com/index.php?option=com_content&view=category&layout=blog&id=8&Itemid=7

3.1.3.2.3 Storm Sewer

3.1.3.2.3.1 Collection

At a minimum the design shall meet the requirements of the VDOT Drainage Manual (http://www.virginiadot.org/business/locdes/hydra-drainage-manual.asp) and Road and Bridge Standards. VDOT Manuals and Guides (http://www.virginiadot.org/business/manuals-default.asp).

3.1.3.2.3.2 Storm Water Management/Best Management Practices

- All aspects of the Stormwater Management and Best Management Practices (SWM/BMP's) for any project must comply with the Mason MS4 permit and the University Master Plan, current version. At a minimum the SWM/BMP's will meet the requirements of the Virginia Stormwater Management Handbook http://www.dcr.virginia.gov/pub_list.shtml
- The project site outfall (s) must be shown as adequate (by computations) down to already established storm structures (ponds). On the Fairfax campus these include Mason Pond, Rivanna River Land Pond, the Braddock Pond, the Krosnow Pond, and the Mason Vale Pond. On the Prince William Campus, project site outfall(s) must be shown as adequate down to University Blvd or Freedom Center Blvd. For all other outfalls, consult George Mason University.
- Drainage from roofs must:
  - Be connected to storm system (not day-lighted) unless it drains directly into a defined channel/swale.
  - Provide cleanout (per detail 4.3-8) for roof drains at building and at change in direction, vertical or horizontal.

3.1.3.2.4 Heating and Cooling Distribution

Mason's Fairfax Campus utilizes a Central Heating and Cooling Plant (CHCP) to supply High Temperature Hot Water (HTHW) and chilled water (CHW) to campus buildings. All new buildings located on Mason's Fairfax Campus shall be designed to utilize HTHW as the primary heating source and chilled water as the primary cooling source unless specifically determined by Mason. The consultant is not responsible for evaluating the adequacy of these campus systems for individual building projects. Mason is responsible for determining adequacy of these central systems and their associated distribution system. The consultant is responsible for providing building heating and cooling loads to Mason during the preliminary design phase. Where Mason directs the consultant to design standalone heating and/or cooling source for the building shall be determined as part of the overall HVAC System Selection Analysis.

In general, Mason does not utilize underground steam distribution systems. Implementation of underground steam distribution systems is not allowed without written justification by the consultant and approval by Mason.

- Refer also to Chapter 3, Section 3.3.1.4.16 and 3.3.1.4.17 for details on design for the HTHW and CHW distributing systems. Refer to Chapter 4, Sections 23 21 13 and 23 21 14 for additional underground hydronic piping system requirements. Refer to Chapter 4, Section 23 05 16 for HTHW piping system expansion compensation requirements. Refer to Section 23 07 00 for HTHW piping insulation requirements. Refer to Section 23 05 23 for HTHW valve requirements.

- The existing campus HTHW underground distribution piping is installed in a tunnel system. All new underground HTHW piping shall be housed within a tunnel system. Refer to details 4.1-1, HTHW Tunnel Detail, Fairfax Campus, 4.1-2, HTHW Tunnel Top Details, and 4.1-3 HTHW Manhole Detail.

- General: The pathway for the campus wide HTHW distribution system piping shall be a system of tunnels and manholes which are designed to facilitate operations and maintenance. The tunnel system shall be designed by a Virginia registered Professional Engineer. The tunnel and manhole system, including hatch covers, shall be designed for HS-20 loading capable of carrying a minimum of 200 passes per day.

- Tunnel System: At least 90% of the tunnel system must have removable tops. At least 75% of the tunnel system must be designed so that the top is at grade. Tunnel height may vary with site contour but the inside (clear) tunnel height shall not be less than four feet and shall not exceed eight feet. The tunnel and manhole system should be designed to minimize the number of low points. All reinforcing steel used in construction of tunnel and manhole system shall be epoxy coated. Tunnels will have their tops primarily exposed as walkways. Therefore, the routing of tunnels shall be coordinated with the pedestrian system. Where deemed appropriate by Mason, sections of tunnel will be covered.

- Tunnel Section: The minimum inside (clear) tunnel height when the tunnel is not at grade is four feet. Minimum clearances between insulated pipes must be 18 inches; minimum clearance between insulated pipes and sides of tunnel must be 12 inches; minimum clearance between insulated pipe and tunnel top must be 24 inches. For branch building service, where the tunnel is at grade with removable tops, the minimum height of the tunnel may be reduced with written approval of George Mason Facilities. Provide drain channel in floor of tunnel, with low points of tunnel and manhole system discharging to campus storm water drainage system.

- Tunnel Tops: Removable tops shall not exceed 4500 pounds weight. Tops to be constructed with an alternating lip pattern to permit easy removal. Refer to Part V Detail 03310 - 2 Tunnel Top Details. Reinforcing steel to extend into the lip. Where the top of the tunnel is exposed at grade, provide broom

finish. Provide neoprene gaskets between the horizontal surfaces at the lips and wherever the top makes contact with walls or an adjoining top section.

- Tunnel Top Lifting Devices: Four epoxy coated reinforcing steel lifting loops will be installed in the sides of each tunnel top section (Refer to Part V Detail 03310 - 2 Tunnel Top Details) unless the top is located adjacent to a paved surface (such as plaza, road, sidewalk, or curb) or other situation that precludes side mounted loops. In which case, four stainless steel lifting lugs will be imbedded in the tunnel top, fitted with a screw in cap. (Refer to Part V Detail 03310 - 3 Tunnel Top Lifting Lug Detail) If lifting lugs are used, a total of ten lifting loops which screw into the lugs will be provided to the Owner; packaged and marked with the project identification.

- Manholes: Manholes shall be provided at all valve and tempering tank locations. Inside height of manhole must be minimum of seven feet. Manholes must be provided with a floor drain, piped to the campus storm drainage system. If a gravity drain is not practical, provide a sump and sump pump for tunnel and manhole system drainage. Sump pump and associated discharge piping, where required, must be rated for minimum design operating temperature of 200 degrees F. Design of manhole shall be such that a person entering the manhole can immediately step-on and access the ladder safely without an under-turn.

- Access Hatches & Hatch Covers: Access hatches and hatch covers shall be provided at all manholes; and at all piping system expansion joints, ball joints, anchors, drain or vent valves, and sump pumps, when these components are not located in a manhole. Access hatches shall provide minimum four foot by three foot clear access and be fitted with a locking cover. A fixed ladder or rungs aligned with hatch opening must be provided at all locations where the depth of the tunnel or manhole is four feet or greater. Hatch lip drains must be piped, using copper or Sched 40 galvanized steel pipe, to within 6 inches of the floor.

- Foundation Drainage: Foundation drainage must be provided around the perimeter of all tunnels and manholes. Drainage pipe must be at least four inches in diameter, perforated ABS pipe. It must be covered by filter fabric and sit a distance equal to its diameter from the tunnel bottom at level with the lower edge of the tunnel bottom. The drainage pipe must be covered in #57 stone to provide drainage to the pipe and the #57 stone must cover the pipe to a height six inches above the bottom slab of the tunnel, and extend to either side at the level in both directions lateral to the pipe a distance equal to the diameter of the pipe. If the tunnel has a bottom lip, the #57 stone has to meet the preceding qualifications and then continue laterally in towards the tunnel to meet the side tunnel water. The #57 stone must be wrapped in an approved filter fabric which must be brought up the side of the tunnel wall and pinned in place against the wall by protection board.

- Waterproofing: Exterior sides of tunnels and manholes must be waterproofed. Wherever the tunnel tops are below grade, the tunnel tops must be waterproofed. Where a tunnel section or manhole extends below the water table, use self-adhered roll-type membrane waterproofing . Provide protection board as required for waterproofing system.

- Design chilled water piping systems with a minimum cover of 36 inches.

- All piping systems shall be designed based on a piping stress analysis and shall be designed to meet the requirements of the latest edition of ASME B31.1. The piping system stress analysis shall include piping system geometry, routing, support locations, specific support types, and expansion compensation information.

- Construction drawings shall include plans and profiles of all piping systems identifying all elevations, fittings, valves, expansion compensation, supports, anchors, vaults, and tunnel structure.

3.1.3.2.5 Fuel Distribution

3.1.3.2.5.1 Fuel Distribution – All Campuses

The designer will verify the availability of gas service to the site. If gas service is available to the site, the designer will verify the university's need for gas service to the facility. If gas service is needed, the designer will work with the utility provider to insure that the site layout will accommodate the extension of gas service lines and appurtenances to the facility. The servicing utility will be provided with all necessary site information to allow them to design their service lines and appurtenances to the site.

3.1.3.2.5.2 Arlington Campus: http://www.washgas.com/

3.1.3.2.5.3 Fairfax Campus: http://www.washgas.com/

3.1.3.2.5.4 Loudoun Campus: TBD

3.1.3.2.5.5 Prince William Campus: http://www.washgas.com/

3.1.3.3 Site Electrical Utilities

3.1.3.3.1 Electrical Distribution

3.1.3.3.1.1 Primary Service – Fairfax East Campus

Mason's primary electrical distribution consists of 15kV - 3 phase underground electrical lines, fed from a 15kV substation and distributed to buildings in the campus via manholes and 15kV underground ductbanks.

- The infrastructure design of the primary electrical distribution shall be comprised of the following:
  - Design of new manholes in the vicinity of new building grounds.
  - Design of new 15kV underground ductbanks (conduits encased in concrete) from manhole to the building.
  - Design of service entrance ductbank and location of main electrical room.
  - Design of main single-ended substation consisting of 15kV loadbreak switch, dry type transformer, and 480/277V or 208/120V secondary switchgear all located in main electrical room.
- To accomplish the above, the Design Team shall submit information of project electrical loads and location of electrical service entrance to Mason's Facilities Management.
- Information related to the specific manhole to be connected to and available fault current shall be provided by Mason's Facilities Management.

3.1.3.3.1.2 Arlington Campus: https://www.dom.com/dominion-virginia-power/

3.1.3.3.1.3 Fairfax Campus: https://www.dom.com/dominion-virginia-power/

3.1.3.3.1.4 Loudon Campus: TBD

3.1.3.3.1.5 Prince William Campus: http://www.novec.com/

3.1.3.3.2 Site Lighting

- Lighting styles shall be consistent within each landscape character zone. For lighting recommendations, refer to Chapter 4, Division 26 – Electrical. The chart below designates the minimum and average recommended lighting levels for various outdoor spaces.

Exterior Space Location	Foot Candle Minimum	Foot Candle Average	Notes
Temporary Site Lighting	1	1.5	For security purposes, and only in areas required for the purpose.
Roadways	1.2	1.5	Where roadways are immediately adjacent to a walkway, the walkway lights can be combined with the roadway lights, so long as the lighting levels of the walkways are maintained at their minimum level as indicated herein.
Walkways			For pedestrian safety.
Crossing Streets	4	4.5	
Adjacent to Parking Lots	2	2.5	
Adjacent to Roads	1.8	2	
Interior of Campus	1.5	1.8	
Interior of Campus in Large Open Areas	1	1.2	
Plazas	5	5.5	
Landscape Areas Adjacent to Walkways	1.5	1.8	
Parking Lots	2	2.5	
Parking Decks	5	5	
Loading Docks	8	10	
Building Entrances	6	6.5	
Underpasses/Contained Areas	10	12	For pedestrian and general campus safety.
Heavily shadowed areas around buildings	3	5	For security purposes.
Sports/Recreation Fields	TBD	TBD	Based on NCAA guidelines, must conform to the above within 5 feet of the field edge.

3.1.3.3.3 Site Communications and Security

3.1.3.3.3.1 Communications

The Mason Campus is provided with communication manholes and handholes throughout the campus from which IT, A/V, and security utility cables are routed to each building's main Telecom room. Refer to Chapter 4, Division 27 and for additional information regarding communications.

- All cables shall run in underground ductbanks (PVC conduits in concrete encasement) from existing or new manholes or handholes to main Telecom room.

- Provide new manholes and handholes with cover locking means for systems security.
- Design service entrance to prevent water infiltration and conflicts with other utilities.
- Provide at least one IDF closet on each floor of the building with 2-4" conduits to main Telecom room. Conduits shall have 2 bends maximum.
- All communication work shall be coordinated with and approved by Mason ITU/NET.

3.1.3.3.3.2 IT

For additional information regarding IT systems, refer to the separate IT Design Guidelines.

- Provide IT drawings and spec Section 27 tailored to all infrastructure work for each project.
- Required shutdown of existing network systems must be scheduled during the Christmas holiday.
- Ensure that security is provided to all telecom rooms.
- Provide all IT equipment and A/C systems with emergency power.
- Provide record drawings to Mason ITU/NET.
- IT rooms must be separate from security rooms.
- The preferred phone system shall be VOIP.
- Show cable trays on all contractor coordinated drawings.
- Establish ADA Standards for phone and data and include in contract documents.
- Extend all conduits from wall jacks to the corridor.
- Include inside and outside wireless systems in the design.
- Provide all IT rooms with sprinklers.
- Design/include temporary IT systems in all renovation projects.

3.1.3.3.3.3 Security

- All doors inside shall have a key pass to meet the Virginia state law.
- Card access system is preferred.
- Omni locks are being phased out on Mason campuses.
- Security closets shall have swipe card access.
- Provide wireless locks for low use spaces.
- Explore EVI contactless card technology for door systems.
- Standardize padlocks to secure outbuildings and athletic equipment.
- Standardize CCTV systems for security systems on campus.