

STORMWATER BEST MANAGEMENT PRACTICES POST-CONSTRUCTION RECOMMENDATIONS

ADDRESSING LEGAL IMPEDIMENTS AND MANDATED IMPERVIOUS AREAS



The St. Louis County Phase II Storm Water BMP Implementation Work Group

February 2011

Introduction

Change is everywhere, and the way we deal with change is important. This is true in the way we develop our communities, and particularly true in the way we manage stormwater. MSD has implemented stormwater regulations on new development and redevelopment to address water quality. St. Louis County and municipalities within St. Louis County have revised their planning and zoning ordinances to direct the growth of their communities in a way that protects water quality. This document (and the process used to prepare it) has been undertaken to help address some of the conflicts resulting from these stormwater management changes, and to promote continued change toward developing communities that are environmentally sustainable by protecting their water resources.

Since October 2006, MSD has required new development and redevelopment projects to meet water quality criteria in its Rules and Regulations. This criteria requires developments to incorporate post-construction best management practices (BMPs) to be installed to treat stormwater runoff from the developed properties. These BMPs introduce a new design element into stormwater management in St. Louis County. Based on the experiences of others across the nation undergoing the same types of change to address water quality under the Clean Water Act, it was anticipated that conflicts would develop between these new BMPs and current practices, including current legal requirements by St. Louis County and municipalities within the County.

This document was specifically developed to meet the goals of the 2007 St. Louis County Phase II Storm Water Management Plan. The goal was to assemble a Work Group to identify and evaluate legal impediments to the design, installation, operation and/or maintenance of BMPs allowed under MSD's Stormwater Design Rules and Regulations; and, to establish and distribute the findings, recommendations and models of the Work Group. A BMP Implementation Work Group was assembled to develop this information for the Phase II co-permittees responsible for the St. Louis Small Municipal Separate Storm Sewer System (MS4) and the general public in their communities. A broad stakeholder group was formed. The original invitation was sent to 35 individuals representing 22 different governmental agencies and stakeholder associations.

EPA and others recommend a review of local ordinances against a checklist to evaluate existing development codes, regulations and ordinances to identify potential regulatory and planning process impediments that affect the use of or successful implementation of best management practices that infiltrate stormwater in new development, and that mandate unnecessary impervious area. Referencing checklists developed by EPA and the City of Indianapolis, MSD developed a checklist for St. Louis County to assess the baseline "state of practice" with regard to the various topics. The Baseline Survey of St. Louis County indicated a weak score in terms of performance related to the referenced sources. Through this process, the Work Group validated the task and set about finding solutions and models that could be recommended and are found herein.

The Work Group did not identify any instances where an installed post-construction BMP resulted in a direct conflict with a local code or ordinance. Therefore, the Work

Group concluded that code conflicts are not a significant impediment to BMP installation. This was a surprising outcome; however, it created an opportunity to address the reasons behind the low score indicated by the St. Louis County Baseline Survey. As a result, the Work Group considered other legal impediments to better stormwater management to include: the creation of unnecessary impervious areas that are mandated, and overcoming the barrier of the unknown and uncertainty related to site permitting approval. Therefore, the Work Group looked for ways to reduce impervious areas in the community, and to promote post-construction BMPs that are environmentally preferred by virtue of their ability to reduce the rate and volume of runoff by infiltrating water into the ground. These environmentally preferred BMPs are legally required to meet Missouri's MS4 stormwater permit condition to mimic pre-construction runoff conditions from new development to the maximum extent practicable. Each section of this document describes a strategy, model ordinances, standard drawings, and recommended resources to demonstrate the benefits of these best practices and their validity by identifying examples of local implementation.

Local government consisting of MSD's co-permittees to the Missouri MS4 stormwater permit will be asked to review the recommendations and models presented in this document and consider incorporating them into their regulations. These recommendations are also compatible with the MSD Site Design Guidance, which has been adopted by the co-permittees, to ensure that private developers of land follow a process of first reducing unnecessary impervious area, using pervious surfaces, and then using infiltrating best management practices in the process of designing stormwater management into a site.

Secondly, a broader reason to implement these recommendations relates to the sustainability of our communities. Increasing impervious area increases the quantity of stormwater discharges, which causes excessive erosion, and stream channel expansion. The volume, duration, and velocity of stormwater discharges causes degradation to aquatic systems. Protecting and restoring the physical, chemical and biological integrity of receiving waters is necessary to meet the Clean Water Act. The recent report of the National Research Council (*Urban Stormwater Management in the United States*, National Academies Press, 2008) recommends that the EPA stormwater program examine the impacts of stormwater flow, treat flow as a surrogate for other pollutants, and include the necessary control requirements in stormwater permits. Specifically, the report recommends that the volume retention practices of infiltration, evapotranspiration and rainwater harvesting be used as primary stormwater management mechanisms. Therefore, it is our goal to reduce impervious surfaces to comply with legal obligations and to protect our water resources for future generations to use and enjoy.

The Phase II BMP Implementation Work Group participants include:

AmerenUE

Associated General Contractors

American Council of Engineering Companies

American Planning Association

American Public Works Association

American Society of Civil Engineers

American Society of Landscape Architects

City of Chesterfield

City of Ellisville

City of Maryland Heights

City of Olivette

City of St. Louis

East-West Gateway Council of Governments

Home Builders Association of St. Louis

Metropolitan Fire Marshals Association

Metropolitan St. Louis Sewer District

Metro West Fire Protection District

Missouri Coalition for the Environment

Missouri Department of Conservation

Missouri Department of Transportation

St. Louis County Government

Shaw Nature Reserve of the Missouri Botanical Garden

SITE Improvement Association

U.S. Green Building Council

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Off-Street Parking

Parking accounts for a significant portion of our built environment. In St. Louis, parking lots account for over 21% of our impervious areas. The topic of off-street, non-residential parking provides for significant opportunities to reduce the effect of large areas of paved surfaces. This can be accomplished in three ways: 1) reduce the number of parking spaces required, 2) reduce the space required per parking space, and 3) reduce the amount of stormwater runoff from parking areas.

1. Reducing parking spaces –

Parking space requirements imposed and approved by zoning authorities result in the creation of more parking spaces than are actually needed in many cases. Several planning and zoning strategies exist to provide opportunities to reduce parking spaces when they are not required.

- Parking ratios - can be reduced to 3 or less spaces for offices and 4.5 or less spaces for retail and medical purposes per 1000 square feet of floor area according to sources identified as benchmarks by the Work Group.
- Maximum parking – requirements should be set for developments so that the number of spaces could not exceed 10% of the parking required by zoning. Property owners could build additional parking spaces, however, they would need to be constructed with pervious paving or otherwise mitigated with an impervious area off-set (e.g. vegetated roof).
- Shared parking – allowed between two or more uses to satisfy all or a portion of the required parking.
- Phantom parking – involves not constructing all the required parking spaces until the parking is actually deemed necessary due to demand. In the mean time, the areas reserved for this unconstructed parking must remain in green space and subject to a potential request to construct in the future.



Aerial of Parking Lot

- Reuse of existing buildings – would not require the construction of additional parking spaces to meet current zoning ordinances.
- Parking study – results can be used to reduce parking requirements when spaces are not needed. The study would take into consideration the

proximity of the property to mass transit, car pooling, bicycling, mixed property use, and hours of operation.

Model examples:

- 1) Parking Ratios – a model parking ordinance was developed by the Work Group and is attached in Appendix A. The model identifies and recommends a parking ratio from those used or recommended by various organizations for a number of use categories. The Minimum Parking and Loading Requirement tables are located in Appendix B.
- 2) Maximum parking – requirements are based on Chesterfield's City Code, Section 1003.165 Parking, Stacking and Loading Requirements. The recommended model parking ordinance contains a section that requires increases in parking areas over 10% of the maximum parking requirement to be reviewed and approved by the Planning and Development Services Director, and applicants must include measures to mitigate for the increase, such as, increased open space, pervious pavement, green roofs, and more.
- 3) Shared parking – City of Maryland Heights Zoning Ordinance, Article 14, Section 25-14.10, Shared Parking allows for shared use of a parking lot where uses are unlikely to produce substantial demand for parking at the same time, based on a parking study and legal agreement between all land owners. See the appropriate section of the model parking ordinance in the Appendix.
- 4) Phantom parking, Deferral of parking construction – Chesterfield's City Code states that a parking deferral of construction may be granted for up to 50% of the off-street parking spaces required in an industrial district, or up to 30% in a commercial or other district, subject to a demonstration of time of day usage, other parking options, proximity to mass transit, and more. See the appropriate section of the model parking ordinance in the Appendix.
- 5) Reuse of existing buildings – St. Louis County Zoning Ordinance, 1003.165, Section 2 exempts buildings older than 1978 from additional parking spaces required under the minimum parking zoning requirements. See the appropriate section of the model parking ordinance in the Appendix.
- 6) Parking study, Modifications of Parking Requirements – Chesterfield's City Code states that a Parking Demand Study can modify zoning ordinance requirements to reduce the number of required parking spaces. The request must include various analysis, as prescribed. Parking lot design strategies must use pavement reducing strategies that mitigate stormwater runoff. See the appropriate section of the model parking ordinance in the Appendix.

- 7) Proximity to mass transit – St. Louis County Ordinance 23787, paragraph 12.b, adopted November 7, 2008, states that minimum parking requirements for developments located within 1000 feet of a transit station may be reduced by an additional 10 percent. See the appropriate section of the model parking ordinance in the Appendix.

Additional resources:

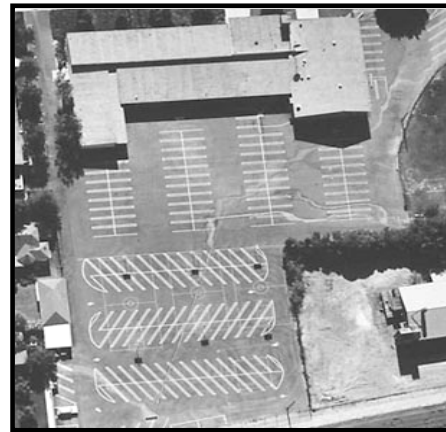
- EPA Water Quality Scorecard, this document was used as a reference and a benchmark in the BMP Work Group's survey of local regulations, http://www.epa.gov/smartgrowth/water_scorecard.htm
- Local Water Policy Innovation, A Road Map for Community Based Stormwater Solutions, American Rivers, Inc. and Midwest Environmental Advocates, Inc. publication, <http://www.americanrivers.org/library/reports-publications/local-water-policy-innovation.html>
- Parking Spaces/Community Places, Finding the Balance through Smart Growth Solutions, publication EPA 231-K-06-001, <http://www.epa.gov/smartgrowth/parking.htm>
- Minnesota Urban Small Sites BMP Manual, Metropolitan Council/Barr Eng http://www.metrocouncil.org/environment/Water/bmp/CH3_RPPImpParking.pdf

2. Reducing space requirements –

Beyond the number of parking spaces approved, steps can be taken to reduce the amount of impervious area required for the given number of spaces to be provided.

Options are limited to the size of the parking space and the configuration of the spaces and lanes accessing those spaces.

- Minimum stall dimensions – can reduce the impervious area of parking lots by allowing smaller parking spaces per car. The EPA Water Quality scorecard recommends a 9 foot wide by 18 foot long parking space. In St. Louis County, a 9 foot wide by 19 foot space is typically used.



Angled versus 90° Parking

Zoning requirements in the St. Louis area had required a number of compact car spaces, but this option has fallen out of favor with local planning and zoning officials. Therefore, a 9 foot by 19 foot stall dimension is recommended. However, Section 5 of the model parking ordinance in Appendix A contains a provision allowing up to 10% of compact parking space by right.

- Efficient stall configurations – under St. Louis County Zoning Ordinance 1003.165, the most efficient parking configuration for minimizing impervious area is the 90 degree parking angle. Compared to a 45 degree parking angle, the 90 degree configuration uses 22% less area and would be preferred. However, the 45 degree configuration can be more desirable if green infrastructure practices are incorporated into the design. For example, if the unusable space at the end of parking rows is used for bioretention instead of being paved, then the imperviousness of the parking area is reduced from 100% to 75% impervious, and beneficial stormwater management facilities are included in the design. Also, the benefits of the 45 degree configuration may be realized where it is desired to reduce wheel turning to increase the life of porous pavement in parking areas.

Additional resources:

- St. Louis County Zoning Ordinance, 1003.165, 3.(1), Minimum Off-street Parking Dimensions.

3. Reducing runoff –

Once planning decisions are made to allow impervious areas to be created, the last option for addressing water quality involves reducing the amount of stormwater runoff from an impervious area. Options to reduce runoff from parking stalls involves using a parking surface that is pervious, intercepting rainfall or managing the runoff from impervious stalls.

- Pervious parking – can reduce the impervious areas of parking lots by using paving materials and designs that allow rainwater to pass through the parking surface. Options typically include: pervious asphalt, pervious concrete, and pervious pavers. All three types of systems are allowed by MSD and the design requirements are available online at: <http://www.stlmsd.com/engineering/planreview/PlanReviewInformation>.



- Landscape guidelines – can be used to require a minimum amount of green space within the parking lot. If the green space is required to include native plants or mature trees, stormwater and other benefits can be realized. Requiring a tree canopy to cover 50% of the parking lots, at maturity, can intercept and reduce rainfall by providing increased surface area that must be wetted before runoff can occur. Trees will also reduce the heat island effect, which reduces the temperature of the local environment. Requiring parking

islands at the ends of parking aisles and within aisles provides locations where native vegetation and bioretention can be used to manage stormwater. Requiring native plants will reduce irrigation requirements and promote bioretention areas in parking lots for treating runoff.

- Bioretention areas (or rain gardens) – can be used in landscaped islands or on the perimeter of parking lots to treat stormwater and possibly reduce stormwater detention requirements. Instead of raised islands that are irrigated to keep plants alive, bioretention areas in depressed islands can be used to meet landscape requirements and MSD stormwater treatment and detention requirements. A curbless or slotted curb design is required for the stormwater to enter the bioretention island. MSD requirements for these types of systems are located in the Maryland Stormwater Design Manual as Urban BMP Group, Filtering Practices.

Model Examples:

- 1) Pervious Parking – See the MSD Engineering Plan Review web site for a Porous Pavement Typical Section Detail Library Drawing for asphalt, concrete and permeable interlocking concrete pavement. An example of permeable interlocking concrete pavement is the College School located at 1 Newport Place, Webster Groves.

The City of Ferguson has installed a pervious concrete parking lot located at 501 S. Florissant Road, Ferguson. The Missouri Botanical Garden parking lot at 4344 Shaw Boulevard, St. Louis includes porous asphalt and pervious concrete. MSD requirements for these types of systems are located under the “proprietary best management practices” link at:



<http://www.stlmsd.com/engineering/planreview/PlanReviewInformation>

- 2) Landscape Guidelines – City of Chesterfield’s Tree Preservation and Landscape Requirements in Chapter 27.5 of City Code (Ordinance 2512) requires landscaped islands with trees in parking lots. The island size must be a minimum of 9 feet wide and 135 square feet of pervious area per parking row. No parking space can be located farther than 50 feet from a tree.

- 3) Parking Bioretention Areas – Bioretention areas are used as water quality BMPs under MSD’s Rules and Regulations, and in fact, are the most popular post-construction BMP used in the community. Bioretention stormwater management facilities have been used successfully in a number of parking lot islands or on the perimeter of parking lots throughout the community. A Non-



City of Ellisville, Bluebird Park

Standard Detail of Bioretention for Parking Islands is in Appendix C and will be included on the MSD Engineering, General, Plan Preparation Guidelines web site in the Non-Standard Details library. The Missouri Botanical Garden parking lot at 4344 Shaw Boulevard, St. Louis contains an example of a bioretention area in a parking lot island. Another example, with a curbless parking lot design feeding a bioretention area, is at Bluebird Park in Ellisville.

Additional resources:

- National Asphalt Pavement Association, select Environment, Porous asphalt, <http://hotmix.org/>
- National Ready-Mix Concrete Association, www.perviouspavement.org
- Interlocking Concrete Paving Institute, <http://icpi.org>

Weed Ordinances

The BMP legal impediment category of weed ordinances reflects the conflict that is created in the community in distinguishing between an environmentally beneficial native plant and an undesirable plant called a weed. BMP requirements specify native plants for their environmental benefits, however, weeds create ecological concerns and are a nuisance to the public. To promote the beneficial use of native plants in BMPs, local government should be concerned about these BMP plantings being illegal under their weed ordinance. The solution to this conflict generally relates to the definition of a weed. Weed ordinances should be revised to define a weed as an undesirable plant, and allowing the use of beneficial native plants in bioretention areas and rain gardens. This can be accomplished by referencing weed lists in the ordinance, and excluding native plants from the weed definition.

1. Native Plants -

Native plants are vegetation species that existed prior to the arrival of European settlers within the State of Missouri, or the eco-region. These plants are identified by the Missouri Department of Conservation. The benefit of native plants in the community is that the maintenance of them will conserve water, reduce pesticide use, and reduce fertilizer use. Furthermore, they add biodiversity into the environment, which provides ecological benefits. Weed ordinances must protect the managed stands of native plants in BMPs by ensuring they are expressly allowed. In addition, public education through signage and proper delineation of these native areas is important for public acceptance and to ensure the areas are not damaged through improper maintenance.

2. Weeds -

Weeds can degrade the natural environment by out-competing other plant species and become a nuisance in the community, which decreases property values and threatens public health. Several categories of plants are undesirable, and need to be defined and regulated by a weed ordinance. The weeds are determined to be a public nuisance under a weed ordinance.

- Invasive Plants – are vegetation species that grow aggressively in Missouri. They are listed by the Missouri Department of Conservation in the Missouri Vegetation Manual and in newer, more complete lists of invasive plants maintained by the Department.



Beneficial Native Plants in Detention Basin

- Noxious Weeds – are vegetation species listed as a Missouri State Noxious Weed by the Missouri Department of Agriculture due to their ability to cause economic harm and the difficulty in controlling the species.
- Nuisance Plant – is a toxic species known to cause death or severe allergic reactions in humans, specifically: poison hemlock, poison ivy and ragweed.

Model examples:

- 1) A model ordinance encouraging the use of native plant communities as an alternative in urban landscape design is included in Appendix D. This model ordinance was developed by the Work Group based on sections of the City of Chesterfield's Weed Ordinance 2498 and the Wild Ones model ordinance listed below.
- 2) Wild Ones, a non-profit education and advocacy organization for native plants, model weed control ordinance is located at:
<http://www.wildones.org/weedlaws/weedlaw.html>



Additional resources:

- Native plants identified by the Missouri Department of Conservation are listed at Grow Native, www.grownative.org, and the Missouri Botanical Garden's Flora of Missouri Project, www.tropicos.org/project/mo.
- Invasive plants identified by the Missouri Department of Conservation are included in the Missouri Vegetation Management Manual, http://mdc.mo.gov/sites/default/files/resources/2010/05/5398_3326.pdf
- Noxious weeds are listed by the Missouri Department of Agriculture under Missouri law, <http://mda.mo.gov/plants/forests/noxiousweeds.php>, and federal noxious weeds are listed by the United States Department of Agriculture, <http://plants.usda.gov/java/noxiousDriver>.
- MSD Landscape Guide for Stormwater Best Management Practices Design contains plant selection guidance for stormwater management facilities, www.stlmsd.com/engineering/planreview/PlanReviewInformation
- Shaw Nature Reserve, www.shawnature.org

Residential Streets

Streets account for a significant portion of our built environment. In St. Louis, public streets account for over 25% of our impervious areas. In addition, 5% of the total impervious area exists for public and private sidewalks. Much of this sidewalk area is associated with street design. The topic of residential streets provides for significant opportunities to reduce the area of paved surfaces.



This can be accomplished by: a) reducing the amount of impervious area required for streets and sidewalks, b) reducing the amount of stormwater runoff from streets by using pervious materials, or c) managing runoff from streets next to the roadway in post-construction BMPs that reduce runoff.

1. Street width -

A strategy to reduce the impervious area associated with streets is to encourage designers to use narrower streets in situations where a wider street is not necessary.

- Street Design Codes – allowing a 20 foot residential street width is an important tool that municipalities can offer the development community to reduce the amount of required impervious area instead of a typical 26 foot wide street width. The option to use a 20 foot street would be limited to those situations where on-street parking is prohibited and alternatives to on-street parking can be provided. These streets are typically short, cul-de-sac streets that would be subject to zoning limitations of 25 lots served, or 50 lots on a loop street.
- Fire Code Restrictions – can vary greatly in St. Louis with 43 individual fire districts and departments, each with their own requirements. However, the International Fire Code is recommended for requirements related to street

width, as this code allows 20 foot street widths in certain circumstances depending on various criteria, such as street length, fire hydrants and sprinklers installed.

Model examples:

- 1) A model ordinance allowing 20 foot wide streets, based on a markup of the St. Louis County Residential Street Design Criteria for Right-of-Way and pavement width requirements, is included in Appendix E (see Note ⁽¹⁾).
- 2) Metro-West Fire District Code, F-503.6.3 Street Widths and Weights: allows 20 foot wide streets where no parking is permitted on either side of the street.

Additional resources:

- The EPA Green Infrastructure Municipal Handbook has several chapters relevant to the topics of this document, refer to the Water Quality Scorecard and the Green Streets chapters, and more:
<http://cfpub.epa.gov/npdes/greeninfrastructure/munichandbook.cfm>
- Neighborhood Street Design Guidelines, An Oregon Guide for Reducing Street Widths, November 2000,
<http://www.oregon.gov/LCD/docs/publications/neighstreet.pdf>
- Better Site Design Fact Sheet: Narrower Residential Streets, Center for Watershed Protection,
http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool4_Site_Design/narrow_streets.htm

2. Pervious Surfaces –

One way to decrease runoff from streets is to use pervious pavement instead of creating impervious surfaces, which is typically the case. Pervious pavement improves water quality by reducing the amount of stormwater runoff, and simulates the way runoff leaves the site under natural conditions.

- Pervious Pavement in Driving Lanes – was considered, however, the Work Group had reservations about making a recommendation to place pervious pavement in driving lanes of public streets until more information and local experience has demonstrated positive results. Uncertainty regarding maintenance requirements, pavement longevity, and a lack of public funding for maintenance contributed to the decision not to make a recommendation.
- Pervious Pavement in Parking Lanes – can reduce the impervious areas of streets by using paving materials and designs that allow rainwater to pass through the surface in the parking lanes of streets. Options typically include: pervious asphalt, pervious concrete, and pervious pavers. All three types of systems are allowed by MSD and the design requirements are available

at: <http://www.stlmsd.com/engineering/planreview/PlanReviewInformation>.

The Work Group is recommending the implementation and evaluation of pilot projects to gain more knowledge and experience about this technology.

- Pervious Pavement Sidewalks – can also reduce impervious areas. The Work Group was optimistic about this application due to low loading demands. However, maintenance costs and longevity remain an uncertainty. Implementation and evaluation of pilot projects is recommended.



Model examples:

- 1) Pervious Pavement – The City of St. Louis currently has a porous asphalt alley located off Cardinal Avenue.
- 2) MSD Engineering, Plan Review Documents web site under Proprietary BMPs lists designer notes and details for pervious concrete, permeable interlocking concrete pavement, and porous asphalt. Current examples of “green” streets planned for the area which will incorporate green infrastructure, such as porous pavement, include: St. Louis City Sarah Street, and the East West Gateway Council of Governments “Great Streets” initiative.
- 3) Pervious Sidewalks – MSD’s Lower Meramec Wastewater Treatment Plant has pervious concrete sidewalks installed.



Additional resources:

- City of Chicago’s Green Alley program uses pervious pavement. Link to the Chicago Department of Transportation’s Green Alley Handbook from: http://www.cityofchicago.org/city/en/depts/cdot/provdrs/alley/svcs/green_alley_s.html
- East West Gateway’s Great Streets Initiative - <http://www.ewgateway.org/greatstreets/greatstreets.htm>
- Designing Pervious, A Minnesota City Eschews Storm Drains for Pervious Streets. Public Works, Volume 141, Number 9, August 2010. p 33.
- See the web links provided above under the pervious parking section also.

3. BMPs at the Edge of Roadway Pavement –

The impervious surfaces of roadways generate stormwater runoff, and the best location to treat runoff is as close to the source as possible, with dispersed micro-practices. The idea of treating stormwater runoff next to streets generates numerous issues and concerns from government officials and utilities. These issues relate to how the right-of-way will be affected, how maintenance will be handled, what the impact will be on utility placement and maintenance, and even how stormwater will drain into the BMP. A variance from existing street design criteria will be required. The recommendation is for new residential development property plats to be adjusted for the following items to accommodate placement and maintenance of BMPs at the edge of pavement, where space is available after considering site restrictions.

- Right-of-ways (ROW) – would be limited to the street edge of pavement. Public maintenance of the street would be enabled through a permanent roadway, improvement, maintenance, utility, sewer and sidewalk easement (PRIMUSSE) up to the former ROW limits. For Missouri Department of Transportation streets, the BMP would be allowed in the MoDOT ROW, and a maintenance agreement would be executed so the property owners or subdivision trustees would be responsible for maintenance.
- PRIMUSSE – shown on the property plats up to twelve feet from the edge of pavement will provide public agencies the access needed to maintain the streets, utilities and sidewalks. Underground utilities should be placed perpendicular to the sidewalk, not parallel under the sidewalk. Coordination with utilities is necessary, and utilities may be placed in an additional utility easement located outside the PRIMUSSE.
- Sidewalks – can be located in the PRIMUSSE. In some cases, sidewalks can be limited to one side of the street subject to the Americans with Disabilities Act (ADA) requirements.
- Common Ground – would be established for the BMP foot print to ensure that the subdivision trustees would maintain the stormwater facility so that it operates properly. This is a typical arrangement for BMPs located elsewhere in a development. The property plat shows the area as common ground and identified as a Stormwater Management Reserve Area. This Reserve Area is subject to a BMP maintenance agreement between MSD and the property owner(s) to ensure the owners maintain the BMP.
- Curb Cuts – allow stormwater from the street to flow into bioretention areas next to the street or through a “bioretention sump” located at the edge of the roadway transitioning into the bioretention area. The sump design can allow for non-erosive flows into the bioretention area, and for larger flows to bypass into the curb gutter for management in a storm sewer inlet. Alternatively, an

inlet can be located within the bioretention BMP.

- Cul-de-sac Islands – create an excellent location for a bioretention stormwater BMP that would avoid the issues identified above, and would typically not require significant changes to current development property plat plans, since these areas are already in common ground that is maintained by the subdivision trustees.

Model examples:

- 1) A recommended model property plat for BMPs at the edge of a roadway has been drawn up and is located in Appendix F. This model has been reviewed and agreed to by the Work Group, which consists of municipal and private engineers and planners, and utilities. Each of the individual elements of the model have been approved locally. Also, refer to the recommended Note ⁽⁵⁾ in Appendix E, Residential Street Design Criteria.
- 2) MSD Non-Standard Details of Sewer Construction Drawings for Roadway Bioretention located at the edge of street pavement, are located in the Appendix G. These four non-standard detail drawings were reviewed and agreed to by the Work Group as a recommendation for locating BMPs next to roadways. Details of the Bioretention Sump are also included.
- 3) Cul-de-sac Bioretention Areas – Bioretention areas are used as water quality BMPs under MSD's Rules and Regulations, and in fact, are the most popular post-construction BMP used in the community. Bioretention stormwater management facilities are ideally suited to being located in cul-de-sacs. MSD has developed plans for a stormwater infrastructure project to include bioretention in a cul-de-sac on Chalet Court in Creve Coeur.

Additional resources:

- EPA has identified, compiled and/or published a great deal of information on various green infrastructure technologies, refer to:
<http://cfpub.epa.gov/npdes/greeninfrastructure/technology.cfm>
- EPA's green streets initiative has identified a number of programs and projects across the country:
http://www.epa.gov/owow_keep/podcasts/greenstreetsusa.html

Residential Parking

Residential parking accounts for a significant portion of our built environment. In St. Louis, private driveways account for over 9% of our impervious areas, plus impervious areas on public right of ways account for additional area for residential parking. The topic of residential parking provides for significant opportunities to reduce the area of paved surfaces. This can be accomplished by reducing the amount of impervious surface required for driveways, and by constructing driveways using pervious materials. Overall consideration needs to be given to providing needed parking within the community in a manner that uses the least amount of impervious surface. The following strategies are tools that can be used in a context sensitive approach to accomplish this.

1. Reduce the size of the driveway –

Less impervious area used for driveways can be accomplished by making the amount of paved surface in the driveway smaller, or by reducing the amount of driveway needed to serve a residential property.

- Two-track driveways – reduce the impervious area of a driveway by providing for green space on the portion of the driveway that is not needed for a vehicle's wheels to travel on. Local American Planning Association members were queried as to their use of this solution. Of the 12 responders, only one city allows the construction of two-track driveways and three do not allow them. The majority of the responders, eight, do not specifically prohibit or allow. Various additional comments indicate that this solution is not very popular.
- Shared driveways – are commonly used in St. Louis County, primarily in duplex properties, where two residences use the same driveway. Also, where off-street parking is provided, such as in lieu of on-street parking along a 20 foot wide street, shared driveways and shared parking can be a tool to reduce the impervious area.
- Smaller driveways – less than 9 feet per lane width was deemed not popular with the public or practical for use by the Work Group, and therefore, is not being recommended.

Model examples:

- 1) Two-track driveways – Rock Hill municipal code Title V, Article IV, section 505.100 allows Hollywood driveways (a strip of grass between two strips of concrete or brick).

2. Reducing runoff from a driveway -

One option to reduce runoff from driveways involves using a pervious surface. Parking areas and driveways are suitable to the installation of pervious pavement.

- Pervious driveways – can reduce the impervious area by using paving materials and designs that allow rainwater to pass through the surface. Options typically include: pervious asphalt, pervious concrete, and pervious pavers. All three types of systems are allowed by MSD and the design requirements are available online at:
<http://www.stlmsd.com/engineering/planreview/PlanReviewInformation>.

Green Space, Buildings, and Site Design

Buildings account for a significant portion of our built environment. In St. Louis, buildings account for over 31% of our impervious areas. The topic of building and site design provides for significant opportunities to reduce the area of impervious surfaces, allow for low impact development concepts, and providing for stormwater runoff treatment using post-construction BMPs that infiltrate stormwater and reduce runoff volume in addition to addressing pollutant removal through treatment alone. Realizing these opportunities can be accomplished through municipal codes that result in the protection of natural water resources and implementation of post-construction BMPs that reduce stormwater runoff:

1. Protecting Natural Resources -

A conscientious effort by government officials and developers is necessary to protect natural resources in the community. Two tools that have been used to facilitate this process include stream buffer ordinances and conceptual plan reviews by local government. These tools have been implemented in St. Louis County by the MS4 co-permittees to comply with their Phase II Stormwater Permit.

- Stream Buffers – are a protected strip of naturally vegetated land along a stream. The purpose of a stream buffer is to physically protect a stream from the encroachment of development. Stream buffers are necessary to protect the integrity of stream ecosystems and habitats. Stream buffers also protect development by maintaining the integrity of the natural storm water drainage systems. St. Louis County and 54 municipalities in the County have adopted stream buffer ordinances or setbacks.
- MSD Site Design Guidance – is a document that city planners and public works professionals can use in their site design approval process to meet the requirements of their MS4 permit and to encourage better site design within their community to protect the environment. St. Louis County and 46 municipalities have implemented the MSD Site Design Guidance or an equivalent process. The document calls for the evaluation of existing conditions on a proposed development site to determine the resources and sensitive areas to protect, plus the evaluation of conceptual plans to reduce impervious area and use green infrastructure, where appropriate, to the maximum extent practicable.

Model examples:

- 1) Stream Buffer Ordinance, City of Olivette Ordinance 2370 adopts the model ordinance recommended by the St. Louis County Phase II Stormwater Management Program Steering Committee.

- 2) Site Design Guidance – City of Olivette Ordinance 2426 incorporates the principles and process put forth in the Site Design Guidance to promote green infrastructure within the city.

Additional resources:

- Model ordinances to protect local resources, Aquatic Buffers, EPA, <http://www.epa.gov/owow/NPS/ordinance/mol1.htm>

2. Post-Construction Runoff Reducing BMPs -

The components of better site design reviewed under MSD's Rules and Regulations for stormwater drainage include the selection of: non-structural BMPs in the form of stormwater credits that reduce the volume requirements of the stormwater criteria; pervious surfaces; post-construction BMPs that infiltrate water; and other post-construction BMPs to manage the stormwater runoff from the development site. Pervious surface materials for parking lots and driveways have been addressed in previous sections of this document and will not be repeated, however, they are definitely applicable. The selection of post-construction BMPs should include engineered systems that treat stormwater runoff and reduce runoff volume through infiltration and vegetation. MSD has adopted the Maryland Stormwater Design Manual for stormwater BMP design.

- Stormwater Credits – are non-structural BMPs that satisfy the MSD water quality criteria requirements or reduce the volume of water that must be managed by a structural BMP. These practices include: natural area conservation, disconnected impervious surfaces, sheet flow to buffers, open channels and environmentally sensitive development.



Parking lot bioretention, MO botanical Garden

- Rain Water Harvesting – involves the collection, storage and utilization of stormwater runoff from a roof. Plumbing codes expressly allowing for this practice are helpful in properly managing stormwater and encouraging sustainable water use.

- Green Roofs – are plants and associated planting media on the roof of buildings that reduce stormwater runoff. Green roofs would be considered a porous area, and reduce the development's stormwater design requirements.
- Maryland Manual BMPs – adopted by MSD that are considered to reduce runoff include: infiltration practices, dry swale open channel practices and bioretention filtering practices or other filter practices, which utilize engineered soil media bed or an enhanced infiltration design.



Model examples:

- 1) Green roof – St. Louis Community College at Wildwood
- 2) Rain water harvesting – example is the Renaissance Place stormwater retrofit (P-0029023-00).
- 3) Bioretention – Missouri Botanical Garden parking lot, 4344 Shaw, St. Louis.

Additional resources:

- MSD Engineering Department, Plan Review Documents, <http://www.stlmsd.com/engineering/planreview/PlanReviewInformation>
- EPA Green Infrastructure Technologies and Approaches, see links under Green Roofs, Rain Harvesting, rain gardens and other technologies, <http://cfpub.epa.gov/npdes/greeninfrastructure/technology.cfm>
- Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA 841-F-07-006, presents 17 case studies to compare the cost of LID and conventional stormwater management. <http://www.epa.gov/owow/NPS/lid/costs07/documents/reducingstormwatercosts.pdf>
- Illinois' Public Act 96-26, the Green Infrastructure for Clean Water Act, requires the Illinois EPA to assess and evaluate using green infrastructure to help manage stormwater in Illinois. Illinois EPA is currently working with the University of Illinois – Chicago: <http://www.epa.state.il.us/green-infrastructure/index.html>

3. Residential Tear-Downs -

Many built-out communities in St. Louis are experiencing a phenomenon called “mansionization”. Mansionization occurs when older, smaller homes are purchased, and torn down or remodeled into a home that is significantly larger than the original home. Adding impervious surfaces in the community results in a proportional amount of stormwater runoff increase due to the amount of impervious area added. Contributing to the issue is that these projects are not associated with changes in existing infrastructure design, and are typically less than an acre, which is below the applicability for MSD water quality criteria. The net effect is flooding and stormwater complaints due to significantly increasing runoff in the community without corresponding infrastructure review or upgrade, and without imposing site stormwater design criteria. A proactive approach by cities involves adopting stormwater criteria to mitigate increased runoff from projects involving less than one acre of land disturbance.

- Applicability – under the ordinance must address sites less than one acre of land disturbance to affect stormwater designs not regulated by MSD. Addressing the new construction footprint versus just impervious area additions is necessary to improve the degraded condition of all our urban streams.



Top left, a new home, larger than the original home.

- Design storm event – affects the sizing of the controls, or mitigation BMPs, to reduce runoff. Generally, a 90 to 95 percentile annual storm is considered a best practice, in St. Louis this is 1.1 to 1.5 inches of precipitation in 24 hours.
- Stormwater designs – that include rain gardens are the most popular BMP used in St. Louis. Other options are discussed in previous sections, and should be designed according to a standard design reference manual.

Model examples:

- 1) Webster Groves Stormwater Ordinance 8665, Chapter 54.

Additional resources:

- Mansionization, White Paper Discussion, City of Rockville, Maryland publication - <http://www.rockvillemd.gov/zoning/mansionization-wp.pdf>
- Managing Teardowns, Preserving Community Character and Livability, see Mansionization and Sustainability and other relevant sections, <http://www.preservationnation.org/issues/teardowns/additional-resources/Teardown-Tools-on-the-Web-1.pdf>

APPENDIX A

Model Parking Ordinance

Off-Street Parking and Loading Requirements

1. Scope of Provisions.

The regulations contained in this section and the following sections shall govern the size, number, location, and design of all off-street parking and loading facilities in the City/County.

It is the intent of this section to:

- (1) Ensure sufficient off-street parking and loading facilities are provided in proportion to the demand created by the use.
- (2) Facilitate orderly traffic circulation patterns within parking and maneuvering areas.
- (3) Reduce underutilized or redundant vehicle parking areas.
- (4) Encourage the use of parking lot design that will be beneficial to the environment and enhance neighborhood character.
- (5) Decrease stormwater impact and improve water quality.

2. Applicability

All buildings or structures which are erected or have a change in square footage or use shall comply with the parking and loading requirements herein.

3. Minimum Parking and Loading Requirements.

Uses in all zoning districts shall comply with the minimum requirements listed by use category in tables of the following sections:

CATEGORY	SECTION
Commercial Uses	Section A
Cultural, Entertainment, and Recreational Uses	Section B
Industrial Uses	Section C
Institutional Uses	Section D

CATEGORY	SECTION
Open Space and Agricultural Uses	Section E
Residential Uses	Section F
Transportation, Communication & Utilities	Section G
Loading	Section H

Planner's Note: *[According to EPA guidance, all permittees should enact parking requirements that are at or below Institute of Transportation Engineer (ITE) requirements. The following tables in this model recommend minimum parking requirements based upon the lowest parking requirement from the sources and uses listed. These referenced sources include ITE standards, American Planning Association (APA) guidance, Urban Land Institute (ULI) guidance, current St. Louis County zoning ordinance, and current City of Chesterfield zoning ordinance. Uses listed herein do not represent all possible uses and permittees may need to add use categories to this list. Ratios in the parking section tables are based on square footage (SF), or gross floor area (GFA) as defined by the sum of horizontal area of all floors of a building, including basement areas, measured from the inside of exterior walls. The GFA does not include interior loading and parking areas, atriums except on the first floor, rooftop equipment enclosures, or enclosed mall areas of shopping centers. Requirements may also be adjusted based on site analysis of developments and actual parking demand/experience. Note that the maximum parking allowed in Section 4 is based on the minimum requirement in this section.]*

Planner's Note: *[See the City of Chesterfield for an example of a municipality who utilized the ITE recommended minimum parking requirements, along with other resources, and conducted a parking demand study in support of a new parking ordinance.]*

Provided, however, that no additional parking spaces are required for permitted uses if located in a building authorized prior to [year] or in [neighborhood/geographic location].

Planner's Note: *[Redevelopment is sometimes impaired by the need to provide additional parking in existing buildings and/or developed neighborhoods. This provision encourages reuse of these areas by waiving requirements that would require additional parking be constructed. Planners should give consideration to how parking needs will be met in these areas.]*

When determination of the number of off-street parking or loading spaces required by this section results in a fraction of a space, the resulting fraction may be disregarded.

4. Maximum Parking Requirements

Non-residential uses in all zoning districts shall not contain more than 110% of the minimum number of parking spaces required except as permitted under part 7.4(b) of this Section.

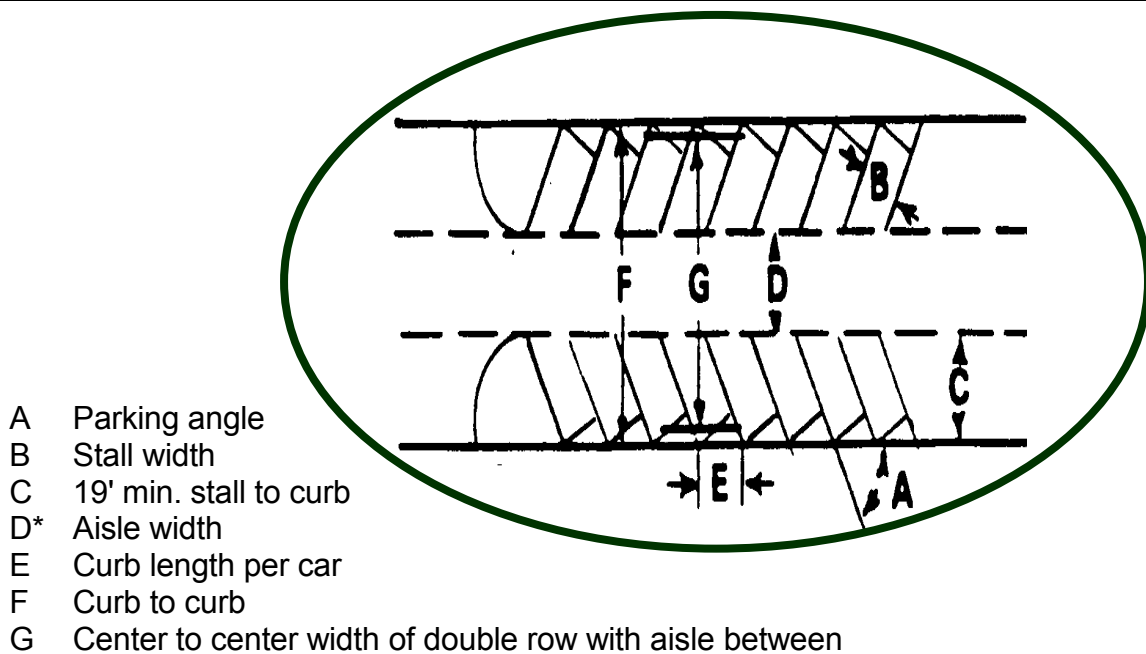
Planner's Note: *[The minimum number of parking spaces required is defined by the tables referenced in Section 3. The ratios given in the tables x 110% are not a cap on total parking, but rather a cap on impervious parking requirements and set a standard to produce the lowest impervious footprint. If more parking is needed, it can be provided by impervious area off-set (e.g. pervious pavement or green roof) or by parking study as described in Section 7.4.]*

5. Minimum Off-Street Parking Dimensions.

The regulations in this subsection shall govern the dimensions for off-street parking spaces, including those provided in developments approved in planned districts or by special procedure prior to the enactment hereof, anything in such planned district or special procedure approval to the contrary notwithstanding.

- (1) Except as otherwise provided for in this subsection, the requirements for off-street parking shall be implemented with regard to the minimum dimensions in the following table:

PARKING TABLE						
A	B	C	D	E	F	G
45°	9.0'	19.7'	12.5'	12.7'	51.9'	45.6
60°	9.0'	21.0'	17.5'	10.5'	59.5'	55.0
90°	9.0'	19.0'	22.0'	9.0'	60.0'	---



*Additional width may be required where the aisle serves as the principal means of access to on-site buildings or structures.

Planner's Note: [Angled parking results in the creation of islands that can be used as either green space or BMPs. Section 6.(9) requires these islands be "green" and not "wasted" imperviousness.]

- (2) All off-street, accessible parking spaces shall adhere to ADA requirements and standards.
- (3) In the event that the desired parking angle is not specified by the above table, Department of Planning may specify other equivalent dimensions associated with the desired parking angle by interpolating from dimensions listed in the table.
- (4) On-site parallel parking stalls shall be 9.0' x 22.0' adjacent to a 22' two-way lane or 15' one-way lane.
- (5) Compact car spaces shall be designed at a minimum of 9.0' x 18.0'. Not more than 10% of the minimum parking spaces required shall be designated for compact cars.

Planner's Note: *[Permittees should allow and encourage some reduction in parking space requirements where compact car parking is provided.]*

6. Supplementary Off-Street Parking and Loading Requirements.

In addition to the above parking and loading requirements, the following standards shall apply:

- (1) In all zoning districts, all parking and loading areas, including driveways, shall be paved with impervious or pervious pavement, except where the City/County may approve an alternate dustproofing method.

Planner's Note: *[Permittees should encourage pervious pavement. Standard details and specifications for porous pavers, pervious concrete, and porous asphalt are available from MSD.]*

- (2) All areas for off-street parking and loading in any District shall be so arranged that vehicles at no time are required to back into any street or roadway.
- (3) Off-street parking areas in the Commercial or Industrial Districts shall provide ingress and egress to any public right-of-way only at such location as approved by the City/County.
- (4) In all districts, parking spaces and drive aisles shall adhere to the minimum setbacks of the underlying zoning district. The limitations of this paragraph may be modified in a development authorized under any special procedure by its site specific ordinance.

- (5) Minimum off-street parking and loading requirements as specified in this section shall not include parking and loading spaces located in the flood plain or floodway, as determined by the City/County. (This provision does not include parking associated with permitted uses authorized in a flood plain zoning district.)
- (6) No off-street parking space required under this ordinance shall be used for any other purpose. Where a change in use creates greater parking requirements than the amount being provided, an occupancy permit shall not be issued until provision is made for the increased amount of required off-street parking.
- (7) Where an addition is made to an existing use which does not comply with the parking requirements cited for such use, additional parking shall be provided in proportion to the addition.
- (8) Where no minimum requirement is specified, or when one or more of the parking requirements may be construed as applicable to the same use, lot or building, the final determination of required parking shall be made by the City/County.
- (9) Green Space Requirements: (a) 10% of the interior parking lot area is to be dedicated to green space, or (b) each parking space shall be within fifty (50) feet of a tree or other approved vegetation, with at least 135 sq. ft. of pervious area per tree or vegetated area. Bioretention areas are encouraged to be placed between parking aisles, at the end of drive aisles, or around the perimeter of a parking lot. Landscape islands featuring no curbs or notched curbs, which contain native plants or deep rooted non-native perennial plants are preferred. Where angled parking is provided, resulting islands shall be landscaped or used for stormwater BMPs.

Planner's Note: *[Permittees should require a minimum amount of interior landscaping that that can be used for tree planting areas or BMPs.]*

- (10) Based upon site conditions and appropriate documentation, the Director of Planning may authorize up to 10% of the required parking spaces to be satisfied by providing bicycle parking spaces in lieu of vehicular parking spaces.
- (11) All parking spaces required by this ordinance shall be located on the same parcel of land as the use to be served except as follows:
 - (a) Parking for one or more uses in a commercial or industrial district may be provided on a separate lot when said separate lot is within a similar zoning district type and within 300 feet of the use or uses to be served,

as measured along a pedestrian walkway designed to allow pedestrians to safely access the use.

- (b) When two (2) or more owners agree to provide their required parking spaces jointly, the number of joint parking spaces shall be equal to the number of parking spaces required if each were to provide parking separately, unless otherwise stated in this Section.
 - (i) The applicants for joint parking shall submit a joint parking plan and an appropriate legal instrument of agreement among the involved property owners for review by the Planning Director.
 - (ii) Such joint parking plan and agreement shall include language binding the owners of the properties and their successors and assigns to the agreement and limiting and controlling use of land to those uses and conditions accepted by the Planning Director and agreed to by the owners of the properties involved.
 - (iii) The applicant shall record the joint parking agreement with the County Recorder of Deeds.

Planner's Note: *[To minimize the creation of excess parking, permittees should encourage shared or joint parking plans.]*

7. Modifications to These Requirements

An applicant may request a modification of the requirements of this Section of the Ordinance by providing a Parking Demand Study, as defined below, that supports the request and demonstrates by clear and convincing evidence that the requested modifications are appropriate for the site and do not cause detriment to adjacent properties.

Planner's Note: *[Permittees should allow parking demand studies to be used to determine when a reduction in the minimum parking requirement is appropriate. Consideration of site proximity to transit, car pooling, bicycle parking, adjacent uses, hours of operation, and other factors should be considered.]*

- (1) A Parking Demand Study is required when an applicant:
 - (a) Requests a reduction in the minimum parking requirements;
 - (b) Requests to exceed the maximum parking requirements;
 - (c) Requests any other modification to the standards of this Section.

(2) The Parking Demand Study shall contain the following information as determined by the City/County:

- (a) A plan which graphically depicts where the parking spaces, loading spaces, stacking area, and parking structures are to be located, as well as the onsite circulation for automobile, pedestrian, and bicycle movement.
- (b) A report which demonstrates how any variations from this Section were calculated and upon what assumptions such calculations were based; and how everything shown on the plan complies with, or varies from, applicable standards and procedures of the City/County.
- (c) The plan shall show all entrances and exits for any structured parking and the relationship between parking lots or structures and the circulation.
- (d) The plan, supported by the report, shall show the use, number, location, and typical dimensions of parking and loading for various vehicle types including passenger vehicles, trucks, vehicles for mobility-impaired persons, motorcycles, buses, other transit vehicles and bicycles.
- (e) The plan, supported by the report, shall include phasing plans for the construction of parking facilities and any interim facilities planned.
- (f) Whenever the applicant requests (1) to reduce the number of required parking spaces, or (2) to exceed the maximum parking provided for in this Section, the required report shall document how the proposed parking was calculated and upon what assumptions such calculations were based.
- (g) Such other information as determined by the Planning Director to be necessary to process the Parking Demand Study.

(3) Design features and review criteria including, but not limited to those listed below, will be reviewed when in conjunction with requests for modification to any of the requirements of this Section.

- (a) The Parking Demand Study provides sufficient number and types of spaces to serve the uses identified on the site.
- (b) Adequate provisions are made for the safety of all parking facility users, including motorists, bicyclists and pedestrians.
- (c) Sites are designed to minimize or alleviate traffic problems.
- (d) Parking spaces are located near the uses they are intended to serve and shall provide safe and convenient access for pedestrian access to the facility.
- (e) Adequate on-site parking is provided during each phase of development of the district.
- (f) The development provides opportunities for shared parking or for other reductions in trip generation through the adoption of transportation demand management (TDM) techniques to reduce trip generation,

such as car pools, van pools, bicycles, employer transit subsidies, compressed work hours, and high occupancy vehicle (HOV) parking preference.

(g) Reductions in the number of parking and loading spaces should be related to significant factors such as, but not limited to:

- Shared parking opportunities between different land use categories or uses with different hours of operation;
- The availability and incorporation of transit services and facilities;
- Opportunities for reduced trip generation through pedestrian circulation between mixed-uses;
- Off-site traffic mitigation measures;
- Recognized variations in standards due to the scale of the facilities;
- Parking demand for a specified use;
- The provisions of accessible parking spaces beyond those required per the City/County Code;
- Provision of bicycle parking spaces; and
- Opportunities for reduced loading requirements, based on business practices.

(4) Requests for modifications will be considered by the Planning Director and may be approved if the requested modifications are appropriate to the site and do not cause detriment to the adjacent properties. If said request for modifications is approved, the property owner(s) involved in the Parking Demand Study shall submit a written agreement to the City/County requiring that the parking facility and any associated transportation demand management (TDM) techniques shall be maintained without alteration unless such alteration is authorized by the Planning Director. Such written agreement shall be approved by the City/County and recorded by the property owner with the County Recorder's Office prior to the issuance of a building permit, and a copy filed in the project review file.

Review Procedure.

- (a) Requests for a reduction in the minimum parking requirement:
- i) The Planning Director shall review, and may approve, requests for reduction for up to twenty percent (20%) of the minimum parking requirement.
 - ii) Requests that exceed twenty percent (20%) shall be subject to the review and approval of the Planning Commission.
- (b) Requests to provide parking in excess of the maximum parking requirement:
- i) Requests to exceed the maximum parking requirement by not more

than fifteen percent (15%) shall be subject to the review and approval of the Planning Director.

- ii) Requests to exceed the maximum parking requirement by more than fifteen percent (15%) shall be subject to the review and approval of the Planning Commission. Where Planning Commission approval is required for the proposed parking, the applicant shall submit a statement that identifies measures to mitigate for the increase in parking area. Mitigation measures shall be subject to the review and approval of the Planning Commission and may include, but not be limited to, the following:

- Increased open space;
- Pervious pavements;
- Green roofs;
- Cool pavement materials;
- Structured parking;
- Native vegetation; or
- Rain gardens or bioretention areas.

- (c) Review of other modifications. Requests for modifications to the requirements of this Section, other than those listed above, shall be submitted to the City/County for review and approval.

8. Phantom or Deferred Parking

Planner's Note: *[Permittees should encourage developments to use "phantom" or deferred parking and loading requirements to reduce imperviousness. Phantom parking protects against over parking a site, provides increased green space, decreases the amount of disturbed areas and is cost effective for developers.]*

An applicant may request phantom parking or deferred parking, which is to defer the construction of the number of required parking spaces and/or loading spaces until a later date. Phantom parking means that some of the required parking spaces and/or loading spaces might not be constructed unless they were deemed to be necessary after full build-out occurs, but that an area on the site would be reserved so that these spaces could be provided in the future upon demand or request by the City/County. Said demand would be made if the spaces were needed to meet the parking and loading needs of the project.

- (1) The Planning Director may grant a deferral for construction of up to 50% of the off-street parking and/or loading spaces required by this Section in an industrial district; 30% in a commercial district and any other district if an applicant demonstrates:

- (a) Trip generation characteristics and time of day usage characteristics for similar uses show that the parking spaces can be reduced without causing parking to overlap into other nearby developments or onto public streets.
 - (b) Vehicles owned by the occupants are characteristically different from the norm or the proximity to employment, shopping, educational and transit developments is such that reduced auto usage would be anticipated.
 - (c) The immediate proximity to public transportation facilities serves a significant proportion of residents, employees, and/or customers.
 - (d) Operation of effective private or company car pool, van pool, bus or similar transportation programs with proof of continued financial viability.
 - (e) Evidence that a proportion of residents, employees, and/or customers utilize, have available or on a regular basis use bicycle or other transportation alternative commensurate with reduced parking requirements.
 - (f) Development will be in phases so that deferring the parking will have green space until further build-out. The site must meet all parking requirements based upon square-footage actually built.
 - (g) The businesses' delivery requirements for operations and delivery vehicles utilized require less loading space than the minimum required.
- (2) Applicants for deferral of parking shall provide a written statement which addresses how the proposal meets the applicable criteria. The application shall include a site plan depicting the total required parking and loading on-site, and the deferred parking and loading area(s) shall be labeled as reserved for future parking.
- (3) The land area delineated for deferred parking shall be shown on the plan with proposed finish grades and landscaping. Landscaping for the deferred parking area shall be as approved by the Planning Director with the remainder of the site landscaped per guidelines for the appropriate district. All landscaping shall be indicated on the plan submitted.
- (4) The owner of the property, or their designated party, shall notify the City/County of any change in the conditions that was the basis for a deferral.
- (5) The City/County may require the construction of parking and/or loading in areas previously reserved at any time upon sixty days written notice. A parking deferral shall apply to the developer and all subsequent owners of said property and shall run with the land and be shown on all recorded plats. The plat shall state that the developer/owner and all subsequent owners grant the City/County, or its designated representative, authority to enter onto its property in the future to construct the deferred parking in the areas shown on the approved site plan if owners fail to take action 60 days after

receiving written notice by the City/County. The costs incurred by the City/County shall be repaid by the owners or shall be placed as a special lien against the property. Development and construction by the City shall not be in lieu of a municipal zoning ordinance violation, but shall be in addition to any action taken for violation of provisions of this ordinance.

APPENDIX B

MINIMUM PARKING and LOADING REQUIREMENT TABLES

The following tables provide recommendations for minimum parking and loading requirements. These requirements were established through discussions with the Phase II Stormwater BMP Implementation Work Group, including St. Louis County and municipal representatives, as well as research from the Institute of Transportation Engineers (ITE), Urban Land Institute (ULI) and American Planning Association (APA). The uses provided below represent an example of some of the more commonly used use terms and are not intended to be an exhaustive list. When possible, we encourage municipalities to conduct a parking demand study or analysis to determine if the parking recommendations from either ITE or APA may be reduced to accommodate the actual needs in your jurisdiction. The minimum parking requirement column lists the requirements used or published by the recommended source. The other sources column lists requirements from other sources for reference; however, these requirements were generally not recommended for the use category because they would result in additional parking spaces and impervious area. Note that the model parking ordinance specifies a maximum number of parking spaces based on a percentage of the minimum requirement.

(St. Louis County parking requirements were used as a source in the table below to represent the local requirements in St. Louis, and was selected as the model for many uses. However, in 2008 the City of Chesterfield completed a city wide parking study. The results of this study were used to reduce existing parking requirements to more accurately reflect the use and associated parking demand. Several of the minimum parking requirements in Chesterfield are less than that required by ITE, ULI, APA and St. Louis County, and therefore, have been incorporated into the model provided below. A full copy of this City of Chesterfield Parking Chapter is available at www.chesterfield.mo.us)

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Auto Sales	3 / 1000 SF of sales and showroom area, 3 spaces for every service bay in repair garage areas, and 1 space for every vehicle customarily used in operation of the use or stored on the premises. This shall not include space provided for vehicles for sale or lease	A	Chesterfield	ITE: None ULI: None APA: Automobile Dealership, 1 to 4 / 1000 GFA StLCo: 3.3 / 1000 SF of sales and showroom area, 3 spaces for every service bay in repair garage areas, and 1 space for every vehicle customarily used in operation of the use or stored on the premises. This shall not include space provided for vehicles for sale or lease
Banquet Facilities	3.3 space per 1000 square feet (SF) of gross floor area (GFA)	None	Chesterfield	ITE: None ULI: None APA: Banquet Hall, 1 to 2 parking space per 200 SF, but not less than 1 space per each 2 seats StLCo: 1 / 50 SF of floor area used for public assembly
Car Wash, Except Self Service	Stacking equal to 5 times the capacity of the car wash beyond cars in car wash	None	StLCo	ITE: None ULI: None APA: Stacking area 5 times the capacity of the car wash, plus 1 parking space per employee
Child Care Centers, Day Nurseries and Adult Day Care Centers	2.66 / 1000 GFA, or 1 space for every 10 children or adults enrolled plus 1 per employee (consider drop-off/pick-up arrangement)	None	APA: Day Care Center	ITE: 0.3/ licensed student, 1.8 / employees ULI: None StLCo: 1 per 6 person enrolled, plus 1 space per operational vehicle
Cigar and Newspaper Stands	3.33 / 1000 GFA	B	StLCo	ITE: None ULI: None APA: 1 per 300 SF of GFA

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Clubs and Lodges	1 space for every 4 seats or 1 space for every 3 members	B	StLCo	ITE: None ULI: None APA: 1 space per each 4 persons of the rated capacity
Commercial Vegetable and Flower Gardening, and Green-houses	4.0 / 1000 GFA of sales area	None	Chesterfield	ITE: None ULI: None APA: Greenhouse, 2.5 to 4 space per 1000 SF of sales area StLCo: 2 spaces for 3 employees on the maximum shift, 1 space for every vehicle customarily used in operation of the use or stored on the premises, plus 5 / 1000 GFA of salesroom
Equipment Sales, Service, Rental, and Repair	3.33 / 1000 GFA	A	StLCo	ITE: None ULI: None APA: 2 parking spaces, plus additional space for each 300 SF of floor area over 1000 SF
Filling Station (service station)	1 space for every employee on the maximum shift	None	StLCo	ITE: None ULI: None APA: 2 space per service bay, plus 1 space per employee of largest shift
Financial Institutions	3.6 per 1000 SG of gross floor area	None	ULI	ITE: 4.6 / 1000 SF of gross floors area up to 10,000 SF; Use Office ratios over 10,000 APA: 1 space per 200 SF of gross floor area, plus 1 space at each electronic banking service facility and 3 additional off-street stacking spaces per drive-in lane, plus adequate stacking area to approach each drive-thru lane StLCo: 4.5 / 1000 GFA (excluding under canopy). For drive-through tellers, stacking for each unit for sufficient size to accommodate 3 cars beyond car using teller window

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Fitness Centers, under 1,500 SF	5 / 1000 GFA	None	StLCo	ITE: 7 / 1000 GFA ULI: 5.75 per 1000 SF of gross floor area APA: 1 space per 4 persons based on the maximum allowance occupancy
Fitness Centers, 1,500 SF or more	3.33 / 1000 GFA of office, consultation, retail sales, tanning, beauty service and non-public eating area; 1 space for every 100 SF gross floor area for exercise, exercise machines and aerobics areas; 2 spaces for every 100 SF of swimming pool. Use applicable ratios for other uses at these facilities found in this table.	None	StLCo	ITE: 7 / 1000 GFA ULI: 5.75 per 1000 SF of gross floor area APA: 1 space per 4 persons based on the maximum allowance occupancy
Food Markets, 5,000 SF Gross Floor Area and over	4.5 spaces per 1,000 SQ of floor area	A	Chesterfield	ITE: 6.7 / 1000 GFA ULI: None APA: Grocery Store, 4.4 to 5 / 1000 GFA StLCo: 5 / 1000 GFA
Food Markets, under 5,000 SF Gross Floor Area (Conv. Store)	3.3 spaces per 1,000 SQ of floor area	B	Chesterfield	ITE: 6.7 / 1000 GFA ULI: None APA: Grocery Store, 3.33 / 1000 GFA StLCo: 3.33 / 1000 GFA
Furniture Store, Retail	2.5 / 1000 GFA	A	ITE	ULI: None APA: Furniture Store, 1 to 2.5 spaces per 1000 SF of floor area StLCo: 3 / 1000 GFA

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Home Improvement Centers	4.5 / 1000 GFA (all superstores)	B	ITE	ULI: None APA: Home Improvement Center, 2.5 to 5 per 1000 SF of gross floor area StLCo: 5 / 1000 GFA
Hotels, Motels	1 space for every sleeping unit, 2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	B	StLCo	ITE: 1.25 / room; plus 10/1000 GFA for restaurant; plus 30/1000 GFA for conference/banquet if 20,000-50,000 SF / room or 20 / 1000 GFA if over 50,000 SF ULI: 1.25 per room APA: 1 space per room or lodging unit
Kennels	2 spaces per kennel, plus 2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	None	StLCo	ITE: None ULI: None APA: 4 per 1000 SF of gross floor area
Laundry and Dry Cleaning Pick-up	2.5 / 1000 GFA	A	ITE: Dry Cleaners	ULI: None APA: 2 to 10 spaces per 1000 SF of gross floor area; a minimum of 4 spaces shall be required StLCo: 5 / 1000 GFA
Medical and Dental Offices and Clinics	4.5 / 1000 GFA	B	StLCo	ITE: 4.5 / 1000 GFA ULI: 4.5 / 1000 GFA APA: 6 spaces per doctor or dentist
Mini-warehouses/ Self-Storage Facilities	3.33 / 1000 GFA of office, 1 space for caretaker	B	StLCo	ITE: 1.75 / 100 units ULI: None APA: 1 space per 100 units, and 2 spaces per on-site caretaker residence

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Mortuaries	1 space for every 5 seats, 10 space minimum	None	StLCo	ITE: None ULI: None APA: 1 per 5 seats of maximum capacity
Offices and Office Buildings	3.0 / 1000 GFA	B	Indianapolis Region, Ordinance Review Checklist	ITE: If less than 25,000 SF then 3.8 / 1000 GFA; 25,000 – 100,000 SF then 3.4 / 1000 GFA ; 100,000 – 500,000 SF then 2.8 / 1000 GFA; over 500,000 SF then 2.8 / 1000 GFA ULI: Same as ITE APA: 1 per 350 SF of gross floor area StLCo: 3.33 / 1000 GFA
Produce Stands and Plant Nurseries	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises and 5 / 1000 SF sales	None	StLCo	ITE: None ULI: None APA: 1 space for every 300 SF of total sales area
Research Facilities and Laboratories (under one owner or management)				
a. Less than 100,000 SF	3.0 / 1000 GFA	B	Chesterfield	ITE: None ULI: None APA: Research Laboratory, 2.5 to 4 per 1000 SF StLCo: 3.33 / 1000 GFA up to 50,000 SF, plus 2.5 / 1000 GFA over 50,000 SF
b. 100,000 SF or larger	3.0 / 1000 GFA	B	Chesterfield	ITE: None ULI: None APA: Research Laboratory, 2.5 to 4 per 1000 SF StLCo: 300 spaces plus 2 spaces for every 3 employees over 400 employees

SECTION A: Off-Street Parking Requirements - Commercial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Restaurants, Bar, Cocktail Lounge	1 space for every 3 seats plus 2 spaces for every 3 employees on the maximum shift , Or 12.0 / 1000 GFA	None	StLCo , Chesterfield	ITE: 20 / 1000 GFA ULI: 18 / 1000 GFA APA: Restaurant, 1 per 4 seats to 20 / 1000 GFA
Restaurants, Fast Food	1 space for every 2 seats plus 2 spaces for every 3 employees on the maximum shift and 5 stacking plus 1 at order station	None	StLCo	ITE: 15 / 1000 GFA ULI: 15 / 1000 GFA APA: 10 to 20 per 1000 GFA, plus 3 stacking spaces for drive-thru window
Restaurants, less than 1,500 SF	4.5 / 1000 GFA	None	BMP Work Group	ITE: None ULI: None APA: 4 to 16.66 /1000 SF usable floor area StLCo: 5 / 1000 GFA
Retail Sales Establishment	4 / 1000 GFA	B	BMP Work Group	ITE: None ULI: None APA: 5/1000 GFA StLCo: 5 / 1000 GFA
Vehicle Service Centers and Repair Facilities	1 space for every employee on the maximum shift, 3 spaces for every service bay, and 1 space for every vehicle customarily used in operation of the use	None	StLCo	ITE: None ULI: None APA: 4 spaces per service bay, 6 spaces minimum
Veterinary Clinics and Hospitals	2.85 / 1000 GFA	None	APA: Animal Hospital	ITE: None ULI: None StLCo: 4.5 / 1000 GFA

Commercial Service Retail Center *			
Model Parking Ordinance Recommendations		ITE, ULI, APA, St. Louis County (StLCo)	
Center Size (Gross Floor Area in Square Feet)		Recommended Source	Other Sources
Under 40,000	4 / 1000 GFA	APA	ITE: None ULI: None
40,001 to 100,000	4 / 1000 GFA	APA: Retail Use	ITE: None ULI: None StLCo: 5 / 1000 GFA
Over 100,000	2.85 / 1000 GFA if center is over 100,000 GFA	APA: Retail Use	ITE: None ULI: None StLCo: 5 / 1000

*The Commercial Service Retail Center minimum parking table is applicable when there is a mixed use development that is owned and managed as a single unit. Section H, Table B applies.

SECTION B: Off-Street Parking Requirements – Cultural, Entertainment, and Recreational			
Model Parking Ordinance Recommendations		ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Recommended Source	Other Sources
Athletic Fields	18 spaces per field or 1 per every 4 seats	APA: Athletic Field	ITE: None ULI: None StLCo: 20 spaces for every diamond or athletic field, or 1 space for every 4 seats, whichever is greater. (1 seat is equal to 2' of bench length)
Auditoriums, Theatres, Meeting Rooms and Places for Public Assembly (except as noted herein)	1 space for every 4 seats or 1 space for every 50 SF of floor area used for public assembly	StLCo	ITE: None ULI: 0.20 / seat APA: 1 space per 4 seats. Theatre - 1 for each 6 seats
Batting Cages, Shooting Ranges	1 space per cage or firing station	StLCo	ITE: None ULI: None APA: Shoot Range, Outdoor - 1 per target area or 1 for 5 seats, whichever is greater. Shoot Range, Indoor - 1 per 200 SF of gross floor area. Batting Cage – 1 per cage
Bowling Alleys	4 spaces per alley	Chesterfield	ITE: 5.5 per lane ULI: None APA: Bowling Alley, 2 per bowling lane, plus 1 per every 2 employees, plus 1 / 100 SF amusement StLCo: 5 spaces for every alley
Camping	1 dust free 10x30 space for every campsite	StLCo	ITE: None ULI: None APA: 1 per campsite or bed, plus 1 for each employee
Clubs and Lodges	1 space for every 4 seats or 1 space for every 3 members	StLCo	ITE: None ULI: None APA: 1 space per each 4 persons of the rated capacity

SECTION B: Off-Street Parking Requirements – Cultural, Entertainment, and Recreational			
Model Parking Ordinance Recommendations		ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Recommended Source	Other Sources
Community Centers and Private, Not-for-Profit Recreation Centers, including Gymnasiums and Indoor Swimming Pools	3.33 for every 1000 SF gross floor area	StLCo	ITE: 5.82 / 1000 GFA ULI: None APA: 1 per 4 occupants or, in the case of nonstructural facility, 1 per 4 persons the facility is intended to accommodate
Drive-In Theatres	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use of stored on the premises	StLCo	ITE: None ULI: None APA: 10% over vehicle capacity
Fairgrounds	Sufficient open land convertible to parking such that no vehicle need be parked on any street	StLCo	ITE: None ULI: None APA: 1 per 5 seats provided
Golf Courses	Space equivalent to 1% of the total land area. Parking area available along park roads or private drives may be used to fulfill this requirement	StLCo	ITE: 9.8 per hole ULI: None APA: 1 per 3 golf holes, plus 1 per each 2 employees
Golf Driving Ranges	2 spaces per tee	StLCo	ITE: None ULI: None APA: Golf Driving Range, 1 to 2 space per tee
Gymnasium without bleachers or fixed seating (except as noted herein)	10 spaces per 1000 GFA	StLCo	ITE: None ULI: None APA: Gymnasium, 20 space for every 1000 SF floor area for seats

SECTION B: Off-Street Parking Requirements – Cultural, Entertainment, and Recreational			
Model Parking Ordinance Recommendations		ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Recommended Source	Other Sources
Indoor Soccer	50 spaces for every playing field, plus 1 space for every 3 seats of spectator seating (1 seat equals 2' of bench length), plus 2 spaces for every 3 employees on the maximum shift, but in no case less than 100 spaces	StLCo	ITE: None ULI: None APA: Soccer Field, Indoor, 40 to 60 per playing field
Miniature Golf	2 spaces for every tee	StLCo	ITE: None ULI: None APA: Golf Course, Miniature, 1 to 3 spaces per hole
Parks, Playgrounds, Picnic Grounds	Space equivalent to 1% of the total land area. Parking area available along park roads or private drives may be used to fulfill this requirement	StLCo	ITE: None ULI: None APA: Park - 1 space per 5,000 SF of land area. Picnic Area – minimum of 1 parking space per table.
Recreation Centers	3.33 spaces for every 1000 SF gross floor area	StLCo	ITE: 5.82 / 1000 GFA ULI: None APA: 1 per 4 occupants or, in the case of nonstructural facility, 1 per 4 persons the facility is intended to accommodate
Stadiums, Sports Arenas, and Gymnasiums with spectator facilities	1 space for every 4 seats (1 seat if equal to 2' of bench length)	StLCo	ITE: None ULI: Arena – 0.33 / seat Football – 0.31 / seat Baseball – 0.35 / seat APA: 1 space per 4 seats
Swimming Pools	20 spaces for every 1000 SF of water area	StLCo	ITE: None ULI: None APA: Swimming Pool, 10 to 20 spaces per 1000 SF of water area

SECTION B: Off-Street Parking Requirements – Cultural, Entertainment, and Recreational			
Model Parking Ordinance Recommendations		ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Recommended Source	Other Sources
Tennis Courts	4 parking spaces per court	StLCo	ITE: None ULI: None APA: Tennis Court, 2 to 5 spaces for every court

SECTION C: Off-Street Parking Requirements – Industrial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Section H Table	Recommended Source	Other Sources
Animal Slaughtering, Meatpacking and Rendering	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on premises	A	StLCo	ITE: None ULI: None APA: 1 space per employee on largest shift
Blacksmith, Sheet Metal, and Welding Shops		A	StLCo	ITE: None ULI: None APA: None
Extraction of Raw Materials, Logging Operations		None	StLCo	ITE: None ULI: None APA: None
Junkyards, Salvage Yards, and Wrecking Yards		None	StLCo	ITE: None ULI: None APA: 1 per every 2 employees on the maximum shift
Laundry or Dry Cleaning Plants	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on premises	A	StLCo	ITE: None ULI: None APA: 1 per employee, plus 1 per delivery vehicle
Mail Order Sales		A	StLCo	ITE: None ULI: None APA: 1 parking space shall be provided for each 2 employees

SECTION C: Off-Street Parking Requirements – Industrial

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Min Parking Requirement	Section H Table	Recommended Source	Other Sources
Manufacturing and Fabrication	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on premises	A	StLCo	ITE: 1.85 / 1000 GFA ULI: None APA: 1 parking space for every 2 employees on the largest shift
Plumbing, Air Conditioning, and Heating Equipment (sales, repairs, and warehousing)	3.33 / 1000 GFA of sales and office area, 2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on premises	A	StLCo	ITE: None ULI: None APA: 2 parking spaces, plus additional space for each 300 SF of floor area over 1000 SF
Warehousing and Wholesaling	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on premises	A	StLCo	ITE: 0.67 / 1000 GFA ULI: None APA: 1 parking space for each 1.5 employees, plus 1 space for every vehicle used in connection with the business

SECTION D: Off-Street Parking Requirements – Institutional

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Churches	1 space for every 4 seats (1 seat equals 2' of bench length), plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	None	StLCo	ITE: 0.25 / seat ULI: None APA: Church, 1 space for each 3 to 10 seats in the largest assembly room
Fire Stations	1 space for every employee on the shift	None	StLCo	ITE: None ULI: None APA: Fire: 1 space per employee on the maximum shift
Foster Homes	1 space for every 5 beds, plus 1 space for every employee on the maximum shift	None	StLCo	ITE: None ULI: None APA: Group Home for Foster Care, 1 per each employee or caregiver, 1 for each 2 residents
Group Homes for Elderly (Assisted Living Units)	1 space per 2 units, plus 2 spaces for every 3 employees on the maximum shift	None	StLCo	ITE: None ULI: None APA: 1 space per 4 residents, plus 1 space per employee
Hospitals	1 space for every 2 beds, plus 1 space for every staff doctor and employee on the maximum shift	B	StLCo	ITE: None ULI: None APA: 1 space for every 2 beds
Libraries, Reading Rooms	2.0 / 1000 GFA	None	Chesterfield	ITE: 4.19 / 1000 GFA ULI: None APA: Library, 2 to 4 for each 1000 SF of floor space, StLCo: 5 / 1000 GFA, 1 space for every 6 seats in an accessory auditorium, and 2 spaces for every 3 employees on the maximum shift

SECTION D: Off-Street Parking Requirements – Institutional

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Nursing Homes (Skilled Care)	1 space for every 5 beds, 1 space for every self-care unit, and 1 space for every 2 employees on the maximum shift	B	StLCo	ITE: 0.5 / bed ULI: None APA: 1 space per 4 beds, plus 1 space per employee
Police Stations	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	None	StLCo	ITE: None ULI: None APA: 1 space for each 1,000 SF of floor area
Postal Stations	4 spaces for every customer service station, 2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	A	StLCo	ITE: None ULI: None APA: 1 per 200 SF of usable floor space, plus 1 per employee
Schools, Collegiate	2 spaces for every 3 employees on the maximum shift, 2 spaces for every 5 non-freshman resident students, 2 spaces for every 9 non-resident, commuting students	None	StLCo	ITE: None ULI: None APA: 1 per every 3.5 full time equivalent students

SECTION D: Off-Street Parking Requirements – Institutional

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Schools, Public and Private, all Grades and Vocational	1 space for every classroom and office, and 1 space for every 4 students over 16 years of age	None	StLCo	ITE: Elementary: higher of 0.2 / auditorium or gym seats and 0.25 / student. High School: higher of 0.3 / auditorium or gym seats and 0.3 / student. ULI: None APA: Elementary: 2 per classroom Primary/Secondary: 1 space per 15 students Vocational: 0.33 per student, plus 1 per staff
Schools, Special	1 space for every classroom and office	None	StLCo	ITE: None ULI: None APA: 30 % of building capacity

SECTION E: Off-Street Parking Requirements – Open Space and Agriculture				
Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Agriculture Operations, Farm Buildings	Sufficient open land available for parking so that no vehicle need be parked on any street	None	StLCo	ITE: None ULI: None APA: 1 per employee
Cemeteries	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises	None	StLCo	ITE: None ULI: None APA: 1 space per 4 visitors to the maximum capacity
Forest and Wildfire Reservations	Sufficient open land available for parking so that no vehicle need be parked on any street	None	StLCo	ITE: None ULI: None APA: Sufficient open land available for parking so that no vehicle need be parked on any street

SECTION F: Off-Street Parking Requirements – Residential				
Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Dormitories or Group Living Facilities	1 space for every 2 dormitory units or 1 space for every 3 occupants	None	StLCo	ITE: None ULI: None APA: Dormitories, 1 space for every 4 sleeping rooms to 1 space per 2 beds
Dwellings, Multiple Family, Row Houses, or Other Group House Arrangement	1.5 spaces for every living unit*	None	StLCo	ITE: 1.65/ dwelling unit rental; 1.85/ dwelling unit owned ULI: Rental: 1.65/unit; Owned: 1.85/unit APA: 1.5/unit
Dwellings, Single Family (including Single Family Earth Sheltered)	1 space for every dwelling	None	StLCo	ITE: 2/dwelling ULI: Rental: 1.65/unit; Owned: 1.85/unit APA: 2 per dwelling
Dwellings, Two Family	1 space for each living unit	None	StLCo	ITE: None ULI: None APA: None
* The off-street parking requirements for housing for the elderly in residential zoning districts may be reduced to 0.75 spaces per dwelling unit when approved by the City/County. When such a reduction is approved, an area of sufficient size shall be designated on the site plan to accommodate additional parking, should conversion to conventional housing occur in the future.				

SECTION F: Off-Street Parking Requirements – Residential

Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Group Homes for the Developmentally Disabled	0.35/dwelling unit	None	ITE: Assisted Living	ULI: None APA: 1 space per 2 resident beds StLCo: 2 spaces for each such use
Group Homes for the Elderly (Reuse of a Single Family Home)	0.35/dwelling unit	None	ITE: Assisted Living	ULI: None APA: 1 space per 2 resident beds StLCo: 2 spaces for each such use
Group Living Facilities for Religious Purposes	1 space for every 2 occupants	None	StLCo	ITE: None ULI: None APA: 1 space per 2 resident beds

SECTION G: Off-Street Parking Requirements – Transportation, Communication, And Utilities				
Model Parking Ordinance Recommendations			ITE, ULI, APA, St. Louis County (StLCo)	
Use	Minimum Parking Requirement	Section H Table	Recommended Source	Other Sources
Highway Department Garages	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used or stored on the premises.	None	StLCo	ITE: None ULI: None APA: 4 spaces per service bay, 6 spaces minimum
Public Utilities and Sewage Treatment Plants		None	StLCo	ITE: None ULI: None APA: 1 per employee
Radio, T.V. and Other Communication Facilities		None	StLCo	ITE: None ULI: None APA: 1 per 500 SF
Terminal (Air, Bus, Railroad, Truck, and Watercraft)	2 spaces for every 3 employees on the maximum shift, plus 1 space for every vehicle customarily used or stored on the premises, plus 1 space for every 200 SF of lobby area	None	StLCo	ITE: None ULI: None APA: Passenger Terminal, 1.66 / 1000 GFA to 5 /1000 SF net leasable area

SECTION H: Minimum Loading Requirements

When required in conjunction with uses specified elsewhere in this Chapter, loading spaces shall be provided in accordance with the following tables:

Table A	
Gross Floor Area	Number of Loading Spaces*
(sq. ft.)	10' x 40' min*
5,000 - 24,000	1
24,000 - 60,000	2
60,000 - 96,000	3
96,000 - 144,000	4
144,000 - 192,000	5
192,000 - 240,000	6
240,000 - 294,000	7
294,000 - 348,000	8
For each additional 54,000	1 additional loading space

Table B		
Gross Floor Area	Number of Loading Spaces	
(sq. ft.)	10' x 25' min	10' x 40' min*
2,000 - 10,000	1	
10,000 - 25,000	2	
25,000 - 100,000	2	1
For each additional 100,000		1 additional

* Each 10' x 40' loading space shall have a height clear of obstruction of not less than 14 ft.

APPENDIX C
MSD Non-Standard Detail, Bioretention for Parking Island

METROPOLITAN ST. LOUIS SEWER DISTRICT

Non-Standard Details of Sewer Construction

SEPT. 2010

DETAIL 7

APPENDIX D

MODEL WEED ORDINANCE

A MODEL MUNICIPAL ORDINANCE ENCOURAGING THE USE OF NATIVE PLANT COMMUNITIES AS AN ALTERNATIVE IN URBAN LANDSCAPE DESIGN

The Common Council of the City of _____ do ordain as follows:

SECTION 1. Legislative Purpose: A variety of landscapes adds diversity and richness to the quality of life in _____. There are, nonetheless, reasonable expectations regarding the city's landscapes which, if not met, may decrease the value of nearby properties, degrade the natural environment, threaten the public health and safety, or create a public nuisance. It is therefore in the public interest, and within the purview of this legislation, to provide standards for the development and maintenance of the city's landscapes, whether corporate, private, or public.

The city recognizes the landowners' and lessees' interest in having managed turf grass landscapes. At the same time, the city encourages the preservation, restoration, and management of native plant communities and wildlife habitats within the city limits. The city recognizes that the use of wildflowers and other native plants in managed landscapes is economical, reduces maintenance, and provides ecological and environmental benefits such as effectively conserving water, soil, and other elements of the natural community. Moreover, the preservation, restoration, and management of native plant communities help to preserve storm water quality, riparian corridors, stream banks, steep slopes, wildlife habitats, and other environmentally sensitive areas, without adversely affecting human health, safety, or public welfare. Native plant communities may also preclude the introduction of toxic pesticides, herbicides, fertilizers, and other pollutants into the environment.

The city further acknowledges the need to enjoy and benefit from the variety, beauty, and practical values of natural landscapes, and seeks to guarantee citizens the freedom to employ varying degrees of natural landscaping as viable and desirable alternatives to other conventional modes of landscaping.

The city seeks to encourage each landowner and lessee to create and sustain a condition of ecological stability on his or her land, that is, a state of good health and vigor, as opposed to one of impairment and decline. It is not the intent of this legislation to allow vegetated areas to be unmanaged or overgrown in ways that may adversely affect human health or safety, or pose a public nuisance. It is the express intent of this city that it shall be lawful to grow native plants, including, but not limited to ferns, grasses, forbs, aquatic plants, trees, and shrubs in a landscape.

SECTION 2. Definitions:

The following terms shall have the stated meanings.

(a) BMP. (Best Management Practice) a method used to manage storm water runoff quality and/or quantity, such as a raingarden or bioretention area.

(b) Destruction, or Destroy: The complete killing of plants, or effectually preventing such plants from maturing to the bloom or flower stage.

(c) Invasive Plant. A vegetation species that grows aggressively in the State of Missouri, as listed by the Missouri Department of Conservation.

Invasive Plant		
Examples include:		
Autumn Olive	Garlic Mustard	Sericea Lespedeza
Black Locust	Japanese Honeysuckle	Sesbania
Bush Honeysuckles	Leafy Spurge	Smooth Sumac
Common Buckthorn	Osage Orange	Sweet Clover (white & yellow)
Crown Vetch	Reed Canary Grass	Wintercreeper

(d) Landowner. One who owns or controls land within the city, including the city itself.

(e) Lessee. Any person, agent, operator, firm, or corporation having possession, occupancy or control of all or a portion of a premises pursuant to a written or unwritten lease, contract, agreement, or license with the owner.

(f) Native Plant. A vegetation species that existed prior to the arrival of European settlers within the State of Missouri, as listed by the Missouri Department of Conservation. Many native plants are listed on the Grow Native Website: www.grownative.org, and the Flora of Missouri Project, www.tropicos.org/project/mo.

(g) Noxious Weed. A vegetation species that is listed as a Missouri State Noxious Weed by the Missouri Department of Agriculture, as amended.

Noxious Weed		
Examples include:		
Canada Thistle	Johnson Grass	Musk Thistle
Common Teasel	Kudzu	Purple Loosestrife
Cut-leaved Teasel	Marijuana	Scotch Thistle
Field Bindweed	Multiflora Rose	Spotted Knapweed

(h) Nuisance Plant. Toxic species known to cause death or severe allergic reactions among a segment of the human population such as Poison Hemlock, Poison Ivy, and Ragweed.

(i) Public Nuisance. Acts committed or suffered to be committed by a person, or a substance kept, maintained, placed, or thrown upon any public or private premises which constitutes a hurt, injury, inconvenience or danger to the health, safety or welfare of the public or residents and occupants of the immediate vicinity as determined by the _____ (ENTER CITY AUTHORITY).

(j) Sight Distance. The clear line of sight necessary for pedestrian safety or safe operation of a motorized vehicle.

(k) Turf Grass. Grass commonly used in regularly-cut lawns or play areas, such as, but not limited to bluegrass, fescue, and ryegrass blends.

(l) Turf Weed. Broadleaf weeds, annual and perennial grasses, that invade or disrupt the uniformity of turf grass lawns.

SECTION 3. Landowners' and Lessees' Rights and Responsibilities:

(a) This ordinance shall apply to all landowners and lessees.

(b) Managed stands of native plants, turf grass, ornamental grasses, or shrubs, including plants that function in a BMP, and cultivated agricultural crops, vegetable gardens, or flower gardens exceeding twelve (12) inches in height are permitted provided they are maintained free of turf weeds, noxious weeds, invasive plants, and nuisance plants, are kept at least four (4) feet from a property line, and do not impair sight distance, or constitute a public nuisance to the public or residents and occupants of the immediate vicinity.

(c) Turf grass shall not exceed 12 inches.

(d) If turf weeds, noxious weeds, invasive plants, and/or nuisance plants are determined to be a public nuisance, said vegetation shall be destroyed by the Lessees or Landowners on whose land they grow.

(e) The City may control turf grass in excess of 12 inches, noxious weeds, invasive plants, and nuisance plants as set forth in Section 4 below.

(f) It is forbidden to place or dump dead plant material such as lawn clippings, weeds, leaves, tree trunks, and tree branches, in or near storm sewers, creeks, drainage swales, stream banks, or steep slopes in such a manner that constitutes a public nuisance to the public or residents and occupants of the immediate vicinity, or impairs drainage.

SECTION 4. Controls:

The city may not damage, remove, burn, or cut vegetation of any landowner or lessee for which the city does not have management responsibilities, except following a hearing at which it is established (1) that noxious weeds, invasive plants, and/or nuisance plants specifically named in the landscape ordinance exist in the landscape and they pose a condition creating a public nuisance ; or (2) that the condition is a threat to the agricultural economy; or (3) that the conditions of SECTION 3, entitled Landowners' and Lessee's Rights and Responsibilities, have not been met. A court order under these subsections shall provide that the destruction, cutting, or removal of the offending vegetation shall be selective so as not to harm that vegetation which is compliant with the law.

SECTION 5. Signage:

Where native plant communities and/or wildlife habitats are present on properties within the City, educational signage shall be posted to describe and identify the general limits of such areas that are likely to be seen by the public. This is required on all non-residential properties and residential common ground properties over 1/4-acre where native plant communities are present.

APPENDIX E

St. Louis County Design Criteria for the Preparation of Improvement Plans, Section 20.30 with recommended revisions underlined.

20.30 Residential Street Design Criteria

1) Right-of-Way and Pavement Width Requirements:

Street Classification	R/W Width	Pavement Width	Standard Dwg. No.
2 Lane Minor Local ⁽¹⁾	34 <u>(5)</u>	20 ⁽³⁾	C203.80
2 Lane Minor Rural ⁽¹⁾	34 <u>(5)</u>	20 ⁽³⁾	C203.81
2 Lane Local	50 ⁽²⁾ <u>(5)</u>	26 ⁽³⁾	C203.82
2 Lane Rural Local	50 ⁽²⁾ <u>(5)</u>	26 ⁽³⁾	C203.83
3 Lane Local	60 <u>(5)</u>	38 ^(3,4)	C203.84

- ⁽¹⁾ The 34' right-of-way width section requires additional drainage and utility easements on both sides of the roadway as determined by the Department. It is limited to cul-de-sac streets serving not more than 25 lots and loop streets limited to 50 lots, where adequate off-street parking is provided on each lot, or in communal or guest parking arrangements.

Planner's Note: *[When making changes to street design requirements, it may be necessary to review and update subdivision, zoning, or other ordinances impacting street design to ensure no conflicts exist regarding any of the recommended revisions.]*

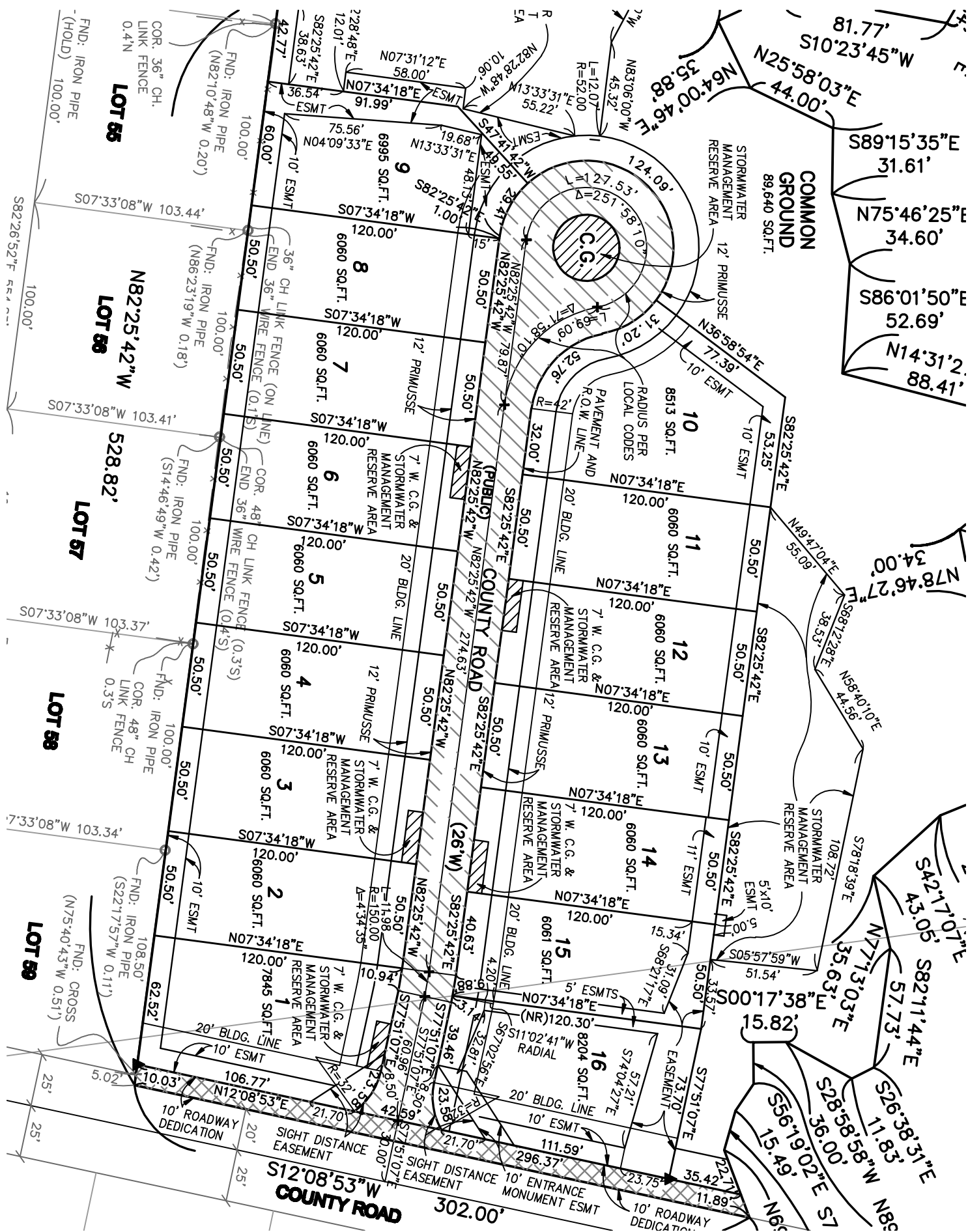
- ⁽²⁾ As provided by Section 1005.180 of the Subdivision Ordinance in any residential zoning district where eight (8) or fewer single family lots, including corner lots, are proposed on a cul-de-sac street which will not contain sidewalks, a forty (40) foot right-of-way is permitted with additional easements as required for drainage and utilities.
- ⁽³⁾ All of the above designated pavement widths shall be constructed with rolled curb with the exception of the following conditions:

- a) Where subdivisions are approved with commercial lot frontages which require vertical curb.
 - b) Where subdivision Collector streets are designed with vertical curb and restricted access and adjacent lots are served from the internal cul-de-sac and loop streets.
 - c) Where 2 Lane Local streets are approved for improvement with open drainage facilities as shown on Standard Drawings C203.81 and C203.83.
- (4) The 38' pavement width shown for 3 Lane Local streets shall be designed in accordance with the following lane configurations:
- a) 3 driving lanes where adjacent residential lots are served from internal cul-de-sac and loop streets.
 - b) 2 driving lanes with 2 emergency parking lanes where adjacent residential lots are served from the collector roadway. However, at major intersections 3 driving lanes with tapers, appropriate pavement joint transitions and posted parking restrictions will be required.
- (5) Where post-construction stormwater quality facilities are located at the edge of pavement, the right-of-way shall end at back of curb, with additional easements as required for roadway, improvements, maintenance, utilities, sewers, and sidewalks (PRIMUSSE).

Planner's Note: [The intent of Note ⁽⁵⁾ is to allow stormwater BMPs to be located at the edge of pavement, and to clarify that BMP maintenance obligations reside with property owners by locating the facilities outside of the right-of-way.]

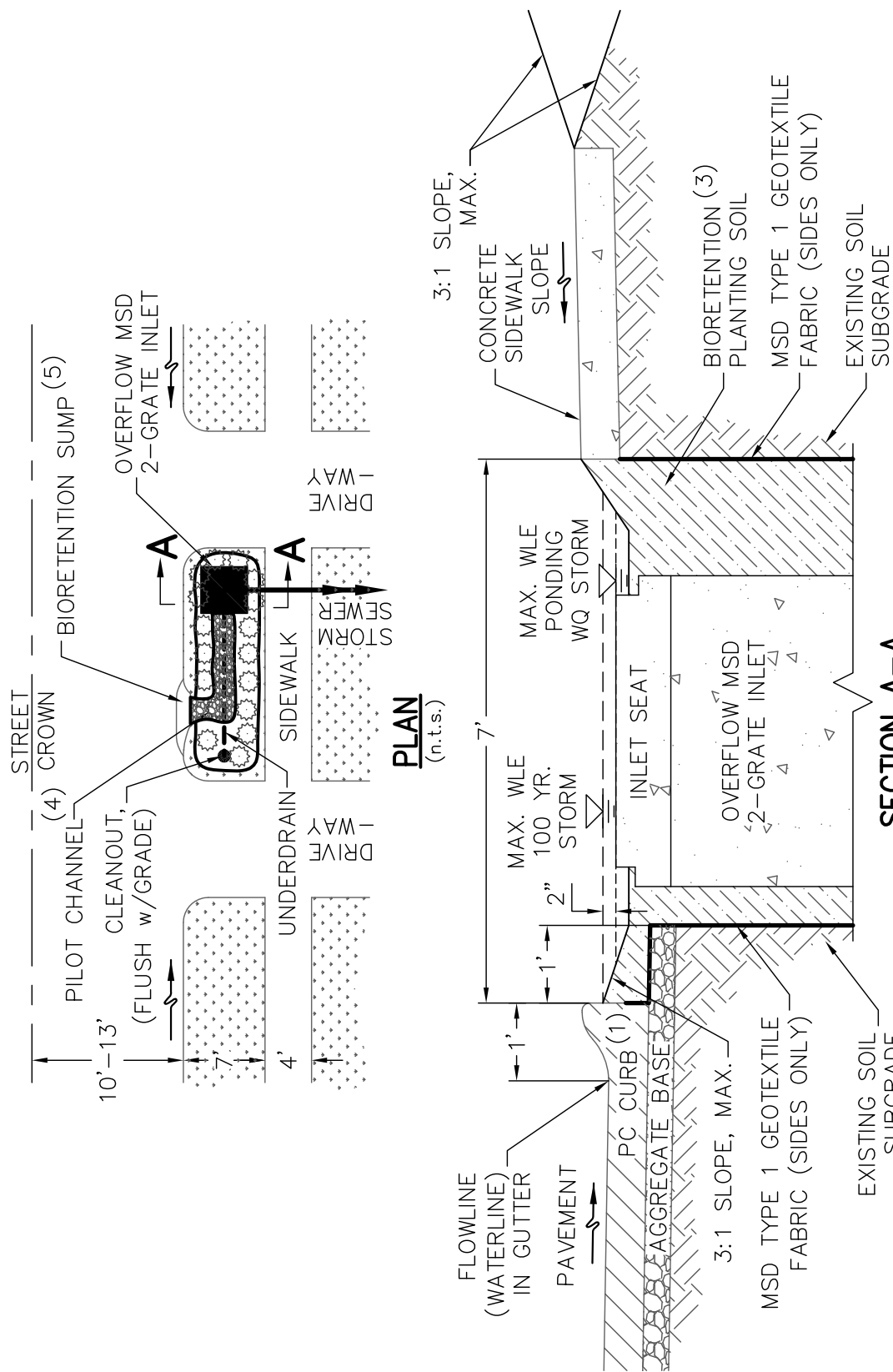
APPENDIX F

Model Property Plat for BMPs at the Edge of Roadway



APPENDIX G

MSD Non-Standard Details of Sewer Construction for Roadway Bioretention



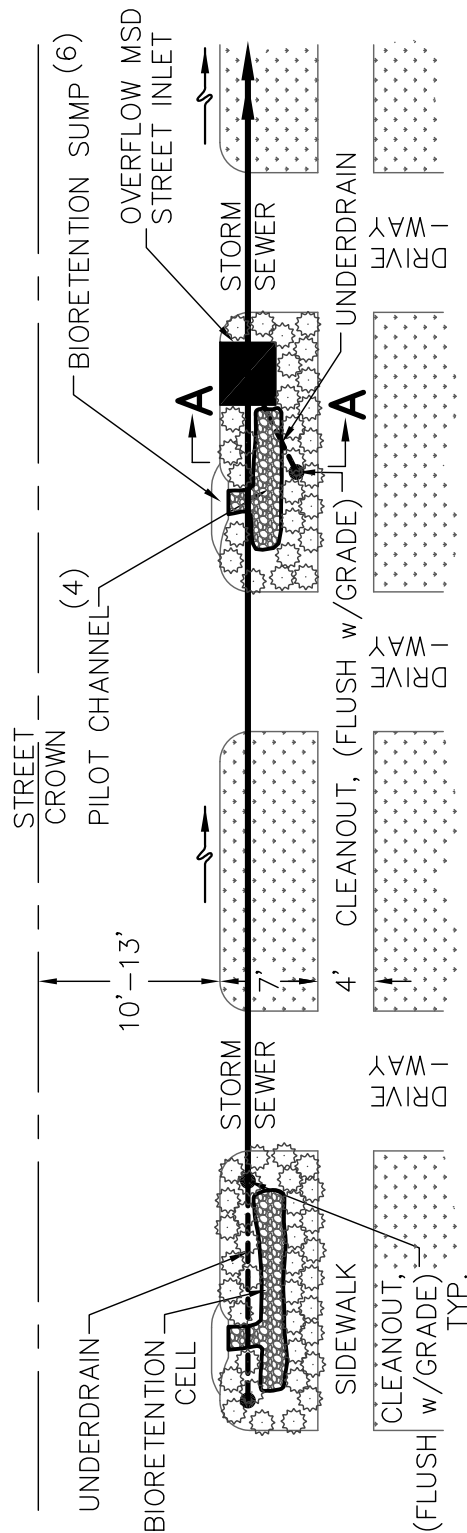
ROADWAY BIORETENTION,
WITH 2-GRATE INLET IN CELL

METROPOLITAN ST. LOUIS SEWER DISTRICT
Non-Standard Details of Sewer Construction

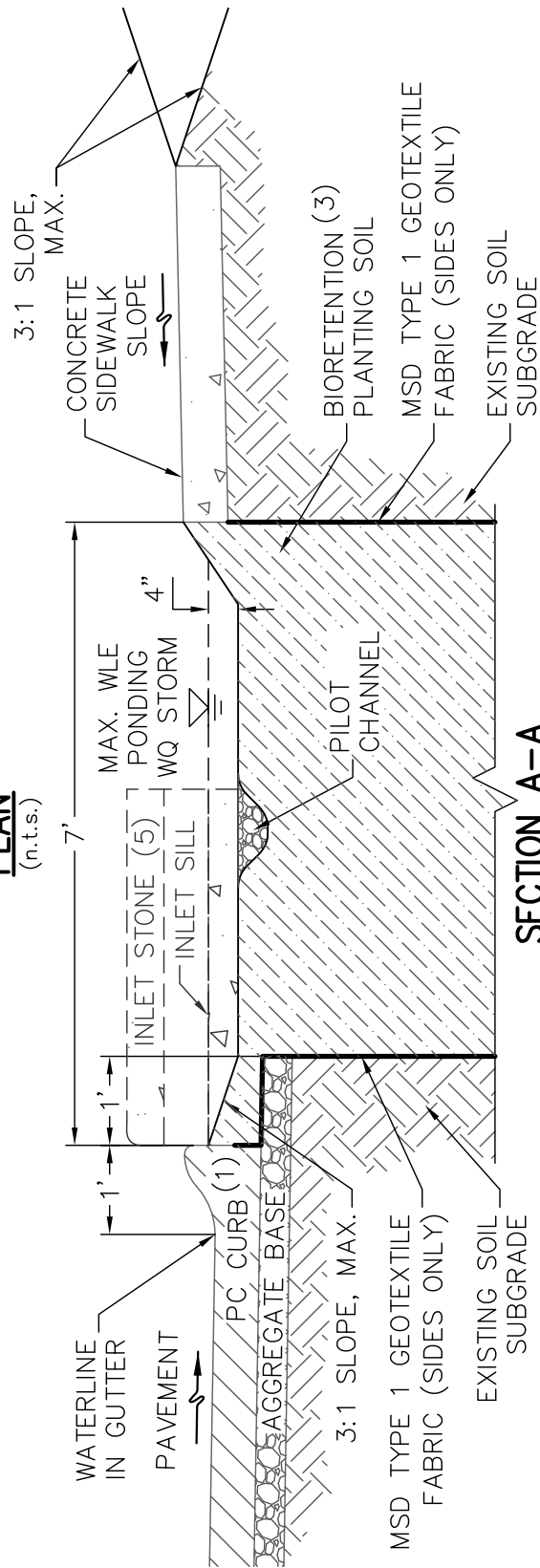
Dr. S.E.G.
Ch. J.S.H.

AUGUST 2010

DETAIL 1



PLAN
(n.t.s.)



SECTION A-A
SCALE: 1"=20'

NOTES:

- (1) ROLLED CURB SHOWN. VERTICAL CURB ALSO ACCEPTABLE.
- (2) UNDERDRAIN NOT SHOWN IN SECTION VIEW, TO BE CONNECTED TO OVERFLOW MSD STREET INLET.
- (3) ALL PLANTING SOIL TO BE VEGETATED. MULCH & VEGETATION NOT SHOWN FOR CLARITY IN SECTION VIEW.
- (4) PILOT CHANNEL DESIGN BY ENGINEER. STONE, PAVERS OR EROSION MAT ACCEPTABLE.
- (5) OVERFLOW MSD STREET INLET SHOWN BEYOND.
- (6) MAX PONDING DEPTH AT SUMP=4". GREATER PONDING DEPTHS ALLOWED WHERE (DOWN GRADIENT) GRADES ALLOW.

ROADWAY BIORETENTION, WITH INLET

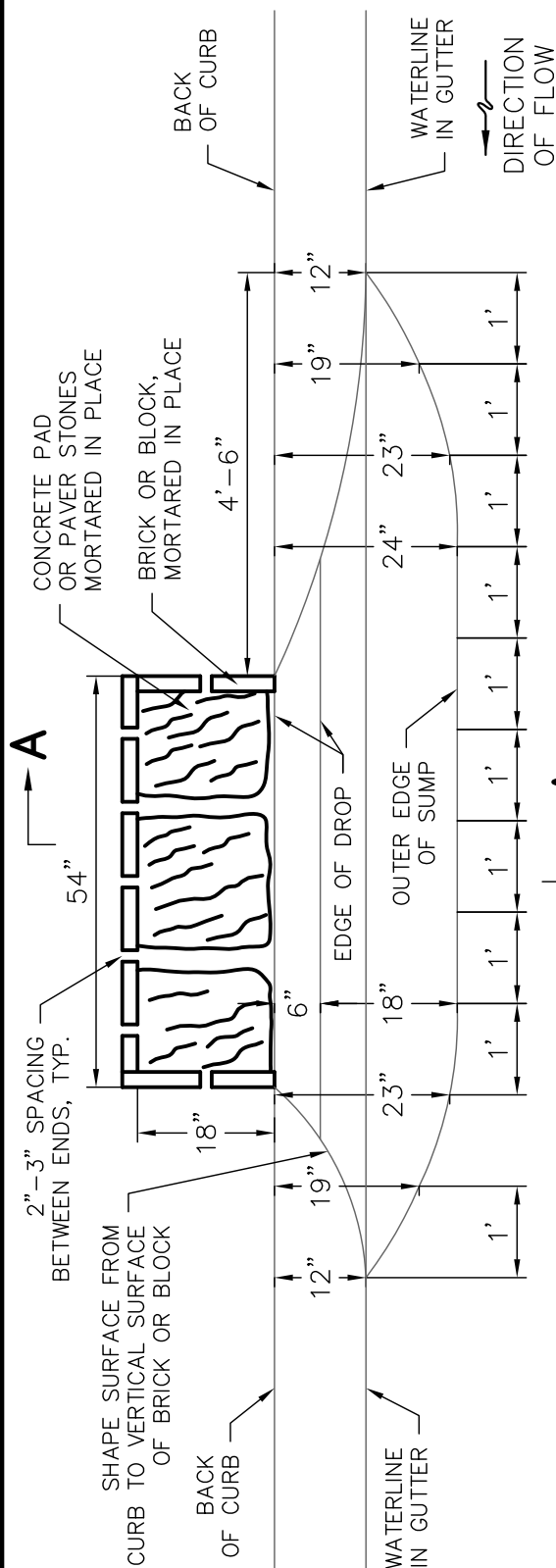
METROPOLITAN ST. LOUIS SEWER DISTRICT Non-Standard Details of Sewer Construction

Dr. S.E.G.
Ch. J.S.H.

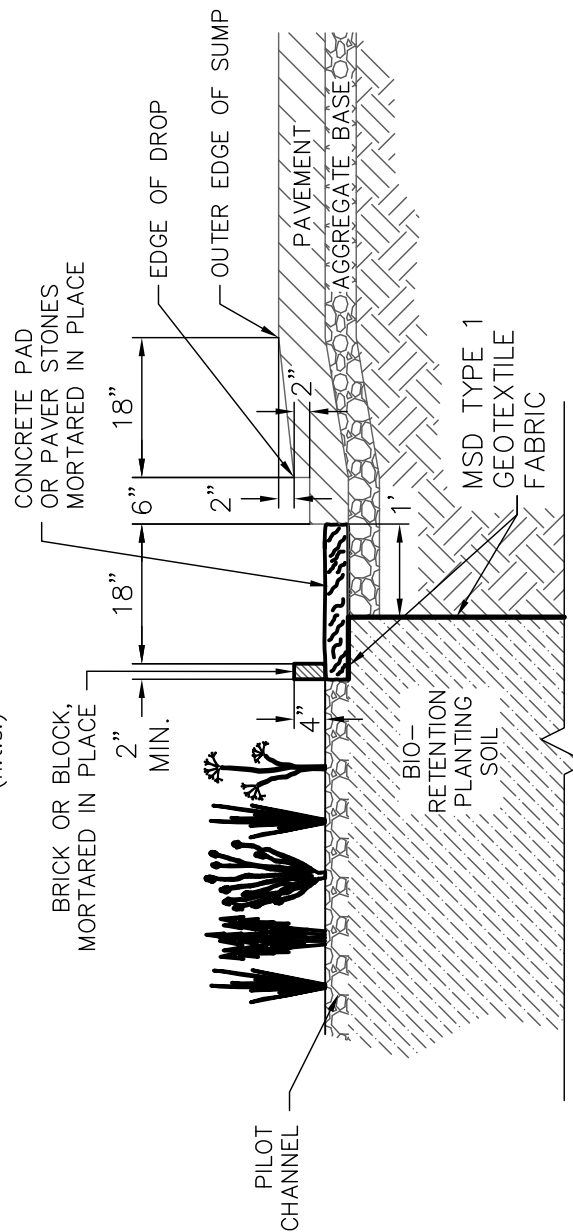
AUGUST 2010

DETAIL 2

DRAFT FINAL



PLAN
(n.t.s.)



SECTION A-A
SCALE: 1"=20'

SUMP DETAIL FOR BIORETENTION AT EDGE OF ROADWAY

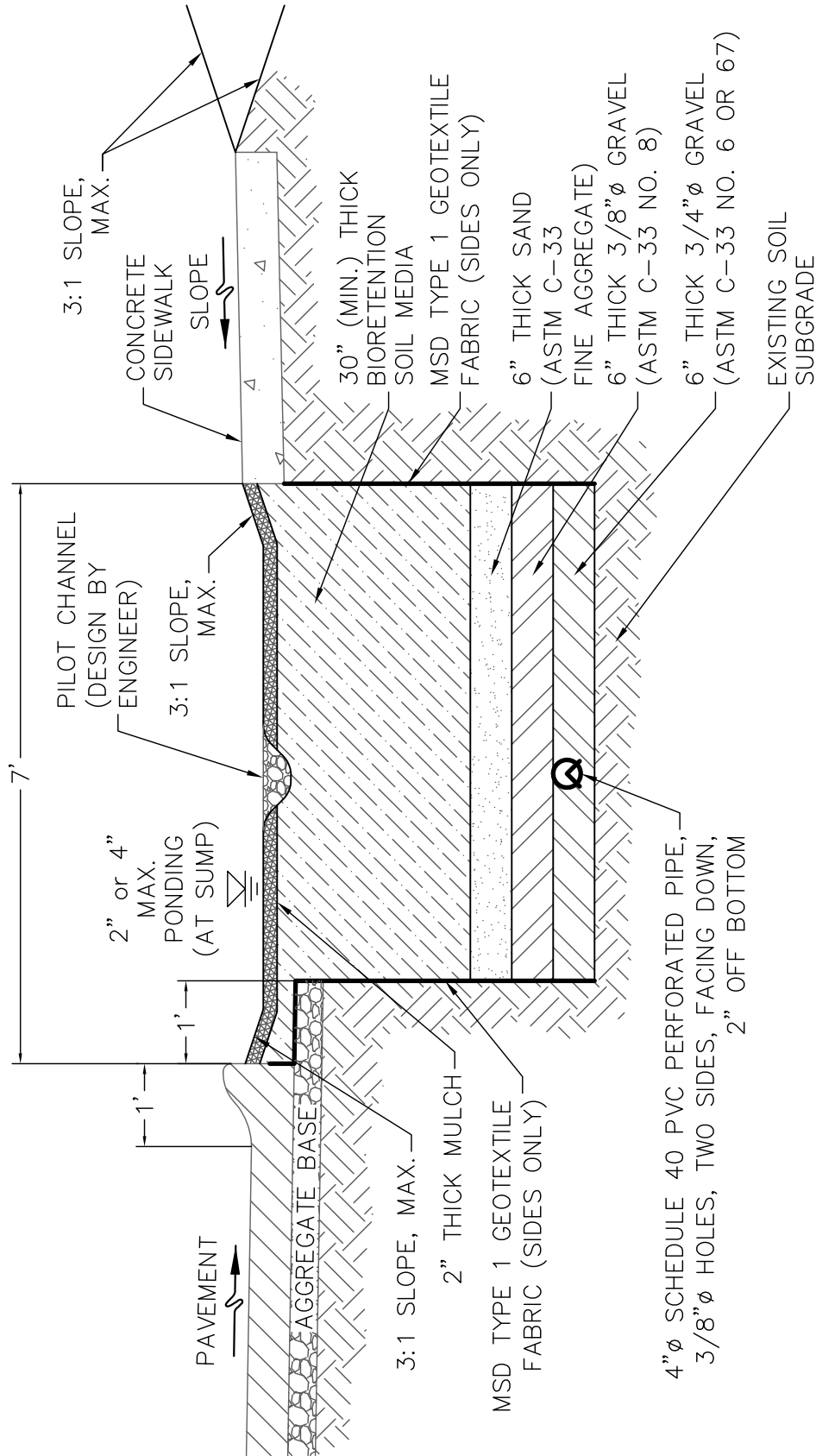
METROPOLITAN ST. LOUIS SEWER DISTRICT

Non-Standard Details of Sewer Construction

Dr. S.E.G.
Ch. J.S.H.

AUGUST 2010

DETAIL 3



TYPICAL SECTION

SCALE: 1"=20'

NOTES:

- (1) MUST BE PROVIDED WITH OVERFLOW INLET.
- (2) SEE MSD LANDSCAPE GUIDE FOR BIORETENTION SOIL SPECIFICATIONS.
- (3) MAXIMUM DRAINAGE AREA TO ANY ROADWAY BIORETENTION = 0.5 ACRES.
- (4) VEGETATION NOT SHOWN FOR CLARITY. SEE MSD LANDSCAPE GUIDE FOR MULCH & SUGGESTED PLANT LIST.
- (5) UTILITIES PARALLEL TO BIORETENTION TO BE PROVIDED BEHIND SIDEWALK OR UNDER PAVEMENT WHERE PRACTICABLE.
- (6) ALL SAND & GRAVEL TO BE NATURAL, UNCRUSHED.

BIORETENTION FOR ROADWAY TYPICAL SECTION

METROPOLITAN ST. LOUIS SEWER DISTRICT *Non-Standard Details of Sewer Construction*

Dr. S.E.G.
Ch. J.S.H.

AUGUST 2010

DETAIL 4