

## **Appendix S-1**

# **Suggested Implementation for All Site and Water Guidelines**

This document is intended to offer some guidance on the issues to consider throughout the planning, design, construction and operation processes to help achieve and improve on the performance for each guideline. This document is optional and is not a checklist to insure compliance. See the guidelines sections themselves to identify specific requirements and any time sensitive deadlines for those requirements.

### **S.1 Avoidance of Critical Sites**

#### **Agency Planning**

- Determine ideal spatial needs for existing or new development.

#### **Pre-design-Programming**

- Determine what type of infrastructure, constructed or natural, will be needed or desired to support the proposed development.
- Require a site and water pre-design meeting with agency and Owner and Owner's consultants.

#### **Pre-design-Site Selection**

- Select a site that will tolerate the stormwater conditions of the proposed development using natural topography of the sites' low point to design system based on gravity.

### **S.2 Stormwater Management**

#### **Pre-design-Site Selection**

- Select a site where the soil conditions will tolerate the increased stormwater flow caused by the impervious surfaces of the building(s) and its infrastructure.
- Perform a topographic, utility, boundary, and wetland survey with supporting calculations.
- Optional: Perform a geotechnical analysis of the site to determine water storage/evaporation conditions and potential problems.

#### **Schematic Design**

- Determine what types of stormwater management techniques are appropriate for the specific building type and supporting infrastructure, including pervious paving.

#### **Design Development**

- Develop details based on the specific site condition and surrounding environment with supporting calculations.

#### **Construction Documents**

- Develop details based on the specific site condition and surrounding environment with supporting calculations.

#### **Construction Administration**

- Make bidders aware of specific requirements for sustainable construction.

#### **Construction**

- Construct stormwater management features in a sustainable manner, according to drawings and specifications.

#### **Ongoing Occupancy and Next Use**

- Maintain stormwater management features as per Operations & Maintenance Plan prepared by designers and/or approved by regulators.
- Maintain as-built records of stormwater systems and performance data.

### **S.3 Soil Management**

#### **Schematic Design**

- Plan for 2 cubic feet of tree root volume per one square foot of mature tree canopy
- Plan for and incorporate guideline requirements into design.

#### **Design Development**

- Plan for 2 cubic feet of tree root volume per one square foot of mature tree canopy
- Plan for and incorporate guideline requirements into design.

#### **Construction Documents**

- Incorporate performance criteria into contract documents

#### **Construction Administration**

- Design Team observe that performance criteria are being met

#### **Construction**

- Implement practices needed to meet performance criteria according to contract documents

#### **Correction Period**

- Confirm successful implementation of performance criteria

### **S.4 Sustainable Vegetation Design**

#### **Predesign-Site Selection**

- Select a site where damage to existing soil, water, and flora/fauna can be minimized, thereby lowering construction costs.

#### **Schematic Design**

- Determine the areas of soil, water, and plant cover on the project site that are necessary to remain undisturbed because of their function of sustaining and protecting the site from soil compaction, soil erosion, and flora/fauna loss. Document that performance criteria are met by design.

### **Design Development**

- Develop site disturbance techniques that minimize negative impacts on soil, water, and flora/fauna on the site and adjacent sites.

### **Construction Documents**

- Develop detailing and specifications that support the use of native plantings, maintain existing biodiversity, and promote enhancement of site conditions for acceptable flora/fauna.

### **Construction Administration**

- Make bidders aware of specific responsibilities for integrating the on-site techniques with adjacent site connection conditions.

### **Construction**

- Protect existing plants and trees indicated to remain and maintain or improve soil and water conditions to promote and improve growth.

### **Ongoing Occupancy**

- Maintain and enhance at least the minimum spatial areas necessary for soil stabilization, stormwater control, and flora/fauna establishment. This is determined by soil-type standards, local watershed guidelines, and minimum plant and green corridor widths.

### **Next Use**

- Document the existing natural condition and its ability to function in its current capacity. Note what enhancements, and enlargements or reductions in spatial area would be needed to accommodate a different building type in the future.

## **S.5 Light Pollution Reduction**

### **Pre-design-Site Selection**

- Avoid sites where adjacent uses or occupancies create negative environmental, community, or human impacts which cannot be mitigated by project site or building design.

### **Schematic Design**

- Determine landscape areas that need maximum, medium, and minimum levels of coverage based safety, security, and environmental concerns. Take into consideration existing nighttime ambient lighting levels.

### **Design Development**

- Develop coverage patterns of lighting and height of light poles in scale with adjacent buildings, natural areas, and pedestrian zones to reduce glare, increase wayfinding, and minimize light trespass at site periphery.

### **Construction Documents**

- Develop site lighting to address the following:
- Add cut-off fixtures to put light only where needed.
- Use lamps with appropriate color rendition for adjacent surroundings.
- Use correct luminaire style to provide subdued or enhanced light patterns for safety in areas with transitioning light levels.

#### **Construction Administration**

- Monitor submittals for compliance with plans and details.
- Make bidders aware that plans are diagrammatic; adjustments will need to be made when installing lighting in wooded areas.

#### **Construction**

- Install site lighting upright and plumb, with correct fixtures and attachments.
- Test lighting for correct coverage pattern and color rendition.

#### **Ongoing Occupancy**

- Monitor and maintain vegetation around lighting to keep it from obscuring light coverage pattern.
- Clean/replace light lenses at regular intervals.

#### **Next Use**

- Study existing site lighting to see if the light poles could be re-used for future projects based on their height, style of pole, lamp rendition, and luminaire type.

## **S.6 Erosion and Sedimentation Control During Construction**

#### **Pre-design-Site Selection**

- Determine soil type, soil structure, and limitations of soil, by performing a detailed geotechnical analysis of the soil.

#### **Schematic Design, Design Development, and Construction Documents**

- Determine what types of erosion and sedimentation control measures are appropriate for the specific types of soils on the site.
- Design site with provisions for preventing erosion and sedimentation. Strategies to consider include: inlet or catch basin protection devices, stockpiling topsoil for reuse, silt fencing, sediment traps, filter bags, construction phasing, stabilization of slopes, and maintaining and enhancing vegetation and groundcover. The minimum wind speed to start soil movement on an erodible soil is 13 to 15 miles per hour.
- Protect hillsides using erosion control measures. Strategies to consider include: cover crops, hydro seeding, and compost, erosion control blankets, erosion control logs or check dams, flocculants to clarify dewatering discharge, and/or sedimentation ponds to collect runoff.
- Document using appropriate drawings, specifications, and worksheets.

#### **Construction Administration**

- Coordinate with contractors to ensure correct application of erosion and sedimentation controls and necessary modifications.

#### **Construction, Ongoing Occupancy**

- Maintain temporary erosion control until the site is vegetated and stormwater infrastructure is fully functional. Thereafter, create an operations and Management manual that requires at least twice per year inspections and necessary maintenance of all BMPs and stormwater infrastructure.”

## **S.7 Landscape Water Efficiency**

### **Pre-design-Site Selection**

- Evaluate the site for existing natural features available for capturing water for re-use, and abundant stands of native plants adapted to harsh conditions and low water.

### **Schematic Design**

- Determine spatial areas needed for plants to perform their functions of protecting the soil from erosion, aerating the soil, and reducing the heat island effect.

### **Design Development**

- Select native plant communities, based on the site's elevation gradient.

### **Construction Documents**

- Select individual plants within each plant community determined by their ability to perform a specific function in protecting and enhancing the site's soil and water resources.

### **Construction Administration**

- Make bidders aware of specific requirements for planting in a sustainable manner using a plant community development model.

### **Construction**

- Install native plants that occupy the low, medium, and high strata in each plant community to more effectively capture rainwater, overland stormwater runoff, and water from streams and water courses.
- Perform first and second year maintenance program to ensure establishment of plant communities which will enable them to continue with projected, minimal or no added water or chemical use.

### **Ongoing Occupancy**

- Maintain the native stands of plants needed to protect the soil and water on the site. Naturalized or adapted species may be introduced in small numbers on non-critical portions of the site.
- Install native stands of plants in an informal manner to assure the most building flexibility and plant sustainability for the next site use.

### **Next Use**

- New building and addition planning should take advantage of mature plant material on the site with its ability to structure the site, in terms of micro-climate enhancement, and screening and view-shed potential.

## **S.8 Building Water Efficiency**

### **Agency Planning**

- Develop a water efficiency improvement goal of at least 30% compared to code which is the required minimum.

### **Pre-design-Programming**

- Adapt the water efficiency goal and document it in the program

### **Schematic Design**

- Communicate the water efficiency goal to all design team members. The goal shall also be documented in the schematic design submittals.

#### **Options to consider to achieve building water efficiency:**

- Use infrared faucet sensors and delayed action shut-off or automatic mechanical shut-off valves.
- Use low-flow or ultra low-flow toilets.
- Use lavatory faucets with flow restrictors for a maximum rate of .5 GPM, or use metering faucets at 0.25 gallons per cycle.
- Use low-flow kitchen faucets at 1.8 GPM.
- Use low-flow showerheads.
- Use domestic dishwashers that use 10 gallons a cycle or less.
- Use commercial dishwashers (conveyor) which use 120 gallons per hour.
- Use waterless urinals.

### **Design Development**

- Document the water efficiency goal in the design development submittal.
- Provide annual water use calculations showing the reduction in water use compared to code. Use the total daily water requirements (Section 4715.3600) from the Minnesota Plumbing Code and the Energy Policy Act of 1992 for the basis of the calculations.\*

### **Construction Documents**

- Clearly indicate the water efficiency goal in the construction documents.
- Confirm or revise calculations from Design Development
- Specify appropriate fixtures.

### **Construction Administration**

- Review shop drawings and verify compliance with specification
- Confirm installation on site

### **Ongoing Occupancy**

- Repair or replace plumbing fixtures with same or better water use performance

#### **Options to consider to achieve building water efficiency:**

- Use infrared faucet sensors and delayed action shut-off or automatic mechanical shut-off valves.
- Use low-flow or ultra low-flow toilets.
- Use lavatory faucets with flow restrictors for a maximum rate of .5 GPM, or use metering faucets at 0.25 gallons per cycle.
- Use low-flow kitchen faucets at 1.8 GPM.
- Use low-flow showerheads.
- Use domestic dishwashers that use 10 gallons a cycle or less. Use commercial dishwashers (conveyor) which use 120 gallons per hour.

- Use waterless urinals.

## **S.9 Appropriate Location and Development Pattern**

### **Pre-design-Site Selection**

- Seek out and evaluate opportunities to locate in areas where existing infrastructure will support increased densities, and where additional development can improve site use.
- Work with local governing units and community representatives to inventory potential sites that will enhance environmental and economic performance for communities and agencies alike.

### **Schematic Design**

- Choose to develop a site where a community revitalization is occurring provided the required development density is achieved by the project's completion.
- For example: Utilize site located within an existing minimum development density of 60,000 square feet per acre (two story downtown development)

### **Design Development**

- Integrate community feedback into density development proposals, working closely with municipality to coordinate development efforts.
- Document development density.

### **Construction Administration**

- Make bidders aware of specific requirements for sustainable development.

## **S.10 Brownfield Redevelopment**

### **Agency Planning**

- In planning for new facilities, include the Brownfield redevelopment option, based on its ability to meet expectations of key locations, appropriate size, and sufficient infrastructure to support planning goals.

### **Pre-design-Programming**

- Select a building approach that is adaptable to Brownfield redevelopment.

### **Pre-design-Site Selection**

- Preferably, select a site that is eligible for the EPA's Brownfield Redevelopment program.
- Select a site where the development has the ability to benefit both owner and user; to provide tax credits and purchase incentives for the owner and to create an improved economic and social environment for the neighborhood.

## **S.11 Heat Island Reduction**

### **Pre-design-Site Selection**

- Consider sites where existing vegetation or site features provide shading that can be integrated into future uses.
- Evaluate effects of maturing plantings or changing adjacent uses and construction on future heat island effects.

- Consider sharing parking facilities, constructing parking structures to minimize parking footprint, or placing parking underground.

#### **Schematic Design**

- Determine landscape features and orientation to provide shade for impervious surfaces.
- Consider replacing impervious surfaces (i.e. roofs, sidewalks, roads, driving lanes, etc.) with open grid paving or high albedo materials to reduce overall heat absorption.
- Consider replacing roofing surfaces with high albedo materials or vegetated surfaces. (This strategy may also contribute to storm water management considerations.)

#### **Design Development**

- Develop site plan to minimize surface areas contributing to heat island effect.

#### **Construction Documents**

- Develop site lighting to address the following:
- Reduce low-albedo areas (pavements, roof, sidewalks, etc.)
- Use high-albedo surfaces (pavements, sidewalks, roof membranes or systems, etc.) to reduce heat accumulation.

#### **Construction Administration**

- Monitor submittals for compliance with plans and details.

#### **Construction**

- Install site or plant features to provide shade as designed.

#### **Ongoing Occupancy**

- Monitor and maintain vegetation around site to preserve its beneficial effects and mitigate negative developments.

#### **Next Use**

- Study existing site shading to see if its effects continue, where additional plantings may increase benefits, or where maintenance is required to preserve benefits.

## **S.12 Transportation Impacts Reduction**

#### **Agency Planning**

- Perform a transportation survey of future building occupants to identify transportation needs. Study feasibility of carpool/van pool programs.
- Determine number of vehicle trips per square foot of building and equate that to amount of CO<sub>2</sub> produced or 'reduced' over a one year life cycle by providing alternative transportation methods and monitoring their use.

#### **Pre-design-Programming**

- Include transportation amenities such as bicycle racks and showering/changing facilities, alternative fuel refueling stations in the building and site program.

### **Pre-design-Site Selection**

- Seek location accessible to two or more bus lines or a light rail station, and within walking distance of retail and public services. Also consider sites that offer the possibility of sharing transportation facilities such as parking lots and refueling stations with neighboring developments.

### **Schematic Design**

- Size parking capacity not to exceed minimum local zoning requirements. Add no new parking for rehabilitation projects.
- Provide preferred parking for carpools or van pools, or hybrid vehicles. Design to encourage use by occupants with clearly marked carpool parking, pick-up areas, and covered waiting spaces within close proximity of the building entrance.

### **Design Development**

- Design means for securing bicycles, with convenient changing/shower facilities for use by cyclists.
- Liquid or gaseous fueling facilities must be separately ventilated or located outdoors.
- Enhance the design hybrid/carpool/vanpool parking to encourage its use by occupants.

### **Construction Documents**

- Develop specifications and drawings to support decisions related to products and construction techniques for use by bicyclists, pedestrians, and mass transit/carpool members.

### **Next Use**

- Evaluate if existing transportation alternatives support next use. Maintain and improve them where possible (including connections to new trailways or transportation opportunities.)

## **S.13 Wastewater Reduction and Management**

### **Agency Planning**

- Seek direction from Local Governing Unit (LGU) or authority having jurisdiction on which water utility districts in the local community are stressed and will be impacted by this development.
- Engage the water authority about alternative proposals of graywater treatment, in order to streamline the approval process.

### **Pre-design-Programming**

- Consider ways to reduce blackwater going to the municipal wastewater system or on-site conventional septic system including: peat moss drain fields, constructed wetlands, aerobic treatment systems, solar aquatic waste systems (or living machines), and composting or ecologically-based toilets. Alternatives that can contribute to this guideline include, but are not limited to: peat moss drain fields, constructed wetlands, aerobic treatment systems, solar aquatic waste systems (or living machines), and composting or ecologically-based toilets. Reduction of building water consumption also contributes to reduced waste water generated.
- Consider ways to use graywater for non-potable water uses such as irrigation, toilets, vehicle washing, sewage transport, HVAC/process make-up water, etc. Technologies include, but are not limited to constructed wetlands, basins, cisterns, and ponds; a mechanical re-circulating sand filter; and graywater reclamation and plumbing systems.
- Determine whether gray water or biological wastewater treatment systems are appropriate based on program and activities within the building and on the site. If so, develop goals and objectives for gray water reclamation or biological treatment.

- Develop specific programming criteria and standards for biological waste treatment.

### **Pre-design-Site Selection**

- In areas not served by a public waste treatment facility, select a site that can accommodate approved exterior biological waste treatment systems such as peat moss, drain fields, treatment wetlands, etc.

### **Schematic Design**

- Evaluate availability of potential storage areas on the site (ponds, etc..) Research and analyze systems early in the design process to ensure successful and effective design solutions.
- Evaluate requirements for permits and/or variances.
- Develop appropriate design strategies and select appropriate systems based on program, occupants, and site.
- Consider alternative waste treatment system options such as peat moss drain field, constructed wetlands, consolidated systems, and composting (or ecologically appropriate) toilets instead of treating waste at municipal treatment plant.
- Develop strategies that integrate ecologically appropriate toilets and related systems.
- If considering constructed wetland systems, (which use microbes and plants to break down waste,) identify design requirements based on users, capacity, pollutants to be removed from water, area and detention time necessary for thorough treatment, vegetation and aquatic life survival requirements, and aesthetics. Two constructed wetland options are: 1) Surface-flow wetlands, or waste water lagoons, which consist of a tiered system of ponds filled with wetland plants to remove the waste, and 2) Subsurface-flow wetlands, which use a gravel medium to anchor plants instead of soil.
- If considering composting toilets, (which use heat and fresh air to turn human waste into a light, dry, odorless humus,) determine whether self-contained units or central systems will be used.

### **Design Development**

- Where biological wastewater treatment systems are under consideration, evaluate savings incurred from minimized amount of piping required because of reduced volume of wastewater.
- Select and design appropriate treatment system based on site and building determinants.

### **Construction Documents**

- Specify type of system, or multiple systems, selected for the site and building. Specify the type of storage area that is most applicable for the project.

### **Correction Period**

- Educate occupants and operations staff about biological wastewater treatment strategies and systems.
- Perform appropriate testing.

### **Next Use**

- Determine whether existing systems are appropriate for next use.