CereS Product Maintenance

BIOSWALE MAINTENANCE

- VEGETATION ESTABLISHMENT

Correct moisture levels in the Bio Retention Swale are essential to plant survival. The first ninety (90) days after planting is the critical time for watering. Young plants require heavy watering to establish.

Set up monitoring points to photograph and document progress of re-vegetation at 6 month intervals. Monitor weed densities and record control measures most effective.

Throughout the establishment phase it may be necessary to review individual species tolerance. Some planted species may not tolerate local conditions within the Bio Retention Swale and may need to be replaced with species that are performing well.

Weeds compete with establishing plants for light, nutrients in the soil and space. Weed infestation could be a significant problem at establishment. As the swale becomes more stable and the planted basin becomes established, weeds should become less of a problem. It is preferable to manually remove weeds before their abundant growth requires herbicide application. Smaller weeds or juvenile specimens can be removed by hand tools to minimize disturbance. The whole weed as well as the root system should be removed. The removal of very large or deep rooted specimens may require removal by machinery. The weed spoils and seeds should be disposed at an approved site.

• EMERGENCY WATERING

Emergency watering may be required during establishment period and is dependent upon rainfall, maturity of planting stock and the water holding capacity of the soil. Generally, the watering program required will be adjusted to suit the site conditions. Emergency watering requirements to sustain healthy vegetation should be determined during ongoing maintenance site visits.

• MANAGEMENT OF EXTREME EVENTS

Drought - In the event of a severe drought, newly established plants and turf may die or retreat below ground. In prolonged periods of drought:

Monitor plant health for signs of stress every month

Prevent drying of the soil by using irrigation, particularly in areas containing water stressed plants.

Flood - Immediately following a flood or significant storm event, the entire system should be assessed for scouring, bank collapse, plant loss, debris build up and general damage. If necessary repair or replant to emulate pre event conditions to prevent further damage. Extreme flow conditions may also introduce noxious weed species into the system. Post event management should therefore place a high priority on monitoring for noxious weed and undesirable species.

BIOSWALE MAINTENANCE (cont.)

• LANDSCAPE MAINTENANCE FREQUENCY

The vegetation management focus is establishing and maintaining healthy low-maintenance native plantings and sustaining the design function of Bio Retention Swales. This includes controlling invasive plants where feasible, and planting cover on bare soils.

Only use plants on the Sarasota County approved low impact development manual plant list.

Training and certification requirements

Equipment requirements

Access requirements

Environmental management considerations

Public safety and stakeholder notification requirements

Traffic sightlines – landscape maintenance should allow for visibility at pedestrian crossings, intersections, rest areas, medians, driveways and bus stops.

Crime Prevention Through Environmental Design (CPTED) The standard principles of informal surveillance, exclusion of places of concealment and open visible areas apply to the landscape design of Bio Retention Swales. Regular clear sightlines should be provided between the roadway and footpaths/ property. Where planting may create places of concealment or hinder informal surveillance, groundcovers and shrubs should not generally exceed 36inches in height.

Some sections of the Bio Retention Swales may require regular plant maintenance for aesthetic reasons. Aesthetic pruning - removal of dead or diseased vegetation material and to stimulate new growth. Plants that are in senescence (hibernation) should not be confused with those that are dead or unhealthy. Senescence generally occurs over the winter months or in times of severe stress. The plants may appear brown or lose their foliage. They differ from dead or unhealthy plants by:

Remnants of viable plant growth are visible green shoots at the base and the root system is firmly anchored.

Pruning or cutting back the vegetation also reduces evapotranspiration and reduces the amount of pollutant uptake until the vegetation reestablishes full growth.

Plant waste should be removed and disposed of properly, as they may have high levels of pollutants. During mowing procedures, the optimal design height off wildflower areas should be taken into consideration.

Allow desirable volunteers to establish - The use of protective bags are recommended if there is a chance of feral or native animals grazing on volunteer plant or competition from weeds is strong. The bags should be removed once the plant is established and is in vigorous growth. A minimum of ninety (90) days.

Consider the use of soil amendments such as compost before using fertilizer. Fertilizers and herbicides are a source of organic compounds which are some of the pollutants that are removed by the vegetation in a Bio Retention Swale and their use for maintenance of the Bio Retention Swale should be avoided as much as possible.

Limit mulch use to covering bare soil while establishing plantings.

BIOSWALE MAINTENANCE (cont.)

• LANDSCAPE MAINTENANCE FREQUENCY (cont.)

Revegetating (to original design specification) - removal of plants that have died and replacement with plants of equivalent size and species as detailed in the plant schedule. Native plant species are a must in Bio Retention Swale design. Proper selection of native species can provide year-round vegetative cover without need for supplemental irrigation or fertilization. Furthermore, native species usually provide high habitat value for indigenous birds and other animals. As water quality data is processed, the selection and planting of vegetation may vary in accordance with the pollutants to be removed, and the flow and velocity design requirements for the Bio Retention Swale. Woody plant materials should only be planted on the side slopes. Trees should not be planted in Bio Retention Swales. If a neighboring tree canopy is protruding into the Bio Retention Swale, lower canopy of shrubs and grasses should be planted underneath the canopy.

Bio Retention Swales are generally composed of three basic vegetation zones: highest (xeric), middle (mesic), and lowest (hydric). Plant the lowest zone with species that can tolerate standing water and fluctuating water levels. Plant the middle zone with species that tolerate slightly drier conditions and more infrequent fluctuating water levels. Middle zone plants, along the slopes, are often selected for erosion control. Plant the highest zone with species adapted for drier conditions. Grasses meet many of the functional criteria for Bio Retention Swale vegetation, such as dense cover, fibrous root or rhizome structure, and upright growth form. Geotextiles, such as jute matting, compost, and straw mulching may be needed to provide physical protection of the planting slope. Plant growth is usually stimulated by mowing or pruning. This can be beneficial during dry periods as plants require less water when kept small. Perennial grasses grow more slowly than annual grasses. Low maintenance and aesthetics in some areas are other considerations. Remember that mowing or cutting of the vegetation usually reduces their ability to remove pollutants by vegetation uptake but some vegetation removal will probably be necessary in order to maintain the vegetations ability to continue to uptake the incoming pollutants in the storm water.

Weed Control - removal and management of invasive plants. Chemical use should be avoided within a certain distance of any area that holds or conveys surface water or stormwater.

Trees or shrubs that block maintenance access may be trimmed or removed if within the maintenance access when access is required for maintenance by equipment.

Trees that pose a risk to stormwater structures due to root growth may be removed and replaced by smaller trees/shrubs.

• REMOVAL OF SEDIMENT

Sediment will build up in the Bio Retention Swale. It should be inspected every month (or after a major rainfall event). If the sediment load is clogging the operation of the Bio Retention Swale and restricting plant growth it should be removed. As with plant waste, sediments should be removed and disposed of properly. It is important that sheet flows entering a Bio Retention Swale system is in a distributed manner (i.e. entering perpendicular to the direction of the swale) and that the flow depths are kept as shallow sheet flow, which maximizes contact with the swale and bioretention vegetation. The Bio Retention Swale should have dense vegetation growth, flow depths are shallow (below the vegetation height) and erosion is avoided at all costs.

BIOSWALE MAINTENANCE (cont.)

• REPAIRING ANY DAMAGE TO THE SWALE PROFILE

The engineered soils of the Bio Retention Swale are subject to erosion from major storm events. Engineered soils depth may be reduced and media lost from the Bio Retention Swale system in large storm events. The Bio Retention Swale must be checked for channeling and erosion every month or after major rainfall events. Re-grading and tilling may be necessary to reshape the Bio Retention Swale cross-section as sediments collect and form pools or clogging occurs.

Clearing - blockages to inlets or outlets

• LITTER, PET WASTE AND DEBRIS REMOVAL

Litter and debris washed into the swale should be removed monthly or after a major rainfall event. The debris could block the inlet and impair the function of the swale for water quantity control.

Pet waste should not be left to decay in Bio Retention Swale because of the danger of contaminating stormwater.

• MOSQUITO MONITORING AND CONTROL

Mosquitoes can be annoying and sometimes pose a serious risk to public health. Mosquitoes can transmit diseases such as West Nile Virus and equine encephalitis. Mosquito control programs place a high priority on trying to prevent a large population of adult mosquitoes from developing so that additional controls may not be necessary.

Since mosquitoes must have water to breed, methods of prevention may include identifying stormwater infrastructure such as catch basins, retention/detention systems, and other water holding areas that may harbor mosquitoes.

If mosquitoes are identified during stormwater facility maintenance or inspection activities and are a concern, a request to the Sarasota County Mosquito Control for service or information regarding mosquito can be made through either the 24-hour service request line.

BIOSWALE IRRIGATION MAINTENANCE

• MANAGEMENT OF EXTREME EVENTS

The Bioswales need to be inspected after a heavy or prolonged storm or hurricane as erosion damage and debris infiltration may expose and compromise sub-surface irrigation lines and infrastructure. Regarding, repairing, flushing and re-alignment of the sub-surface drip lines may be necessary.

• MAINTENANCE FREQUENCY

Accurate site data is important to any irrigation maintenance schedule, but with a low-volume approach it is even more critical because the water is distributed in smaller amounts. Soil absorbs and holds water in much the same way as a sponge. The ability of Bio Retention Swale soil mix to hold moisture, and the amount of moisture it can hold, will greatly affect the irrigation design and irrigation schedule. Capillary action is the primary force in spreading water horizontally through soil. Vertical movement of water in the soil is influenced by both gravity and capillary action. An inline emitter tubing system such as landscape dripline relies on the soil mix to evenly spread water throughout the planting area. The more homogeneous the soil is in the planting area, the more uniform the water distribution. Therefore, compacted soil must be tilled to an 8” to 12" depth and should be irrigated to field capacity prior to planting. In coarser soils, water is more likely to be absorbed vertically, but will not spread very far horizontally. The opposite is true for fine, clay-like soil. Note: Emitters should be used very carefully in very coarse soils as water will percolate downward before it can spread very far horizontally. Maximum infiltration rate indicates how fast water can be absorbed into the soil without runoff. Wetting patterns show the relationship between vertical and horizontal movement of water in the soil up to the maximum wetted diameter. Once the maximum wetted diameter is reached, water movement is downward, forming the traditional “carrot,” “onion,” and “radish” profiles. Maximum wetted diameter is the greatest distance water will spread horizontally from an emitter.

• MAINTAINING A SUBSURFACE IRRIGATION SYSTEM

When designed and installed properly, a Netafim Techline CV or Techline subsurface system offers the designer, contractor and system owner very high quality equipment, unparalleled performance, system reliability and low maintenance. As with any irrigation system, it is important that it be designed according to the manufacturer's specifications and installed according to the designer's specifications. Note: it is important to follow the manufacturer’s recommended maintenance protocol:

Calculate and record zone flow for future reference

Clean filters or screens in irrigation system

Visually inspect all irrigated areas

Check for leaks

Test pressure and flow

BIOSWALE IRRIGATION MAINTENANCE (cont.)

• MAINTAINING A SUBSURFACE IRRIGATION SYSTEM (cont.)

Disc Filters - Disc filters should be inspected and cleaned on a monthly basis. The filter should be inspected several times after installation until a determination on cleaning frequency can be established. To clean the discs, unscrew the plastic housing, or unlatch the band, exposing the spindle on which the discs are stacked. The spindle is held in place by snap-fit. To remove the discs, pull on the spindle. No special tools are needed. The discs can be cleaned in a bucket of water, or by spraying them with a hose. The discs are stacked loosely on the spindle and are easily separated for the thorough removal of debris. Pressure gauges or places to connect pressure gauges immediately upstream and downstream of the filter. This allows personnel to determine when the filter needs to be cleaned by observing the pressure differential between the upstream and downstream gauges. Filters should be cleaned when the pressure loss across the filter is between 5 to 10 psi, or when the downstream pressure falls below the designed working pressure of the system. Record the pressure differential between the gauges when the system is installed as a reference for determining periodic inspection and cleaning.

System Protection Unit - The Greatest threat to a subsurface irrigation system is the intrusion of roots into the drippers. A known preventative measure against root intrusion involves the application of small amounts Trifluralin to the soil around the drippers. The most effective way to introduce the Trifluralin to the soil is through the irrigation system itself. Several manufacturers have developed an integrated filter, a filter that has filtration disks containing Trifluralin which is slowly released in minute quantities (Parts per billion) into the soil immediately around the dripper. The filter is a renewable, controllable and safe way of releasing Trifluralin into the soil around the dripper which creates the required protection barrier preventing roots from impregnating the irrigation system and possibly causing damage. The filters are available in one of six sizes. The product is installed at the “head: or beginning of an irrigation system after the required backflow prevention devices, flow meters and other standard equipment. Water from a pump or other pressurised source is allowed to pass through the “head works” and then the filter. The water moves through the “filter element” which is the set of disks that contain Trifluralin and some Trifluralin is then incorporated into the water as it passes through the system. This water, which now contains Trifluralin, passes through the hydraulic network of pipes and then out the drippers and into the soil immediately around the drippers. The nature of Trifluralin is such that it does not move very far in the soil. The Trifluralin binds to soil particles very quickly after exiting the dripper. This is the key aspect of the nature of Trifluralin that makes this system so effective in protecting the drippers from root intrusion.

Line Flushing Valves - With well water an automatic line flush valve is recommended. This valve allows the system to self- flush at each start-up to wash any debris in the system through this valve, rather than be flushed through the individual drippers. Automatic line flush valves activate every time the irrigation zone is switched on to provide a cleaning action in the drip line. The ability of the line flush valve to dump water at system start-up prior to closing, allows the water velocity inside the drip line to increase momentarily, and this action moves any sediments to and out of the line flush valve from the drip line. These valves require a minimum pressure of 11.5psi to work correctly.

Air/ Release Vacuum Valves - Air Release/Vacuum Valves are used for two reasons:

To provide a means of releasing air from the drip line laterals when the system is turned on, thus eliminating air pockets.

To freely allow air into a zone after shut down. This ensures a vacuum does not draw debris into the drip line laterals via the dripper outlet. (This condition is known as suck back). Like Line Flush Valves, Air/ Release Vacuum Valves requires a minimum operating pressure of 11.5psi.

Flow Meters - are recommended. Flow meters are used to measure the amount of water that flows through the entire system, or each zone.

BIOSWALE CISTERN MAINTENANCE

• UNDERGROUND CISTERN MAINTENANCE WITHIN BIO RETENTION SWALE

The purpose of maintaining a clean and obstruction free cistern is to ensure the system performs its' intended function. A build up of debris in excess of the design storage volume could reduce the efficiency of the system. Maintaining a clean and obstruction-free cistern helps to ensure the system performs the intended function of the primary design. Build up of debris may obstruct flow through the cistern system. This may result in ineffective operation or complete failure of the system.

Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

• COORDINATION

Cistern maintenance should be in direct coordination with road maintenance contractor, Bio Retention Swale landscape maintenance contractor, and research contractor to ensure that system maintenance is properly sequenced for best results.

• MANAGEMENT OF EXTREME EVENTS

Large rain events, tropical depressions and hurricane formation should alert maintenance personnel to perform inlet cleaning and cistern tank maintenance as described in " 7.6.1.1." and "7.6.1.2." of this section. Should flooding occur cisterns will fill to capacity, flood water will then overflow into stormwater system.

• DESIGN INTENT AND DETAILS

Cistern system is designed to capture bioswale run-off for future reuse as irrigation water within the swale. Inlet design allows for primary filtration of swale water, while cistern tank allows for sediment settling.

• CISTERN MAINTENANCE FREQUENCY

Cistern system maintenance based upon visual inspection of system and inlet and sediment build-up within the cistern pipe. Cistern maintenance frequency is weather dependent and the volume of the rain event.

• MAINTENANCE OF THE TUBULAR CISTERN

Tubular Cistern maintenance will consist of the following:

Inlet Maintenance: Visual inspection of cistern inlet should be monthly to ensure no build-up of organic materials or fines at cistern inlet. Manually remove debris from inlet to ensure proper inlet flow into cistern.

Inspection/Maintenance Frequency: All cistern systems must be cleaned and maintained. Underground systems may be maintained more cost effectively if these simple guidelines are followed. Inspection should be performed at a minimum of once per year. Cleaning should be done at the discretion of individuals responsible to maintain proper storage , stormwater quality and flow. Maintenance can generally be performed year round, it should be scheduled during a relatively dry season.

• POST-INSTALLATION INSPECTION

Post-installation inspection should be performed to allow the owner to measure the invert prior to accumulation of sediment within the cistern system. This survey will allow the monitoring of sediment build-up without requiring access to the cistern system.

BIOSWALE CISTERN MAINTENANCE (cont.)

• PRE-MAINTENANCE INSPECTION

The following is the recommended procedure for pre-inspections:

Locate the riser section of the cistern system. The riser will typically be 24" in diameter.

Remove the lid of the riser.

Insert a measuring device into the opening and make note to a point of reference on the stick or string (This is done so that sediment build up can be determined in the future without having to enter the system.).

• SAFETY

Entry into the cistern should be considered an OSHA confined space and appropriate guidelines should be followed.

• INSPECTION/MAINTENANCE

A cistern system should be inspected at a minimum of one time a year or after major rain events if necessary. The following is the recommended procedure to inspect system in service:

Locate the riser section of the cistern system. The riser will typically be 24" in diameter or larger.

Remove the lid from the riser.

Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the cistern system.

Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.

If measured sediment build up is between 5% - 20% of the pipe diameter, cleaning should be considered; if sediment build up exceeds 20%, cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by either manual methods or by a vacuum truck.

• MOSQUITO MONITORING AND CONTROL

Mosquitoes can be annoying and sometimes pose a serious risk to public health. Mosquitoes can transmit diseases such as West Nile Virus and equine encephalitis. Mosquito control programs place a high priority on trying to prevent a large population of adult mosquitoes from developing so that additional controls may not be necessary.

Since mosquitoes must have water to breed, methods of prevention may include identifying stormwater infrastructure such as catch basins, retention/detention systems, and other water holding areas that may harbor mosquitoes.

If mosquitoes are identified during stormwater facility maintenance or inspection activities and are a concern, a request to the Sarasota County Mosquito Control for service or information regarding mosquito can be made through either the 24-hour service request line.

Proper drawdown of cistern water as irrigation in the bio swale, will not allow mosquito larvae to gestate.