STORM WATER QUALITY ISSUES

STORM WATER POLLUTION BASICS – Storm water pollution, also called non-point source pollution, is the contamination of our nation's waters caused by rainfall runoff moving across the land and impervious surfaces. Urbanization leads to an increase in impervious surfaces such as rooftops, parking lots, and roads. As storm water runoff flows over surfaces, it picks up and carries away pollutants that accumulate during dry periods, finally depositing them into lakes, rivers, and wetlands. The runoff from impervious surfaces and urbanized areas normally contains pollutants such as fertilizers, pesticides, fuels, oil, metals, floating debris and dirt that can significantly impact the quality of receiving waters.

WHY IS THIS A CONCERN NOW? – The City of Plano has had a storm water permit with the United States Environmental Protection Agency (USEPA) since December 2000. The permit allows the City to discharge storm water runoff that is collected in the City's storm drain system into the streams and rivers of the U.S. and the State of Texas. Properties within the City that are developed and ultimately discharge into the City's storm drain system create the non-point pollution that is a potential problem.

Over the past several years the City has been working with the NCTCOG and other cities in the North Texas region to develop a plan for integrated Storm Water Management (iSWM). The idea is to look at the impacts that development has on storm water quantity and quality throughout the development process and attempt to minimize these impacts with better site design practices. Much of the following is closely related to the information found in the iSWM Manuals that are available through the North Central Texas Council of Governments (NCTCOG).

STORM WATER QUALITY IN DEVELOPMENT PLANNING

EARLY SITE PLANNING & STORM WATER – The most economical and effective time to address the potential storm water impacts of development is during the conceptual, initial planning and design phases of a project. It is much more costly to correct problems after a project has already been built. During the concept and planning phases, one way to reduce a development's impacts is often as simple as choosing to protect the site's existing runoff conveyance features. This process of storm water quantity and quality planning must begin during the very first steps in the development process, not after the site layout has been completed.

The iSWM Design Manual for Development/Redevelopment suggests that five principals for storm water management should be considered when doing site planning:

- Site planning should utilize an integrated approach to deal with storm water quality protection, stream bank protection and flood control requirements;

- Storm water practices should strive to utilize the natural drainage system;
- Structural controls should only be used after non-structural site design options have been exhausted;
- Storm water solutions should attempt to be multi-purpose and be aesthetically appealing within the site design; and
- Property owners, developers and designers should understand that all sites are unique and one type of storm water solution does not fit all situations.

Developers and consultants are encouraged to meet with the City of Plano's Planning and Engineering Department's staff prior to developing their site plans to ensure that all local requirements will be met. Changes in Federal, State and City storm water regulations are a continual ongoing process and regulations that were in affect a few short years ago may have been revised, rewritten or may no longer exist. The use of BMPs in the City of Plano may require the development of a site specific watershed protection plan.

IDENTIFYING & PROTECTING SITE CRITICAL AREAS – Site critical areas for storm water control may or may not be available on a given piece of property. Identifying and evaluating any areas on your site are crucial first steps in developing a good integrated storm water site plan so that these areas can be utilized or protected. Critical areas for storm water management include significant site features including topography, drainage patterns within sub-basins, intermittent and perennial streams, soils, ground cover and vegetation, existing development, existing storm water facilities, adjacent areas, wetlands, critical habitat areas, boundaries of wooded areas, floodplain boundaries, steep slopes, required buffers, proposed stream crossing locations, and other required protection areas (e.g., well setbacks).

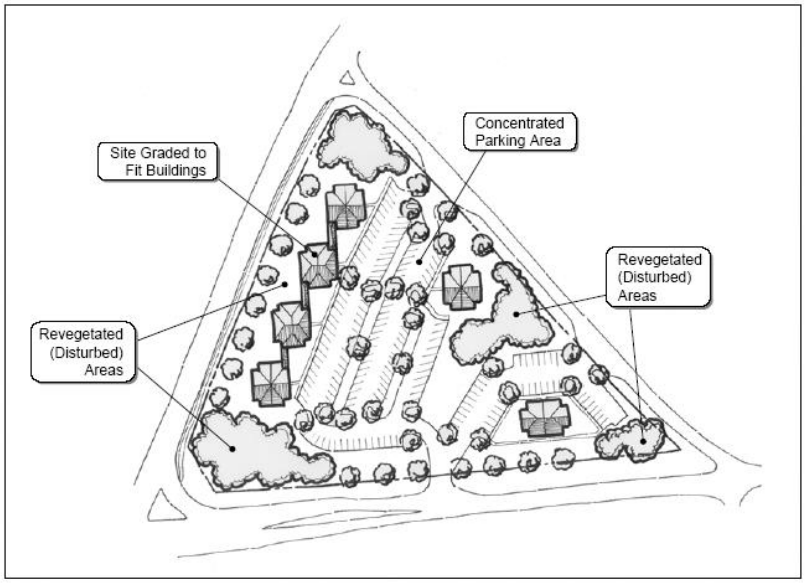

Figure 4.3-2 Comparison of a Traditional Office Park Design (above) and an Innovative Site Plan Developed Using *integrated* Site Design Practices (below).

Once identified, site critical areas should be integrated into the site design and utilized wherever possible to minimize the storm water impacts of the site development. Coordination for the use and protection of site critical areas must be carried through the planning, design and construction processes.

STORM WATER POST-CONSTRUCTION BMPs

BEST MANAGEMENT PRACTICES (BMPs) – BMPs are practices, procedures and devices used to prevent or reduce the impacts created by development on our water resources. As previously noted these impacts from any given site may be related to both pollutant loads and increased runoff quantities. Post construction measures may be either non-structural or structural treatment controls and can normally be either used alone or in series with each other depending upon site constraints.

BIORETENTION AREA

STORM WATER PONDS

WHAT IS AVAILABLE NOW? – The integrated Storm Water Management Design Manual for Development/Redevelopment provides a comprehensive listing of recommended BMPs for use in the North Texas region. The manual gives specific guidance on choosing the correct type of BMP for certain situations as well as design criteria, construction specifications and maintenance requirements.

COST EFFECTIVE BMPs – Implementing cost effective BMPs is of significant importance to all parties involved in the development, ownership and continued maintenance of any site and its storm water infrastructure. Choosing the correct BMP(s) for a given site is the first and sometimes most critical step. As the table that follows indicates, not all available BMPs are well suited for managing all storm water impacts created by site development. Available space, targeted pollutants, site slopes, site soils, flow capacity, aesthetics, and continued maintenance costs are all issues that should be investigated when choosing storm water management devices for a specific site. Selecting a BMP for a site based only upon first cost can lead to installing a device that may create a very costly maintenance burden for the future responsible party.

SAND FILTERS

The following table is from the iSWM Manual and lists the types of devices that are included in the Manual and their recommended primary and secondary uses for controlling storm water impacts. The devices that are in the Manual were individually reviewed to ensure that they can be utilized within the North Texas Region when design and construction recommendations are followed.

SHALLOW WETLAND

Table 4.3-4 Suitability of Storm Water Controls to Meet *integrated* Design Criteria

Category	On-Site Storm Water Controls	Water Quality Protection	Streambank Protection	On-Site Flood Control	Downstream Flood Control
Bioretention Areas	Bioretention Areas	P	S	-	-
Channels	Enhanced Swales	P	S	S	S
	Channels, Grass	S	S	P	-
	Channels, Open	-	-	P	S
Chemical Treatment	Alum Treatment System	S	-	-	-
Conveyance Components	Culverts	-	-	P	S
	Energy Dissipation	-	P	S	S
	Inlets/Street Gutters	-	-	P	-
	Pipe Systems	-	P	P	S
Detention	Detention, Dry	S	P	P	P
	Detention, Extended Dry	S	P	P	P
	Detention, Multi-purpose Areas	S	P	P	P
	Detention, Underground	S	P	P	P
Filtration	Filter Strips	S	-	-	-
	Organic Filters	P	-	-	-
	Planter Boxes	P	-	-	-
	Sand Filters, Surface/Perimeter	P	S	-	-
	Sand Filters, Underground	S	-	-	-
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	S	-	-	-
Infiltration	Downspout Drywell	P	-	-	-
	Infiltration Trenches	P	S	-	-
	Soakage Trenches	P	-	-	-
Ponds	Ponds, Storm Water	P	P	P	P
Porous Surfaces	Green Roof	P	S	-	-
	Modular Porous Paver Systems	S	S	-	-
	Porous Concrete	S	S	-	-
Proprietary Systems	Proprietary Systems *	S	S	S	S
Re-Use	Rain Barrels	P	-	-	-
Wetlands	Wetlands, Storm Water	P	P	P	P
	Wetlands, Submerged Gravel	P	P	S	-

P = **Primary Control:** Able to meet sizing criterion if properly designed, constructed and maintained.

S = **Secondary Control:** May partially meet design criteria. May be a Primary Control but designated as a Secondary due to other considerations. For Water Quality Protection, recommended for limited use in approved community-designated areas.

- = Not typically used or able to meet design criterion.

* = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data.

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STORM WATER BENEFITS OF GRASSY SWALES

GRASSY SWALES – The term grassy swale (a.k.a. Grassed channel, dry swale, etc.) refers to a specifically designed runoff conveyance to provide nominal treatment of runoff as well as to reduce runoff velocity. As storm water runoff flows through these channels, it is treated through filtering by the vegetation in the channel and/or infiltration into the underlying soils. When used as a part of a storm water treatment system, swales should not be confused with steep sided drainage ditches.

As a storm water treatment device or BMP, the use of grass channels alone cannot usually meet the treatment requirements necessary to prevent downstream water quality degradation. Therefore, in most cases they are used in coordination with other storm water treatment practices.

When properly incorporated into an overall site design, grass channels can:

- Reduce impervious cover;
- Reduce total suspended solids from site runoff;
- Reduce the velocity of runoff;
- Promote infiltration and groundwater recharge in areas with pervious soils;
- Accent the natural landscape; and
- Provide aesthetic benefits.

Grass channels are well suited to a number of applications and land uses, including partial treatment of runoff from small roads, interstate type highways and smaller impervious surface areas.

SITE USE RESTRICTIONS – Current City of Plano Zoning and Subdivision Ordinances will only allow the use of open channel drainage when a site is developed with a specific storm water management plan that incorporates the practice as a management practice. Design requirements and construction plans are required to be approved by the City's Engineering Department and plans must clearly show the contractor how the channels are to be constructed and stabilized.

Properly designed and constructed open channels can have a lower annual maintenance cost, but the opposite is also true. Improperly designed or constructed channels can lead to significant and costly maintenance problems. Usually limiting their use to smaller on-site drainage areas reduces the initial costs and ongoing maintenance issues. Using open channels when retrofitting an existing site can sometimes be very difficult to accomplish unless the entire site is cleared and the developer starts over.

EARLY SITE PLANNING & STORM WATER – Early site planning is essential for the use of open channels for drainage conveyance. Planning their locations and design characteristics to work with existing slopes, vegetation and soils helps the swale fit the site development instead of fighting it.

BENEFITS OF ROOF RUNOFF TO PERVIOUS AREAS

ON-LOT TREATMENT – The term "on-lot treatment" refers to a practice or a series of practices that are designed to treat runoff from individual residential lots. The primary purpose of most on-lot practices is to manage rooftop runoff and, to a lesser extent, driveway and sidewalk runoff. These same procedures can also be used for roof runoff in lower density office complexes.

Rooftop runoff, and particularly residential rooftop runoff, generally has low pollutant concentrations compared with other urban sources (Schueler, 1994b). The primary advantage of managing runoff from rooftops is to disconnect these impervious surfaces from flowing directly on to paved surfaces and into the storm drain collection system.

Although there are a wide variety of on-lot treatment options, they can all be classified into one of three categories:

1. Practices that infiltrate rooftop runoff;
2. Practices that divert runoff to a pervious area; and
3. Practices that store runoff for later use.

The best option or series of options for a site depends on the goals of the community, the feasibility of the specific site, and the preferences of the homeowner.

ROOF RUNOFF TO PERVIOUS AREA – The easiest and least costly on-lot treatment is to simply divert the roof runoff to a pervious area (Lawn, garden, landscaped area, etc.).

Advantages that can be realized include:

- Indirectly promotes infiltration and groundwater recharge;
- Potential to reduce site irrigation;
- Reduces storm water quantity and quality impacts to the downstream system;
- Low cost and doable by most homeowners; and
- Healthier for lawns, plants and trees due to use of non-chlorinated water.

SITE USE RESTRICTIONS – Positive drainage must still be maintained away from the building foundation and ultimately to the street or alley to prevent standing water and localized flooding. A concrete splash pad or block is usually necessary to prevent scour and erosion at the downspout. This practice does not work well on very steep slopes.

MINIMIZING STORM WATER FLOATABLES DISCHARGE

FLOATABLES – Almost anything that can be transported by storm water runoff can become floatable debris. Some of the most common items found in urban storm water discharges include:

- Street litter (e.g. cigarette butts, filters and filter elements);
- Food packaging (e.g. styrofoam cups, plastic cup lids, fast food wrappers & containers, etc.);
- Plastic bags;
- Beverage containers (cans, bottles, etc.);
- Household solid waste primarily lost during collection and transportation; and
- Yard waste (Grass clippings, leaves, etc.).

WHAT ARE THE IMPACTS? – The impacts of uncontrolled floatables in storm water runoff include visual aesthetics, life and health impacts to the downstream population, affects on fish and wildlife habitats, and wildlife endangerment. Visual impacts of floating debris in our lakes and streams are normally the first issue that residents and the general public have regarding a floatables debris problem. Ponds, streams with small pools, and channels lined with small shrubs or trees are some areas where floatable debris historically collects. Large collections of floating debris attract insects, rodents and other nuisance pests which can lead to human health problems. Large floating debris fields on larger creeks have also resulted in deaths due to drowning in other areas of the country. Plastics (bags, netting, can holders, etc.) in many forms attract wildlife and ensnares, suffocates or chokes fish and animals that ingest them.

HOW TO CONTROL FLOATABLES – Control of floatables falls into two types, (1) source control and (2) collection.

Source control involves either educating people to reduce or eliminate the floatable debris or preventing the floatables from entering the storm water system at the source site. The use of grated storm drain inlets for specific sites can be approved if they are detailed in a specific storm water management plan for the site.

Collection of floatables once they have been transported into the storm drain system is usually much more costly than source control, but may be more effective if the debris is coming from a wide variety of sources over a large area. The use of skimmers or grates on storm drain outlets or pond overflows is commonly used.

CURRENT PROGRAMS – The City of Plano and many other North Texas communities participate in several programs designed to prevent or collect floatable debris. Several of the more well known programs include annual City-wide cleanups, Keep Plano Beautiful, the Adopt-a-Highway program, and the Clean Campus Program.

Specific site plans or use of BMPs to control floatables should be coordinated with the City of Plano's Planning and Engineering staff to ensure that all local requirements are being met.

STORM WATER INFORMATION, RESOURCES AND REFERENCES

City of Plano (www.planotx.org)

Illegal Discharges, Environmental Health Department		(972) 941-7143
Storm water hotline for illegal dumping or discharges		(972) 941-7184
Used Oil & Toxic Materials. Public Works Department		(972) 769-4140
Site Development & Planning, Construction Erosion Control, and Post Development BMPs.	Engineering Department	(972) 941-7152
	Planning Department	(972) 941-7151
Industrial Inspection & Monitoring Program.	Environmental Health Department	(972) 941-7143
Storm Water Public Education.	Public Works Department	(972) 769-4140
	Engineering Department	(972) 941-7152

North Central Texas Council of Governments NCTCOG (www.dfwinfo.com)

Environmental Services Division		(817) 695-9210
iSWM Program	www.iswm.dfwinfo.com	
Regional storm water programs	www.nctcog.org/envir/SCG/clean/index.asp	

Texas Commission on Environmental Quality TCEQ (www.tceq.state.tx.us)

Headquarters, Austin	(512) 239-4433
Region 4 Office, Ft. Worth	(817) 588-5800

TPDES Construction General Permit
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/construct

Phase II Storm Water Regulations
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/ms4

EPA (http://cfpub1.epa.gov/npdes/home.cfm?program_id=6)

Region 6 Headquarters, Dallas		(214) 665-2200
	Toll free within Region 6	(800) 887-6063
Region 6 Storm Water website	www.epa.gov/earth1r6/6en/w/sw/home	
BMP website	http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post	