Appendix 9

Stormwater Report

STORMWATER MANAGEMENT PLAN
for
Wal-Mart – Lockport, NY

Wal-Mart Supercenter #2107-02
Town of Lockport
NIAGARA COUNTY, NEW YORK

Prepared for:
Wal-Mart Stores Inc.
2001 SE 10th Street
Bentonville, AR 72716

Prepared by:

APD Engineering
3445 Winton Place - Suite 208
Rochester, NY 14623
585.273.0273
585.273.0276.fax
www.apd.com

Original Date: March 26, 2004
Revised Date: September 26, 2006

Proj. No.: 02-0006

TABLE OF CONTENTS

Introduction

The Stormwater Management Plan for the proposed Wal-Mart in the Town of Lockport is outlined in this report. Located in the Town of Lockport, the ±17.9-acre property is located on the northeast side of the South Transit Road (NYS Route 78), Shimer Road intersection. The site is currently occupied by the Lockport Mall. As part of this project, the Lockport Mall and its appurtenances will be demolished, with the exception of the Bon Ton. The Bon Ton will be renovated to become a free standing structure. The proposed Wal-Mart will be constructed within the same general area of the existing mall.

The proposed on-site storm sewer has been designed to mitigate the impacts from the proposed Wal-Mart Supercenter. Design features have been incorporated to improve stormwater quality and quantity, which is required by the New York State Department of Conservation.

It is noted that the NYS Department of Environmental Conservation has issued a General Permit for stormwater discharges pursuant to the Clean Water Act. The most recent NYSDEC requirements for new developments are contained in the "New York State Stormwater Management Design Manual", dated August 2003, including the following criteria: Water Quality Volume, Stream Channel Protection (1-year storm), Over-bank Flood Protection (10-year storm), and Extreme Flood Control (100-year storm). Since this is an existing, developed commercial site, the detailed requirements under this permit are not completely applicable to the proposed project. The NYSDEC has recently announced a policy regarding stormwater systems for re-development projects known as the "Interim Strategy for Redevelopment Projects", dated April 30, 2004. While a detailed determination of compliance is to be made by the NYSDEC on a site-by-site basis, the design of the proposed re-development stormwater system has been based upon the new guidelines and is expected to be found in compliance with the General Permit. These documents and design guidelines were used as a guide in performing the design of the stormwater management system for this project.

Runoff quantities are mitigated through peak flow attenuation. Discharge rates from the proposed development will be limited to or below the existing levels. Specifically, the proposed stormwater management system for the proposed facilities is designed to reduce or maintain the proposed peak discharge rates from the project site for the 10 and 100-year storms when compared to the existing peak runoff rates. This will maintain the adequacy of existing downstream drainage structures and minimize any impact of runoff to downstream properties upon the implementation of the proposed development.

The proposed stormwater management facility was designed consistent with and exceeding the latest New York State Department of Environmental Conservation (NYSDEC) regulations for water quality. This is accomplished through the use of forebays and water quality basins for initial treatment, coupled with additional contaminant removal through the use of oil hoods and sumps.

Methodology

On-site Detention Basin Design

The project's drainage is first analyzed by determining the stormwater runoff discharge points from the site. These points are established in order to provide fixed locations at which existing and proposed drainage conditions can be compared. The areas draining to each analysis point are then delineated using topographic survey maps, grading plans and utility plans.

Next, the matrices in Chapter 7 of the "New York State Stormwater Management Design Manual" (SMDM) are used to select the best Stormwater Management Practice (SMP). These selection matrices consider such factors as land use, physical feasibility, watershed/regional factors, stormwater management capability, and community and environmental factors.

The required Water Quality Volume (WQ_v) is then calculated. The procedure for determining the WQ_v is presented in Chapter 4 of the SMDM. The Water Quality Volume is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume.

The stormwater management pond(s) is then located on the site. Following the performance criteria in Chapter 6 of the SMDM, the stormwater management facilities are designed to provide the required WQ_v and to meet the stated design criteria for that particular facility. The stormwater management facilities performance criteria are based on performance goals with regard to feasibility, conveyance, pretreatment, treatment geometry, environmental/landscaping, and maintenance.

Next, the stormwater management pond's outlet structure is designed and its geometry (storage volume) is redesigned as necessary to meet the stormwater quantity requirements in Chapter 4 of the SMDM. The Stream Channel Protection Volume Requirements (Cp_v – 24 hr extended detention of the 1-yr storm) are met to protect stream channels from erosion. To prevent an increase in the frequency and magnitude of out-of-bank flooding generated by urban development, the Overbank Flood Control Criteria (Q_p – 10-yr storm control) is met. The stormwater management facility is designed per the Extreme Flood Control Criteria (Q_f – 100-yr storm control) with the intent of (a) preventing the increased risk of flood damage from large storm events, (b) maintaining the boundaries of the predevelopment 100-year floodplain, and (c) protecting the physical integrity of stormwater management practices. Also, the stormwater management facility is designed to mitigate impacts due to additional storms as may be required by the local municipality.

Stormwater runoff quantity mitigation (with the exception of Cp_v) is achieved by comparing the runoff rates discharged from the site under the existing conditions to the rates discharged under proposed conditions. Points of discharge from the site provide fixed locations at which existing and proposed stormwater quantities can be compared. The areas draining to each analysis point are delineated using topographic survey maps, grading plans, and utility plans. Peak runoff rates for the design storm are based on the USDA Soil Conservation Service's method of modeling stormwater runoff.

To prevent an increase in the frequency and magnitude of flooding generated by urban development, the Overbank Flood Control Criteria (Q_p – 10-yr storm control) is met. The stormwater management system is designed per the Extreme Flood Control Criteria (Q_f – 100-yr storm control) with the intent of (a) preventing the increased risk of flood damage from large storm events, (b) maintaining the boundaries of the predevelopment 100-year floodplain, and (c) protecting the physical integrity of stormwater management practices.

Intelisolve's Hydraflow Hydrographs 2004 computer model utilizes the USDA Soil Conservation Service (SCS), or now known as (NRCS) National Resources Conservation Service, Runoff Curve Number Method to analyze a given watershed. Hydraflow computes SCS Method runoff hydrographs by convoluting a rainfall hyetograph through a unit hydrograph. Convolution is known as linear superpositioning, and means that each ordinate of the rainfall hyetograph is multiplied by each ordinate of the unit hydrograph, thus creating a series of hydrographs. These hydrographs are then summed to form the final runoff hydrograph. This is done for both existing and proposed conditions to form the basis for analysis.

In order for the computer model to calculate stormwater runoff for a site, various storm specific and project specific information will be required. This includes the type of rainfall distribution (I, IA, II, and III), as well as the storm return period (10-yr, 100-yr). Other parameters required to calculate stormwater runoff are drainage area, curve number, and time of concentration. Each drainage area is evaluated using the SCS's guidelines to determine the curve number and time of concentration.

The parameters required to calculate stormwater runoff are area, curve number, and time of concentration. Each drainage area is evaluated using the guidelines described in USDA Soil Conservation Service's TR-55 to determine the curve number and time of concentration.

The runoff curve number (CN) is based on a weighted average of ground cover and soil type. The underlying soil types are described in county soil maps. Site and grading plans and survey maps outline existing and proposed ground cover. CN values for specific locations are determined from the tables presented by SCS.

Time of concentration (T_c) represents the amount of time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of analysis. Surface roughness, slope, channel shape and flow patterns are the factors that affect the time of concentration. Stormwater runoff flows through the drainage area as sheet flow, shallow concentrated flow,

open channel flow, or concentrated flow (such as in storm sewers). In New York State, maximum cumulative sheet flow is assumed to be 150' for existing conditions and 100' for proposed conditions, after which, sheet flow becomes shallow concentrated. The sum of the travel times over the various surfaces within the assumed flow path for a specific drainage area determines that area's time of concentration. The figures and formulas provided by SCS are employed to compute travel times for sheet flow and shallow concentrated flow. Manning's equation is used to determine flow velocities through swales and pipes.

The stage-storage-discharge relationship for the proposed stormwater management area is determined from existing topographical data, proposed grading, and outlet structure characteristics. Discharge rates and storage volumes at various elevations (stage) are represented by this relationship. The storage capacities are calculated by determining the surface area at various elevations. Outlet structure discharges are computed using orifice and weir equations and the USDOT Federal Highway Administration's "Hydraulic Design of Highway Culverts".

On-site Storm Sewer Design

The Rational Method has been utilized to estimate the peak stormwater runoff discharge rates generated from the site for proposed site conditions. The Rational Method is a hydrological design method based on the rational formula for computation of the peak design flow and is a commonly used method for determining peak discharge rates from small drainage areas. This method is traditionally used to size storm sewers, channels, and other drainage structures, which handle runoff from uniform drainage areas less than one third of a square mile. The validity of the traditional formula is based on the assumption that the rainfall intensity for any given duration is uniform over the entire tributary watershed.

The rational formula is Q = cia in which:

Q = Peak rate of stormwater runoff in cubic feet per second.

c = Runoff Coefficient, an empirical coefficient representing a relationship between rainfall and runoff.

i = Intensity of rainfall in inches per hour taken from the intensity-duration-frequency curves for the specified design return period for the time of concentration (Tc).

a = Area of tributary watershed in acres.

Proposed peak stormwater discharge rates were calculated using the 10-year Rainfall Intensity Curves for Lockport, NY. Manning's Equation was next applied with a 10-year storm frequency to size the full flow carrying capacities of the proposed storm sewer system.

The Manning Formula, suitable for both open and closed conduit, is: