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## I. INTRODUCTION & SCOPE

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The Cross County Shopping Center is an existing shopping center located in the City of Yonkers, New York built more than 50 years ago. The property consists of a total of approximately 71.1 acres of land that is bounded on the north by the Cross County Parkway, on the east by Kimball Avenue, on the south by Vredenburg Avenue, and on the west by Central Park Avenue northbound, which is adjacent to the New York State Thruway (I-87). (See Figure 1a “Regional Site Location Map & Figure 1b “Local Site Location Map”). The Cross County Shopping Center also contains a number of private internal roadways including Xavier Drive, South Drive, North Drive and West Drive.

The proposed improvements include the renovation and demolition of existing buildings and parking areas. It will also include the construction of new buildings and parking areas, both at-grade and structured.

The following is a summary of the proposed improvements to the existing Cross County Shopping Center:

1. The complete renovation of the open air pedestrian mall.
2. The renovation of the existing eight story office building.
3. The net addition of approximately 245,375 square feet of new retail and restaurant space.
4. The removal of approximately 46,550 square feet of currently vacant existing retail space, yielding a net proposed 1,558,936 square foot shopping center.
5. The construction of a new 5 story customer parking structure, containing  $\pm$  1,723 parking spaces.
6. The construction of a one level parking deck at the north end of the site, containing  $\pm$ 373

parking spaces.

7. The construction of related on and off-site traffic and infrastructure improvements.
8. Extension of the existing underground service tunnel.

The proposed expansion and renovation plan includes a completely new drainage system within the project's development area. This Stormwater Management Report investigates the proposed on-site improvements within the property and required stormwater infrastructure to serve the new development.

The proposed stormwater quantity drainage improvements include the abandonment / removal of the existing storm drain pipes, manholes and catch basins. A new stormwater collection system is proposed within the outer ring road which will collect and convey runoff from the existing and proposed buildings, parking structures and on-grade parking areas to the proposed water quantity and quality facilities, and ultimately off-site.

The existing 72" pipe located in the northern portion of the property will be relocated around the proposed Macy's expansion and the adjacent 1-story parking deck. The relocated pipe alignment follows the Mall's ring road until its connection into the existing pipe where it exits the property to the north.

The stormwater analyses included in this report have been prepared in accordance with requirements of the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Construction Activity for Construction Activity (GP-02-01). Since this project is a "re-development project," the NYSDEC's requirements included in its "Interim Strategy for Redevelopment Projects" dated April 30, 2004 (hereinafter referred to as the "Redevelopment Strategy") have also been incorporated into the proposed improvements. The Redevelopment Strategy includes criteria for the implementation of surface water quantity and quality improvements for redevelopment projects.

## **II. METHODOLOGY**

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Runoff rates were calculated based upon the standards set forth by the United States Department of Agriculture Soil Conservation Service Technical Release 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986. The methodology set forth in TR-55 considers a multitude of characteristics for watershed areas including soil types, soil permeability, vegetative cover, time of concentration, topography, rainfall intensity, ponding areas, etc.

The 1, 10, 25, 50 and 100 year storm recurrence intervals were reviewed in the design of the stormwater management facilities (see Appendix A & B - Hydrologic Calculations in Existing and Proposed Conditions).

#### Base Data and Design Criteria

For the stormwater management analysis the following base information and methodology were used:

1. An Existing Drainage Area Map was developed from the topographical survey. The drainage area map reflects the existing conditions within the residential parcel and surrounding area.
2. A Proposed Drainage Area Map was developed from the proposed grading design superimposed over the topographical survey. The drainage area map reflects the proposed conditions within the residential parcel and the existing conditions to remain within the parcel and the surrounding area.
3. "Preliminary Subsurface Soil and Foundation Investigation" by Carlin Simpson & Associates, revised 04/19/2005.
4. Soil Survey of Westchester County, New York.
5. The United States Department of Agriculture Soil Conservation Service National Engineering Handbook, Section 4 - Hydrology", dated March 1985.

6. The United States Department of Agriculture Soil Conservation Service Technical Report No. 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986.
7. The time of concentration was calculated using the methods described in Chapter 3 of TR-55, Second Edition, June 1986. Manning's equation was used to determine the travel time of sheet flow with a maximum reach length of 100 feet in existing and proposed conditions. The two year, 24-hour precipitation amount of 3.50 inches was used in the equation for all storm events. The travel time for shallow concentrated flow was computed using Figure 3-1 and Table 3-1 of TR-55. Manning's equation was used to determine the travel time for channel reaches.
8. All hydrologic calculations were performed with the Haestad Methods Pond Pack software package version 10.0.
9. The New York State Stormwater Design Manual, dated August 2003.
10. New York Guidelines for Urban Erosion and Sediment Control, dated January 2004.
11. The storm flows for the 1, 10, 25, 50 and 100 year recurrence interval storms were analyzed for the total watershed areas. The Type III Distribution Design Storms with a 24-hour duration were used in the analysis with the following rainfall depths:

<u>Design Storm</u>	<u>Inches of Rainfall</u>
1	2.80 inches
10	5.00 inches
25	6.00 inches
50	7.00 inches
100	7.50 inches

### III. EXISTING CONDITIONS

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The 71.1 acre site consists of three (3) drainage basins which discharge stormwater runoff to three separate design (discharge) points in the existing (pre-development) conditions. The individual drainage areas represent the portions of the property that ultimately contribute stormwater runoff to each basin's respective design point.

The drainage basins are designated as EDA-1, EDA-2 and EDA-3, and are depicted Drawing EDA-1 entitled "Existing Drainage Area Map" located in Appendix "D" and "E" of this Report. The basin's discharge stormwater runoff to the Design Points depicted on Drawing EDA-1 located in Appendices 'D' & 'E', labeled as Design Points 1, 2 and 3.

The entire site is developed in existing conditions, including 61.81 acres of existing impervious surfaces, such as existing buildings and parking lots, which represents 87 percent of the site. The remainder of the site is pervious, consisting of small wooded areas within eastern portions of the site, parking lot landscaped islands and courtyards.

Existing Drainage Area #1 (EDA #1) is 54.60 acres is the largest of the three areas analyzed in existing conditions and is 89% impervious (buildings, pavement and rock outcroppings). It includes the northern and western portions of the site and a majority of the existing buildings and parking areas, including Macy's, Sears, the recently constructed Stop & Shop and the Main Mall area. Most of the proposed improvements are located within this basin.

This area drains to the north via the existing storm drainage infrastructure throughout the existing parking areas. The existing storm drainage system discharges into the existing 72" corrugated metal pipe located along the site's northern boundary.

This pipe is owned and maintained by the New York State Thruway Authority and is located within an existing 25 foot wide drainage easement. The pipe enters the site from Central Park Avenue and conveys stormwater runoff from west to east. This pipe exits the property near the midpoint of the northern property line (Design Point #1) where it continues in a easterly direction

to an existing drainage tunnel. This tunnel discharges into the Bronx River located east of Design Point #1 near the Bronx River / Cross County Parkways interchange.

Existing Drainage Area #2 (EDA-2) is 11.49 acres and is located at the southern portion of site and is 86% impervious. This area includes the existing Cross County Cinema and parking area, existing car wash / gas station (Building #19) and a majority of Stop & Shop Parking Area.

It drains to Design Point #2 in Vredenburgh Avenue, which is located immediately south of the existing movie theatre. No improvements are proposed in this portion of the property.

Existing Drainage Area #3 (EDA-3) is 5.01 acres and is located in the northeast corner of the property. This drainage area includes the existing parking lot adjacent to the former Sizzler Restaurant and the recently constructed maintenance building. EDA-3 discharges stormwater runoff to Design Point #3 which is located near the intersection of the existing site driveway and Kimball Avenue.

The following table summarizes peak rates of runoff calculated in the drainage calculations found in Appendix IV for the three (3) drainage areas analyzed in the pre-development conditions:

**Table 1**  
**Peak Rates of Runoff in Existing Conditions**

Storm Frequency (Years)	Peak Rates of Runoff at Design Point in Existing Conditions (c.f.s.)		
	Design Point #1 / EDA-1	Design Point #2 / EDA-2	Design Point #3 / EDA-3
1	103.37	16.08	8.68
10	195.32	38.09	18.12
25	236.62	48.31	22.38
50	277.74	58.52	26.62
100	298.25	63.62	28.73

#### **IV. PROPOSED CONDITIONS**

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Four (4) drainage basins were analyzed in the proposed conditions which are designated as PDA-1a, PDA-1b, PDA-2 and PDA-3, and are depicted on Drawing PDA-1 entitled “Proposed Drainage Area Map” located in Appendix 'D' & 'E' of the report. The basins discharge stormwater runoff to these Design Points, labeled as Design Points 1, 2 and 3. These are the same design points analyzed in Existing Conditions to provide a basis of comparison of pre and post-development peak rates of runoff.

The NYSDEC issued its Redevelopment Strategy because many of the proposed improvements included in the New York State Stormwater Management Manual last revised 2003 (hereinafter referred to as the Manual) are not easily incorporated into redevelopment projects. Therefore, the redevelopment strategy requires all redevelopment projects proposing deviations from the technical standards recommended in the Manual be reviewed by the NYSDEC as required by Section I.D.3.b of the SPDES General Permit GP-02-01 for Stormwater Discharges from Construction Activity.

The Redevelopment Strategy includes specific criteria for the implementation of surface water quantity and quality improvements for the projects. These guidelines are applied to the proposed improvements as follows:

- 1) Water Quantity: Due to the small increase in impervious area, the proposed stormwater management facilities comply with the 10-year (Overbank Flood Control) and 100-year (Extreme Flood Control) water quantity controls in the Manual pipe. Pursuant to Section 4.3 of the Manual, Channel Protection is not required because flows in all storm events are decreased and the existing pipe system discharges into the Bronx River, which is designated by the NYSDEC as a 4th order stream.
- 2) Water Quality: A combination of standard and non-standard practices are proposed since all facilities will treat 100% of the water quality volume from the entire contributing area to each of proposed practice.

Infiltration will be provided as a "Standard Practice" since each of the proposed subsurface system are perforated. Vortech devices (non-standard practice) are proposed to provide 80% removal of total suspended solids from all stormwater runoff generated by the site. These devices are designed based on flow rates to accommodate the required NYSDEC Water Quality Volumes for their contributing drainage areas. These Water Quality Peak Flow calculations are based on NYSDEC requirements in Appendix C of this report. Drainage areas to each Vortech Device are depicted on Drawing WQ-1 "Proposed Water Quality Area Map" located in Appendix 'D' & 'E' of this report.

Proposed Drainage Area #1a (PDA #1a) is 51.48 acres is the largest of the four areas analyzed in proposed conditions. This area is 89% impervious (proposed buildings and parking structures and pavement). It includes the northern and western portions of the site and a majority of the existing buildings and parking areas, including Macy's, Sears, the recently constructed Stop & Shop and the main mall area. Most of the proposed Mall improvements are proposed within this basin.

This area drains without detention, to the relocated 72" culvert to be constructed in the northern portions of the Mall ring road. This drainage area does not include the proposed single story parking deck to be constructed north of Existing Building #1 (PDA-1b) and discharges stormwater runoff to Design Point #1.

Proposed Drainage Area #1b (PDA #1b) is 3.11 acres and is 100% impervious as it includes the surface of the proposed one-story parking deck north of Existing Building #1 and east of the proposed Macy's expansion. This drainage area is routed through the proposed stormwater subsurface management system located north of the proposed Macy's addition, which will provide attenuation and infiltration of stormwater runoff from PDA-1b. This system consists of 920 linear feet of five (5) foot diameter perforated corrugated metal pipe with an outlet control structure to restrict flows leaving the system. The proposed outlet control structure includes an interior wall with a 13" orifice to be constructed at the same elevation at the bottom of the proposed system. The proposed pipes will be perforated, allowing for infiltration of runoff into the ground. Peak rates and total volume of runoff from the proposed system, when combined with the undetained PDA-1a, will be less than those that currently exist at Design Point #1.

Proposed Drainage Area #2 (PDA #2) is 11.48 acres and will remain undisturbed during the construction of the proposed improvements. This area is 0.01 acres smaller than EDA-2 as analyzed in existing conditions due to the modifications required for the proposed drainage collection system. Therefore, peak rates of runoff and runoff volume from this area will virtually remain unchanged in proposed conditions.

Proposed Drainage Area #3 (PDA #3) is 5.03 acres in size and is located at the northeast corner of the site. The impervious coverage in this area increases slightly by 0.13 acres (5700 sq. ft.) due to the proposed widening of the existing site driveway at Kimball Avenue. Additional stormwater flows from this increase are mitigated by 150 linear feet of 48" diameter perforated corrugated metal storage pipe.

Stormwater quality measures do not currently exist at the site. Surface Water Quality will be enhanced in the post-development phase by the use of standard and non-standard practices defined in the Manual as allowed by the Redevelopment Strategy. The proposed subsurface stormwater management facilities will consist of perforated pipe allowing for the infiltration of stormwater runoff into the subsoils. In addition, Vortechics devices will be installed to treat 100% of the required water quality volume and will remove 80% total suspended solids from all contributing areas. The calculations for the sizing of these facilities are included in Appendix C of his report.

The proposed subsurface stormwater infiltration and detention reduces the peak rates and volume of runoff below those that currently exist for the 1, 10 and 100-year storms, as required by the SPDES General Permit GP-02-01. The following table summarizes the flows at each of the design points in post-development conditions:

**Table 2**  
**Peak Rates of Runoff in Proposed Condition**

Storm Frequency (Years)	Peak Rates of Runoff at Design Point in Proposed Conditions (c.f.s.)		
	Design Point #1	Design Point #2	Design Point #3
1	103.28	16.06	7.96
10	194.28	38.06	16.33
25	235.45	48.27	20.09
50	275.83	58.47	23.83
100	296.05	63.56	25.70

The proposed subsurface stormwater infiltration and detention systems reduces the peak rates and volume of runoff below those that currently exist for the 1, 10, 25, 50 and 100-year storms, as required by the SPDES General Permit GP-02-01. The following table summarizes the flows at each of the design points in pre and post-development conditions.

**Table 3**  
**Comparison of Peak Rates of Runoff in Existing and Proposed Conditions**

Storm Frequency (years)	Comparison of Peak Rates of Flows @ Design Points (c.f.s.)					
	Design Point #1		Design Point #2		Design Point #3	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	103.37	103.28	16.08	16.06	8.68	7.96
10	195.32	194.28	38.09	38.06	18.12	16.33
25	236.62	235.45	48.31	48.27	22.38	20.09
50	277.74	275.83	58.52	58.47	26.62	23.83
100	298.25	296.05	63.62	63.56	28.73	25.70

Maintenance of the proposed stormwater management systems is required for the system to properly function. The maintenance of the stormwater facilities will be the responsibility of the property owner and the owner will maintain these facilities in perpetuity. The following is a listing of the components of the system that will require maintenance and the frequency it is to be performed:

- 1) All Vortech devices and catch basin sumps shall be cleaned of all debris at least once per

year.

- 2) The subsurface detention system shall be inspected at least once per year to remove accumulated sediment.
- 3) All paved areas shall be cleaned and swept twice per year to remove debris and sediment to prevent its entrance into the stormwater management facilities.

## V. **SEDIMENT AND EROSION CONTROL**

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Construction of the proposed development can potentially impact soils and by erosion and transport of sediment. A Sediment and Erosion Control Management Program has been established to mitigate these impacts, beginning at the start of construction and continuing to the completion of the project, as outlined in the "New York Guidelines for Urban Erosion & Sediment Control," dated January 2004. A continuing maintenance program will be implemented for the control of sediment transport and erosion control after construction and throughout the life of the project.

### Topographic Features of Project Area

The existing topography is shown on Drawings SP-8 "Preliminary Grading Plan", and SP-10 "Preliminary Sediment & Erosion Control Plan", at a scale of 1"=50'. Two foot contour intervals are provided on the plans. The plans include the location of the project with respect to roadways and other identifiable landmarks.

### On-Site Pollution Prevention

There will be inlet protection, provided for all storm drains and inlets with the use of curb gutter inlet protection structures and stone & block drop inlet protection, which keep silt, sediment and construction litter and debris out of the on-site stormwater drainage system.

## Temporary Control Measures

Temporary Sediment and Erosion Control Measures will be used throughout the construction of the proposed improvements to control on-site erosion and sediment transfer. These measures will include silt fences, interceptor swales, stabilized construction entrances, temporary seeding, mulching and sediment traps. Interceptor swales will be used to direct stormwater runoff to temporary sediment traps to contain sediment on-site.

Descriptions of the temporary sediment & erosion controls that will be used during the development of the site including silt fence, stabilized construction entrance, seeding, mulching and inlet protection are as follows:

- Retaining Walls - are structural walls constructed of rock or concrete and designed to prevent soil movement and retain soil in place in steeply sloping areas;
- Dust Control - consisting of spraying the ground surface with water to prevent dust emissions from vehicular and construction traffic;
- Temporary Storm Drain Diversion - is the redirection of a storm drain so that it will temporarily discharge into a sediment trapping device;
- Silt Fence - is a temporary geotextile fabric used to intercept sediment laden runoff from small drainage areas;
- Storm Drain Inlet Protection - is a permeable barrier placed around the inlet to reduce the amount of sediment entering the storm drainage system;
- Stabilized Construction Entrances - will be constructed at the entrance to each area of construction and will consist of a stabilized pad of aggregate underlain by filter cloth;
- Temporary Diversions or Swales - swales or other channels will be constructed to intercept sediment laden runoff and divert it to a sediment trapping device;

- Temporary Sediment Traps - which act as a trap to intercept sediment laden runoff and permit the sediment to settle;
- Erosion Control Matting will be installed on newly graded slopes to provide immediate stability and to aid the establishment of vegetation. These blankets consist of photodegradable netting with a combination of straw and coconut fibers to protect exposed soil from rain and minimize erosion;
- Sediment & Erosion Control Notes – Construction sequencing is included on the Sediment and Erosion Control Plan to direct the contractor how to proceed during construction to prevent and minimize erosion.

The contractor shall be responsible for maintaining the temporary sediment and erosion control measures through out construction. This maintenance will include, but not be limited to, the following tasks:

1. For dust control purposes, moisten all exposed graded areas with water at least twice a day in those areas where soil is exposed and cannot be planted with a temporary cover due to construction operations or the season (December through March).
2. Inspection of erosion and sediment control measures shall be performed at the end of each construction day and immediately following each rainfall event. All required repairs shall be immediately executed by the contractor.
3. Sediment deposits shall be removed when they reach approximately 1/3 the height of the silt fence. All such sediment shall be properly disposed of in fill areas on the site, as directed by the Owner's Field Representative. Fill shall be protected following disposal with mulch, temporary and/or permanent vegetation and be completely circumscribed on the downhill side by silt fence.

4. Rake all exposed areas parallel to the slope during earthwork operations to minimize concentrated flow across unstabilized areas.
5. Following final grading, the disturbed area shall be stabilized with a permanent surface treatment (i.e. turf grass, pavement or sidewalk). During rough grading, areas which are not to be disturbed for fourteen or more days shall be stabilized with the temporary seed mixture, as defined on the plans.

## **VI. CONCLUSION**

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The downstream properties will not be adversely affected by the proposed development with the implementation of the proposed stormwater management plan described above.

Peak rates of runoff will not increase in the post-development condition since the proposed subsurface stormwater management facilities will provide storage to allow runoff from the additional impervious areas to leave the site at a controlled rate. The project will not increase the volume of stormwater runoff leaving the property since infiltration is also proposed.

Water quality will be enhanced by infiltration of runoff in the proposed perforated subsurface pipes. Water quality will also be enhanced by mechanical means using Vortech devices which are sized to remove 80% total suspended solids from the water quality volume as required by NYSDEC in the Manual.