## I. Description of the Proposed Action

### A. Project Location

The site is located in northwestern Prince George's County, Maryland, within the Washington Metropolitan Area **(See Appendix A)**. The proposed limits of the project consist of the consolidation of the Cochran property parcels "A" and "B" and the 1.03 acres of land presently owned by the Maryland-National Capital Park and Planning Commission (M-NCPPC) **(See Appendix D)**.

### B. Proposed Action

The proposed action is to convey 1.03 acres presently owned by M-NCPPC for 1.03 acres presently owned by the University of Maryland. The 1.03 acres owned by the University of Maryland abuts the M-NCPPC property to the south **(See Appendix D)**.

## II. Purpose and Need

### A. Introduction

The proposed College Park Student Housing Facility is to be located directly across from the intersection of Melbourne Place and Baltimore Avenue (U.S. Route 1). The proposed location is on the west side of Baltimore Avenue, directly north of the main entrance to the University of Maryland. The 1.03 acres owned by the M-NCPPC is part of parcel 137 consisting of 4.34 acres. To construct this facility the 1.03 acres presently owned by the M-NCPPC will be consolidated with parcels "A" and "B" of the Cochran property totaling 3.75 acres. The proposed facility will be a four (4) story wood frame structure with an additional pent house floor. This facility will be built on top of a concrete parking structure. The architecture is consistent and in conformance with the city master plan and will be designed to Leadership in Energy and Environmental Design (LEED) standards. This facility will consist of approximately twenty-four thousand (24,000) square feet of retail development and provide housing for approximately nine hundred (900) University of Maryland students. The hope is to complete this facility for the fall 2010 school year.

In exchange for the 1.03 acres of M-NCPPC property the University of Maryland will convey the exact same acreage to M-NCPPC. The University of Maryland property is presently funded to construct a park known as "Northgate Park" **(See Appendix G)**. This park will consist of pedestrian paths, a pedestrian bridge to the university, a center hub along Baltimore Avenue to connect to the mass transit system as well as a variety of landscape beds and trees.

Bohler Engineering is preparing this Environmental Assessment (EA) on behalf of Mark Vogel Companies to assist the M-NCPPC and the National Capital Planning Commission (NCPC) in the decision making process. The intent of this EA is to assess the potential benefits and impacts of the proposed improvements on the environment.

This documentation is consistent with the National Environmental Policy Act (NEPA) of 1969, as amended, the Council on Environmental Quality (CEQ) regulations implementing NEPA [40 Code of Federal Regulations (CFR) 1500-1508 (1986)].

This EA describes the affected environment, identifies potential environmental impacts and suggests possible mitigation measures associated with implementing the proposed improvements. In addition, resulting impacts and benefits from the implementation of the proposed improvements with other current or planned projects are considered.

B. Existing Conditions

The 1.03 acre (44,867sf) M-NCPPC property which consists of underlying brush and trees will be combined with property currently containing a Merchant Tire Automotive Center, Jerry's Sub Shop, an abandoned building and multiple parking lots. The purpose of the project is to demolish all current surface features and construct a new Student Housing Facility which will include a small amount of retail along the building frontage on Baltimore Avenue.

The 1.03 acre (44,867sf) University of Maryland property directly abuts the M-NCPPC property. It also consists of underlying brush and trees. This property will be converted into a pedestrian park know as "Northgate Park". The park is presently being funded by the University of Maryland and will start construction fall 2008.

C. Proposed Action Needed

The NCPC is the federal government's central planning agency for the surrounding counties of Maryland, Virginia and the District of Columbia. The Commission is responsible for providing overall planning guidance for federally held land. As such, NCPC has the authority to approve the transference of land for the proposed Student Housing Facility. The information contained in this EA is to assist the agency in the decision making process.

D. Public Agency Coordination

M-NCPPC will implement a public notice announcing its intent regarding the proposed land swap and inviting public comments. Public and agency coordination has also occurred with the University of Maryland and College Park Planning Board.

## III. Description of Affected Environment

A. Social, Economic and Land Use

1. Social Environment

As one of the fastest growing areas in the nation, the Washington metropolitan region increased in population by 98 percent between 1950 and 1980. During this time and to the present the University of Maryland has also grown exponentially and is in desperate need for safe student housing that is within walking distance to the university.

2. Economic Environment

Unlike the countywide statistics, retail comprised the greatest portion of employment in College Park. The three existing businesses consist of a take-out sub shop, an unoccupied restaurant and an automotive repair and tire center. Although the proposed building alternative does require business displacement, two of the three businesses are presently closed.

3. Land Use

The M-NCPPC property that is presently zoned R-O-S (Reserved Open Space) will be converted and combined with 2.75 acres that is presently zoned M-U-I (Mixed-Use Infill).
This M-U-I zoning promotes Smart Growth principles by encouraging the efficient use of land, public facilities and services in areas that are substantially developed. These regulations are intended to create community environments enhanced by a mix of residential, commercial, recreational, open space, employment and institutional uses in accordance with approved plans. This infill zone is consistent with the Approved College Park U.S. 1 Corridor Sector Plan and Sectional Map Amendment.

B. Natural Resources

1. Vegetation

A Natural Resource Inventory Report by McCarthy & Associates, dated February 2008 **(See Appendix J)** identifies that both parcels consist of underlying brush and trees. Ten (10) specimen trees, consisting of Yellow-Popular, Green Ash and American Sycamore, will be affected by the proposed facility. The condition of the trees is very poor to fair.

2. Soils, Geology and Topography

The surrounding soils along the Paint Branch Stream are poorly drained soils that are nearly level or gently sloping **(See Appendix K)**. Specifically the two sites soils consist primarily of Hatboro Silt Loam (Ha) with a small component of Codorus Silt Loam (Ch), and Woodstown-Urban Land Complex (Wu) soils.

3. Surface Water Runoff

The existing drainage pattern is from Baltimore Avenue gently sloping west to the Paint Branch Stream. The surface water runoff presently discharges uncontrolled and untreated. The existing impervious area from the three existing businesses that runs into Paint Branch uncontrolled and untreated is 1.65 acres. The existing flows from the encompassed area of 3.75 acres are 9cfs for the 1-year storm event, 22cfs for the 10-year storm event and 33cfs for the 100-year storm event.

4. Floodplains

Based on the 100-year floodplain study (FPS#0019-2002) for the Paint Branch Stream system, the site is presently inundated by the floodplain. An updated floodplain model has been performed that demonstrates no increase in the base flood elevation with the development of the proposed facility. Also, compensatory storage for any fill within the floodplain will be provided.

5. Terrestrial and Aquatic Environment

The Paint Branch, a Use I Stream, abuts the site to the west. The Paint Branch is accessible to anadromous fish and is considered to be a sensitive habitat because of potential fish spawning. Over two decades have passed since the Federal, State and local agencies have removed several barriers to allow a fish passage in College park and downstream areas in the Anacostia watershed. A letter from Maryland Department of Natural Resources dated October 3, 1997 for the College Park U.S. 1 improvements state that there is approximately thirty-seven fish species know to exist in the Paint Branch and Indian Creek tributaries.

There is no deciduous forest terrestrial habitat found within the limits of the proposed student housing facility.

6. Wetlands

Wetlands are areas characterized by hydric soils, hydrophyic vegetation and frequent flooding or inundated during the growing season. Wetlands are included in the broad definition of "Waters of the United States," which include lakes, rivers, streams, mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, and natural ponds.

The proposed student housing facility site was investigated for the presence of Waters of the United States, including wetlands. The investigation utilizes the Corps of Engineers Wetlands Delineation Manual which prescribes a three-parameter approach to delineating wetlands.

7. Paint Branch Stream

Where as Paint Branch, located to the west of the facility is considered "Waters of the United States." The stream is a tributary to the Northwest Branch, which flows to the Anacostia River and then into the Potomac River. Specifically, the Paint Branch is a perennial, fourth order stream, with seasonal variation in stream flow that is dominated by storm flow runoff and is altered due to urban development. A Stream Assessment for the Paint Branch Stream has been performed by Environmental Systems Analysis, dated August 2007 **(See Appendix H)**. Based on this study the stream width ranges from 64 to 79 feet. Meander patterns are irregular and the steam is dominated by point and side bars with a few mid-channel bars. In stream debris is infrequent and consists of small, easily moved, floatable material, such as leaves and small branches.

8. Threatened, Endangered and Species of Concern

According to the Maryland Department of Natural Resources, Wildlife and Heritage Services letters dated July 11, 2007, there are no records of any threatened, endangered, or of special concern species within the area **(See Appendix K)**.

C. Hazardous Waste

Hazardous substances are defined as any material that poses a threat to human health and/or the environment. Hazardous waste possess at least one of the following characteristics; ignitability, corrosivity, reactivity, toxicity, or appears on the Environmental Protection Agency list. These

wastes are by-products that can pose a substantial or potential hazard to human health of the environment when improperly managed.
One of the three existing businesses, the auto repair facility, is classified as a "High" hazard waste generator with potential to house hazardous substances. With the two other existing businesses rank as a low potential waste generator and low potential to house hazardous substances.

D. Transportation

1. Vehicular

Baltimore Avenue is presently a four-lane undivided highway with a center turn lane. Baltimore Avenue is presently a highly congested roadway. There are no parallel service roads along the commercial strip adjacent to the U.S. 1 corridor. Poor circulation along U.S.1, caused by many signalized intersections, a strip of roadside commercial driveways, on-street loading and unloading for commercial deliveries presents an operational problem.

2. Non-Vehicular

The inadequate sidewalk system and the absence of islands and adequate separation from vehicular traffic is present along the U.S. 1 corridor. There is also a lack of sufficient bus stops to allow for convenient passenger pick-up and discharge services that do not infringe upon the flow of traffic.

There are no designated bike lanes along the U.S. 1 corridor. The existing 11-foot outside lane does not provide sufficient room to accommodate bicycle traffic. There is only one crossing connecting to the Paint Branch Hiker/Biker/Equestrian trail in the immediate vicinity. The pedestrian crossing located behind the "University View" apartment complex.
There are in excess of 36,000 students enrolled at the University of Maryland College Park Campus. Out of those only approximately 9,000 are students that are housed on campus; therefore pedestrian and bicycle safety and circulation, and improvements to Baltimore Avenue (U.S. Route 1) are essential.

3. Airport Traffic

The proposed facility is in direct alignment with the college park airport runway approximately 3,500 feet passed the end of the runway and will be located in Accident Potential Zone 4 based on the College Park Airport – Small Aviation Policy Areas Exhibit **(See Appendix K)**. The Accident Potential Zone 4 is 2,500 feet further than Accident Potential Zone 2. The Accident Potential Zone 4 captures two percent (2%) of the accidents in the Hodges & Shutt study. This is the lowest percentage for all of the zones.

According to the Federal Aviation Administration letter dated January 11, 2007 any building exceeding a height of 129 feet from ground level (198 feet above mean sea level) will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

E. Parking

The College Park U.S. 1 Corridor Sector Plan and Sectional Map Amendment objective for parking areas is to reduce the visual impact of parked cars in parking lots adjacent to all roadways with plantings and walls. To provide parking credits and incentives this will encourage the use of shared parking facilities for two or more adjacent land uses. To promote alternative modes of transportation other than single occupancy vehicles this will reduce the number of cars and parking spaces on the U.S. 1 corridor. The use of structured parking is also strongly encouraged in the Main Street and town center areas of the development district.

F. Utility and Infrastructure

The utilities that front the proposed facility within Baltimore Avenue right-of-way consist of a 16-inch water line, an 8-inch sewer line, and a natural gas main and overhead electrical line.

G. Demolition

The three existing buildings consisting of a Merchant Tire Auto Repair, Jerry's Sub and unoccupied restaurant will be Demolished and disposed of properly per regulatory guidelines.

## IV. Environmental Consequences

A. Social, Economic and Land Use Impacts

1. Social Environment Impacts

There are only two alternatives that have been considered.
Alternative 1 (No Land Swap); Will not provide the needed student housing beds. The existing businesses would still be demolished and an alternative commercial site would be constructed on the property presently owned by Mark Vogel Companies.

Alternative 2 (Land Swap); Would provided approximately 900 beds which are needed for the University of Maryland student body as well as providing approximately 24,000 square feet of retail component creating a true life style facility (live, work, play). The proximity of this facility to the University of Maryland is critical to the social community of the proposed residents.

2. Economic Environment Impacts

Alternative 1 (No Land Swap); Will cause a loss to the community due to decrease of needed dwelling units for students. As well as a loss of revenue these student will provide to the immediate vicinity.

Alternative 2 (Land Swap); Although the proposed facility does require business displacement, the overall economic environment should improve as a result of the proposed enhancements. The pedestrian and bicycle circulation and safety as well as the corridor aesthetics are in conformance with the approved sector plan.

3. Land Use Impacts

Alternative 1 (No Land Swap); Will have no effect on the land use.

Alternative 2 (Land Swap); The proposed Student Housing Facility will have no impact to the existing land uses; on the contrary, the proposed facility will provide needed beds for the University of Maryland and a tax benefit for the proposed retail development space. The facility will work in conjunction with "smart growth" development by providing alternative means to vehicular travel and therefore reduce carbon emissions.

B. Natural Resources Impacts

1. Vegetation Impacts

Alternative 1 (No Land Swap); will have no effect on the existing vegetation since the parcel occupied by the three existing business are developed.

Alternative 2 (Land Swap); The proposed facility will remove primarily overgrown underbrush and ten (10) specimen trees located on the M-NCPPC property. The ten (10) specimen trees consist of Yellow-Popular, Green Ash and American Sycamore and are currently in very poor to fair condition. A significant amount of landscaping is proposed with this project. It will consist of courtyard landscaping and green decks on top of the parking structure. The "Northgate Park" will also provide a large portion of landscaping with its implementation.

2. Soils, Geology and Topography Impacts

The proposed alternatives will require minimal changes to the topography. Likewise, neither alternative would disturb the soils in the project location. Construction of either the student housing or any other development would require approval from Prince George's Soil Conservation District to implement erosion and sediment control measures.

3. Surface Water Runoff Impacts

The proposed student housing facility will provide an underground stormwater management facility as well as provide water quality improvements to a site that presently discharges uncontrolled and untreated. The facility will provide, in accordance with Maryland Department of the Environment, channel protection volume as well as provide water quality devices to treat the runoff prior to discharge into Paint Branch Stream. With the construction of the stormwater management facility the approximate proposed flows from the site will be 0.3cfs for the 1-year event, 28cfs for the 10-year storm event and 40cfs for the 100-year storm event. This is flows represent a 300 percent reduction for the 1-year storm event, a 27 percent increase for the 10-year storm event and a 21% increase for the 100-year storm event. These increases are minimal for the overall flows of Paint Branch Stream. The total 100-year flows for the stream based on the approved county floodplain study is 17,191cfs which makes the proposed development increase for the 100-year storm event 0.0004 percent. Since we are discharging to a defined water source the 10-year and 100-year storm attenuation is not required but a fee-in-lieu of approximately **$38,000** will be paid based on section 2.8.1 of the Prince George's County Stormwater Management Design Manual.

4. Floodplains Impacts

The proposed facility will have no affect on the floodplain elevations. A floodplain study has been performed by Bohler Engineering and submitted to Prince George's Department of Public Works & Transportation (DPW&T) for review and approval. The study demonstrates that with the construction of most of the building on piles that the base flood can run underneath the proposed facility unimpeded. Furthermore, for the areas that are being filled within the floodplain that compensatory storage will be provided.

5. Terrestrial and Aquatic Environment Impacts

Construction often causes short-term impacts to fisheries resources. Sedimentation during construction has potential to degrade water quality, thus impact fisheries habitat. Siltation on streambeds has an adverse effect on the habitat of fish spawning and macro invertebrate production.

The Maryland Department of Natural Resources advises that no work is permitted in Use I streams during the period of March 1 through June 15, and that the prohibition should be adequate to protect the resident species in the area. Also, sediment and erosion control methods, and other Best Management Practices typically used for protection of stream resources, need to be implemented to protect the fish population.

No in stream work is proposed and therefore will not directly impact fishery resources. Any earth disturbance that could generate a sediment discharge would be minimal. No impact is expected to affect terrestrial habitat.

Due to the height of the proposed facility and the location of the wooded areas the shadow effects of the building will not affect existing trees. The proposed facility is 100 feet tall and the wooded area is located to the south and west of the site.

6. Wetlands Impacts

According to the Natural Resource Inventory Report by McCarthy & Associates, dated February 2008, **(See Appendix J)** there are no jurisdictional waters of the U.S. including non-tidal wetlands exist on the subject property.

7. Paint Branch Stream Impacts

A Stream Assessment for the Paint Branch Stream has been performed by Environmental Systems Analysis, dated August 2007 **(See Appendix H)**. The proposed Student Housing Facility will cause no detrimental impacts to the existing stream. On the contrary, the developer will contribute the necessary funds to improve the stream based on the recommendations in the stream assessment. The cost associated with the design and construction for these improvements will be approximately **$215,500**. These improvements consist of adding needed revetment in key areas, fixing existing storm water outfalls and encasing the existing sewer line that is presently exposed to the elements. The proposed facility will also control and treat storm drain runoff by Best Management Practices (BMP). These BMP's consist of providing an underground vault system to provide Channel Protection Volume and mechanical devices to improve the water quality to be in conformance with Maryland Department of the Environment standards.

8. Threatened, Endangered and Species of Concern

According to the Maryland Department of Natural Resources, Wildlife and Heritage Services letters dated July 11, 2007, there are no records of any threatened, endangered, or special concern species within the area **(See Appendix K)**.

C. Hazardous Waste

In compliance with local jurisdictions an environmental analysis will determine known or suspected hazardous waste contaminates which will warrant a more detailed assessment and sampling of the substances/waste, soils, surface water, or groundwater. This will determine if any coordination with the Maryland Department of the Environment (MDE) and Environmental Protection Agency (EPA) is needed.

D. Transportation Impacts

1. Vehicular Impacts

Where as the proposed student housing facility would potentially add some traffic to Baltimore Avenue which currently has a Level of Service of "F", it will provide the needed outer 16-foot lane along its frontage for the ultimate Baltimore Avenue (U.S. Route 1) master plan improvement.

2. Non-Vehicular Impacts

In conjunction with the approved sector plans the proposed Student Housing Facility will be promoting non-vehicular movement consisting of cycling on trails and pedestrian movement along off-street trail and sidewalks. This is being done by working in concert with the University of Maryland proposed Northgate Park project. The Northgate Park project is proposing a direct connection via sidewalks and pedestrian bridge from the proposed Student Housing Facility to the University of Maryland campus. Also the park is proposing a bus stop with a covered shelter to tie into the mass transit system currently present.

The proposed Student Housing facility will be directly connected to the University of Maryland campus via sidewalks and a pedestrian bridge. The pedestrian bridge is connected to the paint branch trail system that is present on the west side of the Paint Branch Stream. With these measures in place it should reduce vehicular trips to and from the student housing facility.

3. Airport Traffic Impacts

According to the Federal Aviation Administration letter dated January 11, 2007 any building exceeding a height of 129 feet from ground level (198 feet above mean sea level) will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation **(See Appendix K)**.

The proposed building height to the highest point will be approximately 100 feet from ground level and there for would not warrant a hazard determination.

# VICINITY MAP


Birdseye Aerial View (North)


Birdseye Aerial View (West)


Birdseye Aerial View (East)


Birdseye Aerial View (South)

# APPENDIX A

## Stream Assessment of Paint Branch Map

# EXECUTIVE SUMMARY

A stream assessment was performed using Rosgen Levels I through III methods for a 1,372 linear foot reach of the Paint Branch adjacent to the proposed Hilton Hotel and Conference Center property in College Park, MD. The purpose of the assessment was to determine stream stability and to identify potential stabilization areas in relation to the site. The reach classifies as a moderately entrenched, gravel dominated B4c system. Bankfull width ranges from 64 to 79 feet and the floodprone width ranges from 90 to 115 feet. For the most part, the stream appears to be laterally stable with approximately 156 linear feet of banks supplying moderate amounts of sediment to the stream system. The overall streambank erosion rate predicted for this reach totals 18.19 tons per year.

The majority of bank erosion is occurring in Restoration Area #1, located from Stations 06+04 to 07+60, where banks are vertical and four to six feet in height. A natural material revetment and/or rock vane could be installed along the left bank to arrest and prevent bank erosion. Additionally, the left bank could be graded to provide a stable slope and planted. Restoration Area #2, located at Station 07+60, is a sewer utility that has a three foot vertical drop, which is an aquatic barrier for resident and potential anadromous species. The sewer could be re-encased, while a grade control structure or step pool could be used to protect the stream invert and restore aquatic passage. Restoration Area #3, located at Station 08+16, is an existing 48 inch RCP outfall, which is eroded and undercut with a three to four foot drop in elevation. The headwall to this outfall could be repaired or replaced. A drop structure could be installed to dissipate energy, reduce velocity, and prevent erosion. Finally, removal of the debris jams located from Stations 04+91 to 05+74 and underneath U.S. Route 1, as well as the eradication of the bamboo, located from Stations 12+13 to 13+77, and removal of concrete and rubble along the right bank, near the end of the reach would benefit the stream.

## 1.0 INTRODUCTION

A stream assessment was performed, using Rosgen Levels I through III methods, for a section of Paint Branch, located adjacent to and west of the proposed Hilton Hotel and Conference Center property. This property is located along Baltimore Avenue (U.S Route 1) in College Park, Maryland (ADC Map 7, E10). The assessment began 183 feet upstream of the existing pedestrian wood bridge and extended downstream for 1,189 feet to U.S. Route 1 for a total of 1,372 linear feet. The purpose of this assessment was to determine stream stability and to identify potential stabilization measures that may be necessary to protect the Hilton Hotel and Conference Center property from loss due to channel erosion.

The proposed hotel site is located on an approximately 1.72-acre parcel that is bordered to the west and south by Maryland-National Capital Park and Planning Commission land and Paint Branch; to the east by U.S. Route 1; and to the north by the University Overlooks property consisting primarily of student housing and a parking. Proposed development includes a 300 room Hilton Hotel with a restaurant, meeting space, and parking garage.

Paint Branch is a fourth order stream with a drainage area of approximately 29.20 square miles. Approximately 29.9% of the watershed is impervious and the majority of land use is medium density residential (GISHydro2000). This portion of Paint Branch lies near the fall line, with the headwaters located in the Piedmont Physiographic Province. Upstream of the site, Paint Branch has poor bank stability, causing bank erosion and in-stream sedimentation. The portion of Paint Branch, located adjacent to the property, is mostly stable with some areas of moderate bank erosion. A stream stabilization concept plan map is located in ***Appendix A***.

## 2.0 METHODS

A stream assessment, which included stream quality, geometry measurements, pebble counts, bar sample, channel stability, and predicted total bank erosion components was performed to determine the Rosgen classification and stream condition. The entire 1,372 linear foot study reach was assessed and a brief summary of the protocol is provided.

### 2.1 Stream Quality

Stream quality characteristics, including flow regime, stream order and size, meander patterns and depositional features, debris blockages, and riparian composition were determined. Stream flow categories, such as ephemeral, subterranean, intermittent, or perennial were documented. Furthermore, it was noted if the stream flow was dominated by storm flow, diversions, development, or spring-fed conditions. Stream order was determined from available maps. Meander patterns, depositional features, extent of debris, riparian composition, and the extent of coverage were documented for the canopy, shrub, and herbaceous layers.

### 2.2 Geometry Measurements

Stream geometry measurements, including sinuosity, radius of curvature, meander belt width, and meander length were documented to determine the relationship between the channel and its valley. These measurements were used to determine the degree of channel meandering, potential migration of meander bends, and the ability of the channel to resist erosion. Stream geometry measurements were performed on meanders that were representative of the reach. The meander belt width, meander length, and valley length were determined from available maps. The radius of curvature was determined using the following equation:

$R_c = 0.22\ L_m$; where $L_m$ is the meander wavelength (Williams, 1986).

Longitudinal profile and cross-sections were also surveyed. The profile was surveyed to document the location, distribution, and frequency of bed features, in addition to the water surface slope. The bed features were surveyed in the thalweg. Bed features and water surface elevations were surveyed at all transitions points, such as riffle to run, run to pool, pool to glide, and glide to riffle. Three cross-sections were located in riffles and

one cross-section was located in a pool. Grade breaks, bed and bank features, water surface, and bankfull elevations were documented at each cross-section. Each cross-section was photographed in the upstream and downstream orientation.

Flowmaster®, a hydraulic analysis program, was used to calculate the bankfull discharge. Using information about the shape of the channel (cross-section coordinates), channel slope, roughness coefficient, and bankfull water surface elevation, Flowmaster® solves the Manning's equation for bankfull discharge.

## 2.3 Pebble Counts, Bar Sample, Channel Stability, and Predicted Total Bank Erosion

An active channel pebble count was performed within the wetted width of a riffle cross-section. The representative pebble count was collected throughout the entire reach at transect locations based on the pool to non-pool ratio, with one particle on every other transect sampled from the banks. The pool to non-pool ratio was determined using data collected from the longitudinal profile. Pebble counts were conducted using the random step toe procedure at evenly spaced intervals across ten transects. For each count, 100 particles were measured by sampling ten transects, measuring ten particles in each transect. The intermediate axis of each particle was measured.

A bar sample was collected at a point bar. The samples were wet sieved and the total weights of the samples, as well as the weights of each size class were measured. These results were then used to determine the ability of the existing stream reach to transport its largest particle during bankfull flow. Bar samples were collected within the downstream third of the bar sampled, using a bottomless bucket.

Channel stability was determined using the Pfankuch Channel Stability Form. This method uses several categories to rate the upper and lower banks and the channel bottom in categories from excellent to poor. Categories consist of: landform slope, mass wasting, debris jam potential, and vegetative bank protection for the upper banks; channel capacity enlargement, bank rock content, obstruction to flow, cutting, and deposition for the lower banks; and rock angularity, brightness, consolidation of particles, bottom size distribution, scouring and deposition, and aquatic vegetation for the bottom. A modified channel stability rating was calculated based on the total score, existing stream type, and potential stream type.

Predicted total bank erosion was calculated using the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) methods. BEHI uses the bank height, bankfull height, root depth, root density, bank angle and surface protection to obtain a bank erosion index that corresponds to ratings ranging from very low to extreme. To determine NBS, Method 5 was used. This method uses the ratio between the near-bank maximum bankfull depth and the mean bankfull depth. Using this ratio, the corresponding rating ranging from very low to extreme is determined. Using the pool and riffle cross-section ratings as a reference, BEHI and NBS ratings were determined for all of the actively eroding banks.

The length and height of each eroding bank was also measured and recorded. Based on the BEHI and NBS ratings, an estimated erosion rate (feet per year) was determined for each bank, using Colorado erosion rate data. This rate was multiplied by the length and height of each bank to determine an estimated amount of erosion per year ($ft^3/yr$). The amounts for each bank are summed to calculate the total amount of erosion occurring in the reach per year. This total is then converted to tons per year, which is then divided by the total length of the reach to determine the erosion per unit length of stream (tons/yr/ft).

### 2.4 Photographic Documentation

Photographs were taken to document stream stability, bank erosion, debris jams, bar formation, and bank failure.

## 3.0 RESULTS AND DISCUSSION

### 3.1 Stream Quality

Paint Branch is a perennial, fourth order stream, with seasonal variation in stream flow that is dominated by stormflow runoff and is altered due to urban development. Bankfull widths range from 64 to 79 ft. Meander patterns are irregular and the stream is dominated by point and side bars with few mid-channel bars. Instream debris is infrequent and consists of small, easily moved, floatable material, such as leaves and small branches.

The riparian vegetation consists of American sycamore, black willow, green ash, silver maple, river birch, and black cherry. The herbaceous layer is primarily composed of multiflora rose, Japanese honeysuckle, Asiatic bittersweet, deer tongue, poison ivy, and milkweed. Canopy closure is approximately sixty percent within the riparian buffer, but is only five percent over the stream.

### 3.2 Geometry Measurements

The stream is classified as a moderately entrenched "B4c" channel with a gentle water surface slope and a channel substrate that is primarily composed of medium gravel. The majority of the stream is composed of pools, as a result of backwater conditions created by an exposed sewer line and local scouring. Sinuosity is low. ***Table 1*** lists the geometry measurements, channel dimensions, Rosgen stream classifications, and discharge estimates for the riffle cross sections. As shown in ***Table 1***, the bankfull channel dimensions of width, mean depth, and cross-sectional area are similar for all cross-sections. This is expected, since the sections have a similar drainage area (approximately 29.20 $mi^2$). Cross section and longitudinal profile graphs and channel photographs, as well as the stream classification forms are included in ***Appendix B.***

***Table 1: Geometry Measurements, Channel Dimensions, Stream Classifications, and Discharge Estimates Hilton Hotel and Conference Center, Paint Branch***

| Bankfull Channel Dimension Parameter | Cross-section 1 | Cross-section 2 | Cross-section 4 |
|---|---|---|---|
| Bankfull Width ($W_{bkf}$) (ft) | 78.74 | 63.83 | 65.15 |
| Mean Depth ($d_{bkf}$) (ft) | 3.61 | 4.43 | 4.20 |
| Bankfull Cross Section Area ($A_{bkf}$) ($ft^2$) | 284.42 | 282.58 | 273.56 |
| Discharge ($Q_{bkf}$) (cfs) | 1809.02 | 1976.04 | 1869.66 |
| Width Depth Ratio ($W_{bkf}/d_{bkf}$) | 21.81 | 14.41 | 15.51 |
| Maximum Depth ($d_{mbkf}$) (ft) | 5.41 | 6.03 | 5.34 |
| Width of Flood-prone Area ($W_{fpa}$) (ft) | 115.10 | 90.00 | 95.76 |
| Entrenchment Ratio (ER) (ft) | 1.46 | 1.41 | 1.47 |
| Median Channel Material Size ($D_{50}$) (mm) for Reach | 13.42 | | |
| Median Channel Material Size ($D_{50}$) (mm) for Riffle | 27.95 | | |
| Median Channel Material Size ($D_{50}$) (mm) for Bar Sample | 3.53 | | |
| Water Surface Slope (S) (ft/ft) | 0.003 | | |
| Channel Sinuosity (K) | 1.12 | | |
| Radius of Curvature | 138.5 | | |
| Belt Width (ft) | 100 | | |
| Meander Length (ft) | 630 | | |
| Total Length (ft) | 1372 | | |
| Total Pool Length (ft) | 781 | | |
| Total Glide Length (ft) | 174 | | |
| Total Run Length (ft) | 339 | | |
| Total Riffle Length (ft) | 78 | | |
| Stream Classification | B4c | | |

Regional curve relationships were used to verify bankfull field estimates. Although the site is located near the fall line, the Piedmont regional relationships were used to validate field-derived bankfull discharges because the majority of headwaters are located within the Piedmont Physiographic Province. Furthermore, there were no bankfull indicators observed in the field that corresponded to the Coastal Plain regional relationships. In the Piedmont region of Maryland, bankfull discharges typically occur between a 1.26 and 1.75-year recurrence interval (McCandless and Everett 2002). The following regional relationships were used to validate bankfull cross-sectional areas ($A_{bkf}$) and bankfull discharge ($Q_{bkf}$) using data collected in the field:

- Maryland and Delaware Piedmont urban relationship, developed using data from sites with greater than 20% imperviousness in their watersheds (Gemmill et al., 2003)
- Maryland, All Piedmont relationship, developed using data from five northeast Piedmont locations and 17 Main Piedmont locations ranging from two to 21% imperviousness in their watersheds (McCandless and Everett, 2002)

- Maryland, Main Piedmont, developed using data from 17 Main Piedmont locations of undisclosed watershed imperviousness (McCandless and Everett, 2002)
- Maryland Piedmont, developed from 16 urban gage stations in the Piedmont region, drainage area ranges from 0.49 to 102.05 square miles and imperviousness ranges from 10.9% to 42.8% (Moglen et al., 2006)

Field-derived $Q_{bkf}$ range from 1809.02 cfs to 1976.04 cfs, while field-derived $A_{bkf}$ range from 273.56ft$^2$ to 284.42 ft$^2$. These field-derived estimates are in between the Gemmill and Moglen et al. urban curves. The regional curve relationship data are provided in ***Table 2.***

***Table 2: Paint Branch Regional Relationship Data for Hilton Hotel and Conference Center, Paint Branch***

| Reference, Date | Region of Relationship Development | Bankfull Cross-sectional Area Estimate (ft$^2$) | Equation[1] |
|---|---|---|---|
| Gemmill et al., 2003 | MD & DE Piedmont, Urban | 399.76 | $A_{bkf} = 10^{(1.62 - 0.67(\log A))}$ |
| McCandless and Everett, 2002 | MD, Main and All Piedmont | 204.54 | $A_{bkf} = 17.42\ A^{0.73}$ |
| **Reference, Date** | **Region of Relationship Development** | **Bankfull Discharge Estimate (cfs)** | **Equation[1]** |
| Gemmill et al., 2003 | MD & DE Piedmont, Urban | 2293.09 | $Q_{bkf} = 10^{(2.32 - 0.73(\log A))}$ |
| McCandless and Everett, 2002 | MD, Main Piedmont | 997.15 | $Q_{bkf} = 71.74\ A^{0.78}$ |
| McCandless and Everett, 2002 | MD, All Piedmont | 1098.64 | $Q_{bkf} = 84.56\ A^{0.76}$ |
| Moglen et al., 2006 | MD Piedmont, Urban | 1502.00 | $Q_{1.5(} = 24.66\ A^{(0.648}(IA-1)^{(0.653)}$ |

Notes:
[1] A is a drainage area of 29.2 mi$^2$.

## 3.3 Pebble Counts, Channel Stability, and Predicted Total Bank Erosion

The analysis of the channel material provides an understanding of the stream power being applied to move this material through the system. Particle size distribution is influenced by many factors, including the geology of the watershed, watershed condition, and stream power. Particle size distribution is a point-in-time measurement, subject to change based on local perturbations (bank erosion, in-stream sedimentation, head-cuts, debris blockages, etc.), watershed-scale impacts (agriculture, urbanization), and climatic events

(high intensity storms, floods, drought, etc.). Paint Branch has a representative $D_{50}$ of 13.42 mm and an active channel $D_{50}$ of 27.95 mm, which relates to medium and coarse gravel sizes, respectively. Gravels are frequently deposited on the bars during storm events and the channel has likely changed from an unstable F channel to a more stable B4c due to the extensive bar formation in this reach. Furthermore, the $D_{16}$'s and $D_{84}$'s are as follows: active channel $D_{16}$ of 13.66 mm and $D_{84}$ of 51.94 mm, representative $D_{16}$ of 0.15 mm and $D_{84}$ of 32.26 mm, and bar sample $D_{16}$ of 2.74 mm and $D_{84}$ of 10.44 mm.

Pfankuch channel stability scores suggest that channel stability is "fair", with the lower banks and channel bottom receiving "fair" to "poor" ratings. The lower banks are composed of medium gravels that do not provide much bank protection. Furthermore, bottom materials are frequently moved and there is evidence of deposition and scour at obstructions, constrictions, and bends.

BEHI ratings are moderate and NBS ratings range from low to high. The predicted annual streambank erosion rates suggest that the section of Paint Branch, near the Hilton Hotel and Conference Center, contributes 18.19 tons of sediment per year or 0.12 tons of sediment per year per foot. Particle distribution graphs and data, as well as Pfankuch channel stability, bank erosion hazard index and near bank stress tables are provided in ***Appendix C.***

### 3.4 Photographic Documentation

Photos 1 and 2 document a newly installed cross vane and a pedestrian wood bridge, which crosses a tributary to Paint Branch, located adjacent to the University Overlook property. Photo 3 shows the pedestrian wood bridge, located over Paint Branch and adjacent to the Hilton Hotel and Conference Center property. Photo 4 shows bar formation along the left and right banks, as well as debris jam located along the right bank. A rock vane is apparent in Photo 5, while Photo 6 documents bank erosion in Restoration Area #1. Photo 7 documents Restoration Area #2, which consists of an exposed sewer utility. Photo 8 shows Restoration Area #3, an undercut 48 inch outfall, where sediment-laden water was observed to be entering the stream (Photo 9). Photo 10 documents a 27 inch RCP and Photo 11 documents a debris jam, located underneath U.S. Route 1. Photographs are included in ***Appendix D.***

## 4.0 Conclusion

The study reach consists of approximately 1,372 linear feet of Paint Branch which exists west of the proposed Hilton Hotel and Conference Center. The channel within this study reach classifies as a moderately unstable B4c stream type. Observations, as well as recorded and modeled data conducted as part of this study, indicate the reach would benefit from stabilization in three areas. The majority of bank erosion is occurring in Restoration Area #1, located from Stations 06+04 to 07+60, where banks are vertical and four to six feet in height. This portion of the reach is laterally unstable with moderately eroding banks that are supplying sediment to the system. The overall streambank erosion rate predicted for this section of Paint Branch is 18.19 tons of

sediment per year. A natural material revetment and/or rock vane could be installed along the left bank to arrest and prevent bank erosion. Additionally, the left bank could be graded to provide a stable slope and planted. Restoration Area #2, located at Station 07+60, is a sewer utility that has a three foot vertical drop, which is an aquatic barrier for resident and potential anadromous species. The sewer could be re-encased, while a grade control structure or step pool could be used to protect the stream invert and restore aquatic passage. Restoration Area #3, located at Station 08+16, is an existing 48 inch RCP outfall that is eroded and undercut with a 3 to 4 foot drop in elevation. The headwall to this outfall could be repaired or replaced. A drop structure could be installed to dissipate energy, reduce velocity, and prevent erosion. Finally, removal of the debris jams located from Stations 04+91 to 05+74 and underneath U.S. Route 1, as well as the eradication of the bamboo, located from Stations 12+13 to 13+77, and removal of concrete and rubble along the right bank, near the end of the reach would benefit the stream.

## 5.0 REFERENCES

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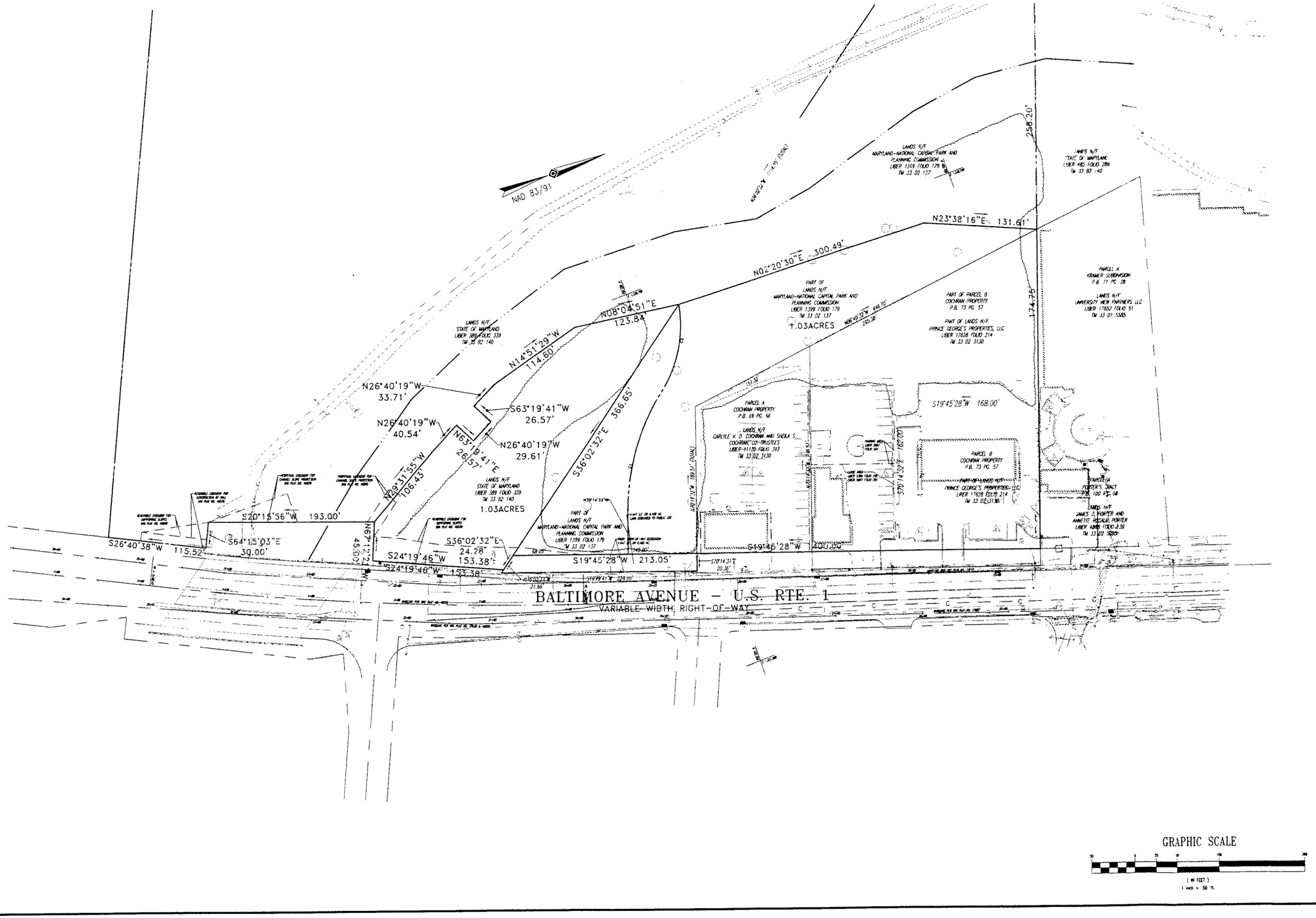


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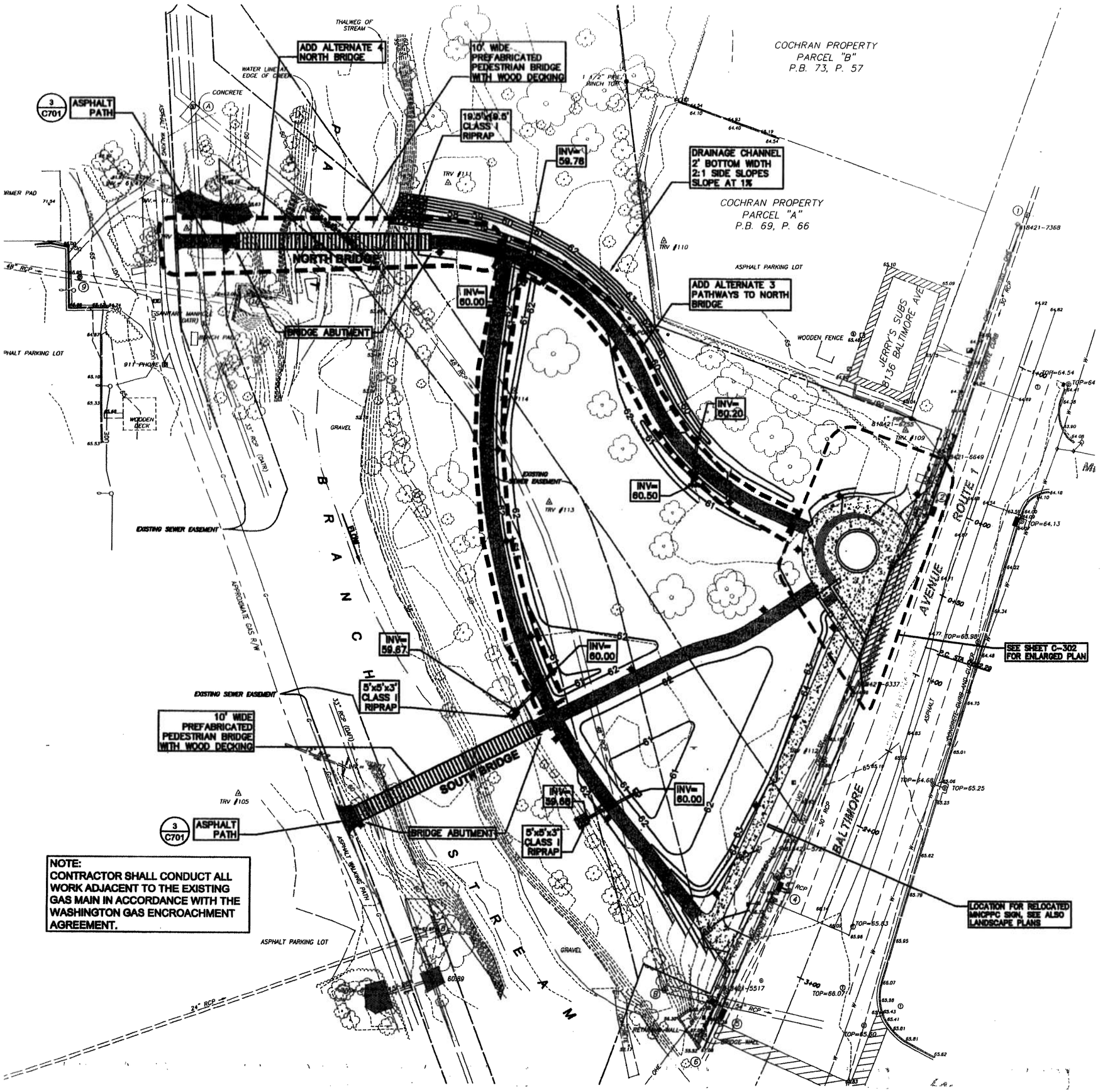


LEGEND

- 64 MINOR CONTOUR
- 65 MAJOR CONTOUR
- ASPHALT PATH (3 / C701)
- CONCRETE SIDEWALK (2 / C701)
- HEAVY DUTY CONCRETE (7 / C701)

**NOTES:**

1. SEE SHEETS C-201 THROUGH C-205 FOR EROSION AND SEDIMENT CONTROL INFORMATION.
2. SEE SHEET C-303 FOR SITE LAYOUT INFORMATION.
3. SEE LANDSCAPE PLANS FOR ADDITIONAL INFORMATION.
4. SEE SHEET C-306 AND SPECIFICATIONS FOR ADDITIONAL INFORMATION FOR PREFABRICATED PEDESTRIAN BRIDGES.
5. SEE STRUCTURAL PLANS FOR BRIDGE ABUTMENT AND FOUNDATION SUPPORT.
6. ALL CONCRETE STORM DRAIN PIPING SHALL BE ASTM C-76 CLASS IV.
7. INSTALL CONCRETE HEADWALLS AT ALL ENDS OF THE CONCRETE STORM DRAIN PIPING. HEADWALL SHALL BE MSHA STANDARD DETAIL MD/350.02.
8. ALL ASPHALT PATHS AND CONCRETE SIDEWALK WITH THE EXCEPTION OF THE PLAZA AREA SHALL BE 8' WIDE.
9. CONTRACTOR SHALL COORDINATE AS NECESSARY WITH PRINCE GEORGE'S COUNTY AND/OR CITY OF COLLEGE PARK TO RELOCATE THE EXISTING BUS SHELTER FROM ITS CURRENT POSITION TO THE PLAZA AREA LOCATION INDICATED ON THE LANDSCAPE PLANS.
10. SEE SHEET C-701 FOR SITE DETAILS.

GRAPHIC SCALE

( IN FEET )
1 inch = 80 ft.

CLIENT/PROJECT

NORTH GATE PARK

DESIGNER

DMJM DESIGN | AECOM

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KEY PLAN

SHEET TITLE

SITE IMPROVEMENTS PLAN

C-301