

TAKOMA PARK STORMWATER RESILIENCY STUDY

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AGENDA

- Summary of study goals and focus
- Discussion of study areas
- Resident assistance
- Proposed Projects
- Code Assessment
- Q&A



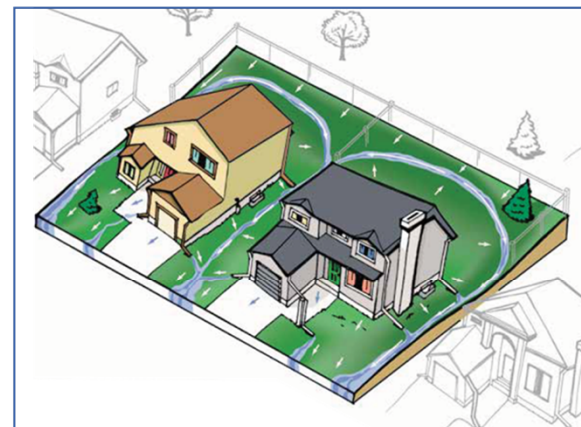
Resident Assistance Document

Stormwater Runoff Management Techniques



Technique #1: Ensure that Positive Drainage is Maintained through Site Grading

Lawns and paved surfaces should be sloped or "graded" to maintain positive drainage. Surface runoff should be able to flow away from homes and other structures toward the public right-of-way. Depending on surrounding topography, maintaining positive drainage may require the use of graded landforms such as swales to direct water flow between lots and around buildings. When making grading adjustments, care must be taken to avoid changes that cause runoff to flow to a neighboring property.



Grading can be used to maintain positive drainage without directing runoff to neighboring properties.
Image Credit: City of Edmonton, AB, Canada
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Technique #2: Direct and Reinforce the Path of Overland Flow

Overland flow can be directed by creating a shallow swale for water to follow. A winding flow path lined with erosion-resistant material such as stone will help to slow water and reduce erosion. Vegetation can be used to further stabilize paths and reduce flow velocity. On particularly steep slopes, terracing may be necessary. Consult a professional landscape contractor to determine the best approach for your property.

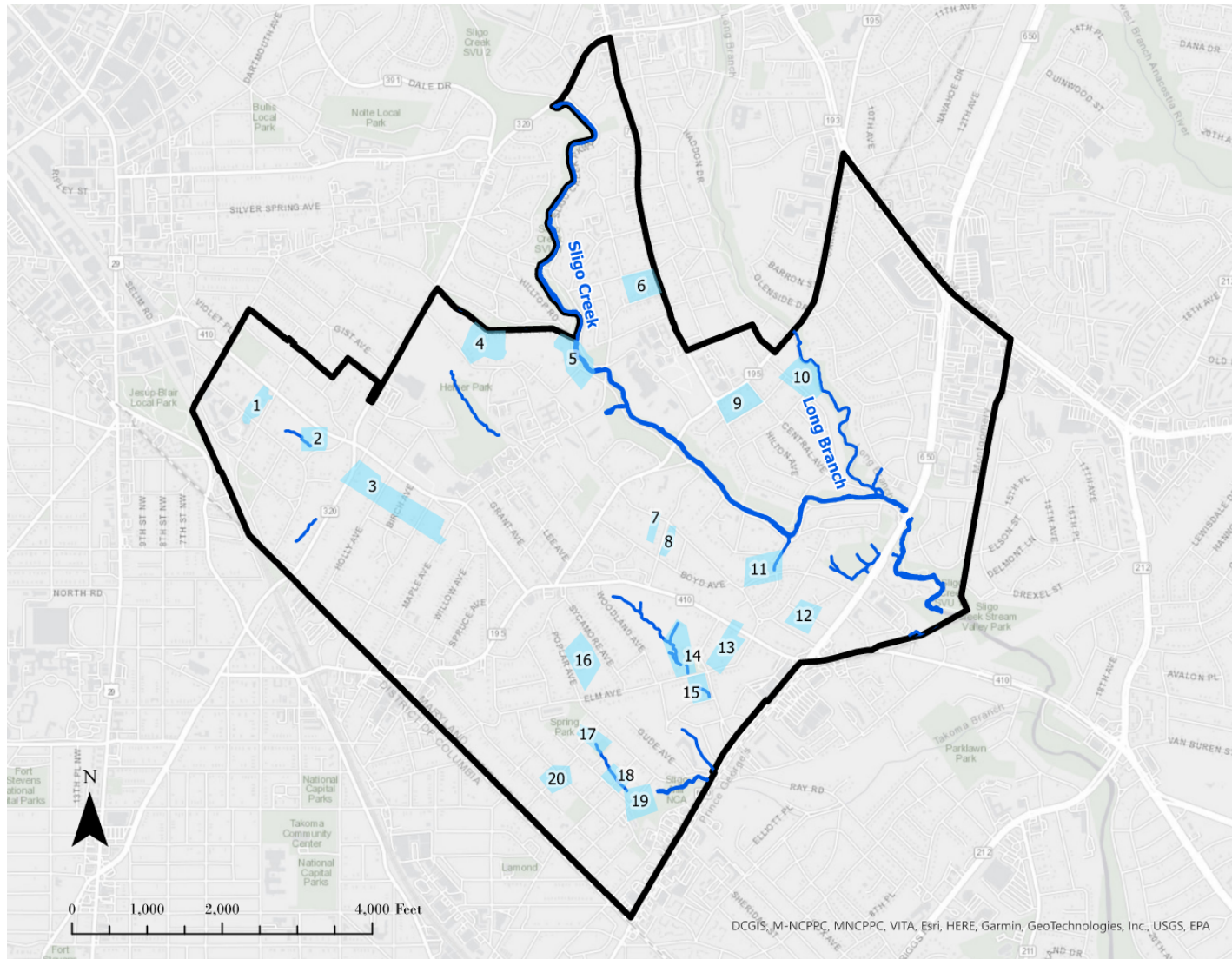


Overland flow paths can be used to direct storm water flows and reduce erosion.

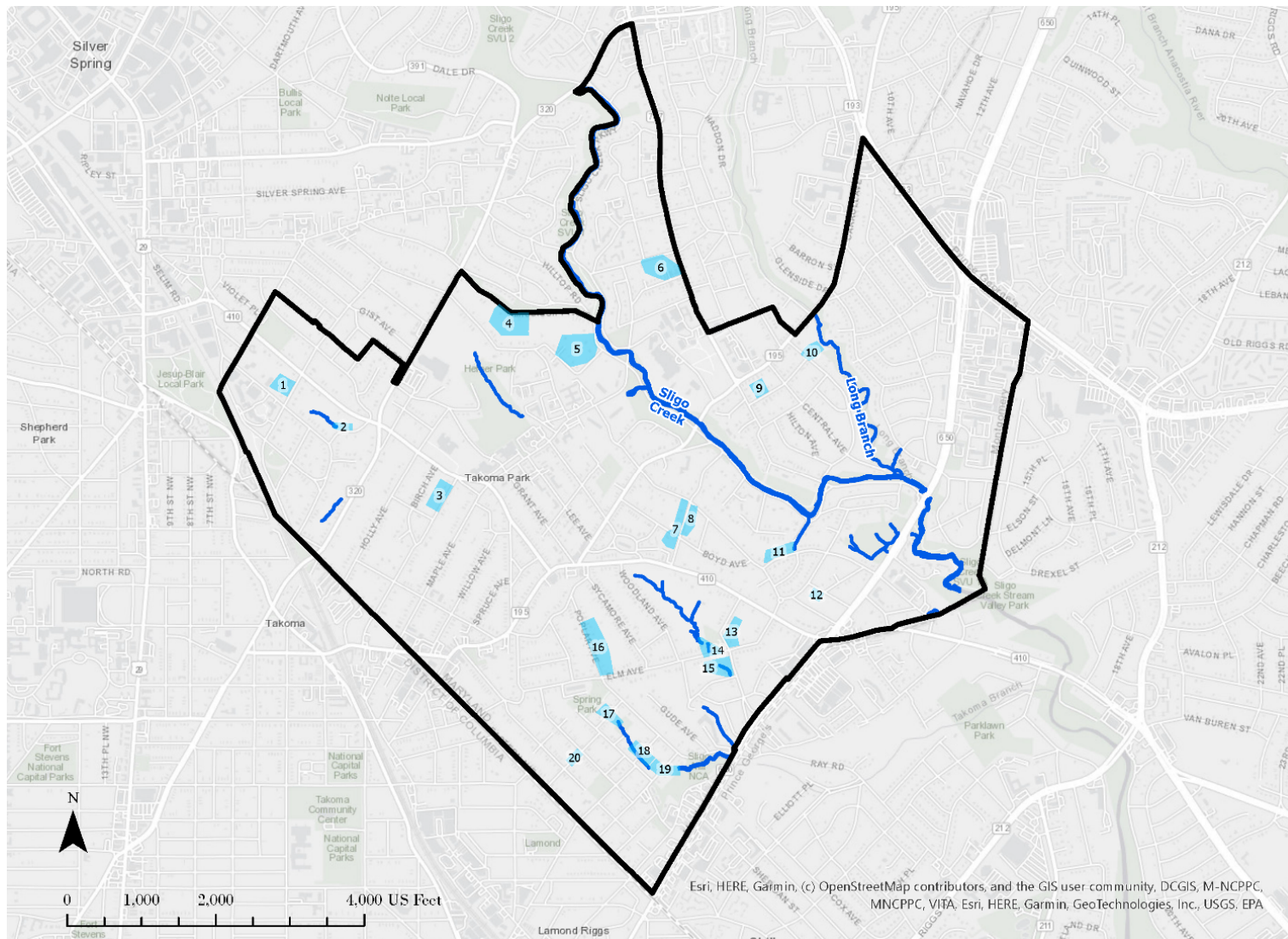
STUDY GOALS AND FOCUS

- Assess study areas compiled by City staff and outreach efforts
- Provide recommendations and assistance
- Detailed study of smaller area

Study Areas



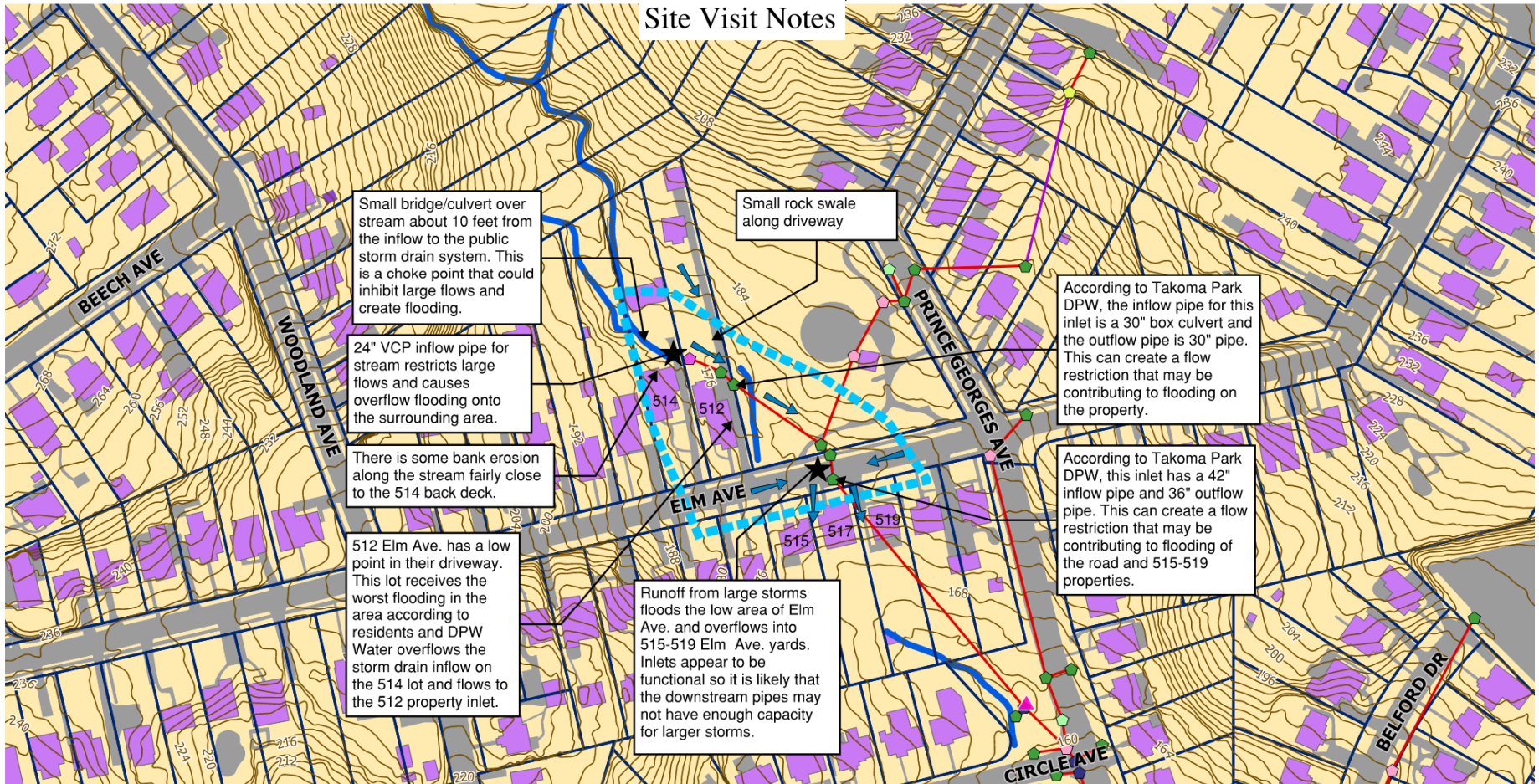
Study Area Refinement



Study Area Investigation

Takoma Park Study Area 14

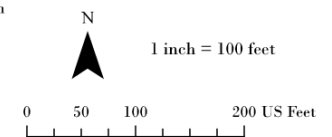
Site Visit Notes



- Property Lines
- 2 ft Contours (2020)
- Study Area
- Stormwater BMPs
- Roads, Sidewalks, Driveways, etc.
- Pervious Surfaces
- Streams
- Buildings by Roof
 - Flat
 - Gable

- Storm Drain Conveyance
 - Ditch
 - Pipe
- Storm Drain Structures
 - End Wall

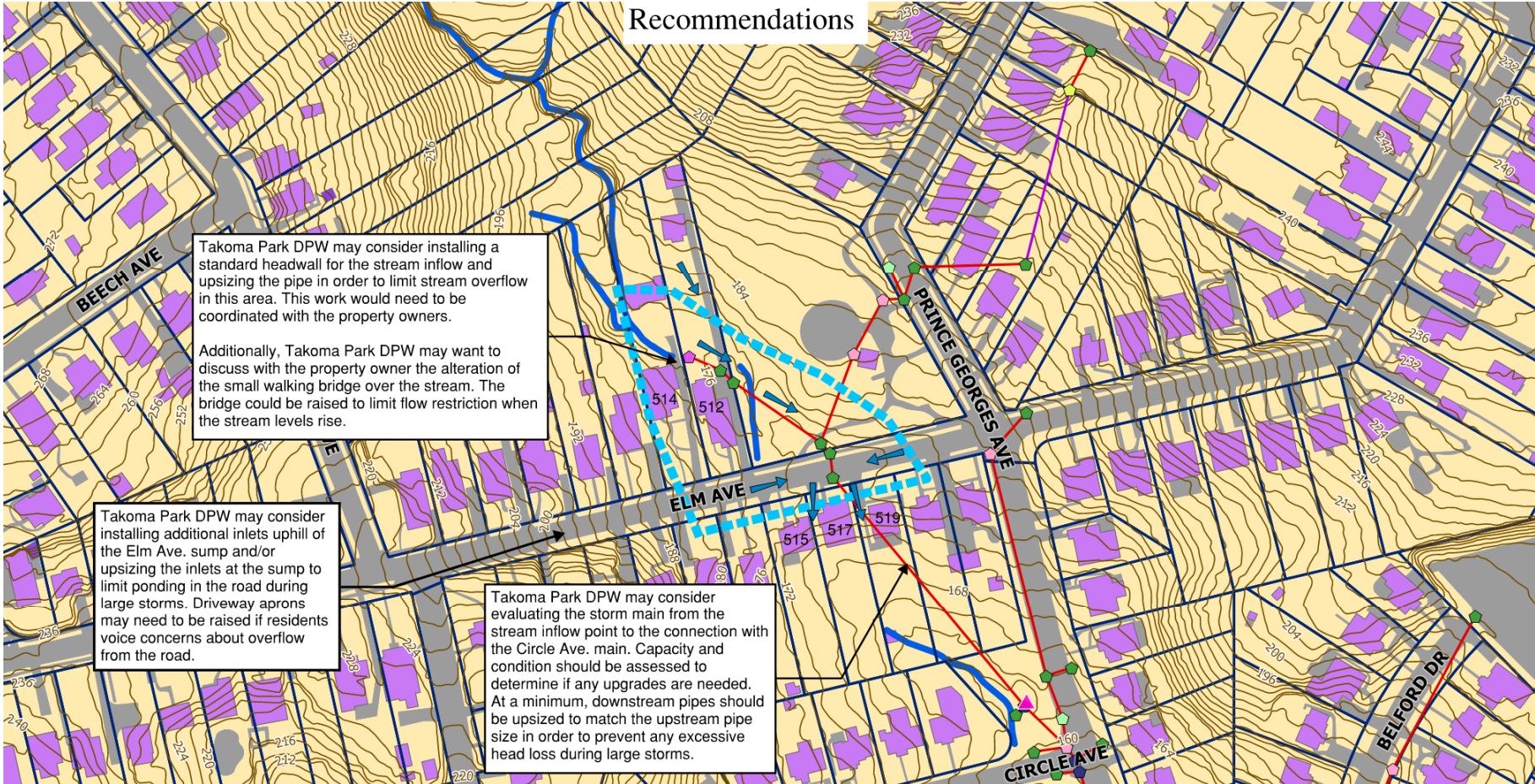
- Inlet
- Manhole Structure
- Pipe Connection
- Pipe Direction
- Projecting Pipe
- Runoff Flow Path
- Point of Concern



Study Area Recommendation

Takoma Park Study Area 14

Recommendations



Takoma Park DPW may consider installing a standard headwall for the stream inflow and upsizing the pipe in order to limit stream overflow in this area. This work would need to be coordinated with the property owners.

Additionally, Takoma Park DPW may want to discuss with the property owner the alteration of the small walking bridge over the stream. The bridge could be raised to limit flow restriction when the stream levels rise.

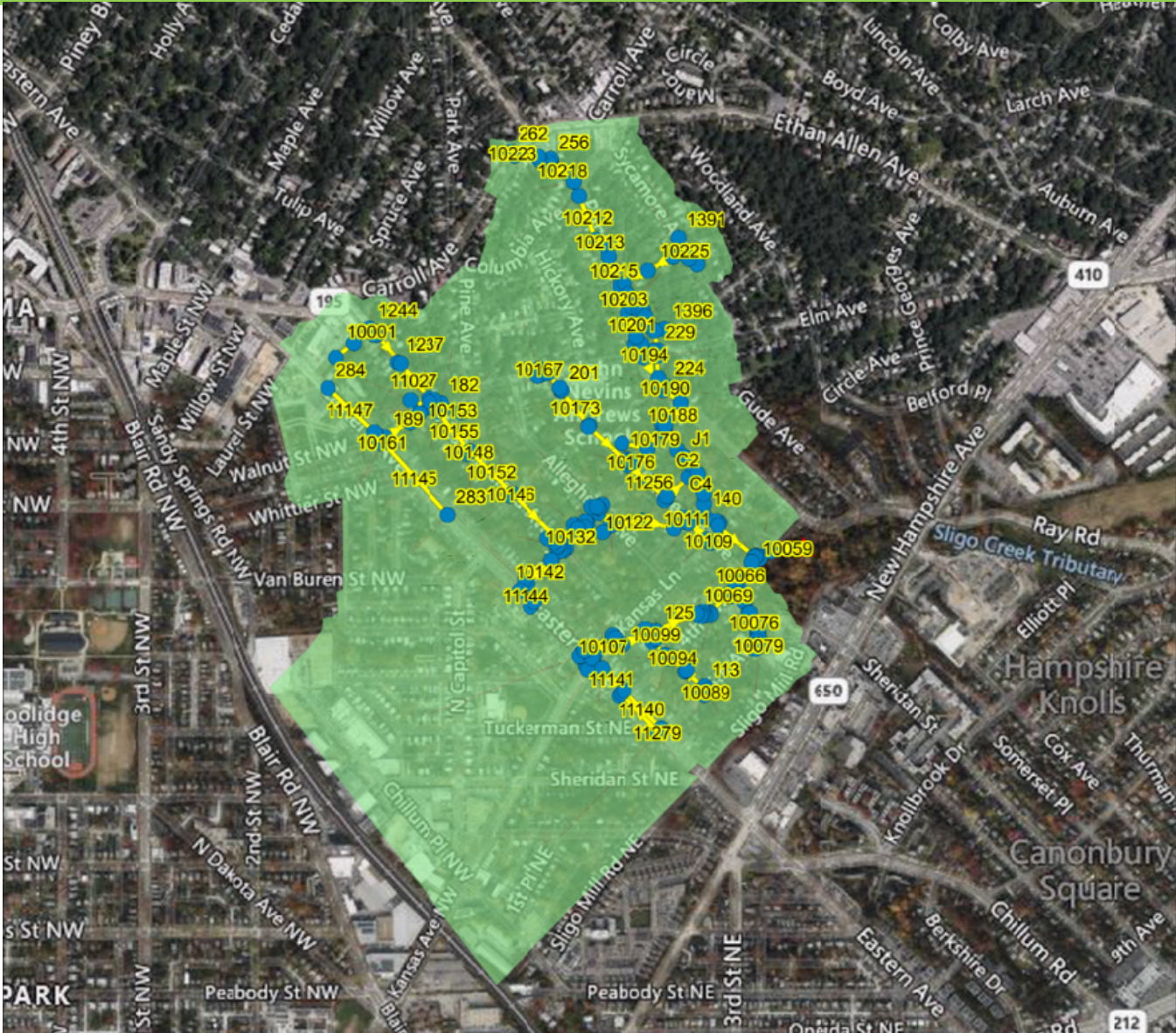
Takoma Park DPW may consider installing additional inlets uphill of the Elm Ave. sump and/or upsizing the inlets at the sump to limit ponding in the road during large storms. Driveway aprons may need to be raised if residents voice concerns about overflow from the road.

Takoma Park DPW may consider evaluating the storm main from the stream inflow point to the connection with the Circle Ave. main. Capacity and condition should be assessed to determine if any upgrades are needed. At a minimum, downstream pipes should be upsized to match the upstream pipe size in order to prevent any excessive head loss during large storms.

- | | | | | |
|-----------------------------------|--------------------------|-------------------------------|-------------------|--|
| Property Lines | Pervious Surfaces | Storm Drain Conveyance | Inlet | Runoff Flow Path |
| 2 ft Contours (2020) | Streams | Ditch | Manhole Structure | N
1 inch = 100 feet
0 50 100 200 US Feet |
| Study Area | Buildings by Roof | Pipe | Pipe Connection | |
| Stormwater BMPs | Flat | Storm Drain Structures | Pipe Direction | |
| Roads, Sidewalks, Driveways, etc. | Gable | End Wall | Projecting Pipe | |



MODEL STUDY AREA



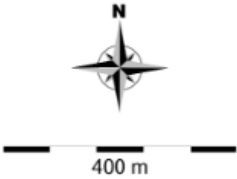
Legend

- Junctions
- ▲ Outfalls
- + Dividers

Conduits

- Visible
- Major System

- ARM Subcatchments



Resiliency Projects

Table 1. Takoma Branch Potential Resiliency Projects

#	Project Name	Location	Scope	Flood Control Benefit	Water Quality Benefit	Priority	Time frame	Cost
1	Circle Woods Stream Inflow Replacement and Wetlands BMP	Circle Woods	Large	Large	Large			~\$750,000 - \$1,000,000
2	Circle Avenue and Poplar Avenue Drainage Improvements	Circle Avenue and Poplar Avenue	Small	Moderate	Small			~\$150,000 - \$300,000
3	Lake Street BMP and Peak Flow Attenuation System	Lake Street	Moderate	Moderate	Moderate			~\$200,000 - \$400,000
4	2 nd Avenue Inlet Improvements	2 nd Avenue between Alleghany Avenue and Westmoreland Avenue	Small	Moderate	Small			~\$50,000 - \$100,000
5	Columbia Avenue and Poplar Avenue BMP and Peak Flow Attenuation System	Columbia and Poplar	Moderate	Moderate	Moderate			~\$100,000 - \$300,000
6	VFW Parking Lot Green Drainage Improvements	VFW Parking Lot	Moderate	Moderate	Moderate			~\$200,000 - \$400,000
7	Orchard Avenue Green Street	Orchard Avenue	Large	Large	Large			~\$750,000 - \$1,250,000
8	Estrellitas Montessori BMP	Estrellitas Montessori School	Moderate	Moderate	Moderate			~\$200,000 - \$400,000
9	Hickory Avenue Uphill Storm Drain Extension	Hickory Avenue and Elm Avenue	Moderate	Moderate	Small			~\$250,000 - \$500,000
10	Citywide Inlet Upgrades	Takoma Park	Large	Large	Small			\$10,000 - \$20,000 *Per inlet

PROJECT #1: CIRCLE WOODS

Project #	1
Project Name	Circle Woods Stream Inflow Replacement and Wetlands BMP
Location	Circle Avenue and Cockerille Avenue Intersection
Project Scope	Large
Flood Reduction	Large
Water Quality Benefit	Large
Priority	TBD
Timeframe	TBD
Cost	~\$750,000-\$1,000,000
Coordinating Agencies	WSSC

Problem Description:

- The Circle Woods stream overflows the 48" inflow pipe during large storm events. This has led to substantial surface flooding of the surrounding residential properties, Circle Avenue, and downhill Cockerille Avenue properties. Takoma DPW has taken action to limit flooding by installing a high curb along Circle Avenue and a small culvert under the Circle Avenue asphalt path. These measures have been effective in limiting excessive downhill flooding; however, the area directly around the stream inflow still experiences flooding when stream levels rise. LID Center's preliminary stormwater modeling results suggest the stream inflow pipe could benefit from an increased capacity. The pipes in this area are on undeveloped WSSC lots with a large open grass area. WSSC plans to sell their properties in this area and the City has notified WSSC of their interest in acquiring the lots.

Project Recommendation:

- Purchase the WSSC lots if feasible and use the area for stormwater management. Replace the 48" pipe stream inflow with a large box culvert at least 6' wide and 4' high. The culvert will allow for increased capacity and decreased head losses as the stream enters the pipe system. A more detailed hydrologic and storm drain analysis will be required as part of the design.
- Design and install a large wetlands BMP in the open grass area. The BMP will store stormwater runoff thereby reducing overland flooding and peak flows in the storm drain system. The wetlands system will also filter stormwater pollutants and provide impervious area restoration credits towards the City's NPDES permit requirements. The BMP may be designed to take runoff from the road and/or divert flow from the nearby storm drain culverts. A detailed engineering assessment will be required to determine the size and configuration of this facility.



PROJECT #2: CIRCLE AVE. & POPLAR

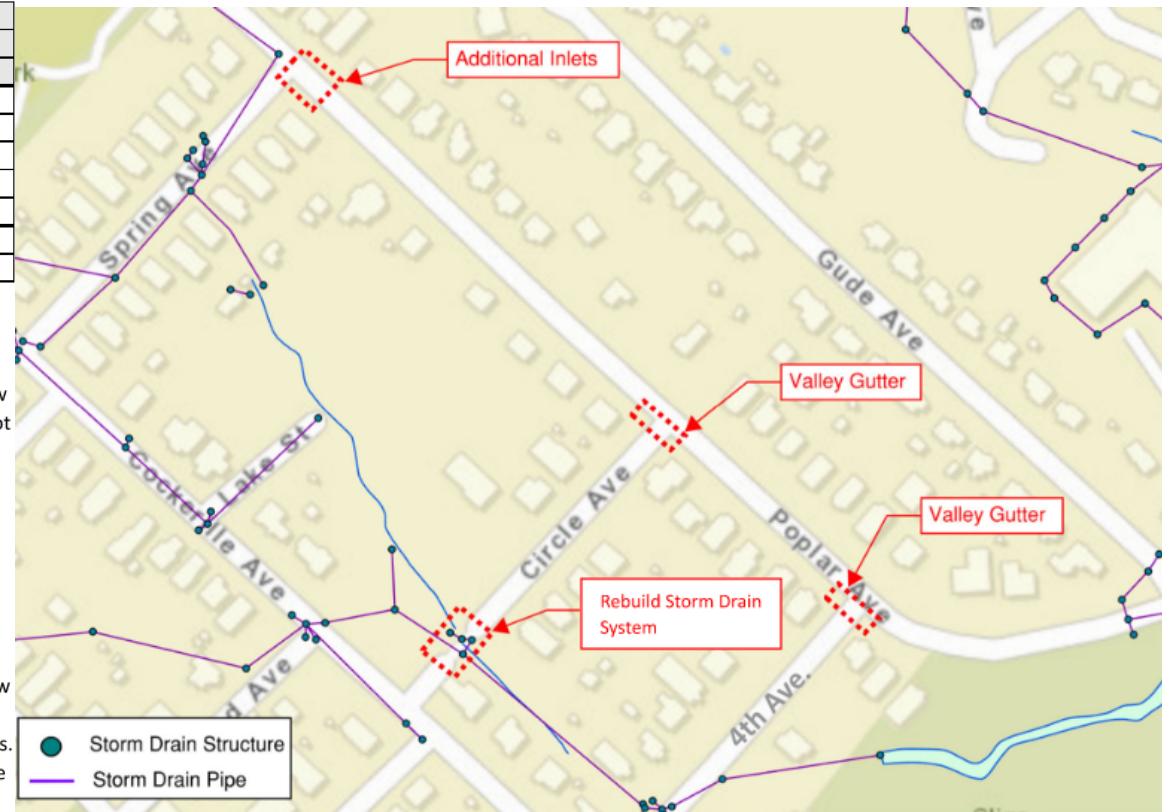
Project #	2
Project Name	Circle Avenue and Poplar Avenue Drainage Improvements
Location	Circle Avenue and Poplar Avenue
Project Scope	Small
Flood Reduction	Moderate
Water Quality Benefit	Small
Priority	TBD
Timeframe	TBD
Cost	~\$150,000 - \$300,000
Coordinating Agencies	N/A

Problem Description:

- The low points of Spring Avenue, Circle Avenue, and 4th Avenue often flood during large storm events. Stormwater runoff from Poplar Avenue flows downhill onto each of the three roads. The low point of Circle Avenue floods from surrounding stream overflow and roadway runoff. Water does not easily drain into the small inlet and runoff often flows onto the residential lots downhill. At the low point of Spring Avenue and 4th Avenue stormwater can overflow the inlets and pond in the road, occasionally causing overflow onto the adjacent residential properties. Takoma DPW has recently upgraded inlets on Spring Avenue to improve drainage and plans to upgrade inlets on 4th Avenue as well.

Project Recommendation:

- Rebuild the drainage infrastructure at the low point of Circle Avenue. Remove the small culvert under the asphalt walkway and abandon the small inlet behind the asphalt path and close the inflow curb cut to it. Install inlets on either side of the dead end and in the adjacent grass area and install pipes to connect all inlets. Adjust road grades and curbs as needed to facilitate drainage to the inlets. The abandoned inlet may be able to be converted to a manhole type structure for connection to the existing culvert. If this is not feasible, install a new field connection from the inlets to the culvert. Modify the driveway apron grades along Circle Avenue as needed to keep stormwater flow in the roadway. An engineer should be consulted in the drainage redesign efforts.
- Install valley gutters along Poplar Avenue across the Circle Avenue and 4th Avenue intersections to redirect flow towards the outfall further east on Poplar Avenue. Enlarge the inlet on Poplar Avenue as needed. Proceed with plans to upgrade the inlets at the low point of 4th Avenue. Install a pair of curb inlets on the east side of the intersection of Spring Avenue and Poplar Avenue and connect into the nearby manhole. The inlets will intercept runoff that currently flows down to Spring Avenue. This will reduce ponding at the low point of Spring Avenue during large storm events. A hydrologic analysis will be needed to confirm the pipes in this area have capacity for the additional stormwater flow from the new inlets.



PROJECT #3: LAKE STREET BMP

Project #	3
Project Name	Lake Street BMP and Peak Flow Attenuation System
Location	Lake Street
Project Scope	Moderate
Flood Reduction	Moderate
Water Quality Benefit	Moderate
Priority	TBD
Timeframe	TBD
Cost	~\$200,000 - \$400,000
Coordinating Agencies	N/A

Problem Description:

- The stormwater outflow from the Lake Street outfall contributes to flooding downstream at the stream inflow point and along Circle Avenue and 4th Avenue. Lake Street is a publicly owned paper street with open space to install flood control infrastructure.

Project Recommendation:

- Design and install a surface BMP in conjunction with an underground peak flow attenuation system adjacent to the Lake Street storm main. The storage system will alleviate peak flows in the downstream storm drain system while the BMP will provide a water quality benefit as well as a modest storage benefit. A detailed engineering assessment will be required to determine the size and configuration of each facility.



PROJECT #4: 2ND AVENUE INLET

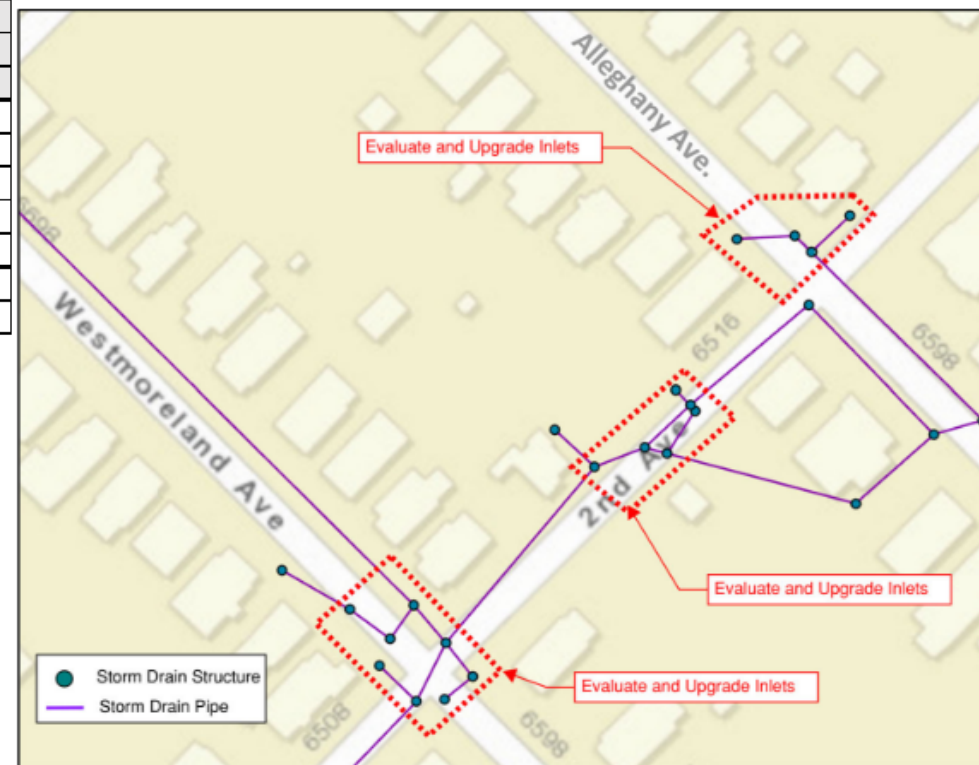
Project #	4
Project Name	2 nd Avenue Inlet Improvements
Location	2 nd Avenue between Alleghany Avenue and Westmoreland Avenue
Project Scope	Small
Flood Reduction	Moderate
Water Quality Benefit	Small
Priority	TBD
Timeframe	TBD
Cost	~\$50,000 - \$100,000
Coordinating Agencies	N/A

Problem Description:

- The low point of 2nd Avenue between Alleghany Avenue and Westmoreland Avenue floods during large storms. Water has ponded multiple feet and caused traffic hazards. There is an old 48" storm main that goes through private property near a house. Takoma DPW has installed a 24" public pipe and a weir wall in the inlet structure that the two pipes outflow from in order to divert flow away from the 48" pipe under private property.

Project Recommendation:

- Evaluate all existing inlets at the Westmoreland Avenue and Alleghany Avenue intersections to ensure they are properly capturing water to limit runoff downhill to 2nd Avenue. Upgrade any inlets that do not provide sufficient drainage. Modify the weir wall in the inlet on 2nd Avenue to allow increased flow into the 48" pipe through private property. This will increase the capacity of the storm drain system in this area.



PROJECT #5: COLUMBIA & POPLAR BMP

Project #	5
Project Name	Columbia and Poplar BMP and Peak Flow Attenuation System
Location	Columbia Avenue and Poplar Avenue Intersection
Project Scope	Moderate
Flood Reduction	Moderate
Water Quality Benefit	Moderate
Priority	TBD
Timeframe	TBD
Cost	~\$100,000 - \$300,000
Coordinating Agencies	N/A

Problem Description:

- Stormwater runoff from Columbia Avenue collects at the intersection with Poplar Avenue and flows down the road. LID Center's preliminary stormwater modeling results suggest the storm drain pipes in this area may benefit from increased capacity. Takoma DPW has already successfully installed a bump-out bioretention BMP at the intersection. The large three-way intersection provides additional space for a BMP.

Project Recommendation:

- Install a bump out filtration-type BMP at the intersection in conjunction with an underground peak flow attenuation system. A detailed engineering assessment will be required to determine the size and configuration of these facilities. A flow splitter device should be installed to direct runoff to the attenuation system only during peak flow events.



PROJECT #6: VFW PARKING LOT

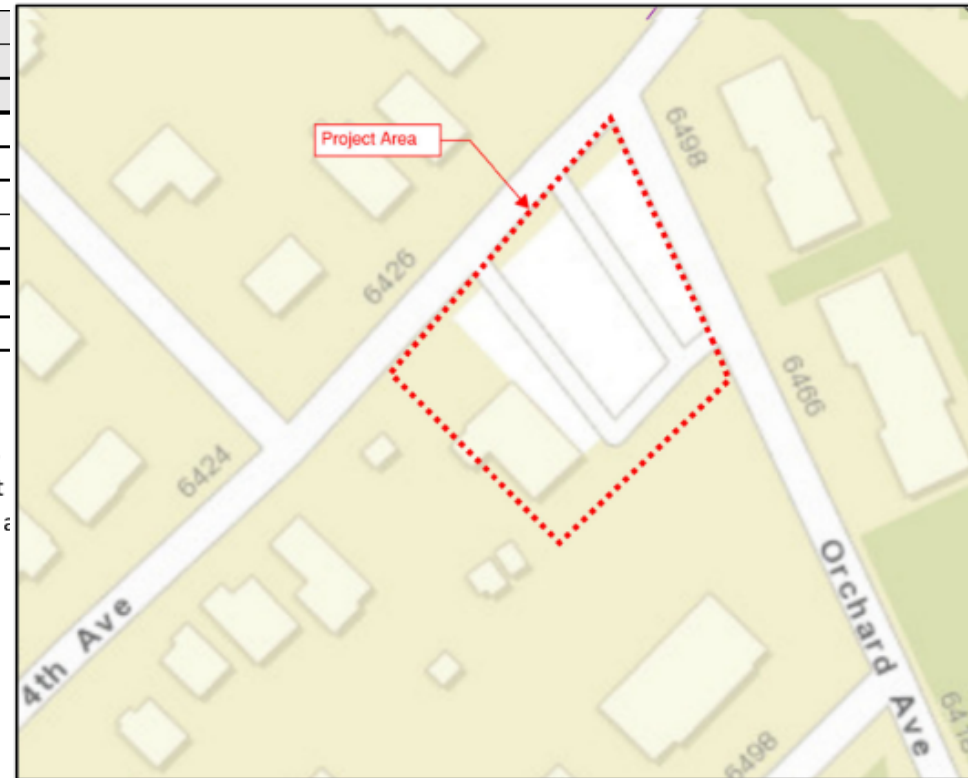
Project #	6
Project Name	VFW Parking Lot Green Drainage Improvements
Location	VFW Parking lot
Project Scope	Moderate
Flood Reduction	Moderate
Water Quality Benefit	Moderate
Priority	TBD
Timeframe	TBD
Cost	~\$200,000 - \$400,000
Coordinating Agencies	VFW Property owners

Problem Description:

- The VFW parking lot is a large impervious area near the bottom of the Takoma Branch watershed's stream valley. The lot produces a significant quantity of overland runoff. Field observations suggest that there could be bypass of the nearby curb inlets which would contribute to the flooding issues at the 4th Avenue low lying area.

Project Recommendation:

- Engage and partner with property owners to implement a green drainage improvement project. Install curbs and inlets around the parking lot to capture runoff. Regrade the asphalt as needed to redirect surface runoff. Install a filtration-type BMP such as a swale to provide a modest flood reduction and water quality benefit for the area. An underground peak flow attenuation system could also be used as an alternative to a surface BMP. An engineer should be consulted in the drainage and BMP design efforts.



PROJECT #7: ORCHARD AVE.

Project #	7
Project Name	Orchard Avenue Green Street
Location	Orchard Avenue
Project Scope	Large
Flood Reduction	Large
Water Quality Benefit	Large
Priority	TBD
Timeframe	TBD
Cost	~\$750,000 - \$1,250,000
Coordinating Agencies	M-NCPPC

Problem Description:

- Orchard Avenue connects to 4th Avenue near the bottom of the Takoma Branch watershed's stream valley. At the uphill end of Orchard Avenue there are impervious commercial and industrial lots that are a significant source of the runoff down Orchard Avenue. There is minimal storm drain infrastructure in this area. LID Center's preliminary stormwater modeling results suggest the storm drain system in this area may benefit from increased capacity. Parallel to the Orchard Avenue storm main there is a 60" pipe for excess stormwater storage that has become defunct due to sediment infill. Takoma DPW has already begun renovating this area through the Sligo Mill Overlook Park redevelopment and there is more opportunity to uplift the area through adjacent green infrastructure and street beautification. A green street project will go together with the existing environmental motif of Sligo Mill Park's community garden and the Takoma Branch natural area.

Project Recommendation:

- Design and install green infrastructure along Orchard Avenue and Sligo Mill Overlook Park. Multiple streetside and bump out filtration-type BMPs can be installed on the uphill end of Orchard Avenue to provide a modest flood reduction and water quality benefit. Storm drain inlets and pipes can be included with the BMPs to decrease runoff downhill and increase the capacity of the existing system. The existing 60" storage pipe should be fully cleaned and modified so that it can be used as a functional peak flow attenuation system. A pretreatment system can be installed to limit sediment inflow to the pipe. Street beautification including tree plantings and landscaping can also be installed where feasible in order to provide community aesthetics.



PROJECT #8: ESTRELLITAS BMP

Project #	8
Project Name	Estrellitas Montessori BMP
Location	Estrellitas Montessori School
Project Scope	Moderate
Flood Reduction	Moderate
Water Quality Benefit	Moderate
Priority	TBD
Timeframe	TBD
Cost	\$200,000 - \$400,000
Coordinating Agencies	Estrellitas Montessori School

Problem Description:

- The Estrellitas Montessori School is a large impervious area contributing to stormwater runoff into the downstream storm drain system. The large property may have areas that are suitable for stormwater management devices that can alleviate flooding downstream.

Project Recommendations:

- Engage and partner with the private property owner to implement a stormwater BMP project. Conduct an initial BMP feasibility assessment and subsequent BMP design. Filtration type BMPs may be feasible in some of the open grass areas around the property and a peak flow attenuation system may be feasible underneath the parking lot. Install one or both as deemed appropriate during the initial assessment. A detailed engineering analysis will be required for any design plans.



PROJECT #9: HICKORY AVE.

Project #	9
Project Name	Hickory Avenue Uphill Storm Drain Extension
Location	Hickory Avenue between Elm Avenue and Montgomery Avenue
Project Scope	Moderate
Flood Reduction	Moderate
Water Quality Benefit	Small
Priority	TBD
Timeframe	TBD
Cost	~\$250,00-\$500,000
Coordinating Agencies	N/A

Problem Description:

- There is minimal storm drain infrastructure in the uphill areas of the Takoma Branch watershed, specifically along Hickory Avenue. The primary inflow points of the storm drain systems at Elm Avenue near the Estrellitas Montessori school has a large drainage area from this upland area. LID Center's preliminary stormwater modeling results suggest some of these primary inflow points to the storm drain system could benefit from increased capacity uphill of this area.

Project Recommendation:

- Conduct a desktop assessment to determine the benefit and feasibility of installing storm drain infrastructure along Hickory and Elm Avenue uphill of the existing storm drain system at Elm Avenue. Additional inlets and pipes can reduce overland flooding, provide additional storage, and reduce peak flow. The capacity of the downstream system will need to be verified via a hydrologic analysis in order to justify diverting any substantial amounts of stormwater runoff. Depending on the results of the study, perform a subsequent design and installation of the new storm drain system extension. In coordination with this project, it may be valuable to pursue projects #3 (Lake Street BMP) and #8 (Estrellitas Montessori BMP) to offset the increase in flows due to diverting additional stormwater to the Elm Avenue/Cockerille Avenue storm main.



PROJECT #10: INLET UPGRADES

Project #	10
Project Name	Citywide Inlet Upgrades
Location	Takoma Park
Project Scope	Large
Flood Reduction	Large
Water Quality Benefit	Small
Priority	TBD
Timeframe	TBD
Cost	~\$10,000 – \$20,000 per inlet upgrade
Coordinating Agencies	N/A

Problem Description:

- There are a large number of older and smaller inlets around Takoma Park that do not drain well. DPW has successfully begun the process of replacing and enlarging these inlets. This project should continue and follow a few general guidelines.

Project Recommendation:

- Assess the condition and inflow capacity of inlets in areas with reports of flooding.
- All replaced inlets should have a minimum 10' width when feasible.
- Replace or restore any curb inlets with a less than 6" opening. The road and gutter can be rebuilt to provide an adequate opening, or the inlet can be fully replaced if appropriate.
- Primary inflow inlets can include a large catch basin chamber and/or weir wall to slow stormwater release into the outflow pipe. (Note: Inlets at pipe junctions should not include any weir wall or structure within the catch basin.)

Code Assessment

- Re-evaluate groundwater recharge requirements for stormwater management permits
- Consider “mini” review for small projects under current regulatory thresholds

QUESTIONS?

