

Project Concept Plan

Stream Reach ID: PCL031, PCL100, PCL101, PCL102, PCL103
Catchment Code: 715
Candidate Site: 715-1
Type: Stream Enhancement
Size or Length: 4000 LF
Location: Powells Creek, upstream of Spriggs Road
Drainage Area: 4,331 Acres

Problem Description: This property is a large tract of farmland. The farm had fencing along the stream which protected the channel from livestock (bank height ratios of 1.2 to 1.3 were found), so restoration is not recommended. However, the buffers have not been protected and should be planted to restore the functional value intended by the RPA regulations in Virginia.

Project Description: This project would consist of planting sparse areas of the RPA with native and resident vegetative species to provide additional protection for Powells Creek from the effects of future development pressure.

Benefits:

Quantity (Flow): This project would not be expected to noticeably affect the discharge rate in Powells Creek.

Quality (Pollution reduction): Buffer enhancements have been shown to provide water quality benefits by filtering runoff and allowing the stream to function without lateral constraints that lead to scour and erosion.

Erosion Control: Some erosion control may be provided through filtration of overland and future drainage system prior to reaching the main channel of Powells Creek. However, erosion control would be incidental to this project.

Project Concept Plan

Constraints:

Environmental permits: Environmental permits should not be necessary to establish new plantings in the upland areas of the RPA. Should clearing be deemed necessary, land disturbance permits may be required.

Property Ownership: The following properties may be affected by this project:
 Spriggs Neighborhoods LLC - GPIN 8091-30-1983
 PWC Park Authority - GPIN 8090-49-0860

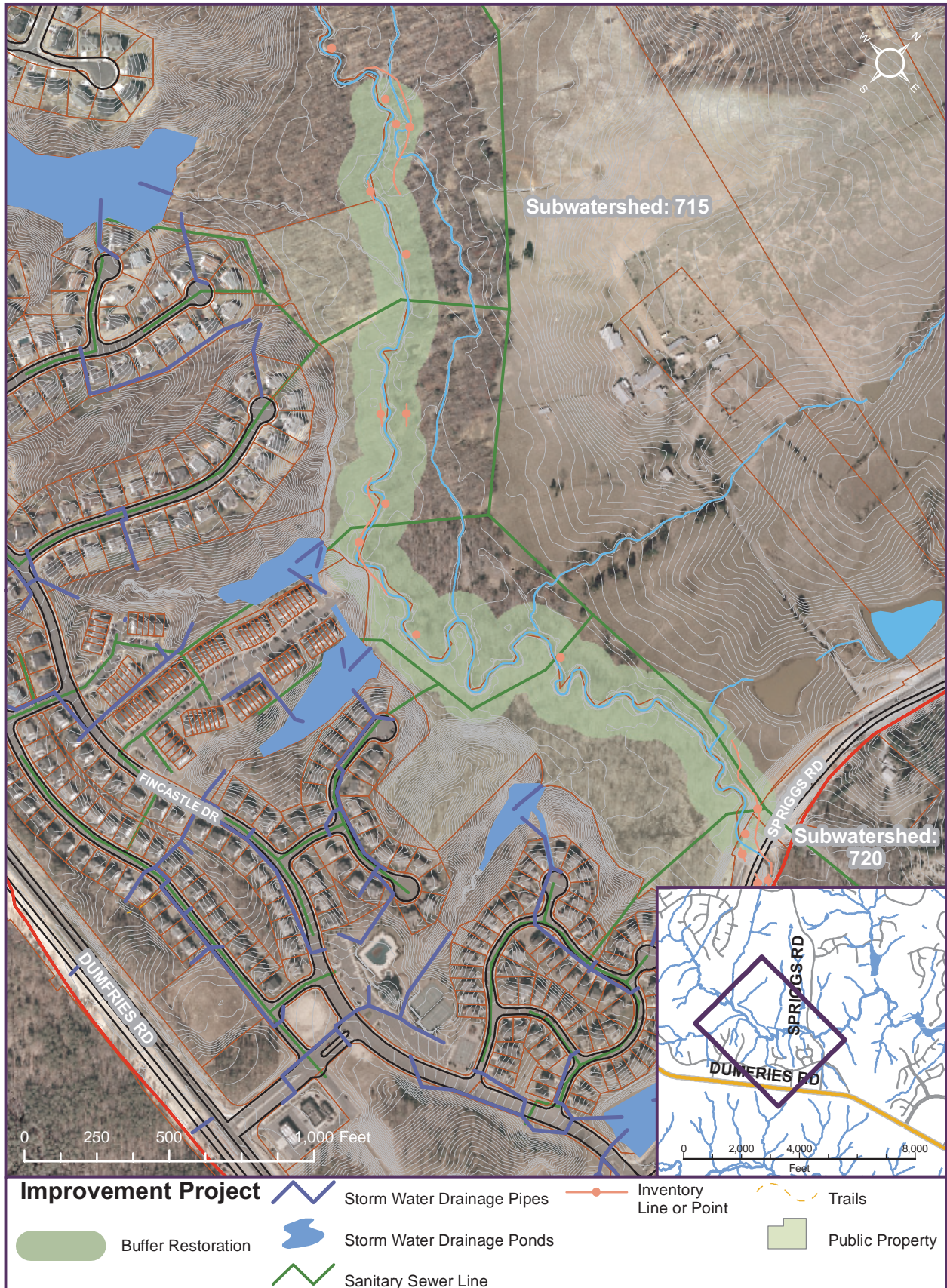
Facility Access: Access is provided along the length of the project by way of the former farm property.

Design or Construction: Work should be done in a manner to protect the existing riparian vegetation.

Design Assumptions: N/A

Estimated Costs:

<i>Design:</i>	\$	35,000
<i>Construction:</i>	\$	300,000
<i>Total:</i>	\$	335,000



Project Concept Plan

Beaver dams were prevalent throughout most of the Powells Creek Watershed.



While areas such as this had good riparian and bank vegetation, this was not the case throughout most of this reach.



Project Concept Plan

Stream Reach ID:	PCL106, PCL107
Catchment Code:	715
Candidate Site:	715-2
Type:	Roadway Culvert Replacement/Stream Enhancement
Size or Length:	3500 LF
Location:	Powells Creek, downstream of Minnieville Road
Drainage Area:	3,582 Acres

Problem Description: The Minnieville Road crossing of Powells Creek has long been identified as an undersized culvert. Field investigations found indications that the road overtops during high flow events and that the channel downstream of the culvert is impacted as a result. The undersized culverts have significant sediment blockage. Erosion has occurred along the downstream reach but may be able to be solved with live staking and/or buffer planting. Erosion downstream of the Minnieville Road culvert, on the left bank, may warrant a structural solution to re-direct water back toward the center of the stream.

Project Description: This project would consist of a culvert replacement for the corrugated metal pipe culverts, and may require from a roadway realignment. The culverts should be designed to effectively allow sediment transport, which may require a realignment and/or structural improvements to the channel immediately downstream. The riparian buffer for the 3500LF below the crossing may be enhanced with a minimally invasive approach, requiring only planting sparse areas of the RPA with native vegetative species and live staking areas where erosion may occur to provide an additional level of protection for Powells Creek. During the course of this study, the County has solicited contractors for a significant project to upgrade Minnieville Road to a four lane, divided roadway. It is recommended that special attention be given to the hydraulic aspects to capitalize on the work being done while addressing the needs of Powells Creek.

Benefits:

Quantity (Flow): The hydraulic design of the culvert would be expected to noticeably affect the peak discharge in Powells Creek, but given that the roadway overtops during high flow events, this impact may not be as much as anticipated. Detailed hydraulic calculations would need to be performed to determine the affect on the downstream channel.

Quality (Pollution reduction): Buffer enhancements have been shown to provide water quality benefits by filtering runoff and allowing the stream to function without lateral constraints that lead to scour and erosion.

Erosion Control: Some erosion control may be provided through filtration of overland and future drainage system prior to reaching the main channel of Powells Creek. However, erosion control would be incidental to this project.

Project Concept Plan

Constraints:

Environmental permits: Structural improvements deemed necessary in the channel would require 401/404 permits. Should clearing be deemed necessary, land disturbance permits would be required.

Property Ownership: The following properties may be affected by this project:
 Didlake Foundation, Inc. - GPIN 7991-85-1702
 Pulte Home Corporation - GPIN 7991-83-5693

Facility Access: There is a sanitary sewer easement that runs along Powells Creek along the entire reach where this project is proposed. This easement provides access from Minnieville Road.

Design or Construction: Minnieville Road carries a relatively high volume of traffic. Measures would need to be taken to minimize the impact to local traffic while working in the right-of-way. Work should be done in a manner to protect the existing riparian vegetation.

Design Assumptions: It is assumed that the upgrades to the culverts and roadway are only those necessary to address the observed impairments of the stream system in this area.

Estimated Costs:

Design:	\$	60,000
Construction:	\$	900,000
Total:	\$	960,000



Project Concept Plan

The culverts under Minnieville Road had substantial amounts of sediment within them that eliminated much of the design discharge capacity. Note the relatively low elevation of the roadway centerline.



Downstream of the culverts, Powells Creek was deemed to be in reasonable shape. There is a sanitary easement to the left side of the photo and additional bank vegetation could help stabilize the channel, avoiding more costly, invasive procedures in the future.



Project Concept Plan

Stream Reach ID: PCL107, PCL108
Catchment Code: 715
Candidate Site: 715-3
Type: Stream Enhancement
Size or Length: 1500 LF
Location: Powells Creek, upstream of Minnieville Road
Drainage Area: 3,227 Acres

Problem Description: Minor erosion has occurred along the reach but may be able to be solved with live staking and/or buffer planting.

Project Description: This project would consist of planting sparse areas of the RPA with native and resident vegetative species and live staking areas where erosion may occur to provide an additional level of protection for Powells Creek.

Benefits:

Quantity (Flow): This project would not be expected to noticeably affect the discharge rate in Powells Creek.

Quality (Pollution reduction): Buffer enhancements have been shown to provide water quality benefits by filtering runoff and allowing the stream to function without lateral constraints that lead to scour and erosion.

Erosion Control: Some erosion control may be provided through filtration of overland and future drainage system prior to reaching the main channel of Powells Creek. However, erosion control would be incidental to this project.

Constraints:

Environmental permits: Environmental permits should not be necessary to establish new plantings in the upland areas of the RPA. However, structures that may be deemed necessary in the channel would require 401/404 permits. Should clearing be deemed necessary, land disturbance permits would be required.

Property Ownership: The following properties may be affected by this project:
 PWC Park Authority - GPIN 7991-75-8964

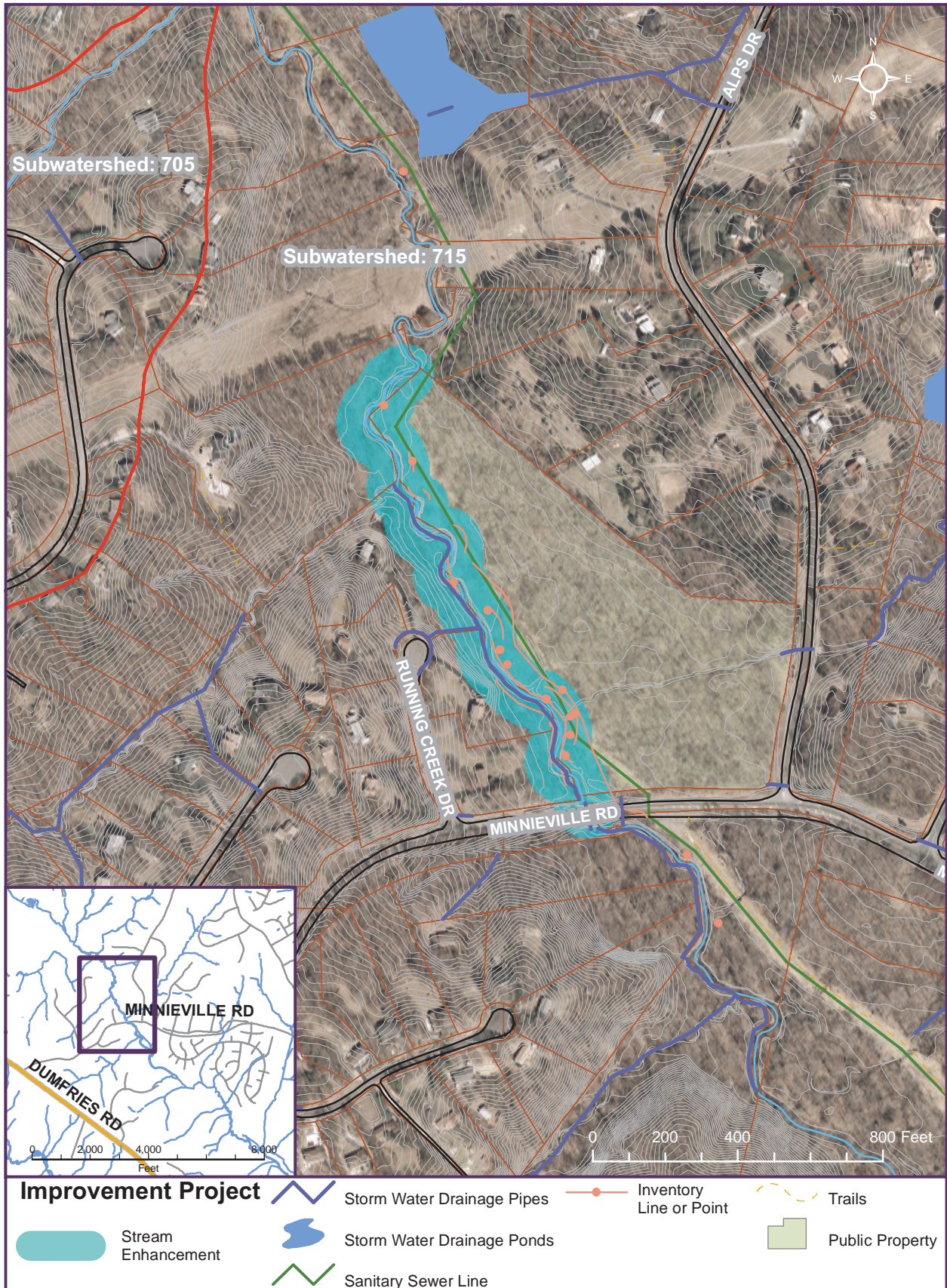
Facility Access: There is a sanitary sewer easement that runs along Powells Creek through Minnieville Manor Park. This corridor provides access to the entire project length.

Design or Construction: Work should be done in a manner to protect the existing riparian vegetation.

Design Assumptions: N/A

Estimated Costs:

Design:	\$	10,000
Construction:	\$	75,000
Total:	\$	85,000



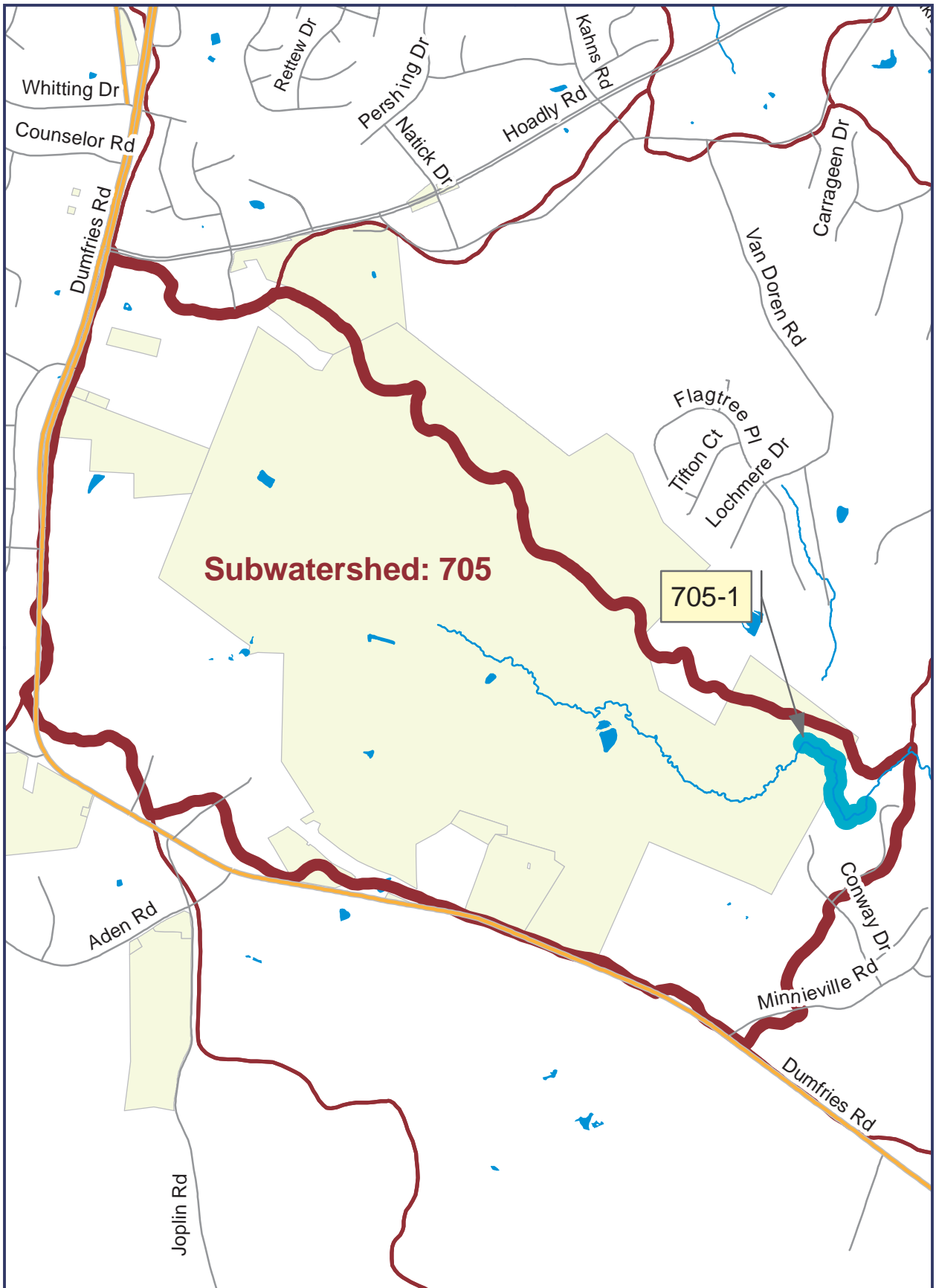
Project Concept Plan

Bankfull features were found on the inside and outside of bends suggesting that this stretch of Powells Creek was not in need of an invasive approach.



Some areas do show greater signs of stress, and should be monitored over time.





Project Concept Plan

Stream Reach ID:	N/A
Catchment Code:	705
Candidate Site:	705-1
Type:	Stream Restoration
Size or Length:	3500 LF
Location:	Powells Run, from the OWML monitoring weir on the downstream end to the leachate pond
Drainage Area:	1,111 Acres

Problem Description: This reach has a wide floodplain. The channel is littered with large woody debris that should be removed. Above the weir, Powells Creek is ponded due to beaver activity for approximately 2000'. Restoration potential exist, if the dams are removed. Nice floodplain to meander a new priority one channel restoration through. Above the ponded water, the channel (1500') is acting like a flume with little bedform or substrate being retained. The bed is mostly hard cohesive clay. BHR is 1.5 - 3.0. The meander geometry is unstable and the channel flow does not reach the floodplain during large flow events. The upper 500' has some instability due to large woody debris. The meander geometry in this upper reach is a little irregular, but is not in dire need of restoration or enhancement.

Project Description: The opportunity exist for either a priority level one, two or more likely, a combination of the two. Priority level one would allow the channel to re-establish a stable dimension, pattern and profile and restore the floodplain's hydrologic function. Priority level two would require removal of trees along the banks for benching and off-site removal of material. Either approach may provide an excellent opportunity to mitigate the impacts planned elsewhere in the sub-watershed.

Benefits:

Quantity (Flow): Additional storage provided by making better use of floodplain area would have a minor impact on the discharge at the lower end of the project. However, this effect would be negligible in isolation.

Quality (Pollution reduction): Stream restoration projects are expected to provide significant and holistic water quality improvements. Natural Channel Design approaches improve the ecosystem, as a whole, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnects the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: This reach shows significant erosion, scour and sediment export. A restoration project would dramatically improve and reduce the sediment and nutrient production from this portion of the watershed.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
 PWC Board of County Supervisors - GPIN 7991-19-0636
 Route 234 Associates LLC - GPIN 7991-35-0108
 Ridge and Long, Ltd. Co. - GPIN 7991-25-8653
 PWC School Board - GPIN 7991-15-1570

Facility Access: Access to this reach is available through the County Landfill

Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach for mitigation of other impacts within the area. Additional design cost are factored into the project to aid justification of mitigation and demonstration of project success.

Estimated Costs:

<i>Design:</i>	\$	360,000
<i>Construction:</i>	\$	1,400,000
<i>Total:</i>	\$	1,760,000



Project Concept Plan

As is the case throughout the watershed, beaver dams are prevalent throughout this reach.



Root mass on the banks is no longer providing the stability as it would in a more stable system. Once the channel incises below the root mass, the rate of change due to instability will increase.



Some depositional features were found, but undercutting of the banks is apparent.



Project Concept Plan

Bank height ratios indicated greater instability toward the downstream end of the reach.

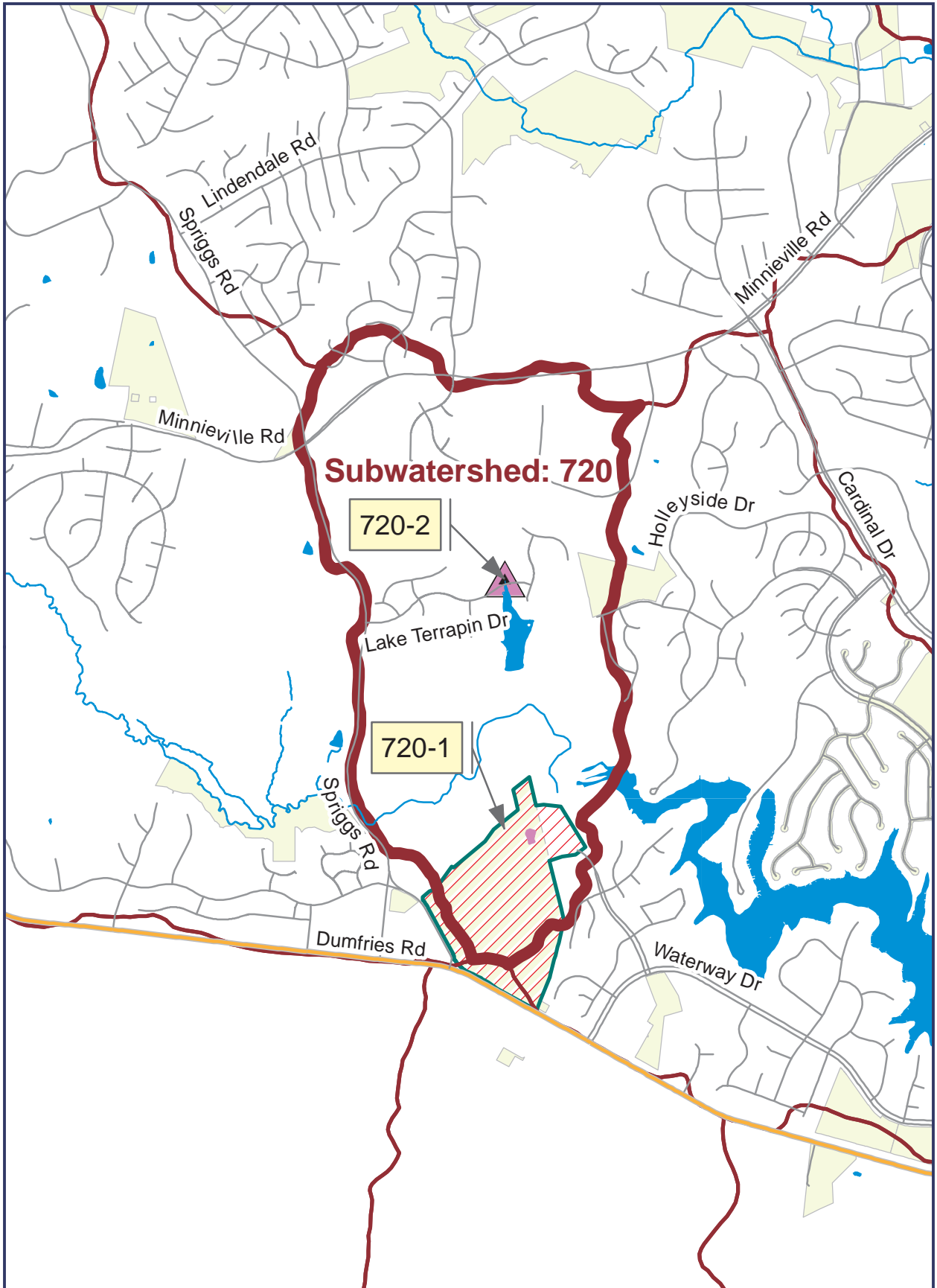


Another clear example of the lack of root mass in the stream banks.



Debris jam found at the upstream end of the reach.





Project Concept Plan

Stream Reach ID: N/A
Catchment Code: 720, 723, 625
Candidate Site: 720-1
Type: Low Impact Development Retrofit
Size or Length: 86 Acres
Location: Dumfries and Spriggs Roads, Forest Park HS and adjacent property
Drainage Area: +/-45 acres

Problem Description: The property in the vicinity of Forest Park High School drains directly into Powells Creek. The observed stormwater management facility at the rear of the school property did not appear to be shoehorned into a space not ideally suited for addressing the effects of this development on receiving waters. The drainage on-site appears to be conventional, in nature, with direct pipes to the lower end of the property for a single outfall location. There is an adjacent residential area that drains to the same outfall, which has no stormwater management.

Project Description: The project proposed here would be a Low Impact Development (LID) drainage retrofit of the properties draining to this single outfall location, with the goal being to retain the maximum amount of runoff on-site, such that the volume, rate and frequency of the receiving channel(s) are not subjected to greater stresses than in a natural, pre-developed scenario. This project would focus on: reduction of impervious areas; increasing the time of concentration; improvement of the hydrologic functionality of drainageways and infiltration of runoff. Since this property is almost entirely a County owned educational facility, this project would make an excellent opportunity to prepare a demonstration project for the community on drainage issues associated with development and ways to reduce the impact that development has on our water resources.

Benefits:

Quantity (Flow): It is often difficult to achieve perfect hydrologic replication across the entire range of return intervals through the exclusive use of LID approaches. However, it is reasonable to expect that hydrologic replication could be achieved for more frequent events (perhaps including the 5-year design event), and with the amount of pervious surface on the school property, it is reasonable to expect more. Achievable (i.e. feasible) performance, however, would be a function of more detailed analysis for the site.

Quality (Pollution reduction):

An LID retrofit of this property could effectively eliminate almost all water quality impacts associated with this development, particularly if regulatory impacts are the standard.

Erosion Control:

The property is stable at this point, so the erosion and sediment control benefits for this project would primarily be those benefits to scour in the outfall channel, below the existing stormwater management facility.

Project Concept Plan

Constraints:

Environmental permits: No work is anticipated that would require 401/404 permitting for this project. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
 PWC School Board - GPIN 8090-78-1541
 South Lake Coves Townhomes Assoc - GPIN 8091-80-2204

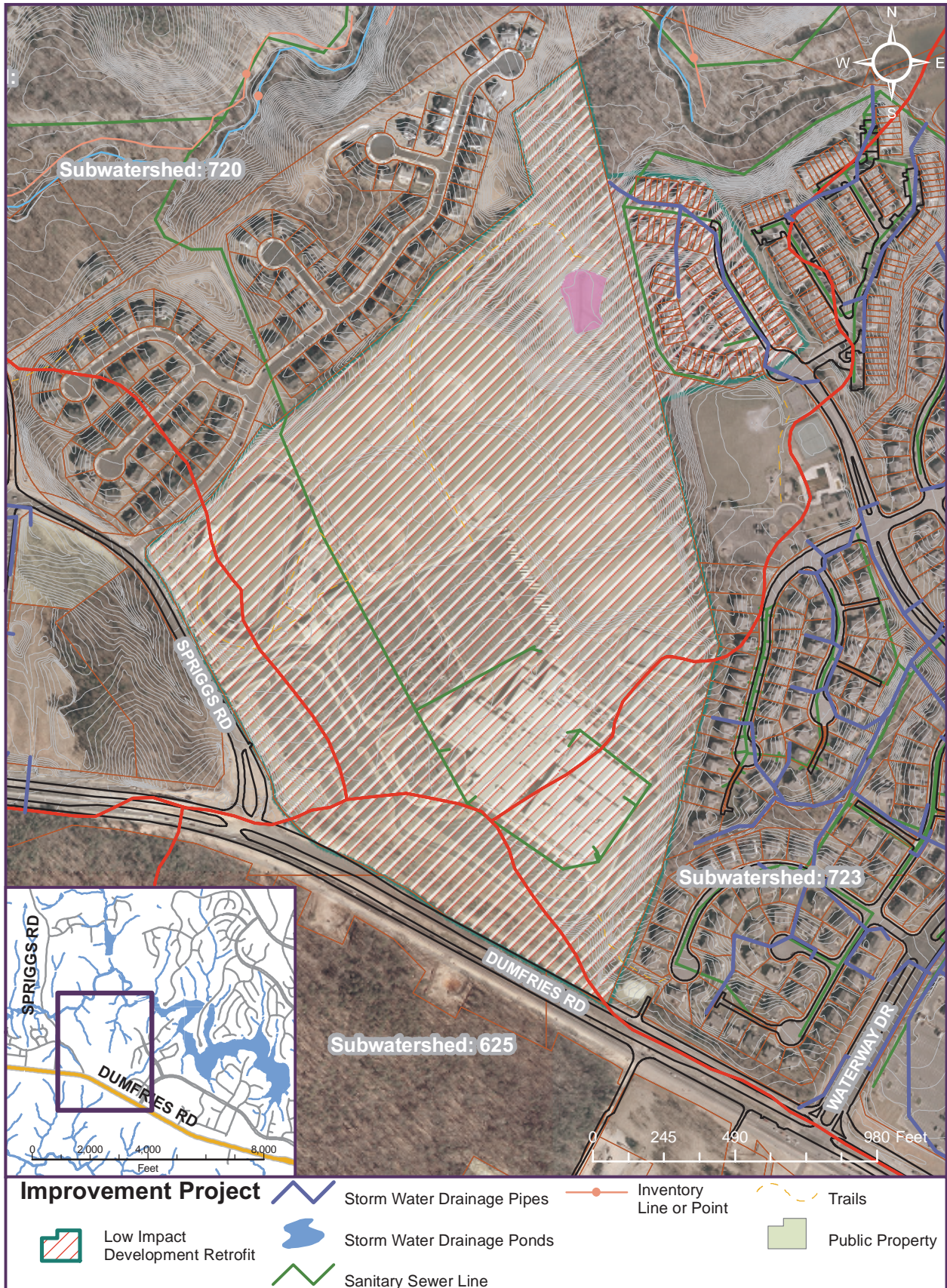
Facility Access: Access to this reach is available through the Forest Park HS and South Lake Blvd

Design or Construction: N/A

Design Assumptions: Low Impact Development approach

Estimated Costs:

Design:	\$	65,000
Construction:	\$	450,000
Total:	\$	515,000



Improvement Project



Low Impact Development Retrofit



Storm Water Drainage Pipes



Storm Water Drainage Ponds



Sanitary Sewer Line



Inventory Line or Point



Trails



Public Property

Project Concept Plan

The only stormwater management facility to mitigate the school's runoff is a single dry pond located at the lowest corner of the property.



Project Concept Plan

Stream Reach ID:	N/A
Catchment Code:	720
Candidate Site:	720-2
Type:	Culvert Retrofit
Size or Length:	2 Acres
Location:	Culvert under Lake Terrapin Drive near Copper Turtle Place
Drainage Area:	269 Acres

Problem Description: Lake Terrapin is a quasi-regional stormwater management facility that functioned as a "farm" pond prior to residential development. This facility failed at the embankment in 2004 and was rebuilt to a modified version of the original standards at the County's expense. There is a lot of headwater development going on that will undoubtedly result in sediment in Lake Terrapin. This culvert retrofit could be designed to act as a maintainable forebay to improve the water quality and reduce sediment making its way into the Lake. Additionally, equalization of rapidly fluctuating flows to Lake Terrapin could reduce the likelihood of future facility failures.

Project Description: This project would be dependant on the ability to permit a beneficial facility above Lake Terrapin. The location of such a facility may depend on permitting requirements and maintenance access. A restricted opening upstream of the culvert under Lake Terrapin Drive would allow sediment to fall out prior and equalize flows reaching the lake. Lake Terrapin Drive is a VDOT maintained roadway and as such would not be allowed to permanently impound water against the roadway embankment. However, use of extended detention approach may be allowed. The 100-year water surface elevation of the lake is shown on county maps to extend well upstream of Lake Terrapin Drive, so this elevation may provide a benchmark against which temporary inundation would be allowed.

Benefits:

Quantity (Flow): Lake Terrapin provides a large volume for runoff detention, so this project may not significantly affect peak flow rates at Powells Creek. A detailed analysis would need to be performed to determine what, if any, affect on flow rate might be realized.

Quality (Pollution reduction): Water quality could be significantly improved, depending on the extent of the design for an upstream forebay facility. At a minimum, the lake water quality would improve, and maintenance cost would be reduced by preventing sediment accumulation to occur. The potential exist for an anoxic facility to be followed by a steep, aeration inducing step pool sequence which would be a much more extensive and costly project, but could lead to noticeable denitrification in addition to phosphorus removal associated with sediment reduction.

Erosion Control: Erosion control, per se, would not be accomplished through this project. Rather the sediment could be removed from the system before it can impact the water quality in Lake Terrapin.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Lake Terrapin Homeowners Assoc Inc - GPIN 8091-73-3342

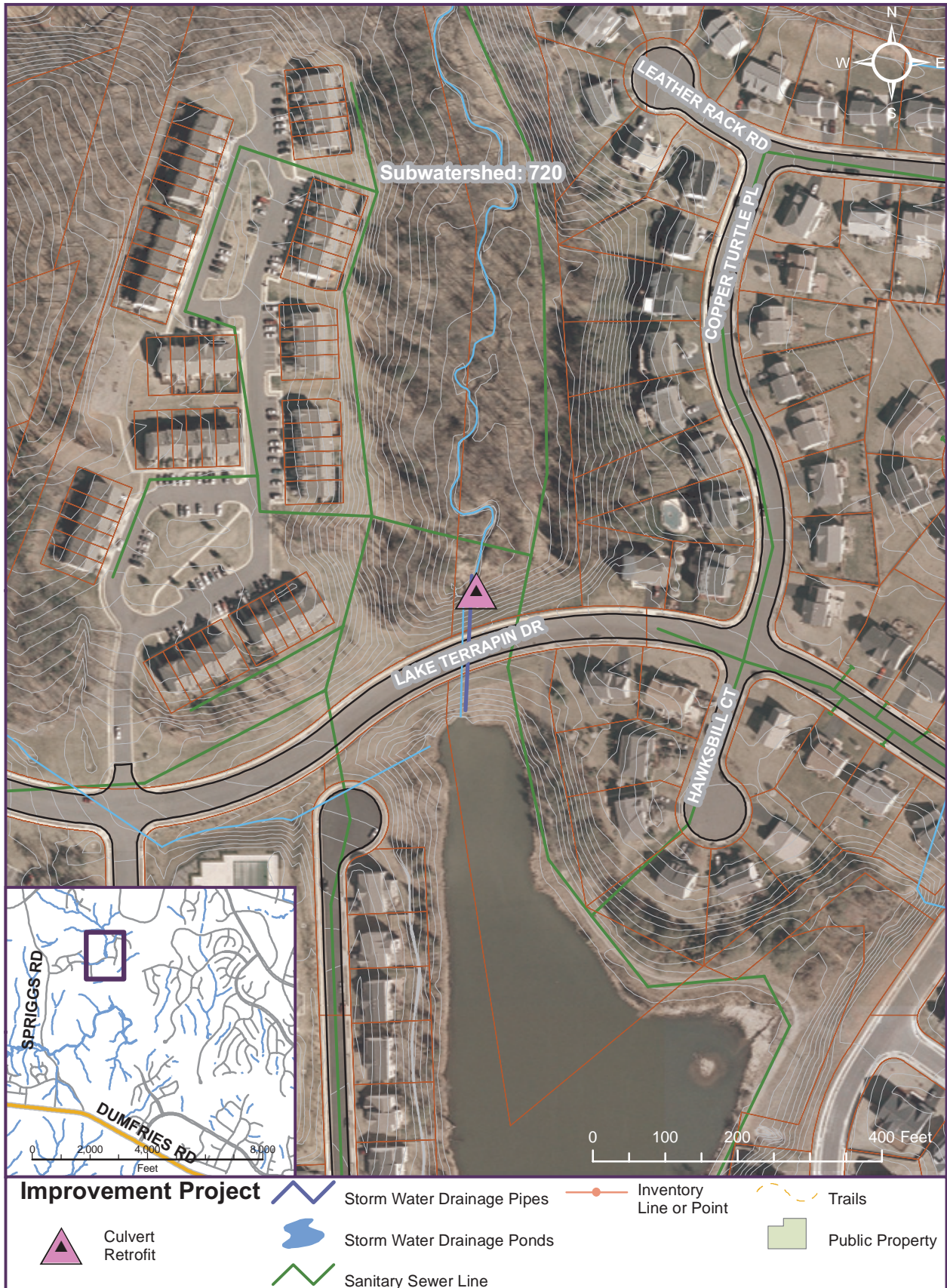
Facility Access: Access to this reach is available through Lake Terrapin Drive.

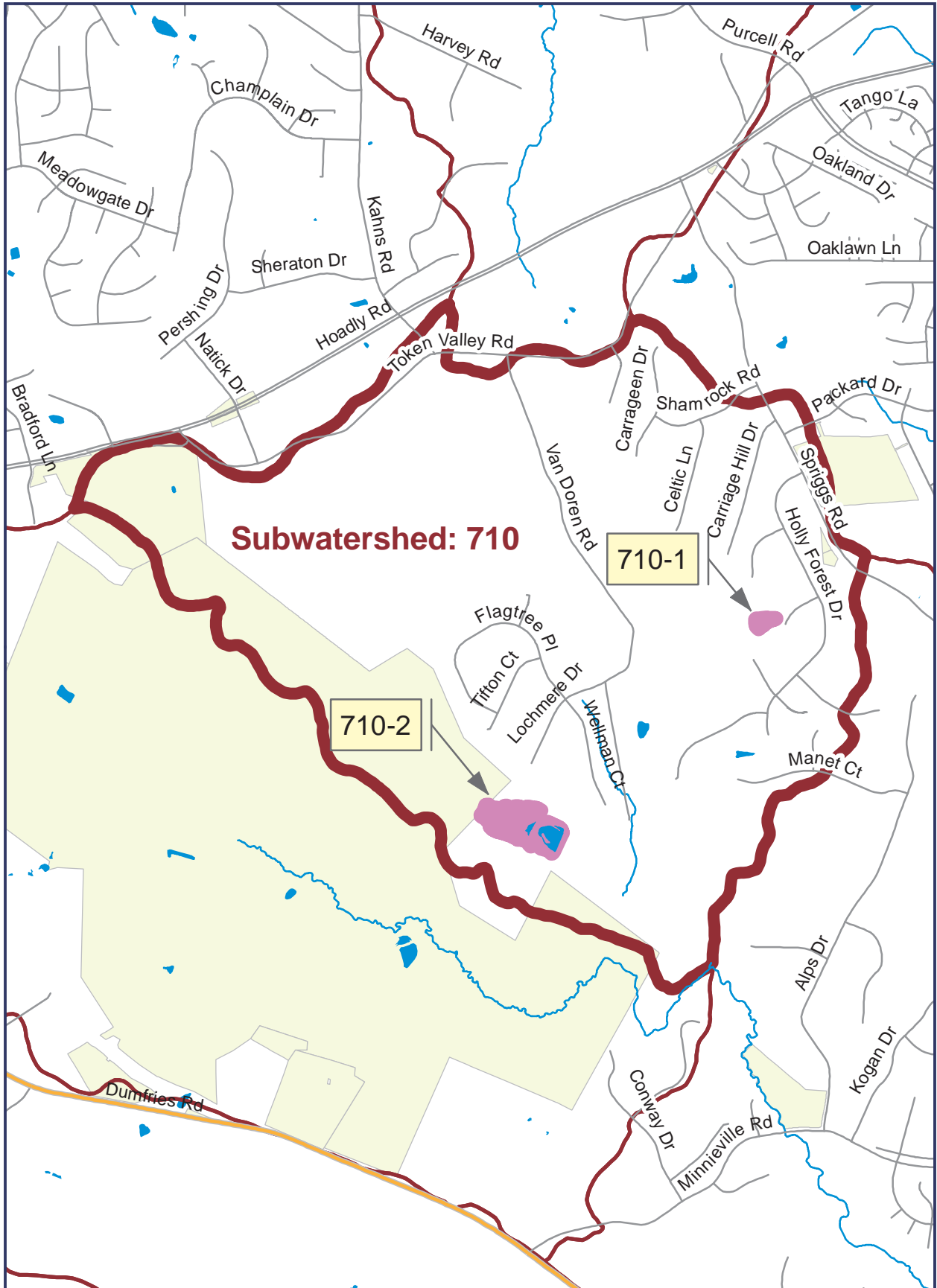
Design or Construction: Design should be able to be done based on design, as-built and reconstruction plans for Lake Terrapin.

Design Assumptions:

Estimated Costs:

<i>Design:</i>	\$	25,000
<i>Construction:</i>	\$	250,000
<i>Total:</i>	\$	275,000





Project Concept Plan

Stream Reach ID:	N/A	SWM Facility ID:	190
Catchment Code:	710		
Candidate Site:	710-1		
Type:	Pond Retrofit		
Size or Length:	0.5 Acres		
Location:	Pond at end of Cherry Ridge Court		
Drainage Area:	35 Acres		

Problem Description: With an established goal of increasing the detention available in sub-watershed 710, this existing facility is one of many where an opportunity exists to retrofit for a greater level watershed scale performance integration. The pond appears to be functioning as designed and is wedged between residential properties, both of which need to be more thoroughly investigated before a retrofit moves forward. However, re-focussing the performance of the facility toward extended detention may be a part of a management strategy for the entire sub-watershed.

Project Description: By regrading the pond and re-configuring the outlet works, the ability of this pond to aid in the accomplishment of a watershed based approach, rather than a development scale, regulatory solution may be reached.

Benefits:

Quantity (Flow):

A primary goal of this project would be to substantially decrease the peak flow rate associated with the 1- and 2-year events. Greater dry storage volume than these frequent events would not be anticipated due to siting issues. Outfall protection should be improved.

Quality (Pollution reduction):

This facility is presumed to accomplish the regulatory water quality requirements set forth by state and local ordinances. Increased water quality benefits would come from a watershed based approach that exceeds the minimum requirements, and whose dividends would be evidenced well downstream.

Erosion Control:

Improved outlet protection and increased dry detention volume would benefit the receiving channel by reducing point source energy at the end of the pipe.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
 Holly Forest Homeowners Assoc - GPIN 7992-72-3439
 William M and Marjorie H Washington - GPIN 7992-72-4929

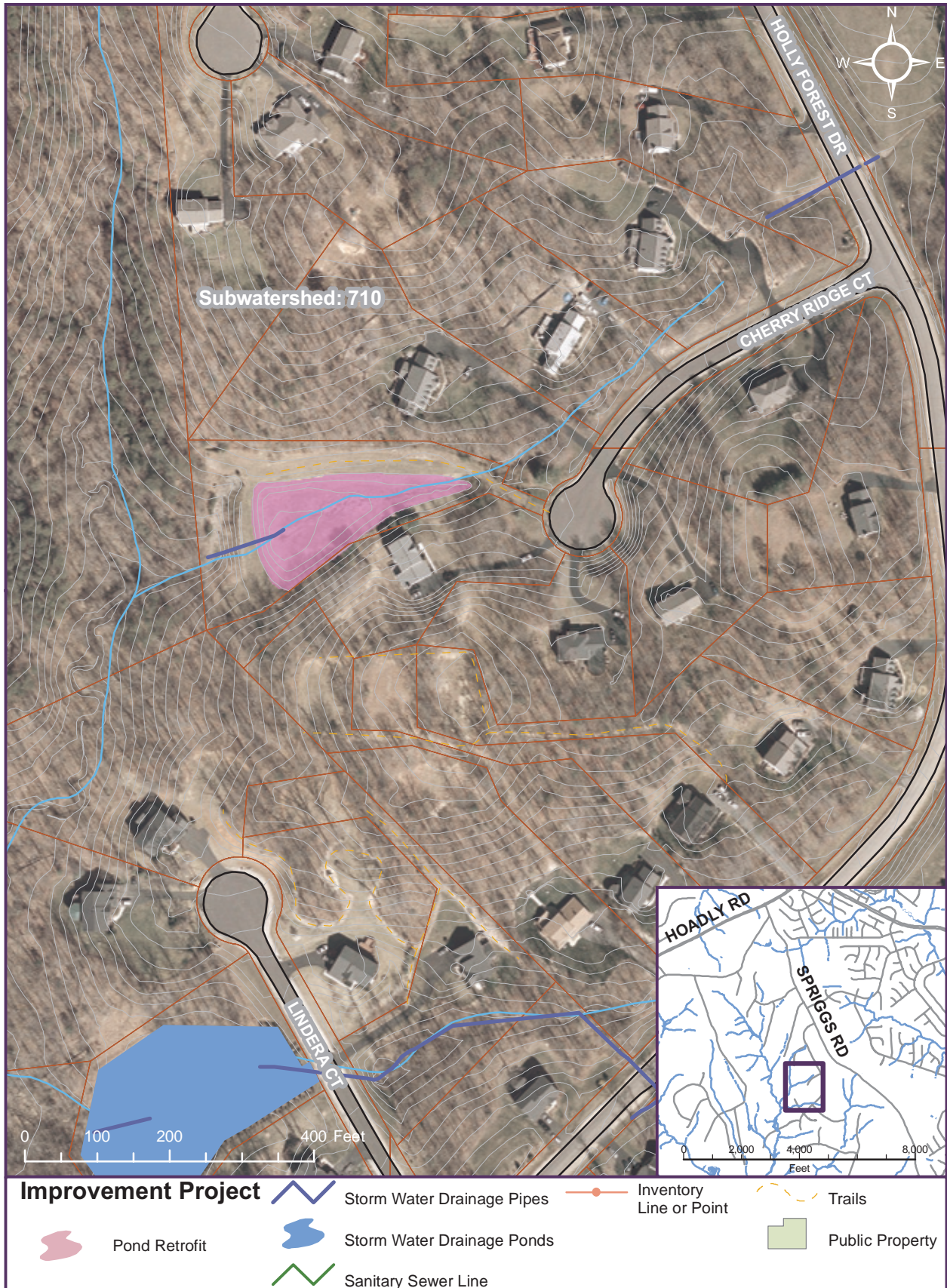
Facility Access: Maintenance access to this facility is found at the end of Cherry Ridge Court.

Design or Construction: N/A

Design Assumptions: It is assumed that as-built drawings and/or design plans are available and

Estimated Costs:

<i>Design:</i>	\$	25,000
<i>Construction:</i>	\$	250,000
<i>Total:</i>	\$	275,000



Project Concept Plan

This dry pond facility appears to be operating as designed. The pond bottom, however, is not regularly maintained, which may aid in the uptake of contaminants.



Project Concept Plan

Stream Reach ID:	N/A	SWM Facility ID:	N/A
Catchment Code:	710		
Candidate Site:	710-2		
Type:	Pond Retrofit		
Size or Length:	9 Acres		
Location:	About 600 feet south of end of Lochmere Drive		
Drainage Area:	615 Acres		

Problem Description: This existing pond has fallen into a state of disrepair and does not appear to have any appreciable hydrologic impact on the watershed. The Dewberry study had placed one of the recommended "regional" ponds immediately upstream of this location. While this pond is on private property, which may be an obstacle to a capital improvement project for the County, it is an existing impact to waters of the US and as such may be significantly easier to permit. The key to success for this approach would be working with the property owner to establish a win-win relationship, whereby the County can achieve their hydrologic goals within the sub-watershed, and the homeowner can improve the aesthetic value of their property. This may require a greater level of landscaping than would otherwise be necessary on County lands, but could set a precedent for cooperative watershed management.

Project Description: This project would essentially be the rehabilitation and re-configuration of a large quasi-regional stormwater management facility. By using an existing failed detention structure, the County may be able to achieve the goals of one of the recommendations from the Dewberry H&H study. This tributary makes up one of four tributaries in sub-watershed 710, and makes up a greater percentage of the drainage area. If a single facility could be used to control the hydrology for this drainage area, it would go a long way toward meeting the management goals laid out in this report.

Benefits:

Quantity (Flow): The goal of this facility would be to substantially drop the peak rate of discharge and increase the time of concentration for this tributary by a large factor. This approach would have a significant impact on the overall hydrographic response for all of Powells Creek, down to Lake Montclair.

Quality (Pollution reduction):

The failed impoundment structure is contributing to some scour and sediment export. However, this is negligible in comparison to the impact such a project would have on the stability of the entire upper Powells Creek Watershed, if this project were to move forward.

Erosion Control: A dramatic decrease in watershed scale, in-stream erosion and scour would be expected from a project such as this.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Olin D and Srace W Bockes - GPIN 7992-49-0740

Facility Access: Access to this reach is available through private road at end of Van Doren

Design or Construction: N/A

Design Assumptions: Pond currently exists and is in disrepair. It is assumed that this approach would be permittable and that the property owner would be amenable to a mutually beneficial project to improve the functionality of this facility.

Estimated Costs:

<i>Design:</i>	\$	85,000
<i>Construction:</i>	\$	600,000
<i>Total:</i>	\$	685,000



Project Concept Plan

Main stem of channel that feeds the pond system.



View of upstream side of culvert under driveway. Upper cell of pond system is in the distance.



Looking across lower cell of pond system.

