CONCEPTUAL PLAN NARRATIVE

THE GOAL OF THIS PROJECT IS TO ANALYZE THE AREA OF SIGNIFICANT FLOODING OF TRAMMEL BRANCH OCCURRING ON OR NEAR PROPERTIES ALONG SHADOW WALK AND WEST COLUMBIA STREET IN THE CITY OF FALLS CHURCH. THE STORM SEWER NETWORK AND CULVERTS IN THE SUBJECT PROBLEM AREA HAVE BEEN MODELED TO DETERMINE THEIR CAPACITY DURING A 10-YEAR STORM EVENT.

THIS CONCEPTUAL PLAN CONSIDERS A NEW PARALLEL STORM SEWER SYSTEM STARTING FROM THE WASHINGTON AND OLD DOMINION (W&OD) TRAIL CULVERT (EX. STR. A3000) NORTH OF SHADOW WALK AND DAYLIGHTING INTO FOUR MILE RUN ADJACENT TO EX. STR. A5101. THE NEW PARALLEL STORM SEWER SYSTEM WOULD CONVEY THE 10-YEAR STORM FROM TRAMMEL BRANCH, SEPARATING THIS FLOW FROM THE EXISTING STORM SEWER SYSTEM.

FURTHERMORE, THREE (3) CULVERTS UPSTREAM OF THE W&OD TRAIL CULVERT (EX. STR. A3000) HAVE BEEN INCLUDED IN THE ANALYSIS.

GKY USED XPSWMM VERSION 2019.1.1 TO MODEL THE EXISTING PIPE NETWORK USING NRCS METHODS FOR RUNOFF COMPUTATIONS AND A 1D MODEL WITH 2D COMPONENT FOR HYDRAULIC ANALYSIS. THE MAIN TRUNK LINE OF THE EXISTING PIPE NETWORK WAS EVALUATED USING THE 1D COMPONENT, WITH NODAL PONDING ALLOWED AT THE NODES. FLOODING UPSTREAM OF THE W&OD CULVERT WAS MODELED USING A 2D GRID NETWORK LINKED TO THE 1D PORTIONS OF THE MODEL. THE 2D PORTION ASSIGNS A CELL ELEVATION AND MANNING'S N ROUGHNESS TO EACH 3-FT BY 3-FT SQUARE GRID CELL BASED ON INPUT DATA. GRID CELL ELEVATIONS ARE DERIVED FROM A TIN SURFACE, WHICH IS SOURCED FROM FINAL SURVEY TOPOGRAPHY DATA PROVIDED BY WALTER L. PHILLIPS INCORPORATED. MANNING'S N-VALUES WERE ASSIGNED BY ANALYSIS OF LAND COVER USING 2019 AERIAL IMAGERY.

FOR THE 10-YEAR AND 100-YEAR STORM EVENTS, AN SCS TYPE-II, 24-HOUR RAINFALL DISTRIBUTION WAS USED, WITH TOTAL RAINFALL AMOUNTS OF 4.9 AND 8.46 INCHES, RESPECTIVELY (NOAA ATLAS 14). THE PROPOSED DESIGN IS INTENDED TO CONVEY THE 10-YEAR DESIGN STORM ONLY - A 100-YEAR, PROPOSED CONDITION SCENARIO WAS NOT EVALUATED. PER VDOT SPECIFICATIONS, DOWNSTREAM TAILWATER CONDITION AT THE STORM SEWER OUTFALL WAS SET TO 0.8 TIMES THE PIPE DIAMETER (FOR BOTH EXISTING AND PROPOSED PIPE LINES).

THE EXISTING CONDITION MODEL SHOWS THAT THE MAIN TRUNK LINE NORTH OF THE W&OD TRAIL IS SURCHARGED FAR BEYOND CAPACITY EVEN DURING A 10-YEAR STORM. ADDITIONALLY, THE CULVERT UNDER THE TRAIL IS FLAT (SURVEY SHOWS SAME UPSTREAM AND DOWNSTREAM INVERT ELEVATIONS). DURING A FLOOD EVENT, THE WATER FROM THE OVERWHELMED MAIN TRUNK LINE ATTEMPTS TO FLOW OUT THROUGH THE CULVERT IN AN UPSTREAM DIRECTION. THIS MEANS RUNOFF COMING FROM THE NATURAL CHANNEL UPSTREAM OF THE CULVERT HAS NO PLACE TO GO, CAUSING A SEVERE PONDING EFFECT AT THE CULVERT/TRAIL EMBANKMENT, WHICH PROPAGATES UPSTREAM AND IMPACTS SEVERAL HOMES.

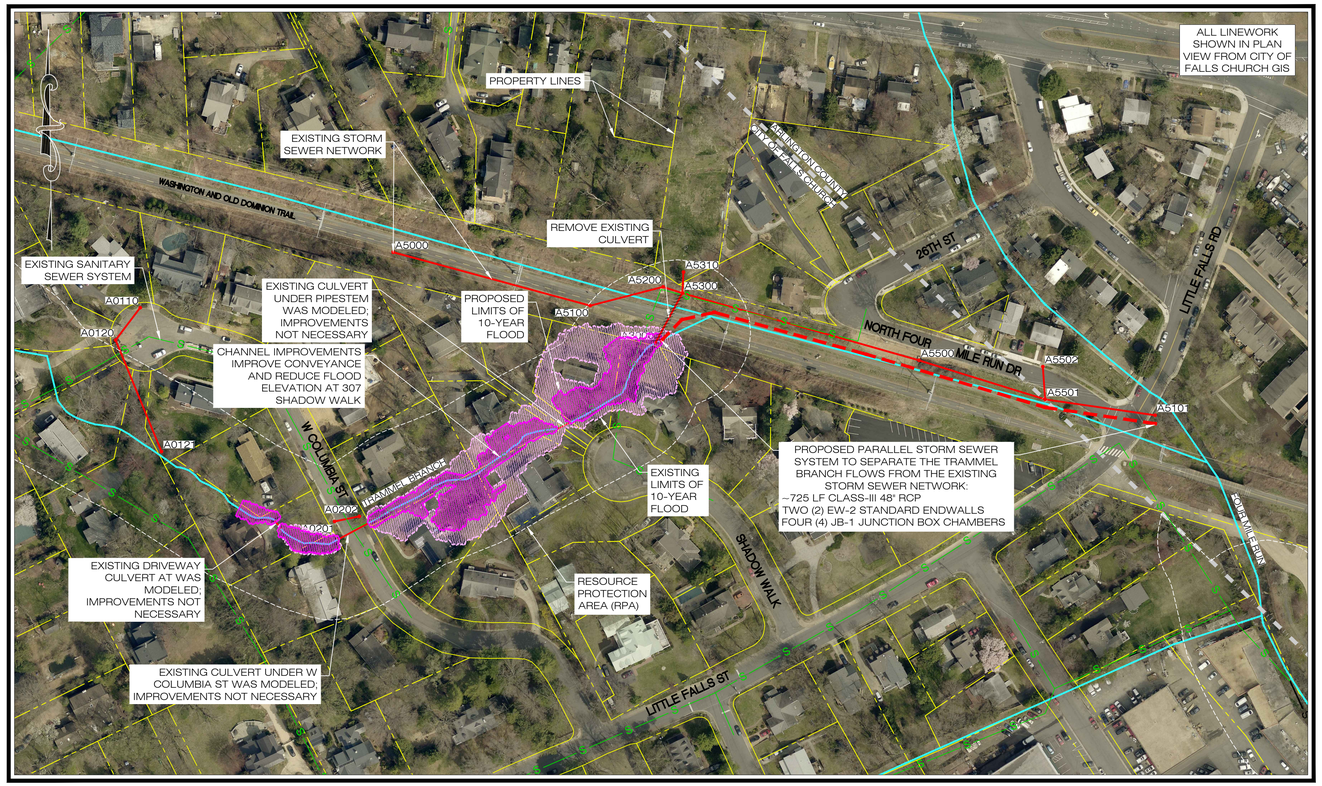
GKY'S PROPOSED SOLUTION SHOWN ON THESE CONCEPT PLANS INVOLVES PLUGGING AND ABANDONING THE EXISTING CULVERT UNDER THE TRAIL. THIS PREVENTS EXCESS WATER FROM THE MAIN TRUNK LINE FROM BACK-FLOWING THROUGH THE FLAT CULVERT INTO THE YARDS OF THE HOMES THAT ARE EXPERIENCING FREQUENT FLOODING. GKY PROPOSES INSTALLING A NEW CULVERT AND PIPE LINE THAT RUNS PARALLEL TO THE EXISTING LINE, BUT HAS NO CONNECTION TO THAT LINE. GKY MODELED THIS NEW LINE USING ONLY 48-INCH DIAMETER CIRCULAR CONCRETE PIPE, WITH SLOPES BETWEEN 1 AND 2 PERCENT. IN A 10-YEAR DESIGN STORM, THE PROPOSED PIPE IS ONLY FLOWING AT HALF CAPACITY - SMALLER PIPES AND/OR ELLIPTICAL PIPES MAY BE EVALUATED AT FINAL DESIGN IF SPACE, GROUND COVER, OR COST CONSTRAINTS REQUIRE IT.

GKY ALSO MODELED SEVERAL PROPOSED CONDITION SCENARIOS THAT ARE NOT SHOWN ON THIS CONCEPT PLAN:

- OPTION A: ADD NEW MANHOLE TO EXISTING CULVERT UNDER THE W&OD TRAIL, LEAVING THE CONNECTION TO EXISTING TRUNK LINE IN PLACE. NEW PIPE IS PLACED STARTING AT THE NEW MANHOLE AND PARALLELS THE EXISTING PIPE TO THE OUTFALL.
- OPTION B: ADD NEW MANHOLE TO EXISTING CULVERT UNDER THE W&OD TRAIL, BUT REMOVE THE CONNECTION TO EXISTING TRUNK LINE. NEW PIPE IS PLACED STARTING AT THE NEW MANHOLE AND PARALLELS THE EXISTING PIPE TO THE OUTFALL.
- OPTION C: ADD ENTIRELY NEW CULVERT AND PIPE RUN PARALLEL TO THE EXISTING RUN. THE NEW PARALLEL RUN HAS NO CONNECTION TO THE EXISTING TRUNK LINE. LEAVE THE EXISTING CULVERT OPEN AND IN PLACE (AS OPPOSED TO PLUG AND ABANDON).

ALL OF THE ABOVE OPTIONS IMPROVED THE 10-YEAR FLOODING UPSTREAM OF THE W&OD TRAIL, WITH OPTION B PROVIDING THE MOST RELIEF AND C PROVIDING THE LEAST. THE OPTION SHOWN ON THE CONCEPT PLAN PROVIDES SUBSTANTIALLY MORE RELIEF THAN ANY OF THE OPTIONS ABOVE.

RESULTS OF GKY'S PROPOSED MODELING SHOW A MASSIVE IMPROVEMENT IN 10-YEAR FLOODING AT 312, 310, AND 305 SHADOW WALK, AND AT 302 WEST COLUMBIA STREET, WITH ALL OF THESE RESIDENCES NO LONGER SHOWN AS BEING IN CONTACT WITH THE 10-YEAR FLOODPLAIN. SEE MAPPED RESULTS ON NEXT SHEET. AT 307 SHADOW WALK, THE 10-YEAR FLOOD ELEVATION IS REDUCED BY 2.0 FEET, BUT THE HOUSE MAY STILL EXPERIENCE BASEMENT FLOODING (BASEMENT OPENING ELEVATION IS 301.4 FT, THE SAME AS THE PROPOSED CONDITION 10-YR FLOOD ELEVATION). GKY ANALYZED THE SHADOW WALK CULVERT TO DETERMINE IF REPLACING IT WITH A LARGER CULVERT WOULD REDUCE THE FLOOD ELEVATION. INCREASING THE CULVERT SIZE DID NOT CHANGE THE RESULTS, INDICATING THAT THE NATURAL CHANNEL IN FRONT OF THE HOUSE IS NOT CAPABLE OF PASSING THE 10-YEAR STORM. AS DEPICTED BY THE SURVEY, THE CHANNEL IS ONLY 3 TO 4 FEET WIDE AND CONFINED BY RETAINING WALLS ON BOTH SIDES. IMPROVING THE CHANNEL UPSTREAM OF SHADOW WALK OR REGRADING OVERBANK AREAS MAY RESOLVE THE FLOODING ISSUE AT 307 SHADOW WALK.



1 / 1 TRAMMEL BRANCH PROJECT CONCEPTUAL LAYOUT

1" = 100'

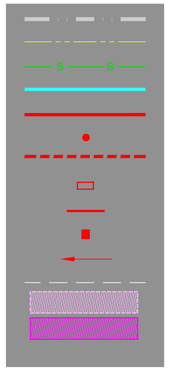
GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

CONCEPTUAL PLAN LEGEND

- JURISDICTIONAL BOUNDARY
- PROPERTY LINES
- EXISTING SANITARY SEWER
- STREAM CENTERLINE
- EXISTING STORM SEWER PIPE
- EXISTING STORM STRUCTURE
- PROPOSED STORM SEWER PIPE
- PROPOSED CURB INLET
- PROPOSED CULVERT PIPE
- PROPOSED JUNCTION BOX
- DIRECTIONAL ARROW
- RESOURCE PROTECTION AREA
- EXISTING LIMITS OF 10-YR FLOOD
- PROPOSED LIMITS OF 10-YR FLOOD



ALL INFORMATION HEREON, INCLUDING THE PLAN AND COST ESTIMATE, IS IN DRAFT FORM AT A CONCEPTUAL LEVEL OF DESIGN, PRODUCED AS AN INTERIM PRODUCT. INFORMATION WILL CHANGE AS SUBSEQUENT LEVELS OF DESIGN ARE COMPLETED.

CONCEPTUAL PLAN CONSTRAINTS

No.	Constraint	Cost	Schedule	Constructability	Comments
1	Overhead utility lines are present along path of new parallel storm sewer system.		Yellow		Easement language will need to be examined. If necessary permissions would need to be obtained from easement-holders.
2	A portion of the proposed parallel storm sewer system and area of potential channel improvements are in a Resource Protection Area (RPA).			Green	Limits of disturbance will need to be restricted to the minimum area required for installation of improvements. A Water Quality Impact Assessment will be required to address disturbance in the RPA.
3	Much of the proposed parallel storm sewer system is along the Washington and Old Dominion Trail (W&OD), owned by NOVA Parks.		Yellow		Permissions will need to be obtained.
4	The path of the proposed parallel storm sewer system is within two jurisdictions: The City of Falls Church and Arlington County.	Green	Yellow		Plans will need to be processed through an additional jurisdiction, with approvals obtained and permits pulled.
5	A sanitary sewer line exists along or close to a portion of the proposed path of the new parallel storm sewer system.			Green	Proposed pipe horizontal and vertical alignment will be located to minimimize conflicts with sanitary sewer; however, care must be taken in construction to protect existing pipe and avoid damage during excavation.
6	Sanitary sewer lines existing along or close to the culvert under West Columbia Street and the culvert under the pipestem driveway at the end of Shadow Walk; both of these culverts are to be analyzed for potential upsizing/improvement.				Based on current modeling results, improvements are no longer anticipated at this location.
7	A water line exists along West Columbia Street (not shown) that could impact potential upsizing/improvement of the culvert located underneath the street.				Based on current modeling results, improvements are no longer anticipated at this location.
8	There may be other unknown utilities in the area of proposed work that could cause a potential conflict.	Yellow	Yellow	Yellow	Pending final utility survey, proposed pipe horizontal and vertical alignment will be located to minimimize conflicts with existing utilities; however, care must be taken in construction to protect existing pipe and avoid damage during excavation. If utilities are found to be in conflict, they may need to be relocated.
9	Improvements may be required to culverts on private property.	Green	Yellow	Green	Permissions will need to be obtained.

Legend

- Green: Minimal Impact
- Yellow: Moderate Impact
- Red: Significant Impact

Project: City of Falls Church Watershed Master Plan: Trammel Branch Project					
Design Assumptions: New Parallel Storm Sewer System					
Estimate Type: Conceptual Construction Cost Estimate					
Prepared by: GKY & Associates, Inc.					
Date: March 4, 2020					
#	ITEM	QUANTITY	UNIT	UNIT COST	COST
1	**EROSION & SEDIMENT CONTROL**				
2	Erosion and Sediment Controls	1	LS	$60,000 / LS	$60,000
3	**EROSION & SEDIMENT CONTROL SUB TOTAL:**				**$60,000**
4	**PROPOSED IMPROVEMENTS**				
5	48" RCP CL III Pipe	725	LF	$800 / LF	$580,000
6	EW-2 Endwall for 48" Pipe	2	EA	$15,000 / EA	$30,000
7	Handrail for EW-2	20	LF	$150 / LF	$3,000
8	JB-1 Junction Box Chamber for 48" Pipe	4	EA	$25,000 / EA	$100,000
9	Grading and Channel Improvements at 307 Shadow Walk	1	EA	$80,000 / EA	$80,000
10	Remove Existing CMP Culvert, Full Haul Off and Backfill	80	LF	$120 / LF	$9,600
11	Remove Existing Connection to Junction Box	1	EA	$1,500 / EA	$1,500
12	Pavement Restoration	1	LS	$150,000 / LS	$150,000
13	**PROPOSED IMPROVEMENTS SUB TOTAL:**				**$954,100**
14	**MISCELLANEOUS**				
15	Mobilization	1	EA	$25,000 / EA	$25,000
16	Maintenance of Traffic	1	LS	$40,000 / LS	$40,000
17	Utility Coordination and/or Relocation	1	LS	$90,000 / LS	$90,000
18	Construction Design, Survey, and Stakeout	1	LS	$90,000 / LS	$90,000
19	**MISCELLANEOUS SUB TOTAL:**				**$245,000**
20					
21	**PROJECT SUB TOTAL:**				**$1,259,100**
22	**CONTINGENCY (45% of PROJECT SUB TOTAL):**				**$566,595**
23	**PROJECT SUB TOTAL:**				**$1,825,695**

2 / 1 TRAMMEL BRANCH PROJECT CONCEPTUAL COST ESTIMATE

GKY & Associates, inc.

GKY & ASSOCIATES, INC.
4229 LAFAYETTE CENTER DRIVE
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TRAMMEL BRANCH PROJECT
CONCEPTUAL PLAN (1 OF 2)

WATERSHED MANAGEMENT PLAN PROJECTS
CITY OF FALLS CHURCH, VIRGINIA

NOT FOR CONSTRUCTION

DATE	DESCRIPTION
-	-

H SCALE: 1" = 100'
H DATUM: NAD83
V SCALE: N/A
V DATUM: NGVD29

DESIGNED: SM/CA
DRAFTED: SM/AJ
CHECKED: BK

PROJECT#: 2016-006
CONTRACT#: TO#30

SHEET: 1 OF 9

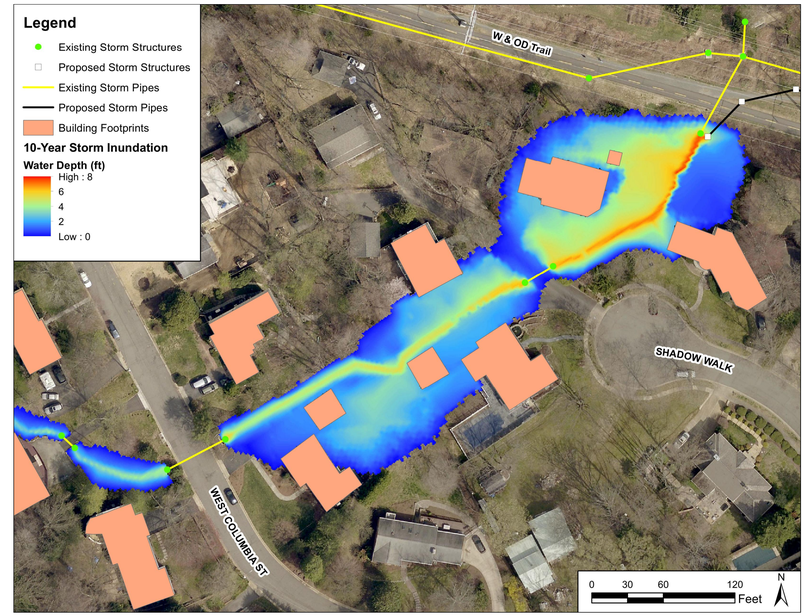
STORM SEWER STR. A5501 AND OVERHEAD UTILITY LINES
ALONG NORTH FOUR MILE RUN DRIVE

STORM SEWER STR. A3000

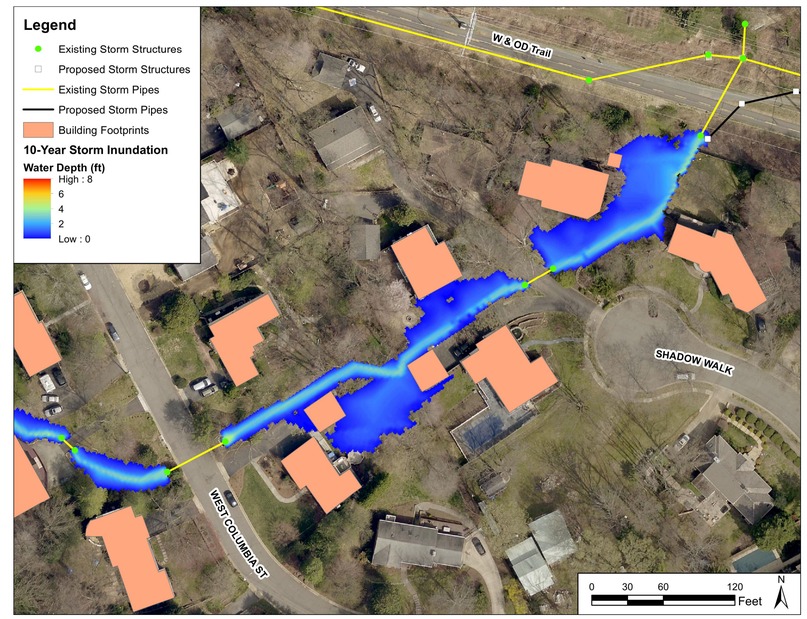
CULVERT OUTLET UNDER WEST COLUMBIA STREET

DRIVEWAY CULVERT AT 307 WEST COLUMBIA STREET

1
1A
EXISTING CONDITIONS PHOTOS
NOT TO SCALE



2
1A
EXISTING CONDITIONS 10-YEAR FLOOD DEPTHS
1" = 100'



3
1A
PROPOSED CONDITIONS 10-YEAR FLOOD DEPTHS
1" = 100'

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TRAMMEL BRANCH PROJECT
CONCEPTUAL PLAN (2 OF 2)

WATERSHED MANAGEMENT PLAN PROJECTS
CITY OF FALLS CHURCH, VIRGINIA

NOT FOR CONSTRUCTION

DATE	DESCRIPTION
-	-

H SCALE:	1" = 100'
H DATUM:	NAD83
V SCALE:	N/A
V DATUM:	NGVD29
DESIGNED:	SM/CA
DRAFTED:	SM/AJ
CHECKED:	BK
PROJECT#:	2016-006
CONTRACT#:	TO#30
SHEET:	1A OF 9