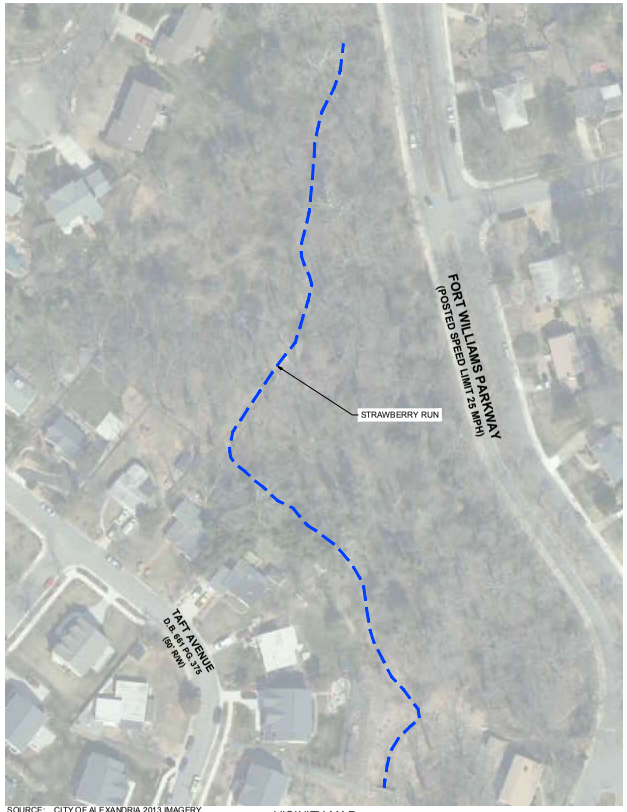
APPENDIX K

STRAWBERRY RUN CONCEPT DESIGN

CITY OF ALEXANDRIA, VIRGINIA

STRAWBERRY RUN
CONCEPTUAL DESIGN

Sheet Index	
Sheet Number	Sheet Title
01	COVER
02	EXISTING CONDITIONS - PHOTOS
03	EXISTING CONDITIONS - PROFILE
04	CONCEPT LAYOUT
05	TYPICAL SECTIONS & ROCK AND LOG VANE DETAILS
06	CONSTRUCTED RIFFLE DETAIL
07	ROCK CROSS VANE DETAILS
08	STACKED ROCK WALL AND ROCK TOE
09	TOE WOOD DETAILS
10	PLUNGE & STEP POOL DETAILS
11	CASCADE DETAILS
12	PLANTING PLAN DETAILS



SOURCE: CITY OF ALEXANDRIA 2013 IMAGERY
LOCATION: FORT WILLIAMS PARK
(38.811423, -77.094672)

VICINITY MAP

60 0 60 120 FT
1 inch = 60 feet

PROJECT DESCRIPTION:

APPROXIMATELY 811 LINEAR FEET (LF) OF PROPOSED STREAM RESTORATION DOWNSTREAM OF AN EXISTING 72 INCH CORRUGATED METAL PIPE (CMP) OUTFALL. THROUGH THE PROCESS OF BANK EROSION, THIS SITE AREA CONTRIBUTES LARGE AMOUNTS OF SEDIMENT DOWNSTREAM, ALONG WITH ASSOCIATED NUTRIENTS (NITROGEN AND PHOSPHOROUS) LOADS. IN ORDER TO MEET THE CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) REQUIREMENTS, RESTORATION OF THIS USING STREAM RESTORATION TECHNIQUES COULD RESULT IN REDUCTIONS IN TOTAL SUSPENDED SOLIDS (TSS), TOTAL NITROGEN (TN), AND TOTAL PHOSPHOROUS (TP). AS SUCH, THIS CONCEPTUAL RESTORATION DESIGN PLAN WAS SUBMITTED AS PART OF THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) STORMWATER LOCAL ASSISTANCE FUND (SLAF) GRANT IN OCTOBER, 2018. BASED ON THE PRELIMINARY CONCEPT, THE APPROXIMATE LIMITS OF DISTURBANCE ARE 3.4± ACRES. IT SHOULD BE NOTED THIS AREA MAY CHANGE AND NEED REVISING UPON COMPLETION OF A FIELD SURVEY AND THROUGHOUT THE DESIGN PROCESS.

EXISTING CONDITIONS NOTES:

THE STREAM CHANNEL HAS DOWNCUT WITH ABANDONED MEANDERS WHICH ARE APPROXIMATELY 3 FT. HIGHER THAN THE CURRENT STREAM BED, AND TRIBUTARIES ALONG THE REACH HAVE HEADCUT. SIGNIFICANT AMOUNTS OF BROKEN CONCRETE WERE OBSERVED IN THE CHANNEL, WHERE IT APPROACHES AND RUNS APPROXIMATELY PARALLEL TO TAFT AVENUE. DOWNSTREAM OF THE PROJECT REACH, THERE IS A STREAM RESTORATION PROJECT THAT WAS COMPLETED IN 2010 NEAR THE VICINITY OF THE PEDESTRIAN BRIDGE. THIS RESTORATION PROJECT WAS FUNDED BY THE DEVELOPER TO MEET WATER QUALITY REQUIREMENTS AS PART OF THE TAFT AVENUE DEVELOPMENT.

STRAWBERRY RUN CONCEPT DESIGN
NOT FOR CONSTRUCTION

NO.	DD	MON	YYYY	ISSUE / REVISION DESCRIPTION	ENG.	APPR.

CLIENT: CITY OF ALEXANDRIA, 301 KING STREET, ALEXANDRIA, VA 22314

ENGINEER: Wood Environment & Infrastructure Solutions, 4795 Meadow Wood Lane, Suite 310 East, Chantilly, VA 20151-1678, Tel. (703) 488-3700, www.woodplc.com

DRAWN BY: CAL
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: 1" = 60'

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: COVER

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 01 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:COVER February 04, 2019 10:40:38am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\01-COVER.DWG

LEGEND

- LOCATION AND PHOTO DIRECTION
- EXISTING STREAM CENTERLINE
- PROPERTY LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER

50 0 50 100 FT
1 inch = 50 feet

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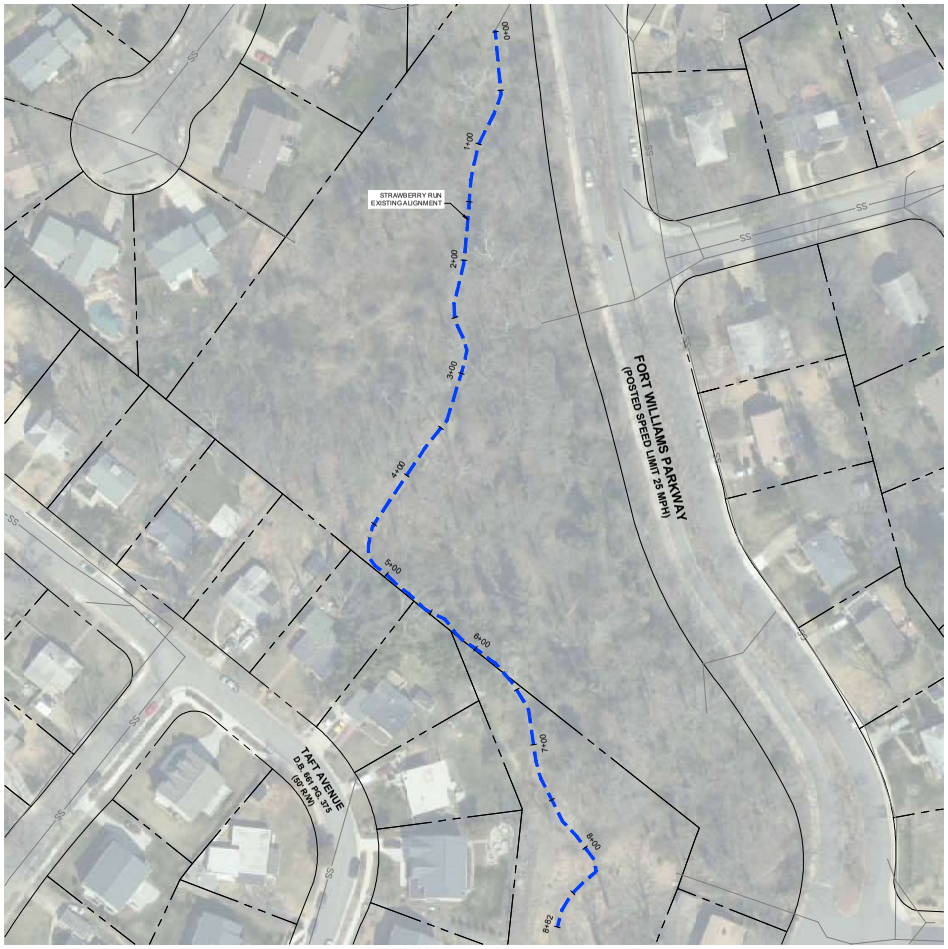
DRAWN BY: CAL
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: 1" = 50'

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

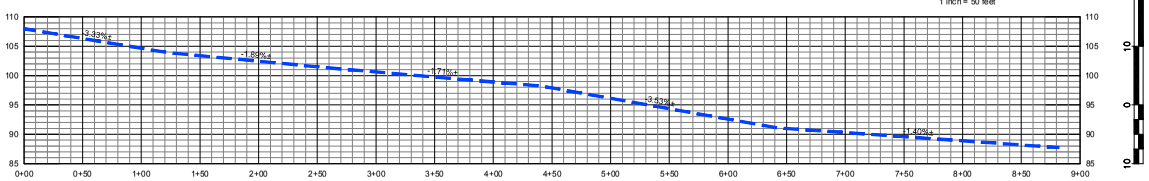
SHEET TITLE: EXISTING CONDITIONS - PHOTOS

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 02 OF 12



EXISTING STREAM ALIGNMENT - PLAN VIEW

50 0 50 100 FT
1 inch = 50 feet



EXISTING STREAM ALIGNMENT - PROFILE VIEW

50 0 50 100 FT
1 inch = 50 feet

20 FT
10
0
10

NOTE:
EXISTING STREAM CENTERLINE AND TOPOGRAPHIC DATA IS BASED ON THE CITY OF ALEXANDRIA'S GIS DATA.

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CLIENT:
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ALEXANDRIA, VA 22314

ENGINEER:
Wood Environment & Infrastructure Solutions
4795 Meadow Wood Lane, Suite 310 East
Chantilly, VA 20151-1678
Tel. (703) 488-3700
www.woodplc.com

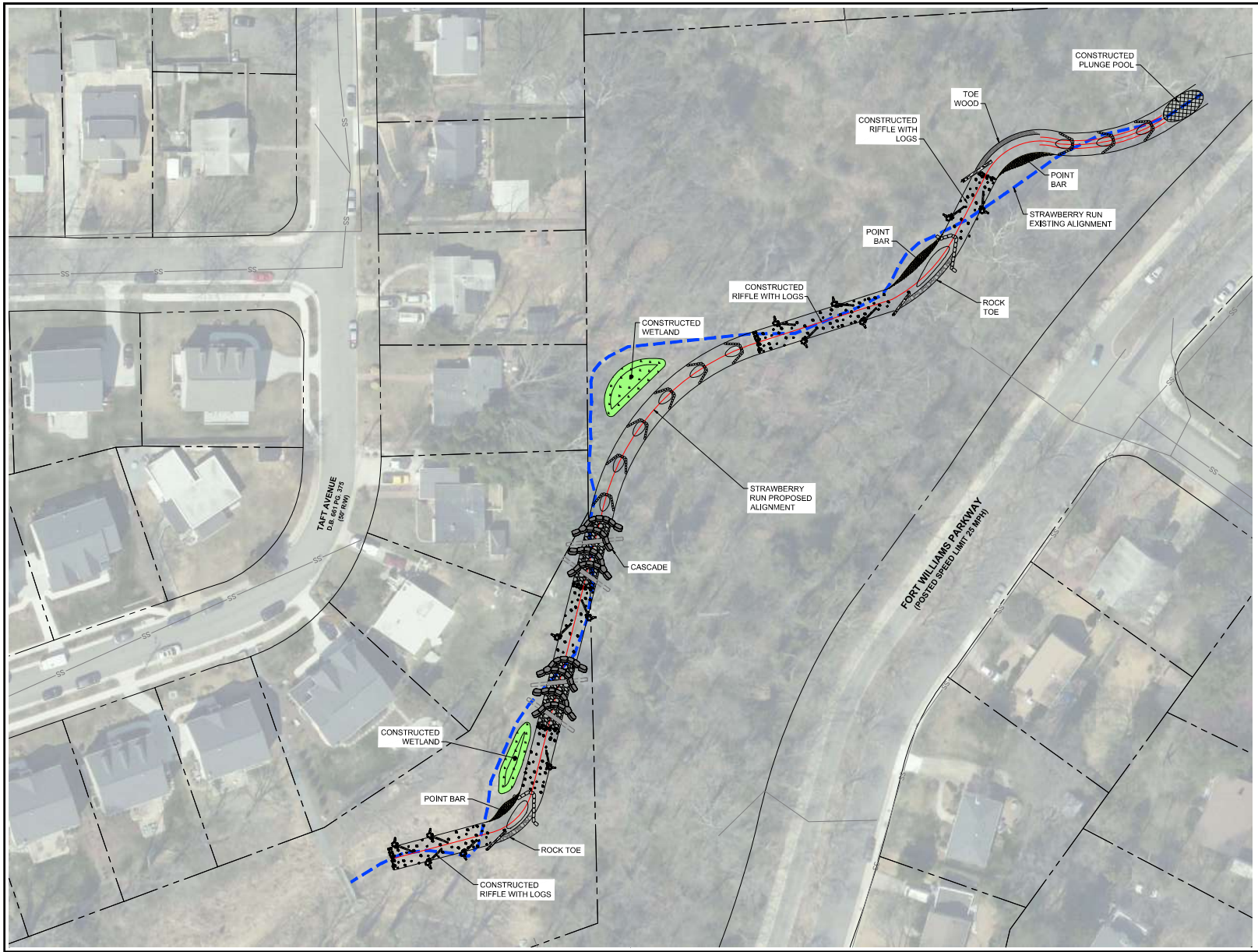
DRAWN BY: CAL
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: AS NOTED

PROJECT:
PHASE III ASSESSMENTS
STRAWBERRY RUN STREAM RESTORATION
207 FORT WILLIAMS PARKWAY
ALEXANDRIA, VA 22304

SHEET TITLE:
EXISTING CONDITIONS - PROFILE

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 03 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:24x36 February 04, 2019 10:41:05am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\03-EXISTING CONDITIONS - - PROFILE.DWG



N

LEGEND

- CROSS VANE
- LOG VANE
- CONSTRUCTED RIFFLE
- CASCADE
- TOE WOOD
- ROCK TOE
- PLUNGE POOL

NOTE:
1. CONCEPT LAYOUT IS PRELIMINARY AND BASED ON FIELD RECONNAISSANCE AND THE CITY OF ALEXANDRIA'S GIS TOPOGRAPHIC DATA. AS SUCH, THE NUMBER OF STRUCTURES AND PLANIMETRIC LAYOUT IS SUBJECT TO CHANGE AND WILL BE REFINED UPON COMPLETION OF A FIELD SURVEY.
2. DEPENDING ON THE AVAILABILITY OF WOOD MATERIAL, ROCK TOE COULD BE SUBSTITUTED FOR TOE WOOD.

30 0 30 60 FT
1 inch = 30 feet

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wood.

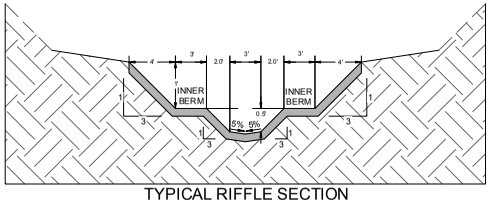
DRAWN BY:	CAL
CHECKED BY:	MJH
APPROVED BY:	MTB
SCALE:	1" = 30'

PROJECT:
PHASE III ASSESSMENTS
STRAWBERRY RUN STREAM RESTORATION
207 FORT WILLIAMS PARKWAY
ALEXANDRIA, VA 22304

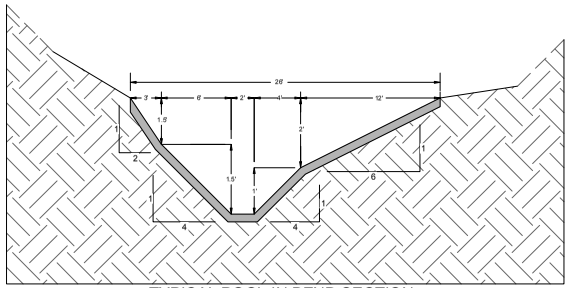
SHEET TITLE:
CONCEPT LAYOUT

PROJECT NO.:	7526173001
DATE:	31 JANUARY 2019
DWG. SIZE	ARCH D
SHEET NUMBER	04 OF 12

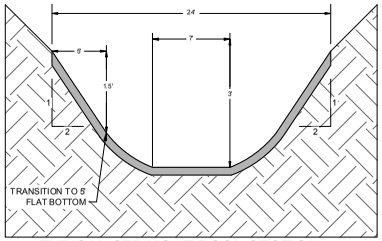
PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:24x36 February 04, 2019 10:41:18am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\04-CONCEPT LAYOUT.DWG



TYPICAL RIFFLE SECTION



TYPICAL POOL IN BEND SECTION

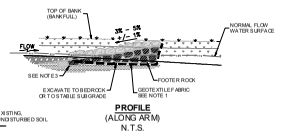


TYPICAL STRAIGHT POOL SECTION

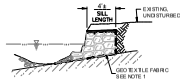
NOTE:
DIMENSIONS FOR TYPICAL SECTIONS ARE PRELIMINARY AND BASED ON BEST PERSONAL JUDGEMENT AND PREVIOUS EXPERIENCE. AS THE PRELIMINARY CONCEPTS MOVE INTO A 30% DESIGN PHASE, AFTER COMPLETION OF A FIELD SURVEY AND DETAILED STREAM CHARACTERIZATION, TYPICAL SECTIONS WILL BE REFINED AND DEVELOPED FROM HYDROLOGIC ANALYSIS AND FURTHER FIELD INVESTIGATION OF DEPOSITIONAL AREAS IN STABLE STREAM SECTIONS LOCATED UPSTREAM (US), DOWNSTREAM (DS), AND/OR IN THE VICINITY OF THE PROJECT SITE.

TYPICAL USES:

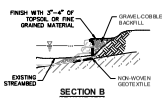
- RE-DIRECTION OF FLOW AWAY FROM LOCALIZED AREA OF BANK RIOSION WHERE A FULL J-HOOK VANE IS NOT PRACTICAL.
- IN SHARP STREAM BENDS WHERE THERE IS NOT ENOUGH SPACE FOR A J-HOOK VANE.
- LOWER COST ALTERNATIVE TO FULL J-HOOK STRUCTURE. HOWEVER, A J-HOOK VANE PROVIDES MORE BENEFITS.



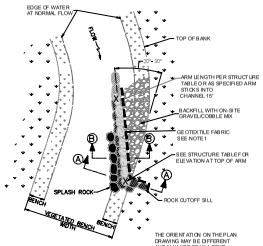
PROFILE
(ALONG ARM)
N.T.S.



SECTION A
(AT CUTOFF SILL)
N.T.S.



SECTION B
(AT VANE ARM)
N.T.S.



PLAN VIEW
N.T.S.

STRUCTURE ROCK SIZE				
	Representative Size			
	Width (Feet)	Length (Feet)	Height (Feet)	Weight (Tons)
Minimum	2	3	2	2

Assumed Rock Density: 165 LB/CU.FT.

THE ORIENTATION ON THE PLAN DRAWING MAY BE DIFFERENT AND MAY NOT BE IN A BEND. THE LOWER END OF THE ARM POINTS UPSTREAM.

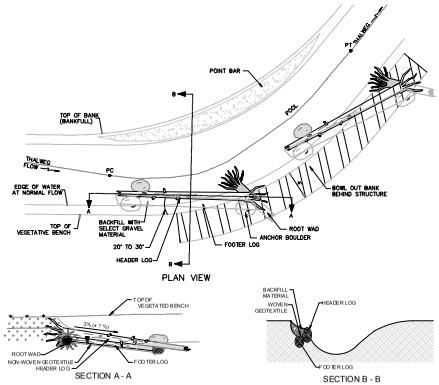
ROCK NOTES:

A. PROVIDE A RANGE OF ROCK SIZES FOR FLEXIBILITY TO MEET DESIGN GRADES & LINES. AT LEAST 80% OF THE ROCK SHALL MEET OR EXCEED THE AVERAGE SIZE ROCK REQUIREMENTS. UP TO 15% OF ROCK MAY BE 1/2 THE AVERAGE SIZE ROCK REQUIREMENT AND SHALL BE SMALLER FRAGMENTS FOR CHINKING USE.
B. SMALLER HEIGHT ROCKS ARE REQUIRED TO TAPER STRUCTURES AT APEX ON BEDROCK. FOOTER ROCKS SHALL MEET STRUCTURE ROCK REQUIREMENTS.
C. FOR MAIN STRUCTURE ROCK, SILL, AND FOOTER ROCK, THE ROCK SOURCE SHALL BE FROM AN ACCEPTABLE WIDOH QUARRY OR FROM ENGINEER APPROVED SOURCE.
D. ON-SITE COBBLE AND BOULDERS MAY BE USED TO FILL VOIDS AND FOR SPLASH ROCKS, BUT NOT FOR USE AS ANY MAIN STRUCTURE ROCK, UNLESS APPROVED BY ON-SITE ENGINEER.

NOTES:

1. USE CLASS I, NON-WOVEN GEOTEXTILE FABRIC AS DESCRIBED IN THE SPECIFICATIONS. PLACE GEOTEXTILE BEHIND THE ARM (UPSTREAM SIDE), DRAPED FROM TOP OF ROCK STRUCTURE TO BOTTOM OF FOOTER ROCK AND EXTENDING A MINIMUM OF HALF THE TRENCH BOTTOM WIDTH. TRIM EXCESS ON SMALLER FABRIC. EXTEND GEOTEXTILE ALONG HALF OF THE SILL LENGTH.
2. ON BEDROCK STREAM BEDS, EXCAVATE ROCK BEFORE INSTALLING STRUCTURE. EXCAVATION AND BACKFILL WORK RELATED TO THIS

ROCK VANE DETAIL
NOT TO SCALE



NOTES:

1. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE 4-DIAMETER FROM THE TOP OF THE LOG. THE NAILS SHALL BE ON ON CENTERS. FILTER FABRIC SHALL BE BURIED IN THE BOTTOM OF THE CHANNEL AND SHALL BE PLACED THE ENTIRE LENGTH OF THE STRUCTURE.
2. A TRENCH SHALL BE DUG IN SUCH A MANNER THAT THE ANCHOR BOULDERS ARE BURIED BENEATH THE BED SURFACE ELEVATION.
3. A HYDRAULIC EXCAVATOR WITH A BUCKET THAT CONTAINS A HYDRAULIC THUMB SHALL BE USED TO PLACE BOULDERS AND LOGS WITH THE SUPERVISION OF THE ENGINEER
4. HEADER AND FOOTER LOGS SHALL BE A MINIMUM OF 18-24 IN IN DIAMETER WITH A LENGTH OF 30 TO 50 FT. THE HEADER LOG SHALL BE PLACED ABOVE THE CHANNEL INVERT ELEVATION AND BEHIND THE HEADER LOG PRIOR TO BACKFILLING THE TRENCH
5. 1/3 OF THE WAY ACROSS THE CHANNEL FROM THE OUTSIDE BANK THE HEADER ROCK SHALL BE PLACED AT 2 IN ABOVE THE CHANNEL INVERT ELEVATION
6. EXCAVATE POOL TO A MINIMUM DEPTH OF 3 FEET BELOW EXISTING STREAMBED. IF BEDROCK IS ENCOUNTERED BEFORE REACHING THE MINIMUM DEPTH THE EXCAVATION MAY STOP AT BEDROCK. EXCAVATED MATERIAL MAY BE USED FOR BACKFILLING ALONG THE LOG VANE
7. SEED, MULCH, AND RESTORE DISTURBED AREAS TO PRE-EXISTING CONDITIONS OR BETTER. PROVIDE PLANTINGS AS REQUIRED BY PLANTING PLAN, IF PROVIDED.
8. ANY SOILDS TURBIDED DURING THE PLACEMENT OF J-HOOK VANES, SHALL BE SEEDED USING TEMPORARY AND PERMANENT SEEDING METHODS.
9. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAMM SIDE OF THE VANE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDER TO FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF THE STRUCTURE.
10. THE GAP BETWEEN THE HEADER AND FOOTER LOG SHALL BE CHINKED BY HAND WITH GRAVEL, COBBLE AND WOODY DEBRIS FROM THE UPSTREAM SECTION.
11. THE HORIZONTAL ANGLE OF THE HEADER LOG OF THE VANE AND THE BANK SHALL BE BETWEEN 20-30 DEGREES
12. SELECT GRAVEL MATERIAL CAN BE HARVESTED FROM SPOIL PILES ON SITE BUT SHOULD HAVE A GRADATION WITH A D16 40MM (1.6IN), D50-60MM (2.1IN, D90-200MM (8IN), D95-300MM (12IN, OR BE APPROVED BY ON-SITE TECHNICAL REPRESENTATIVE.
13. THE ROOTWAD SHALL BE A MINIMUM OF 6.0 FT IN LENGTH WITH A ROOT FAN WITH A DIAMETER OF AT LEAST 5 FT, AND A DIAMETER OF 18IN - 24IN.
14. STRUCTURE INVERT ELEVATION SHALL BE THE SAME ELEVATION AS THE RIFFLE IMMEDIATELY DOWNSTREAM OF THE STRUCTURE IN THE PLAN VIEW.

EXAMPLE ROCK VANE

EXAMPLE ROCK VANE

EXAMPLE ROCK VANE
(LOOKING DOWNSTREAM, ALONG VANE ARM)

EXAMPLE CONSTRUCTED LOG VANE

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NOT FOR CONSTRUCTION

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wood.

DRAWN BY:	CAL
CHECKED BY:	MJH
APPROVED BY:	MTB
SCALE:	NOT TO SCALE

PROJECT:
PHASE III ASSESSMENTS
STRAWBERRY RUN STREAM RESTORATION
207 FORT WILLIAMS PARKWAY
ALEXANDRIA, VA 22304

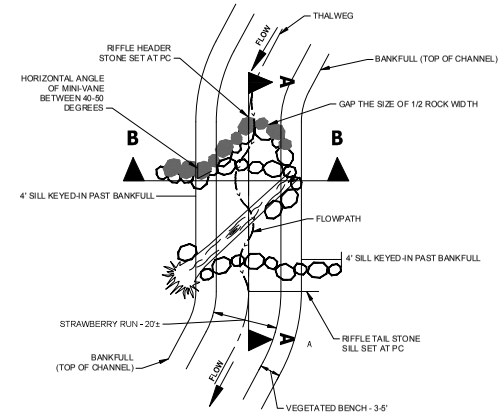
SHEET TITLE:
STREAM RESTORATION STRUCTURE DETAILS
TYPICAL SECTIONS & ROCK AND LOG VANE DETAILS

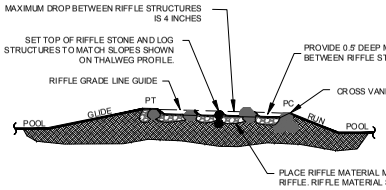
PROJECT NO.:	7526173001
DATE:	31 JANUARY 2019
DWG. SIZE	ARCH D
SHEET NUMBER	05 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:TYPICAL SECTIONS & ROCK AND LOG VANE DETAILS February 04, 2019 10:41:36am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG

RIFFLE SECTION STRUCTURES

NTS

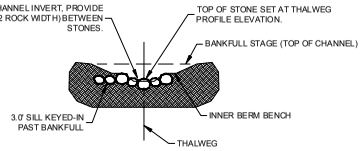




TYPICAL RIFFLE STRUCTURE INSTALLATION PROFILE

(NOT TO SCALE)

SECTION A-A



TYPICAL RIFFLE STRUCTURE INSTALLATION CROSS SECTION

(NOT TO SCALE)

SECTION B-B

RIFFLE MATERIAL MIXTURE

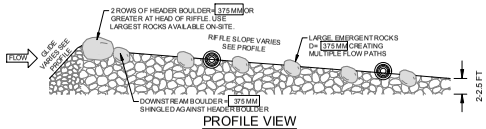
4' X 3' X 2' STRUCTURE STONE
CLASS I (D_{50} = 1.1')
CLASS III (D_{50} = 2.2')
57 STONE
SUPPLEMENTAL EX. BED MATERIAL

*CLASS I, CLASS III, AND 57 STONE SHALL BE EQUALLY MIXED AND SUPPLEMENTED WITH EXISTING BED MATERIAL AT THE DIRECTION OF THE FIELD ENGINEER.

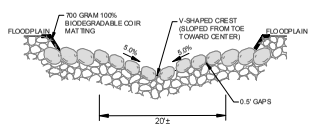
EXAMPLE RIFFLE
(SHOWN FOR INFORMATION ONLY)

RIFFLE NOTES:

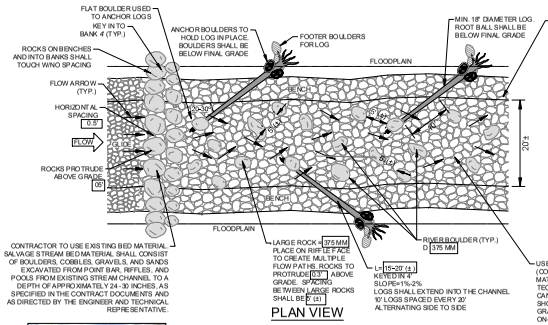
1. THE MAXIMUM AMOUNT OF DROP FROM ONE MINI-VANE TO THE NEXT SHALL BE NO GREATER THAN 4-INCHES. THE COMBINED AMOUNT OF DROP OVER ALL THE MINI-VANES SHALL NOT EXCEED THE TOTAL AMOUNT OF FALL ALONG THE RIFFLE SLOPE.
2. MINI-VANES SHALL BE EQUALLY SPACED ALONG THE RIFFLE.
3. A HYDRAULIC EXCAVATOR WITH A BUCKET THAT CONTAINS A HYDRAULIC THUMB SHALL BE USED TO PLACE BOULDERS AND LOGS WITH THE SUPERVISION OF THE ENGINEER.
4. LOGS FOR CONSTRUCTED RIFFLE SHALL BE A MINIMUM OF 1.5-FOOT IN DIAMETER WITH A LENGTH OF 10± FEET. LOGS AND BOULDERS CAN BE SUBSTITUTED DURING CONSTRUCTION WITH THE APPROVAL OF THE TOWN OF LEESBURG.
5. ⅔ OF THE WAY ACROSS THE CHANNEL FROM THE OUTSIDE BANK, THE HEADER ROCK SHALL BE PLACED AT 2 INCHES ABOVE THE CHANNEL INVERT ELEVATION.
6. THERE SHALL BE A GAP BETWEEN THE HEADER ROCKS OF 1/2 ROCK WIDTH.
7. THE BOULDERS SHALL SLOPE FROM THE BED ELEVATION, AT THE HEAD OF THE VANE, TO ½ BANKFULL ELEVATION AT A SLOPE OF 3%-5%. HEADER AND FOOTER BOULDERS SHALL BE TIED SECURELY INTO THE BANK IN SUCH A WAY THAT IT ELIMINATES THE POSSIBILITY OF STREAMFLOW DIVERTING AROUND THEM.
8. ANY SOIL DISTURBED DURING THE PLACEMENT OF THE RIFFLE SHALL BE SEEDED USING TEMPORARY AND PERMANENT SEEDING METHODS.
9. THE THALWEG OR LOW POINT IN THE CHANNEL SHALL ALTERNATE LEFT AND RIGHT OF THE CHANNEL CENTERLINE BY 10 INCHES.
10. THE GAP BETWEEN THE HEADER AND FOOTER BOULDERS SHALL BE CHINKED BY HAND WITH GRAVEL AND COBBLE FROM THE UPSTREAM DIRECTION.
11. THE HORIZONTAL ANGLE OF THE HEADER BOULDERS OF THE MINI-VANE AND THE BANK SHALL BE BETWEEN 40-50 DEGREES.
12. RIFFLE MATERIAL SHALL CONSIST OF A 2' - 2.5' THICKNESS OF CLASS I, CLASS III AND 57 STONE MIXED IN EQUAL PARTS BY THE CONTRACTOR AND SUPPLEMENTED WITH EXISTING BED MATERIAL AT THE DIRECTION OF THE ON-SITE TECHNICAL REPRESENTATIVE. ANY DEVIATION FROM THE SPECIFIED MIX DESIGN SHALL BE APPROVED BY THE TOWN OF LEESBURG.
13. IF A ROOT WADS IS USED IN THE STRUCTURE, THE ROOT WAD SHALL BE A MINIMUM OF 7 FT IN LENGTH, WITH A ROOT FAN WITH A DIAMETER OF AT LEAST 4 FT AND A DIAMETER OF 1.5 FT. 90% OF THE ROOT FAN SHALL BE BURIED IN THE BANK OF THE STRUCTURE.
14. THE ELEVATION OF THE STRUCTURES CAN BE INTERPOLATED FROM THE DESIGN PROFILE AT THE LOCATION AND STATIONING OF EACH INDIVIDUAL STRUCTURE.
15. AS THE TAIL OF THE RIFFLE APPROACHES THE PROPOSED CROSS VANES, THE CONTRACTOR SHALL CONSTRUCT THE INNER BERM FEATURE SUCH THAT IT GRADUALLY REDUCES AND FANS OUT/TAPERS INTO THE BACKSIDE OF THE VANE ARM AND DOES NOT IMPEDE OR BLOCK THE FLOW OF WATER THROUGH THE THROAT OF THE CROSS VANE.



PROFILE VIEW



CROSS-SECTION VIEW



PLAN VIEW

CONSTRUCTED RIFFLE WITH LOGS NOTES:

1. AFTER ROCK AND GRAVEL SOURCES HAVE BEEN EITHER BROUGHT TO THE SITE OR FOUND IN THE EXISTING STREAM, A TYPICAL CONSTRUCTION SEQUENCE IS AS FOLLOWS:
   a. BANK CLEARING, SURVEY STAKING AT THE HEEL, CREST (ELEVATION) AND TOE.
   PLACING A ROW OF LARGE ROCK ACROSS A TRENCH AT THE RIFFLE CREST (LARGE ROCKS TO PROTRUDE NO MORE THAN 6 IN. AND GAPS SPACING EQUAL TO 0.5 FT).
   PLACING A SECOND BACK UP ROW OF SLIGHTLY SMALLER ROCKS DOWNSTREAM.
   IN-FILLING RIFFLE VOLUME WITH A RANGE OF ROCK SIZES AND IN-FILLING THE SPACES BETWEEN ROCKS WITH COBBLES AND GRAVELS SO THERE ARE NO VOIDS IN THE RIFFLE STRUCTURE, FINISHING THE UPPER SURFACE OF THE DOWNSTREAM FACE WITH LARGER EMERGENT ROCKS TO CREATE 4 OR 5 FLOW PATHS THROUGH THE RIFFLE (OFTEN ROUNDED ROCKS).
   b. BOULDERS SHALL BE PLACED IN RANDOM PATTERNS THAT REPLICATE NATURAL STREAM CONDITIONS AS DIRECTED BY THE PROJECT ENGINEER.
   c. A GRADED MIX OF SMALLER DIAMETER COBBLES AND GRAVELS WILL FORM THE MATRIX OF THE RIFFLE (SEE GRADATION ON THIS SHEET).
   d. LOGS (18" MIN DIAMETER) ARE TO BE PLACED AT 20-30 DEGREE ANGLE WITH THE CHANNEL AND SLOPED FROM THE BED SURFACE AT 1%-2%. THE LOGS SHALL BE KEYED INTO THE BANK MINIMUM OF 4 FT. LOGS SHALL EXTEND INTO THE CHANNEL 10 FT. FROM THE EDGE OF THE BENCH. LOGS SHALL BE ANCHORED WITH BOULDERS. "POCKET POOL" AREAS SHALL BE CREATED ON THE DOWNSTREAM SIDE OF THE LOG.
   e. REINFORCED BED MATERIAL SHALL BE PLACED ALONG THE ENTIRE RESTORED CHANNEL UPSTREAM AND DOWNSTREAM OF THE LOG VANES, WITH THE GEOTEXTILE FABRIC BETWEEN THE STREAMBED MATERIAL AND ANCHOR ROCKS AND LOG VANES.

- HEADER BOULDERS SHALL BE 3FT.
- RIVER BOULDERS PLACED ON RIFFLE SURFACE SHALL BE 375MM.

EXAMPLE RIFFLE SECTION

SHOWN FOR INFORMATION ONLY

CONSTRUCTED RIFFLE WITH LOGS DETAIL

N.T.S.

EXAMPLE CONSTRUCTED RIFFLE

STRAWBERRY RUN CONCEPT DESIGN

NOT FOR CONSTRUCTION

NO.	DD	MON	YYYY	ISSUE / REVISION DESCRIPTION	ENG.	APPR.

CLIENT: CITY OF ALEXANDRIA, 301 KING STREET, ALEXANDRIA, VA 22314

ENGINEER: Wood Environment & Infrastructure Solutions, 4795 Meadow Wood Lane, Suite 310 East, Chantilly, VA 20151-1678, Tel. (703) 488-3700, www.woodplc.com

DRAWN BY: CAL
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

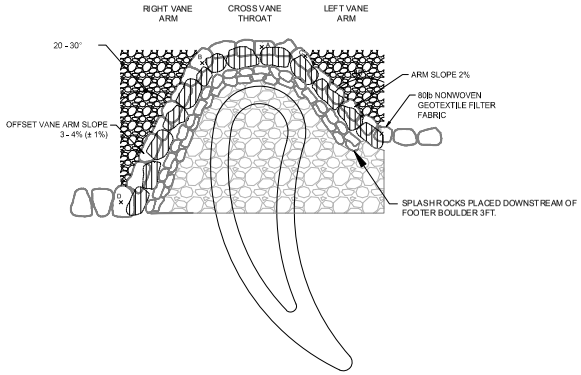
SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, CONSTRUCTED RIFFLE DETAIL

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 06 OF 12

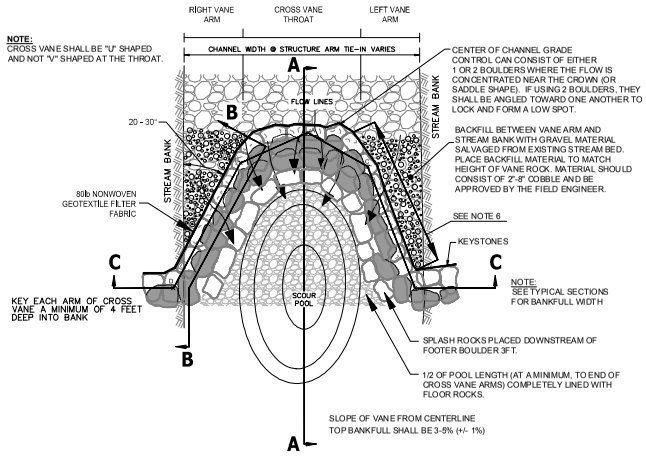
PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:CONSTRUCTED RIFFLE DETAIL February 04, 2019 10:41:44am \\DHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:ROCK CROSS VANE DETAILS February 04, 2019 10:41:50am \\GHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG

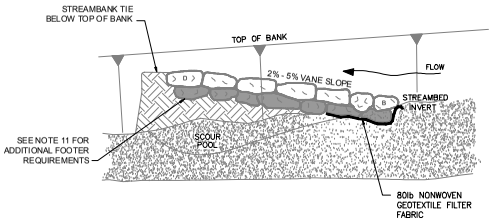
CROSS VANE - PLAN VIEW



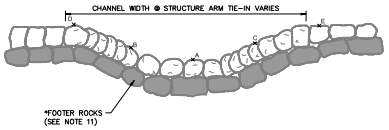
PLAN VIEW
OFFSET CROSS VANE



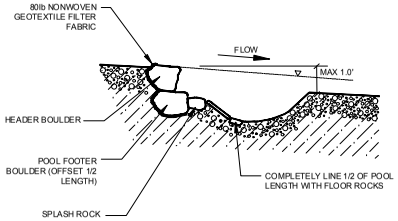
PLAN VIEW



SECTION B-B
PROFILE OF VANE ARM



SECTION C-C
CROSS SECTION THROUGH CENTER OF CROSS VANE



SECTION A-A
PROFILE THROUGH CENTER OF CROSS VANE

CROSS VANE NOTES

1. ALL STONES ARE TO BE STRUCTURE STONE. STRUCTURE STONE IS DEFINED AS BLOCK LIKE, CUBICAL, OR STRAIGHT EDGED BOULDERS.
2. GAPS BETWEEN BOULDERS SHALL BE MINIMIZED BY FITTING BOULDERS TOGETHER, PLUGGING WITH STRUCTURE STONE CLASS A AND NO.57 OR CHINKING STONE, AS APPROVED BY THE TOWN OF LEESBURG, AND LINING WITH FILTER FABRIC.
3. DIMENSIONS AND SLOPES MAY BE ADJUSTED TO FIT BY THE TOWN OF LEESBURG'S QUALIFIED REPRESENTATIVE.
4. CONTRACTOR WILL BE REQUIRED TO FIT BOULDERS TIGHTLY.
5. FOOTER BOULDERS AND VANE BOULDERS SHALL BE NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE.
6. THE SLOPE OF THE VANE ARM FROM CENTERLINE ELEVATION TO THE TIE-IN AT THE BANK SHALL BE 2-5%.
7. THERE SHALL BE NO DROP GREATER THAN 1.0 FOOT. VERTICAL TOLERANCE SHALL BE 0.1' FOR CROSS VANE STRUCTURES.
8. THE ELEVATION OF EACH GRADE CONTROL STRUCTURE SHOULD BE EQUAL TO OR GREATER THAN THE ELEVATION OF THE TOP OF THE FOOTER BOULDER DIRECTLY UPSTREAM.
9. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDER TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF STRUCTURE.
10. ⅔ THE POOL LENGTH OR POOL LENGTH TO THE END OF THE CROSS VANE ARMS (WHICHEVER IS GREATER) IS TO BE LINED WITH FLOOR ROCKS. SPLASH ROCKS SHALL EXTEND A MINIMUM LENGTH OF 3 FEET DOWNSTREAM OF THE FOOTER BOULDERS AND BE PLACED TO PROVIDE A ROUGH SURFACE SUCH THAT ROCK EDGES PROTRUDE 0.3 TO 0.5 FT ABOVE THE BED SURFACE.
11. IF BEDROCK IS PRESENT DIRECTLY BELOW SURFACE BOULDER, FOOTING MAY NOT BE NECESSARY. HOWEVER, BASED ON THE DEPTH TO BEDROCK, ADDITIONAL FOOTER BOULDERS MAY BE REQUIRED IN ORDER TO SEAT FOOTERS ON BEDROCK. CHIP BEDROCK 0.5' FOR PLACEMENT AND SEAT FOOTER BOULDERS IN BEDROCK AT THE DIRECTION OF THE FIELD ENGINEER. IF BEDROCK IS NOT ENCOUNTERED, ADDITIONAL FOOTER BOULDERS MAY BE REQUIRED. IN THIS CASE THE ADDITIONAL TIER OF FOOTER BOULDERS SHALL EXTEND BELOW THE MAX SCOUR DEPTH (CHANNEL INVERT).
12. AS THE TAIL OF RIFFLE APPROACHES THE PROPOSED CROSS VANES, THE CONTRACTOR SHALL CONSTRUCT THE INNER BERM FEATURE SUCH THAT IT GRADUALLY REDUCES AND FANS OUT/TAPERS INTO THE BACKSIDE OF THE VANE ARM AND DOES NOT IMPEDE OR BLOCK THE FLOW OF WATER THROUGH THE THROAT OF THE CROSS VANE.

EXAMPLE ROCK CROSS VANE
(SHOWN FOR INFORMATION ONLY)

EXAMPLE OFFSET ROCK CROSS VANE
(SHOWN FOR INFORMATION ONLY)

STRAWBERRY RUN CONCEPT DESIGN

NOT FOR CONSTRUCTION

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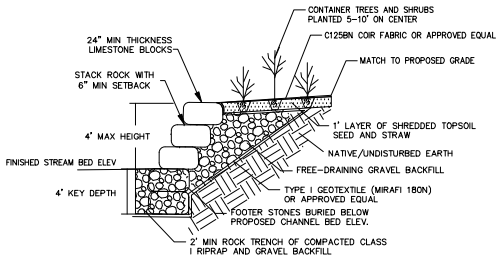
APPROVED BY: MTB
SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, ROCK CROSS VANE DETAILS

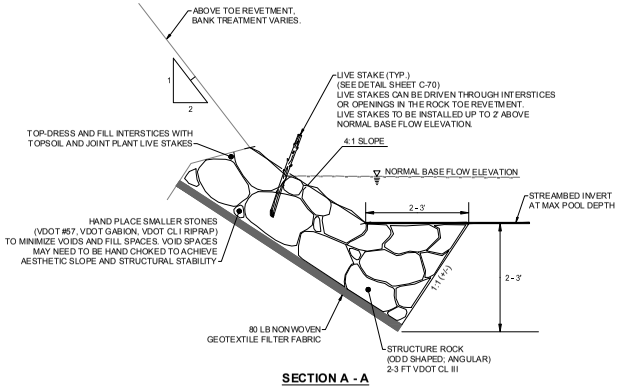
PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 07 OF 12



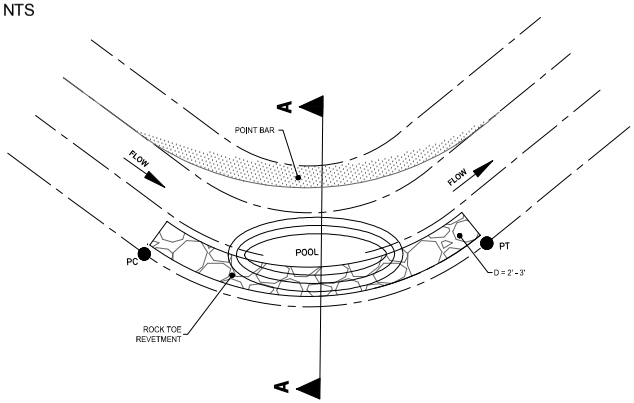
IMBRICATED ROCK WALL
N.T.S.

ROCK TOE REVETMENT - PLAN VIEW

NTS



SECTION A - A



EXAMPLE IMBRICATED ROCK WALL
(SHOWN FOR INFORMATION ONLY)

EXAMPLE ROCK TOE REVETMENT
(SHOWN FOR INFORMATION ONLY)

ROCK TOE REVETMENT NOTES:

1. ALL STRUCTURE ROCK TOE SHALL BE 2-3 FT DIAMETER BOULDER (LARGE ANGULAR ODD SHAPED) OR APPROVED BY THE ENGINEER BEFORE INSTALLATION.
2. ROCK TOE SHALL BE PLACED SUCH THAT MATERIALS LOCK TOGETHER.
3. SELECT BACKFILL AND SOIL BACKFILL MATERIAL SHALL BE COMPACTED SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
4. ASSUMED ROCK DENSITY = 165 LB/FT3.
5. IF BEDROCK IS ENCOUNTERED, SEAT FOOTER REVETMENT IN BEDROCK AT DIRECTION OF THE FIELD ENGINEER.
6. ROCK TOE REVETMENT TO BEGIN AT CROSS VANE ARM AND END AT PT (HEAD OF RIFFLE)
7. CONTRACTOR TO DIG 1" PILOT HOLES FOR PLACEMENT OF LIVE STAKES IN ROCK TOE REVETMENT.
8. CONTRACTOR TO INSTALL ROCK TOE REVETMENT TO A DEPTH 2-3' BELOW MAXIMUM POOL DEPTH INVERT THE ENTIRE LENGTH OF THE ROCK TOE REVETMENT.

INSTALLATION GUIDELINES:

1. EXCAVATE A TRENCH ALONG THE TOE OF THE STREAMBANK TO 2-3 FT BELOW THE STREAMBED INVERT.
2. PLACE FILTER CLOTH ALONG THE BACKSIDE OF THE TRENCH. PLACE FILTER FABRIC LOOSELY AND EVENLY ON THE PREPARED SLOPE AND SECURED WITH STAKES ON 2 FOOT CENTERS. ADJACENT STRIPS SHOULD OVERLAP 12 INCHES AND BE STAPLED ON 12 INCH CENTERS. THE UPSTREAM OR UPSLOPE FILTER FABRIC SHOULD ALWAYS BE PLACED OVER THE DOWNSTREAM OR DOWNSLOPE FILTER FABRIC. IF THE FILTER FABRIC IS TORN OR DAMAGED, IT SHOULD BE REPAIRED OR REPLACED.
3. PLACE STRUCTURE ROCK STARTING IN THE BOTTOM OF THE TRENCH WORKING UP THE BANK. ROCK MAY HAVE TO BE HAND PLACED IN VOIDS TO ACHIEVE THE DESIRED RESULTS OF LOCKING THE REVETMENT.

STRAWBERRY RUN CONCEPT DESIGN

NOT FOR CONSTRUCTION

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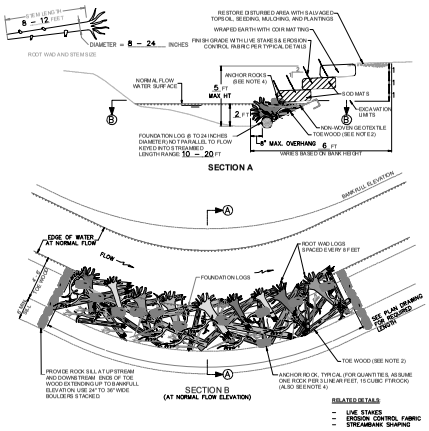
SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, STACKED ROCK WALL AND ROCK TOE

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 08 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:STACKED ROCK WALL AND ROCK TOE February 04, 2019 10:41:53am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG



TYPICAL TOE WOOD WITH BANK SHAPING IN BEND

NOT TO SCALE

NOTES:

1. PLACE THE TOP OF TOE WOOD AT OR WITHIN ONE FOOT OF THE ESTABLISHED NORMAL FLOW ELEVATION.
2. TOE WOOD CONSISTS OF A MIX OF "DEAD WOOD" LOGS, BRANCHES, SHRUBS, AND OTHER WOODY VEGETATION INSTALLED AT VARIOUS ANGLES, BUT NOT PARALLEL TO THE FLOW, LAYER THE WOOD WITH LARGER MATERIAL ON BOTTOM AND FORM A MAT OF BRANCHES ON TOP LAYER. ANGLE ROOT WADS SLIGHTLY UPSTREAM INTO FLOW.
3. FILL BETWEEN ROOT WAD LOGS WITH MIX OF WOODY DEBRIS PER NOTE 2.
4. PROVIDE ANCHOR ROCKS TO WEIGHT DOWN LARGER SIZE LOGS. USE A MINIMUM ROCK SIZE OF 2.0 FT MEDIAN DIAMETER.

TYPICAL USES:

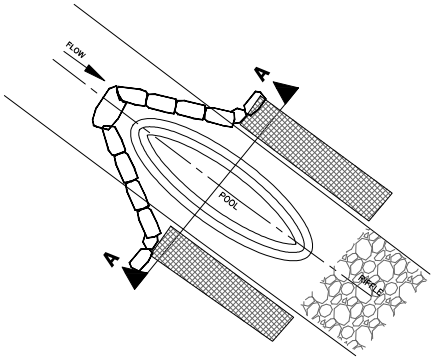
- PROVIDES EXCELLENT AQUATIC HABITAT BY INTRODUCING ORGANIC MATTER AND COVER TO THE RIPARIAN ENVIRONMENT.
- REDUCES NEAR BANK SHEAR STRESS, WHICH STOPS OR SLOWS BANK EROSION, REDUCES SEDIMENT LOAD AND SAVES SOIL.
- REINFORCES STREAMBANK USING VEGETATION THAT STRENGTHENS THE BANK OVER TIME.

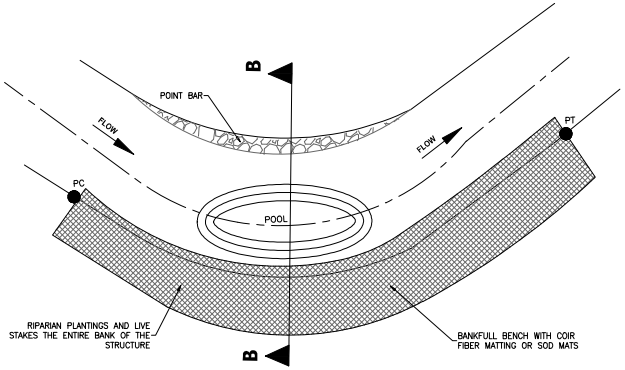
EXAMPLE TOE WOOD

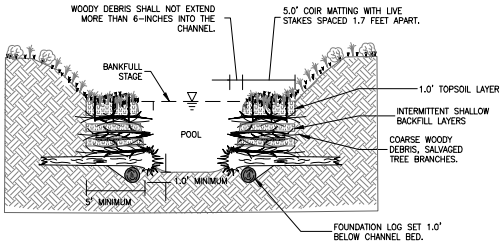
EXAMPLE ROCK WALL WITH TOE WOOD

TOE WOOD - PLAN VIEW

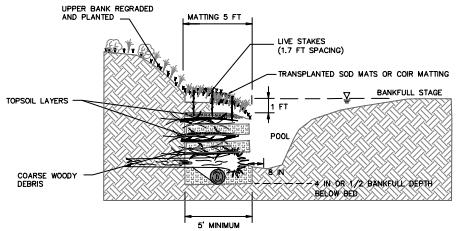
NTS







SECTION A-A



SECTION B-B

TOE WOOD STRUCTURE NOTES:

1. SALVAGE TREE TOPS AND BRANCHES FROM FALLEN ON-SITE TREES FOR RE-USE AS COARSE WOODY DEBRIS.
2. MIX LAYERS OF TOPSOIL ON TOP OF COARSE WOODY DEBRIS.
3. FOR THE BOTTOM LAYER, INSTALL LIVE STAKES ON TOP OF COARSE WOODY DEBRIS AND COVER WITH A LAYER OF TOPSOIL. THIS SHALL BE AT A DEPTH OF 4 INCHES OR 1/2 BANKFULL, BELOW THE BOTTOM OF THE BED.
4. WOODY DEBRIS SHALL NOT EXTEND INTO THE CHANNEL MORE THAN 8 INCHES.
5. ON STRAIGHT POOL SECTIONS, TOE WOOD SHALL EXTEND FROM END OF VANE ARMS TO HEAD OF RIFFLE.

STRAWBERRY RUN CONCEPT DESIGN

NOT FOR CONSTRUCTION

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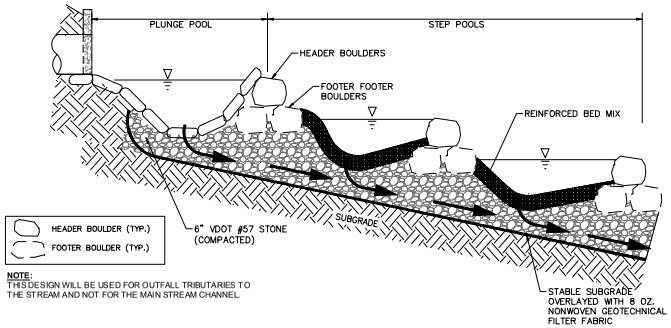
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, TOE WOOD DETAILS

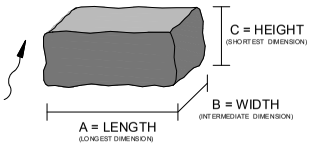
PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 09 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:TOE WOOD DETAILS February 04, 2019 10:41:55am \\CITY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG



NOTE:
THIS DESIGN WILL BE USED FOR OUTFALL TRIBUTARIES TO THE STREAM AND NOT FOR THE MAIN STREAM CHANNEL.

UNDERDRAIN FOR STEP-POOL SYSTEM
N.T.S.



NOTE:
MINIMUM A AND B DIMENSIONS FOR ALL BOULDERS SHALL BE 1.5 FT. BACKFILL COMPACTED TO 90% MAXIMUM STANDARD PER STANDARD PROCTOR AASHTO T-99 OR ASTMD 698 SHALL BE PLACED AS CHANNEL BACKFILL IN 8" LOOSE LIFTS. BEFORE PLACEMENT OF BACKFILL, CHANNEL SHALL BE EXCAVATED TO A STABLE SUBGRADE (APPROVED BY CITY OF ALEXANDRIA ON-SITE ENGINEER). FOOTER BOULDERS MUST HAVE ATLEAST ONE CONTACT POINT WITH HEADER BOULDERS, AND MAY BE MORE ROUNDED THAN HEADER. FOR VANE ARMS, MULTIPLE FOOTERS MAY BE REQUIRED FOR HEADER STONE DEPENDING UPON HEADER BOULDER SIZE AND DEPTH TO STABLE SUBGRADE.

STRUCTURE DIMENSIONS

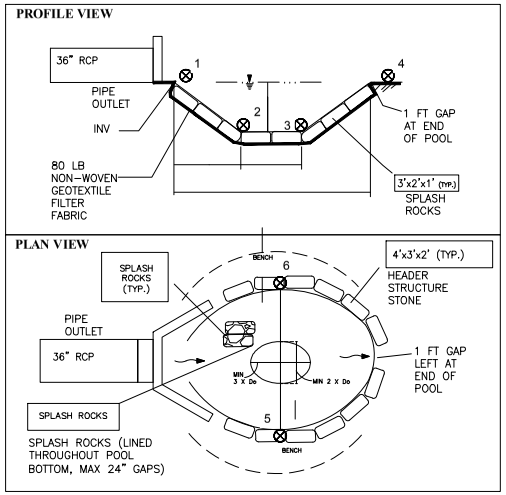
STRUCTURE SIZE TABLE		A	B	C
STRUCTURES	HEADER BOULDER/ VANE ARMS	4'	3'	2'
	FOOTER BOULDER	4'	3'	2'
	SPLASH ROCKS	3'	2'	1'
CHANNEL BED MATERIAL SPECS				
REINFORCED BED MIX	SPLASH BOULDERS (TYP. 3' X 2' X 1') VOID SPACES AND 2.5 FT DEPTH FILLED WITH MIX OF #57 (2 PARTS), GABION STONE (1 PART), AND COA CLASS IV RIPRAP (1 PART). EXISTING ON-SITE RIPRAP HARVESTED FROM EXISTING CHANNEL MAY BE USED TO SUPPLEMENT THE BED MIX.			
SELECT BACKFILL	COMPACTED TO 90% PER MAXIMUM STANDARD PROCTOR DENSITY AASHTO T-99 OR ASTMD 698			

CONSTRUCTED STEP POOL SYSTEMS
(SHOWN FOR INFORMATION ONLY)

PLUNGE POOL (FIRST POOL BELOW PIPE OUTFALL)

NTS

CONSTRUCTED PLUNGE POOL
(SHOWN FOR INFORMATION ONLY)



PLUNGE POOL TYPICAL DETAIL
N.T.S.

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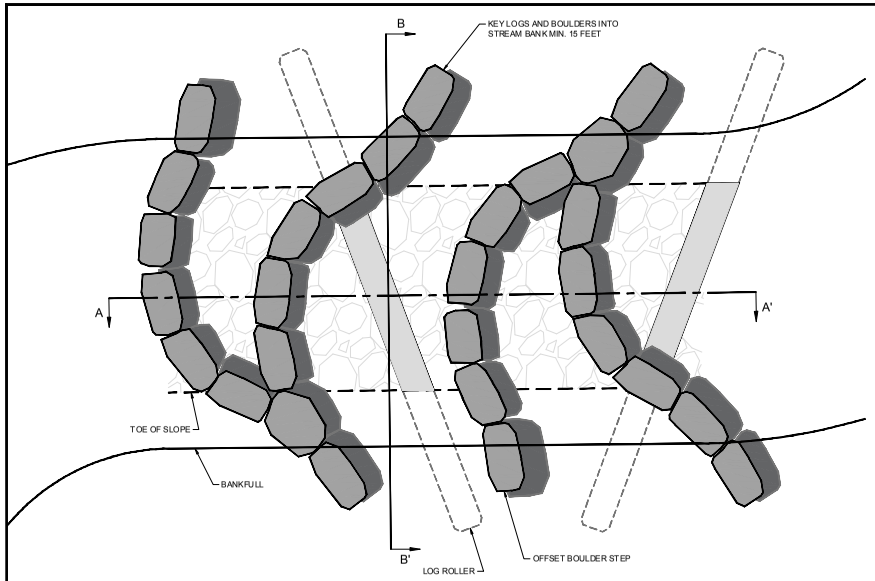
SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, PLUNGE & STEP POOL DETAILS

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 10 OF 12

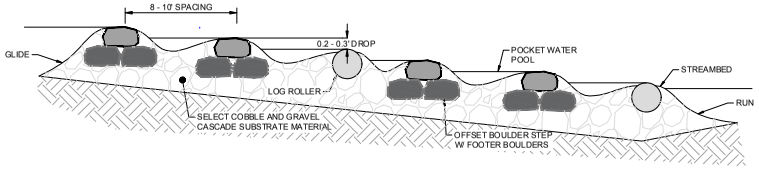
PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:PLUNGE & STEP POOL DETAILS February 04, 2019 10:41:57am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG



CASCADE WITH BOULDER STEPS AND LOGS — NOT TO SCALE

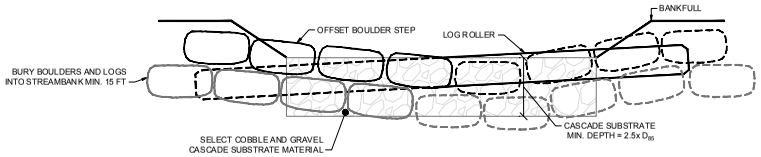
PLAN VIEW

CONSTRUCTED CASCADE
(SHOWN FOR INFORMATION ONLY)



CASCADE WITH BOULDER STEPS AND LOGS — NOT TO SCALE

PROFILE A-A' VIEW



CASCADE WITH BOULDER STEPS AND LOGS — NOT TO SCALE

CROSS-SECTION B-B' VIEW

CASCADE WITH BOULDER STEPS AND LOGS

NOTES

1. THE CASCADE STRUCTURE WITH OFFSET BOULDER STEPS AND LOG ROLLERS IS A STREAM AND RIVER RESTORATION DESIGN FEATURE THAT INCORPORATES COARSE SUBSTRATE MATERIAL, BOULDERS AND LARGE WOOD (LOGS) IN THE CHANNEL BOTTOM THAT WILL NOT BE MOBILIZED UNDER DEFINED FLOW CONDITIONS. REPLACING (OR ADDING TO) THE NATIVE CHANNEL BED MATERIAL WITH LARGER DIAMETER ROCK AND LARGE WOOD CREATES A RIFFLE THAT FUNCTIONS AS A RIGID GRADE CONTROL AND HABITAT FEATURE. LARGER ROCK MATERIAL AND WOOD ENHANCES FLOW DIVERSITY AND TURBULENCE UNDER BASE FLOW CONDITIONS, WHICH PROMOTES AQUATIC HABITAT, NUTRIENT PROCESSING, AND RE-AERATION OF STREAM FLOW BENEFITING WATER QUALITY. THE D50, D85, D90, OR D100 PARTICLES OF THE CONSTRUCTED CASCADE SHOULD BE DESIGNED TO RESIST IBKF WHILE ALLOWING SMALLER SUBSTRATE PARTICLES TO BE MOBILIZED AND REPLACED BY UPSTREAM SEDIMENT SUPPLY. THIS STRUCTURE MAY BE USED AS RIFFLE WITH STEEPER SLOPES AS GRADE CONTROL.
2. ALL SELECT CASCADE MATERIAL SHALL BE QUARRIED STONE UNLESS NATIVE MATERIAL OF SIMILAR SIZE IS AVAILABLE ONSITE AND MEETS THE CONSTRUCTED CASCADE SIZE SPECIFICATIONS. THE ENGINEER MUST APPROVE THE USE OF ALL ONSITE NATIVE MATERIAL.
3. THE GRAVEL AND COBBLE SUBSTRATE USED FOR THIS DESIGN FEATURE SHOULD BE PREFERENTIALLY HARVESTED FROM THE EXISITING CHANNEL AND OTHER DESIGNATED MINING AREAS ONSITE.
4. SORTING AND SIEVING OF THE HARVESTED RIFFLE SUBSTRATE IS INCIDENTAL TO THE CONSTRUCTION OF THIS STRUCTURE.
5. LOGS SHALL HAVE MINIMUM DIAMETER OF 2.0 FEET. LOGS SHALL HAVE A MINIMUM LENGTH OF R_W.
6. ALL LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS AND BRANCHES SHALL BE TRIMMED FLUSH.
7. FOR INSTALLATION, THE CONTRACTOR SHALL OVER EXCAVATE THE LENGTH OF THE CASCADE, INSTALL 700 GRAM COIR FIBER EROSION CONTROL MATTING, KEY MATTING INTO THE CASCADE TRENCH AND BACKFILL WITH THE SPECIFIED SELECT CASCADE SUBSTRATE MATERIAL TO THE ELEVATIONS SHOWN ON THE PROPOSED PROFILE.
8. CONSTRUCTED CASCADE MATERIAL SHALL EXTEND A MINIMUM OF 15 FEET UPSTREAM OF THE P.T. INTO THE GLIDE AND DOWNSTREAM TO THE P.C.
9. P.T. AND P.C. STATIONS AND ELEVATIONS ARE INCLUDED IN THE PROPOSED PLAN AND PROFILE SHEETS. SET RIFFLE INVERTS AT ELEVATION SHOWN ON THE PLAN AND PROFILE SHEETS. NO ELEVATIONS OF THE CONSTRUCTED RIFFLE WITH LOG ROLLERS MAY VARY FROM THE PLAN SHEETS WITHOUT DIRECTION FROM THE ENGINEER.
10. THE VERTICAL SLOPE OF EACH LOG AND BOULDER ARM SHALL NOT EXCEED 2% UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE SLOPES WILL BE DICTATED BY THE WIDTH TO DEPTH RATIO OF THE REACH, TYPICAL RIFFLE INNER BERM CHANNEL, AND THE VERTICAL DROP OVER THE LOG AND LOG DIAMETER.
11. SELECT CASCADE MATERIAL SHALL BE USED AS BACKFILL MATERIAL AROUND THE STRUCTURE.
12. SECURE ALL GEOTEXTILE FABRIC ON TOP OF FOOTER LOGS USING 3 INCH 10D GALVANIZED COMMON NAIL ON 12 INCH SPACING ALONG LOG. NAIL NON-WOVEN GEOTEXTILE TO EDGE OF HEADER LOG AND BACKFILL.
13. SELECT RIFFLE MATERIAL DEPTH SHALL BE AT LEAST 2.5 TIMES THE D85.
14. SELECT RIFFLE MATERIAL WILL BE PLACED AT A UNIFORM THICKNESS.
15. THE SELECT CASCADE MATERIAL WILL BE PLACED SUCH THAT, IN CROSS-SECTION, ITS LOWEST ELEVATION OCCURS IN THE CENTER OF THE CHANNEL AS PER THE DETAIL.
16. SELECT CASCADE MATERIAL SHALL BE COMPACTED USING TRACKED EQUIPMENT OR AN EXCAVATOR BUCKET SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
17. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.
18. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.

STRAWBERRY RUN CONCEPT DESIGN

NOT FOR CONSTRUCTION

NO.	DD	MON	YYYY	ISSUE / REVISION DESCRIPTION	ENG.	APPR.

CLIENT: CITY OF ALEXANDRIA, 301 KING STREET, ALEXANDRIA, VA 22314

ENGINEER: Wood Environment & Infrastructure Solutions, 4795 Meadow Wood Lane, Suite 310 East, Chantilly, VA 20151-1678, Tel. (703) 488-3700, www.woodplc.com

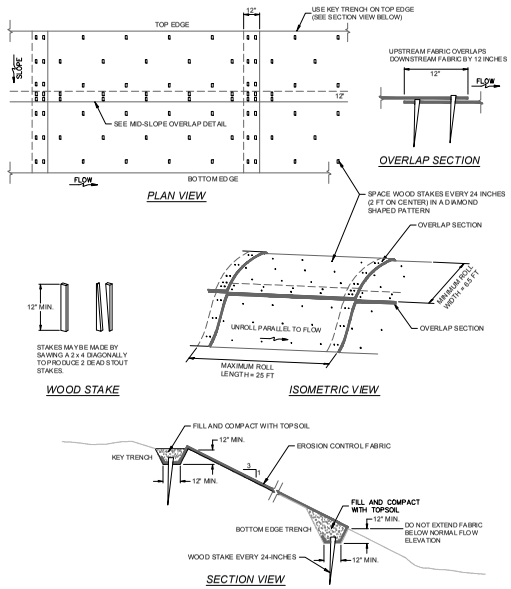
DRAWN BY: CAL
CHECKED BY: MJH
APPROVED BY: MTB
SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: STREAM RESTORATION DETAILS, CASCADE DETAILS

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 11 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:CASCADE DETAILS February 04, 2019 10:41:58am \\GHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG



EROSION CONTROL FABRIC DETAIL

NOT TO SCALE

INSTALLATION NOTES:

1. PREPARE SOIL BEFORE INSTALLING MAT, INCLUDING APPLICATION OF SEED.
2. BEGIN AT UPSTREAM END OF CHANNEL BY ANCHORING MAT IN 12" DEEP x 12" WIDE TRENCH. BACKFILL AND COMPACT SOIL IN TRENCH AFTER INSTALLING WOOD STAKES.
3. ROLL MATS IN DIRECTION OF WATER FLOW.
4. PLACE MATS END OVER END (SINGLE STYLE WITH UPSTREAM END ON TOP) WITH A 12" OVERLAP. USE 2 STAKES TO SECURE MAT AT OVERLAP POINTS (AS SHOWN ON OVERLAP SECTION) SPACED AT 24".
5. MATS ON SIDE SLOPES MUST OVERLAP CENTER BLANKET 12".
6. FULL LENGTH EDGE OF MATS AT TOP OF SIDE SLOPES MUST BE ANCHORED IN 12" DEEP x 12" WIDE TRENCH. BACKFILL AND COMPACT SOIL IN TRENCH AFTER INSTALLING WOOD STAKES.
7. THE TERMINAL END OF MATS MUST BE ANCHORED IN 12" DEEP x 12" WIDE TRENCH. BACKFILL AND COMPACT SOIL IN TRENCH AFTER INSTALLING WOOD STAKES.
8. SECURE MAT THROUGHOUT WITH WOOD STAKES USING PATTERN SHOWN. INSTALLED MAT SHALL BE TAUT, LAYING FLUSH WITH SOIL SURFACE, IN CORRECT ALIGNMENT AND LOCATION, AND PROPERLY ANCHORED TO PREVENT DISPLACEMENT.

100% BIODEGRADABLE EROSION CONTROL BLANKET FOR RE-VEGETATION MADE OF COIR YARN. COIR YARN IS A COARSE FIBER EXTRACTED FROM THE FIBROUS OUTER SHELL OF A COCONUT. THESE FIBERS ARE RELATIVELY WATERPROOF AND ARE ONE OF THE FEW NATURAL FIBERS RESISTANT TO DAMAGE BY SALT WATER. COMPLETELY BIODEGRADABLE MATTING IS AN IDEAL METHOD TO STOP EROSION DAMAGE AND TO KEEP SOIL IN PLACE UNTIL PLANT MATERIAL HAS TAKEN HOLD. EXCELLENT COVERAGE ON ALL TERRAINS, EVEN SLOPES. THE NATURAL LOOKING , HIGH STRENGTH COIR YARN MESH PROTECTS THE SOIL SURFACE FROM WATER AND WIND EROSION WHILE OFFERING PARTIAL SHADE AND HEAT STORAGE TO ACCELERATE VEGETATIVE DEVELOPMENT ALLOWING UNINHIBITED GROWTH OF WOOD PLANT SPECIES, GRASS AND GROUND COVER.

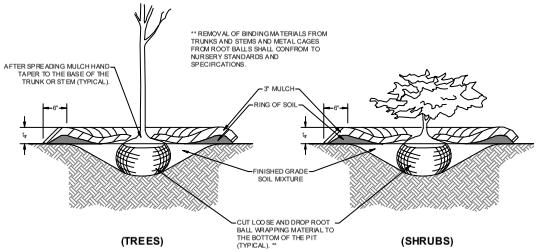
NOTES:

1. COIR MATS TO BE USED IN ALL AREAS WITHIN LIMITS OF DISTURBANCE WHERE NEW VEGETATION IS TO BE ESTABLISHED (NOT TO BE USED IN CHANNEL BEDS OR WETLAND BOTTOMS).
2. USE COIR BLANKET WITH TIGHT WEAVE AND WEIGHT OF 700 GRAMS PER SQUARE METER SUCH AS COIRMAT 700 (BY ROLANKA INTERNATIONAL, INC.) OR APPROVED EQUAL.

COIR BIO-EROSION CONTROL FABRIC INFORMATION

(OR APPROVED EQUAL)

"MAT," "BLANKET," AND "FABRIC" ARE USED INTERCHANGEABLY TO REFER TO THIS PRODUCT WITHIN THESE PLANS.



PLANTING NOTES

1. THE PLANT MATERIAL SHALL BE WOODY SHRUB SPECIES RECOMMENDED FOR PLANTING WITHIN ZONE 2 OF THE RIPARIAN AREA AND SHALL INCLUDE A COMBINATION OF BLACK HAW, AMERICAN ELDERBERRY, AND/OR MAPLELEAF VIBURNUM. TREE SPECIES ARE NOT PROVIDED TO BE INSTALLED IN ZONE 2.
2. THE PLANT MATERIAL SHALL BE FROM COMMERCIAL SOURCES. THE PLANT MATERIAL ORDER SHALL BE PLACED WELL IN ADVANCE OF PLANNED WORK DATES TO ENSURE A TIMELY DELIVERY OF MATERIAL. ROOT SYSTEMS, LIMBS, AND BARK SHALL BE KEPT INTACT AND UNDAMAGED. THE PLANT MATERIAL SHALL BE FREE FROM DISEASE OR BLIGHT.
3. SHIPPED PLANT MATERIAL SHALL BE TRANSPORTED IN ENCLOSED OR COVERED TRUCKS, AND SCHEDULED TO ARRIVE ON SITE WITHIN 24 HOURS. THE PLANT MATERIAL SHALL BE PROPERLY PACKAGED AND HANDLED DURING TRANSPORTATION TO PROTECT THEM FROM INJURY. THE SHIPMENT OF PLANTS TO THE PROJECT SITE SHALL REQUIRE A DELIVERY TICKET INDICATING THE SOURCE OF SUPPLY, EXACT QUANTITIES, SIZES, AND SPECIES DELIVERED.
4. THE PLANT MATERIAL SHALL BE INSPECTED UPON DELIVERY BY THE SITE ENGINEER OR OTHER OWNERS REPRESENTATIVE PRIOR TO INSTALLATION. PLANTING STOCK NOT MEETING MATERIAL SPECIFICATIONS WILL NOT BE APPROVED AND SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
5. THE PLANT MATERIAL SHALL HAVE NORMAL, WELL-DEVELOPED BRANCHES AND VIGOROUS ROOT SYSTEMS. PLANTS SHALL BE SOUND, HEALTHY, AND VIGOROUS, WITHOUT DEFECTS, DISFIGURING KNOTS, BARK ABRASIONS, SUN SCALE, DISEASE, INSECT INFESTATIONS, BORERS AND ALL OTHER FORMS OF INFECTIONS.
6. THE INSTALLATION OF THE PLANT MATERIAL SHALL BE ACCOMPLISHED DURING THE DORMANT SEASON, TYPICALLY FROM NOVEMBER TO APRIL. SCHEDULING OF PLANT MATERIAL DELIVERY AND INSTALLATION WORK SHALL BE CONDUCTED IN A PROFESSIONAL AND ORGANIZED MANNER. PLANT MATERIAL ORDERS SHALL BE PLACED WELL IN ADVANCE OF THE PLANNED WORK DATES TO ENSURE A TIMELY DELIVERY OF MATERIAL.
7. THE PLANTING AREA SHALL BE PREPARED VIA CLEARING, GRADING, GRUBBING, SCARIFYING AND/OR OTHER ACCEPTABLE CONSTRUCTION PRACTICE TO ENHANCE SURVIVORSHIP OF THE PLANT MATERIAL TO BE INSTALLED. THE SLOPE OF THE PLANTING AREA SHALL BE PROTECTED FROM EROSION BY MULCHING WITH STRAW MULCH AND/OR COIR WATTLES PLACED AT THE TOP OF THE SLOPE.
8. FIELD ADJUSTMENTS DURING INSTALLATION SHALL BE MADE, IF NECESSARY, TO IMPROVE SURVIVORSHIP OF PLANT MATERIAL.
9. THE PLANT MATERIAL SHALL BE INSTALLED WITH A SHOVEL OR AUGER, RATHER THAN A DIBBLE BAR. THE SOIL SHALL BE BACKFILLED AND HAND-COMPACTED AROUND EACH SAPLING. THE PLANT MATERIAL SHALL NOT BE PLANTED IF THE SOIL IS FROZEN OR DRY. THE SAPLINGS SHALL BE PLANTED IN A VERTICAL POSITION WITH THE ROOT COLLARS APPROXIMATELY ½-INCH BELOW THE SOIL SURFACE. THE PLANTING HOLE SHALL BE DEEP AND WIDE ENOUGH TO PERMIT ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING OR U-ROOTING. AFTER INSTALLATION OF THE PLANT MATERIAL, THE SOIL AROUND EACH PLANT SHALL BE PACKED FIRMLY TO ELIMINATE AIR POCKETS. THE INSTALLED PLANT MATERIAL SHALL BE PERIODICALLY WATERED TO REDUCE DESICCATION.

CONTAINER PLANTS TYPICAL DETAIL

NOT TO SCALE

LIVE STAKE NOTES:

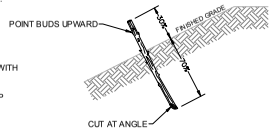
1. SPECIES SELECTION MAY VARY DUE TO AVAILABILITY. IF AVAILABLE, USE NATIVE SPECIES.
2. DO NOT ALLOW STAKES TO DRY OUT.
3. SOAK STAKES BEFORE PLANTING.
4. DRIVE A PILOT HOLE IN FIRM SOIL AT RIGHT ANGLES WITH BUDS ORIENTED UP.
5. BURY 70% OF STAKE LENGTH AS SHOWN IN CLOSE-UP DETAIL.
6. PLANT STAKES ON DIAMOND SPACING.
7. CUT THE BASAL OR BUTT ENDS AT AN ANGLE FOR EASY INSERTION INTO THE SOIL. CUT THE TOP SQUARE OR BLUNT.
8. LIVE STAKES MAY EXTEND DOWN TO NORMAL WATER LEVEL AND MAY EXTEND 2 FT VERTICALLY FROM EDGE OF WATER. USE WATER TOLERANT SPECIES BELOW BANKFULL.
9. RECOMMENDED SPECIES FOR THIS SITE (CHOOSE AT LEAST 3 AS AVAILABLE FROM NURSERY):

   SILKY DOGWOOD, BLACK WILLOW, AND SMOOTH ALDER

   DIAMETER RANGE = 1.0 TO 1.5 INCHES

   LENGTH RANGE = 3 TO 4 FEET

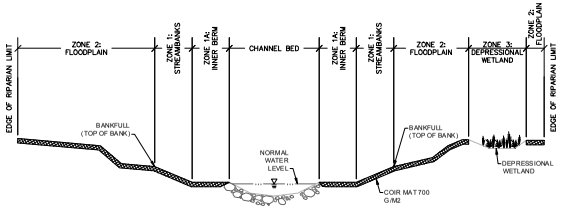
   PLANTING DENSITY, EVERY 2 FT ON DIAMOND SPACING WITHIN WESTERN (UPSTREAM) AND CENTRAL PORTIONS OF REACH.



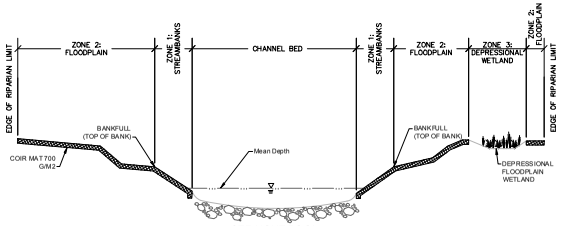
LIVE STAKE CLOSE-UP

TYPICAL LIVE STAKE DETAIL

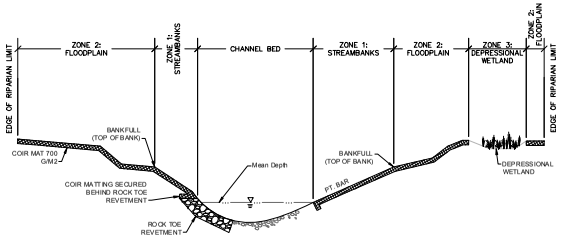
NOT TO SCALE



RIFFLE PLANTING ZONES DETAIL



STRAIGHT POOL PLANTING ZONES DETAIL



POOL IN BEND PLANTING ZONES DETAIL

STRAWBERRY RUN CONCEPT DESIGN

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CLIENT: CITY OF ALEXANDRIA, 301 KING STREET, ALEXANDRIA, VA 22314

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DRAWN BY: CAL
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SCALE: NOT TO SCALE

PROJECT: PHASE III ASSESSMENTS, STRAWBERRY RUN STREAM RESTORATION, 207 FORT WILLIAMS PARKWAY, ALEXANDRIA, VA 22304

SHEET TITLE: STREAM RESTORATION STRUCTURE DETAILS, PLANTING PLAN DETAILS

PROJECT NO.: 7526173001
DATE: 31 JANUARY 2019
DWG. SIZE: ARCH D
SHEET NUMBER: 12 OF 12

PLOTTED BY:HEPP, MICHAEL SHEET SET:Strawberry Run Concept LAYOUT:12 PLANTING PLAN DETAILS February 04, 2019 10:41:59am \\CHY-FS1\CAD_PROJECTS\7526173001_ALEXANDRIA STREAM ASSESS\STRAWBERRY RUN\PLANSHEETS\05-CONCEPT DETAILS.DWG