

Diamond Hills Stream Restoration

Town of Christiansburg, Virginia



CONCEPT PLAN NARRATIVE

- Project Description:** The project team is proposing stream restoration activities on approximately 2,180 linear feet of an unnamed tributary of Crab Creek resulting in 2,233 linear feet of restored stream. The tributary is located within Diamond Hills, a residential subdivision, and it receives stormwater runoff from this subdivision, commercial properties, and town properties located within the contributing watershed totaling approximately 514 acres. The project site can be accessed from Independence Blvd. off of North Franklin St. (Rt. 460) in Christiansburg, Virginia.

The restoration activities are being proposed to alleviate the various impacts that are associated with the stream including but not limited to degraded aquatic habitat, flooding, channel incision, bank erosion, sedimentation, fixed grade controls such as utility crossings and culverts, and inadequate buffering. Upper Crab Creek is listed as an impaired water according to the 2008 Water Quality 305(b)/303(d) Integrated Report for not supporting aquatic life and recreation. The listed impairments consist of *Escherichia coli* (*E. coli*) and Benthic Macroinvertebrate. It is the intention and expected outcome that restoration activities will also improve water quality and aquatic habitat thereby helping to alleviate the impairment to the larger Crab Creek.

The restoration activities not only address an immediate need for the improved function of the restored tributary and Crab Creek but also will act as a mitigation site for the Wythe IDA in Wythe County, Virginia. The development project is located within the same Hydrologic Unit Code (05050001) as the restoration project, which means that both sites ultimately contribute runoff to the same section of the New River.
- Existing Conditions:** The 514 acre drainage area is highly urbanized with residential, commercial, and industrial land uses. The land surrounding the unnamed tributary of Crab Creek and adjacent to Crab Creek is predominately open grassland with sparse trees consisting primarily of Black Willow, Box Elder, Catalpa, and Black Cherry along the stream banks. The stream is highly unstable evidenced by channel incision up to six feet, vertical bank walls, active bank erosion, deleterious debris, and sedimentation among other impacts. Instream habitat is degraded or non-existent due to sediment loading, channel instability (i.e. bank failure, high velocity flows, rapidly changing channel pattern or profile, etc.), and lack of woody debris. There are multiple sanitary sewer crossings downstream of Independence Blvd. and a stormwater management facility including a vegetated dam and culverts. The stream receives runoff from overland flow and both vegetated and rip rap outlets.
- Conceptual Restoration Description:** All restoration activities proposed are based on Natural Channel Design Principles.
 - Channel Alteration:** The profile, pattern, and cross-section of reaches 1 & 2 shall be altered to address stability issues. A riffle/pool sequence shall be utilized based on present conditions and current design research and practices. Rock Cross Vanes and other step/pool practices shall be utilized where applicable. The new cross-section and bed elevation adjustments will re-connect the stream to its historic floodplain. The bed shall be reinforced with a minimum of 1' depth to prevent incision and control grade throughout the stream. Habitat structures shall be installed where appropriate and reduced sediment loading, proper substrate, and reduced volume and velocities from storm events will increase ecological diversity within the stream. The section of Crab Creek that is located adjacent to the property, Reach 3, can be restored or enhanced with buffer plantings and bank slope modifications in the future. The existing stream approximately 150' below Independence Blvd. shall be abandoned and filled with compacted soil and stone.
 - Best Management Practices (BMPs):** The following BMPs are expected to be installed but do not represent a comprehensive list of practices: Rock Cross Vanes, Live Stakes, Step Pools, J-Hook Vanes, Rootwad Revetments, Stacked Stones, Live Fascines, Bio-Retention Areas, and Log Vanes.
 - Buffer:** Buffer trees and shrubs shall be planted throughout the property to the maximum width possible. Plantings in or around utility easements shall be coordinated so as to not conflict with utility lines. The buffer shall be densely planted with a diverse planting mix in order to provide a wide range of habitat, woody debris, and ensure a greater probability of success.
 - Habitat Creation:** Habitat structures shall be installed along the banks and within the stream for reaches 1 and 2. These structures shall be specifically chosen to provide the maximum beneficial effect without compromising the stability or function of the stream. Examples of habitat creating structures include Root Wad Revetments and Live Stakes.
 - Outfall Improvements:** Outfalls shall be managed to reduce erosive velocities, settle sediment, and provide pre-treatment. Energy dissipation techniques and bio-retention areas shall be implemented where applicable to reduce the damaging effects of concentrated inflow to the stream.
 - Educational & Recreational Improvements:** A future walking trail can be incorporated into the design and educational signs describing the ecological benefits of the design shall be placed at key points along the stream.
 - Dam & Stormwater Management Facility:** The dam and stormwater culvert shall be removed to allow for a natural channel design to be implemented. The stream shall be routed to intersect Crab Creek at a less severe angle and reduce the damaging effect of large storm events to the railroad embankment. Storage capacity will be maintained through a series of smaller detention/engineered wetland areas to control storm events.
 - Erosion Control:** Erosion control measures shall be implemented during construction in accordance with The Virginia Stream Restoration & Stabilization Best Management Practices Guide and the Virginia Erosion & Sediment Control Manual Second Edition. The completed design shall reduce the erosive impact of storm events and add to the overall stability of the stream.



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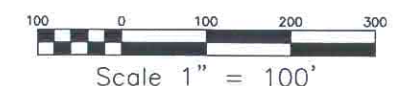
Balzer and Associates, Inc.
15871 City View Drive
Suite 200
Midlothian, VA 23113
804-794-0571
FAX 804-794-2635

Diamond Hills
Stream Restoration
Concept Plan
Christiansburg, Virginia

DRAWN BY WKM
DESIGNED BY WKM
CHECKED BY BW
DATE 08-23-2010
SCALE AS NOTED

REVISIONS:
9-13-2010
9-28-2010

SHEET NO.
1 of 2
JOB NO. B1000031.00



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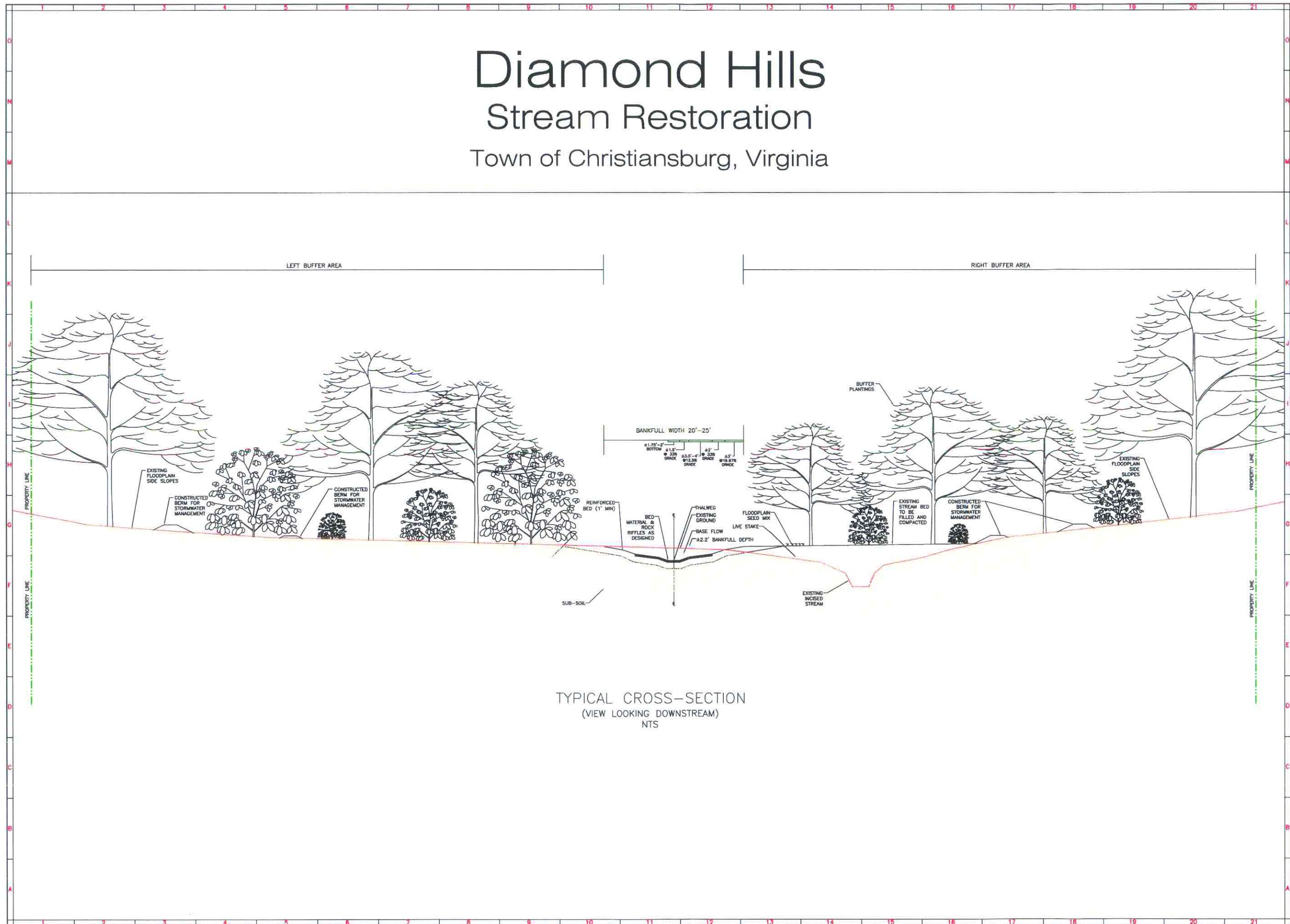


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TYPICAL CROSS-SECTION
 (VIEW LOOKING DOWNSTREAM)
 NTS

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 Concept Plan Cross-Section
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