

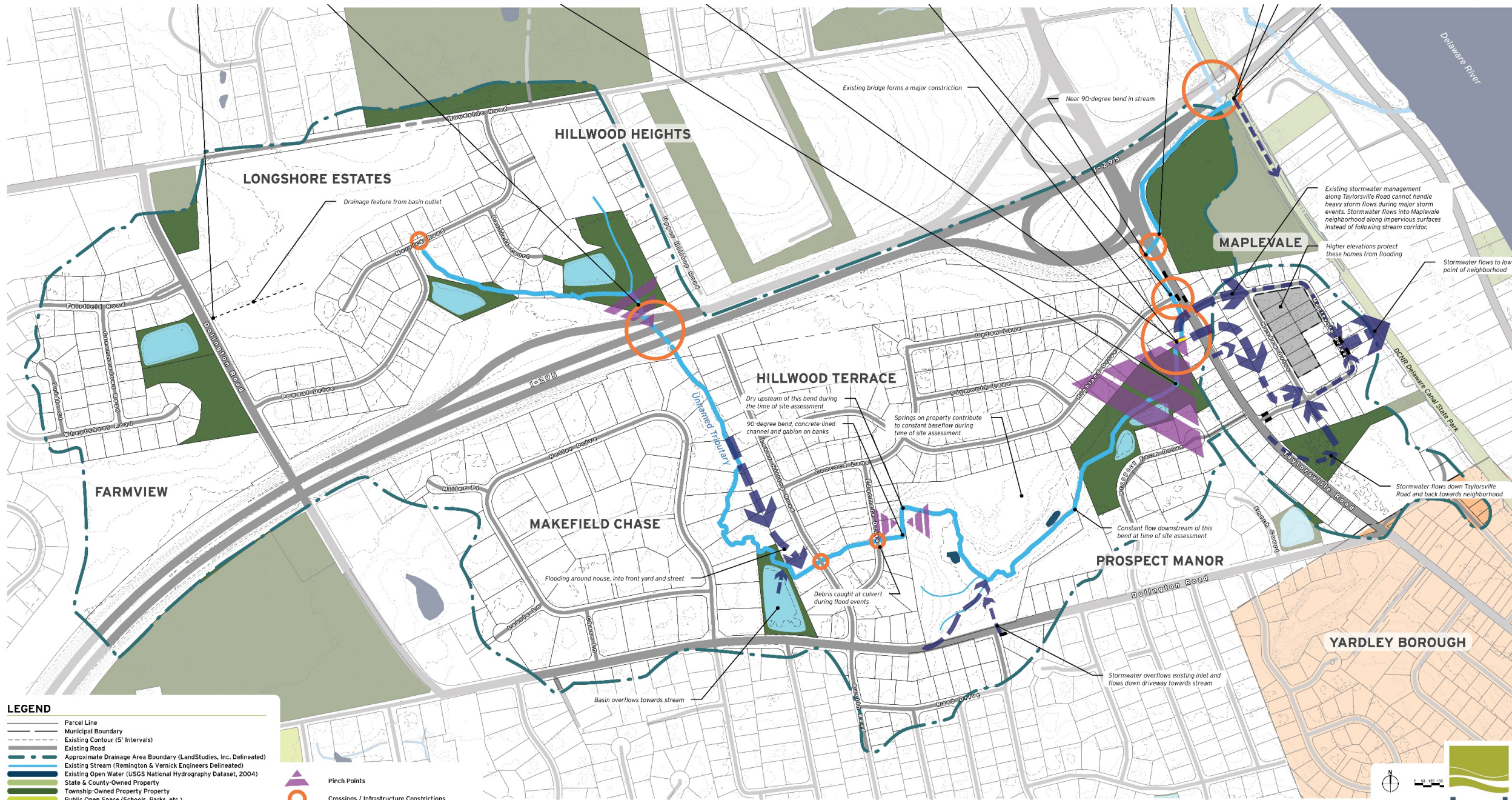
Flood Mitigation Assessment

FINDINGS & RECOMMENDATIONS

Lower Makefield Township
December 20, 2023

Presented by Ward Oberholtzer

Existing Conditions



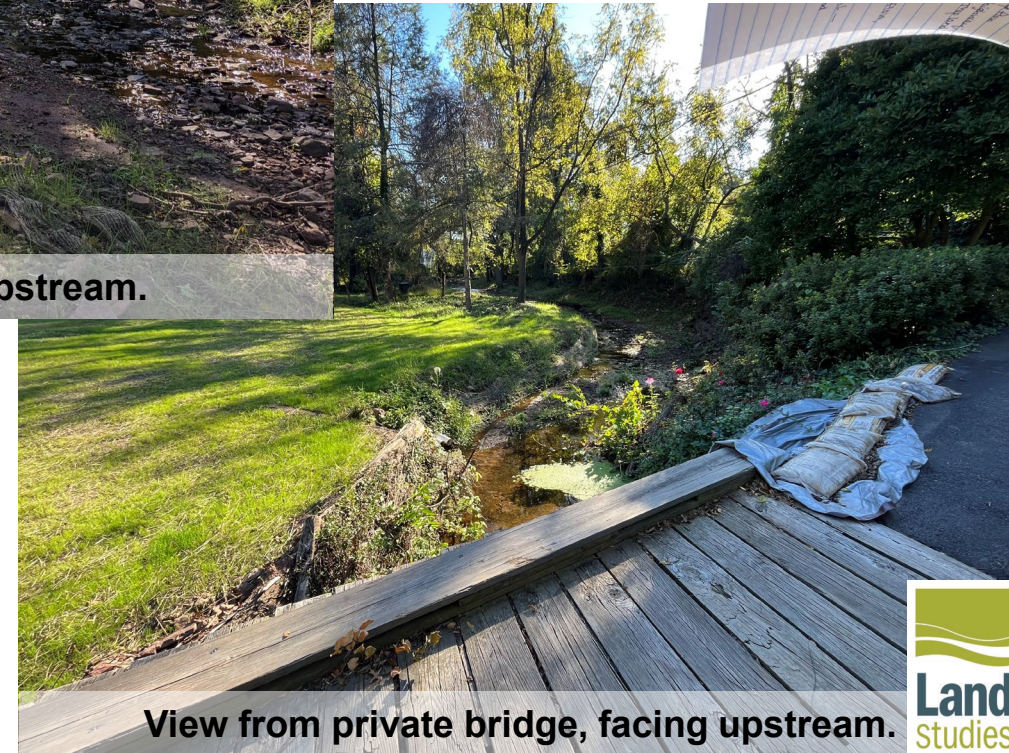
- LEGEND**
- Parcel Line
 - Municipal Boundary
 - Existing Contour (5' Intervals)
 - Existing Road
 - Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
 - Existing Stream (Remington & Verrick Engineers Delineated)
 - Existing Open Water (USGS National Hydrography Dataset, 2004)
 - State & County-Owned Property
 - Township-Owned Property
 - Public Open Space (Schools, Parks, etc.)
 - Stormwater Management Basin
 - Existing Street Inlet
 - Pinch Points
 - Crossings / Infrastructure Constrictions
 - Direction of Flow

Existing Conditions – Pinch Point & Constriction



LEGEND

	Parcel Line		Pinch Points
	Municipal Boundary		Crossings / Infrastructure Constrictions
	Existing Contour (5' Intervals)		Direction of Flow
	Existing Road		
	Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)		
	Existing Stream (Remington & Vernick Engineers Delineated)		
	Existing Open Water (USGS National Hydrography Dataset, 2004)		
	State & County-Owned Property		
	Township-Owned Property		
	Public Open Space (Schools, Parks, etc.)		
	Stormwater Management Basin		
	Existing Street Inlet		



Existing Conditions – Crossing & Infrastructure Constriction



LEGEND

	Parcel Line		Pinch Points
	Municipal Boundary		Crossings / Infrastructure Constrictions
	Existing Contour (5' Intervals)		Direction of Flow
	Existing Road		
	Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)		
	Existing Stream (Remington & Vernick Engineers Delineated)		
	Existing Open Water (USGS National Hydrography Dataset, 2004)		
	State & County-Owned Property		
	Township-Owned Property		
	Public Open Space (Schools, Parks, etc.)		
	Stormwater Management Basin		
	Existing Street Inlet		








Highland Drive culvert, looking downstream.

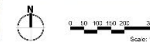
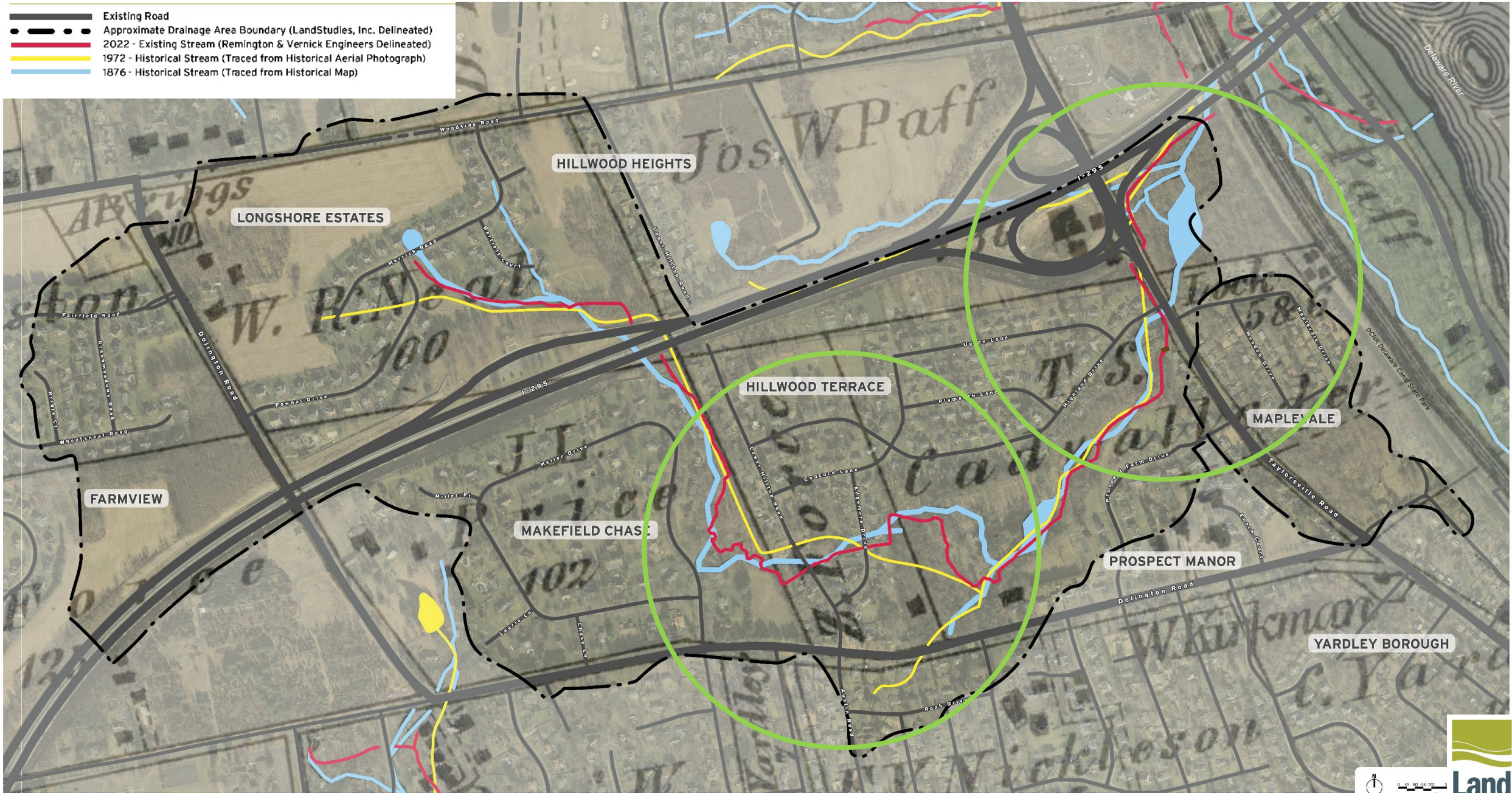


Taylorville Road crossing, facing upstream

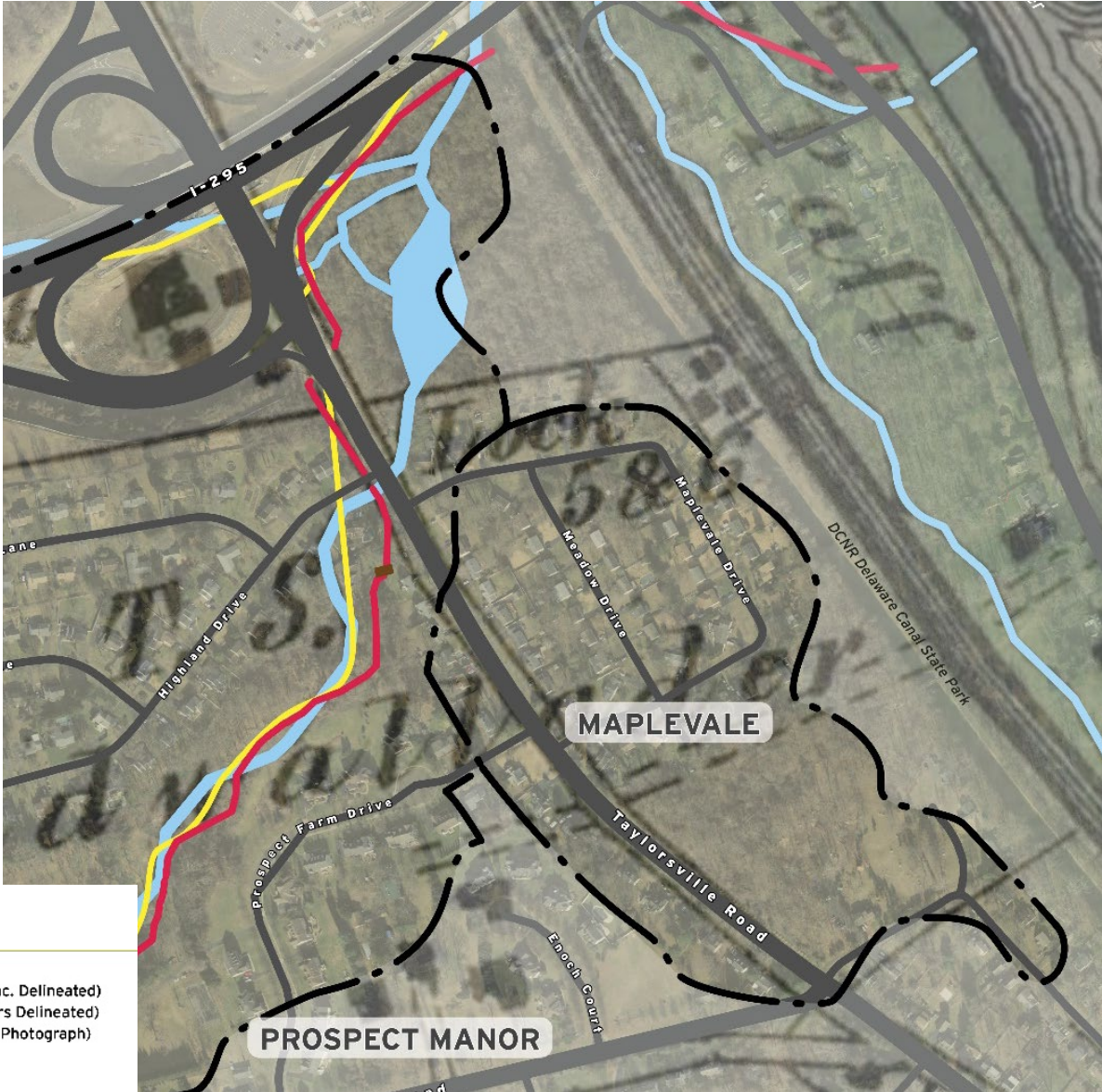
Historical Impacts

LEGEND

-  Existing Road
-  Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
-  2022 - Existing Stream (Remington & Vernick Engineers Delineated)
-  1972 - Historical Stream (Traced from Historical Aerial Photograph)
-  1876 - Historical Stream (Traced from Historical Map)



Historical Impacts – Taylorsville Road Drainage



- LEGEND**
- Existing Road
 - Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
 - 2022 - Existing Stream (Remington & Vernick Engineers Delineated)
 - 1972 - Historical Stream (Traced from Historical Aerial Photograph)
 - 1876 - Historical Stream (Traced from Historical Map)

Recommendations

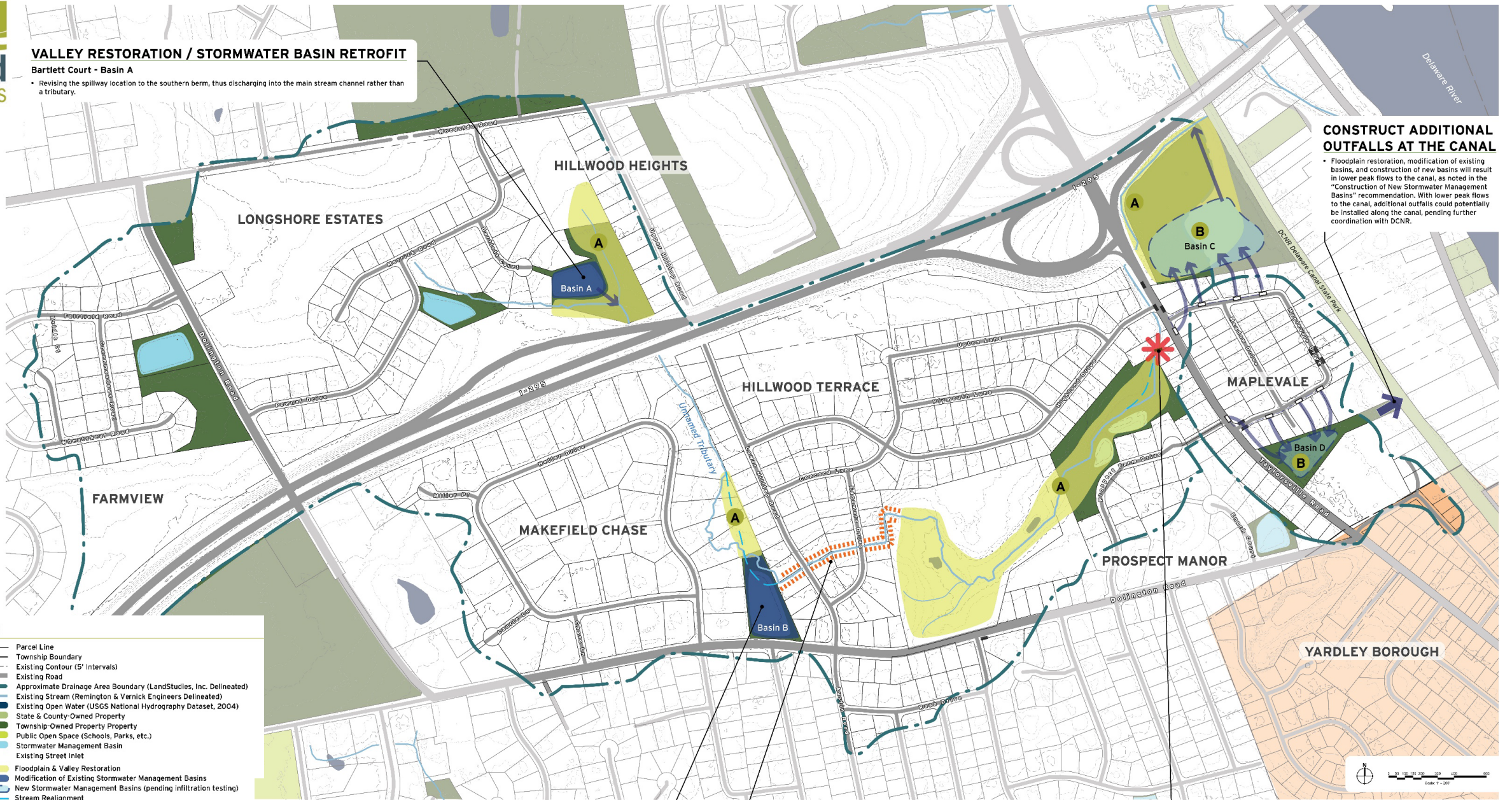
VALLEY RESTORATION / STORMWATER BASIN RETROFIT

Bartlett Court - Basin A

- Revising the spillway location to the southern berm, thus discharging into the main stream channel rather than a tributary.

CONSTRUCT ADDITIONAL OUTFALLS AT THE CANAL

- Floodplain restoration, modification of existing basins, and construction of new basins will result in lower peak flows to the canal, as noted in the "Construction of New Stormwater Management Basins" recommendation. With lower peak flows to the canal, additional outfalls could potentially be installed along the canal, pending further coordination with DCNR.



LEGEND

- Parcel Line
- Township Boundary
- Existing Contour (5' Intervals)
- Existing Road
- Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
- Existing Stream (Remington & Vernick Engineers Delineated)
- Existing Open Water (USGS National Hydrography Dataset, 2004)
- State & County-Owned Property
- Township-Owned Property
- Public Open Space (Schools, Parks, etc.)
- Stormwater Management Basin
- Existing Street Inlet
- Floodplain & Valley Restoration
- Modification of Existing Stormwater Management Basins
- New Stormwater Management Basins (pending infiltration testing)
- Stream Realignment
- Channel & Bank Armoring
- New Street Inlet
- Direction of Flow
- Additional Outfall Into Canal
- New Culvert Crossing

MODIFICATION OF EXISTING STORMWATER BASIN

Lower Hilltop Road/Dolington Road - Basin B

- Revising the existing stormwater basin and stream alignment such that the stream flows through the basin, rather than around, will eliminate the 90-degree bend at Lower Hilltop Road and reduce localized flooding in the area.

STRATEGIC CHANNEL STABILIZATION - 2D HYDROMODEL

Channel & Bank Armoring

- Blockage-causing trees and other vegetation are prevalent in these locations. However, long-term removal via floodplain reconnection is infeasible due to bedrock and existing structures. Instead, conventional bank armoring such as concrete or riprap will deter vegetation while also stabilizing the reach.

NEW CULVERT CROSSING - 2D HYDROMODEL

New Stream & Private Bridge Alignment at Taylorsville Road

- The existing private bridge and stream alignment upstream of the Highland Drive crossing are constricting conveyance of the reach, particularly when blockages occur. Realigning the stream and constructing a new culvert crossing will improve conveyance and reduce the likelihood of the stream spilling out of the banks in this area.


























LONGSHORE ESTATES

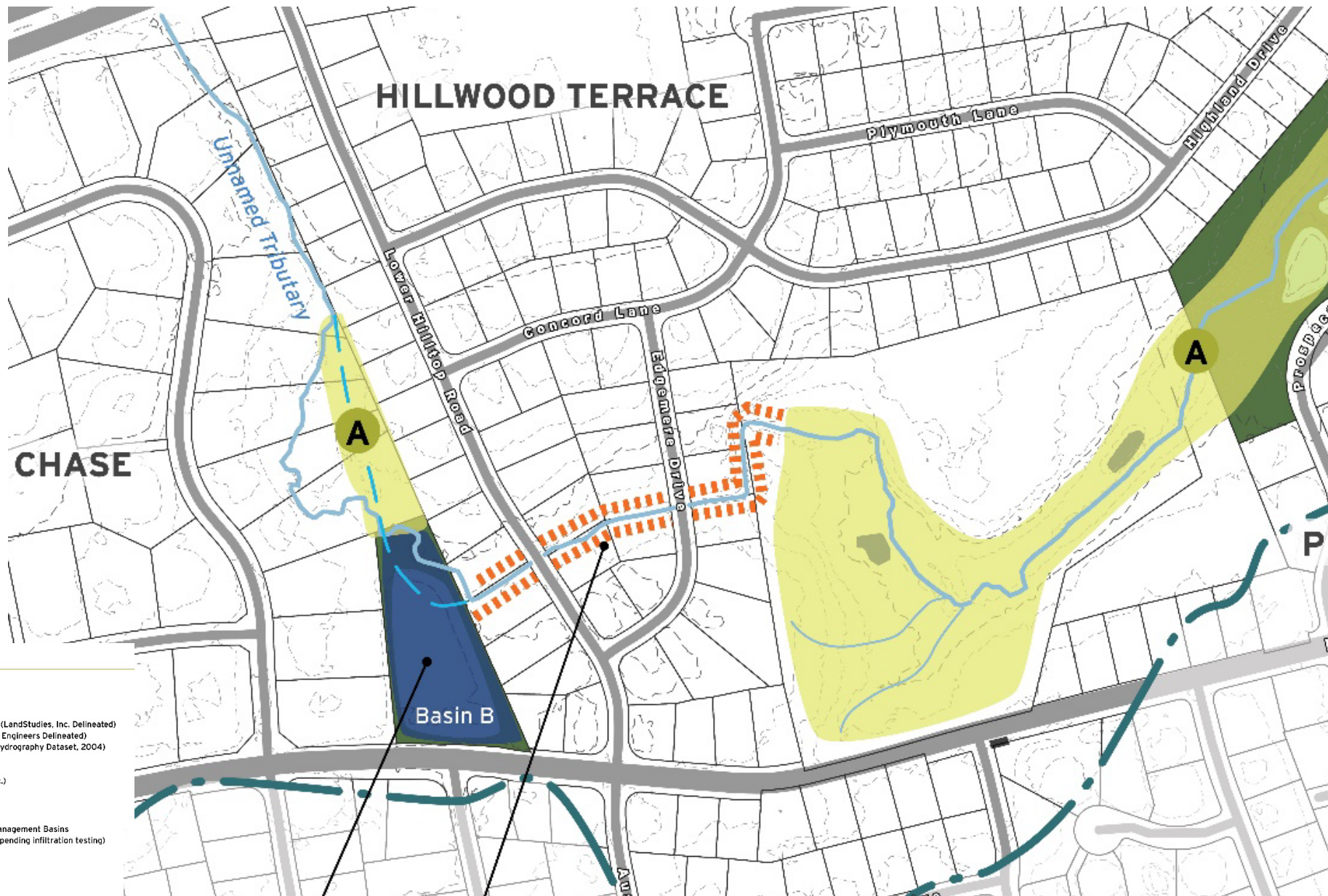
HILLWOOD HEIGHTS

A

Basin A

LEGEND

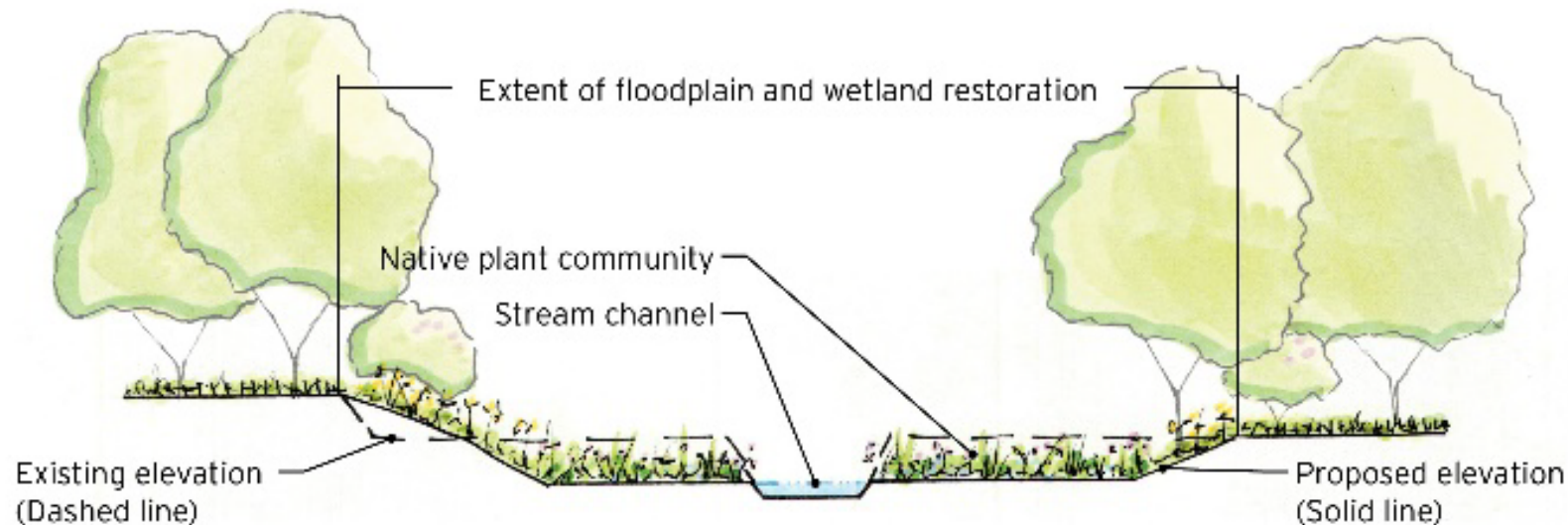
-  Parcel Line
-  Township Boundary
-  Existing Contour (5' Intervals)
-  Existing Road
-  Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
-  Existing Stream (Remington & Vernick Engineers Delineated)
-  Existing Open Water (USGS National Hydrography Dataset, 2004)
-  State & County-Owned Property
-  Township-Owned Property
-  Public Open Space (Schools, Parks, etc.)
-  Stormwater Management Basin
-  Existing Street Inlet
-  Floodplain & Valley Restoration
-  Modification of Existing Stormwater Management Basins
-  New Stormwater Management Basins (pending infiltration testing)
-  Stream Realignment
-  Channel & Bank Armoring
-  New Street Inlet
-  Direction of Flow
-  Additional Outfall Into Canal
-  New Culvert Crossing



- LEGEND**
- Parcel Line
 - Township Boundary
 - Existing Contour (5' Intervals)
 - Existing Road
 - Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
 - Existing Stream (Remington & Vernick Engineers Delineated)
 - Existing Open Water (USGS National Hydrography Dataset, 2004)
 - State & County-Owned Property
 - Township-Owned Property
 - Public Open Space (Schools, Parks, etc.)
 - Stormwater Management Basin
 - Existing Street Inlet
 - Floodplain & Valley Restoration
 - Modification of Existing Stormwater Management Basins
 - New Stormwater Management Basins (pending infiltration testing)
 - Stream Realignment
 - Channel & Bank Armoring
 - New Street Inlet
 - Direction of Flow
 - Additional Outfall Into Canal
 - New Culvert Crossing

A FLOODPLAIN & VALLEY RESTORATION

- Widening the existing channel and connecting the floodplain will provide stormwater storage within the reach itself, improving detention in the system. This will result in lower peak flows downstream of the restored areas, similar in effect to a conventional stormwater management basin.
- Trees, shrubs, and woody debris will be replaced by wetland meadow grasses in these areas. This will significantly reduce blockage-causing debris within the channel. Additionally, the reconnected floodplain will provide locations for debris to deposit, rather than in choke points like culverts.
- Floodplain restoration will also result in a significantly more stable reach. This will deter channel and bank erosion, which causes conveyance issues when deposited.



Floodplain & Valley Restoration Example

Pourhouse Run, York PA

BEFORE (2018)



AFTER (2023)

Floodplain & Valley Restoration Example – Culps Run



BEFORE (2020)

Culps Run

- 2,990 feet of Impaired Channel Restored
- 4.5 acres of Wetlands Restored
- 13.6 acres of Meadow Buffer Enhancement

Construction (2022)

Culps Run

- Annual Pollutant Load Reductions
 - 107,712 lbs of sediment
 - 180 lbs of Phosphorous
 - 438 lbs of Nitrogen

AFTER (2023)

Strategic Channel Stabilization



- LEGEND**
- Parcel Line
 - Township Boundary
 - Existing Contour (5' Intervals)
 - Existing Road
 - Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
 - Existing Stream (Remington & Vernick Engineers Delineated)
 - Existing Open Water (USGS National Hydrography Dataset, 2004)
 - State & County-Owned Property
 - Township-Owned Property
 - Public Open Space (Schools, Parks, etc.)
 - Stormwater Management Basin
 - Existing Street Inlet
 - Floodplain & Valley Restoration
 - Modification of Existing Stormwater Management Basins
 - New Stormwater Management Basins (pending infiltration testing)
 - Stream Realignment
 - Channel & Bank Armoring
 - New Street Inlet
 - Direction of Flow
 - Additional Outfall Into Canal
 - New Culvert Crossing



Existing Channel



Example Channel Stabilization



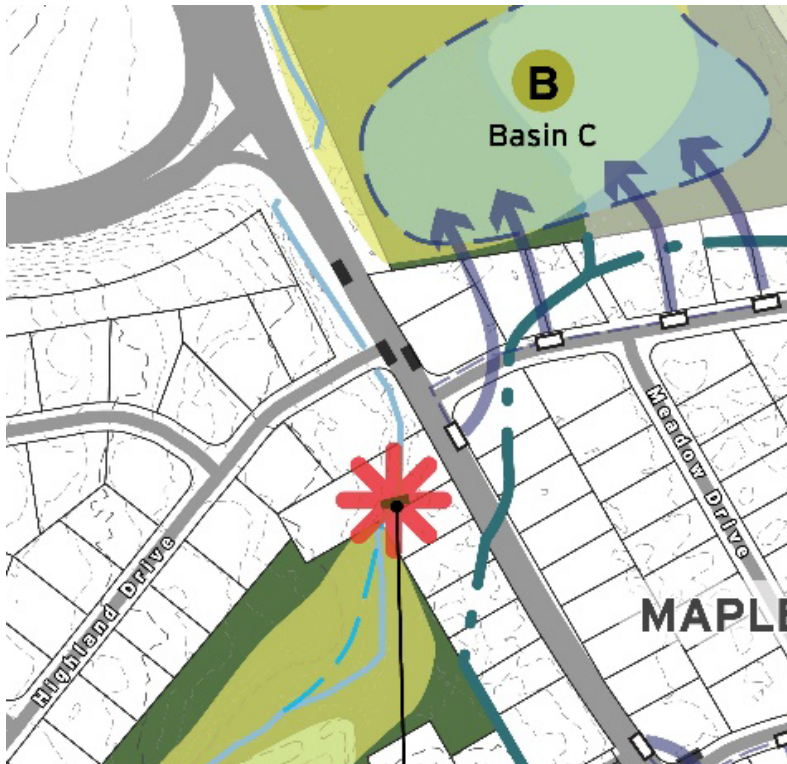
Basin C, facing upstream.



Infiltration Testing at Basin D



New Culvert Crossing



- LEGEND**
- Parcel Line
 - Township Boundary
 - Existing Contour (5' Intervals)
 - Existing Road
 - Approximate Drainage Area Boundary (LandStudies, Inc. Delineated)
 - Existing Stream (Remington & Vernick Engineers Delineated)
 - Existing Open Water (USGS National Hydrography Dataset, 2004)
 - State & County-Owned Property
 - Township-Owned Property
 - Public Open Space (Schools, Parks, etc.)
 - Stormwater Management Basin
 - Existing Street Inlet
 - Floodplain & Valley Restoration
 - Modification of Existing Stormwater Management Basins
 - New Stormwater Management Basins (pending infiltration testing)
 - Stream Realignment
 - Channel & Bank Armoring
 - New Street Inlet
 - Direction of Flow
 - Additional Outfall Into Canal
 - New Culvert Crossing



Existing Private Bridge



Example Crossing



Thank you!

www.landstudies.com