IV. MITIGATION

Although the Compensatory Mitigation for Losses of Aquatic Resources rule issued by the USACE and Environmental Protection Agency (EPA) on April 10, 2008 indicates the mitigation banking and in-lieu fee are the preferred methods of mitigation, based on direction and coordination with USACE and MDE, MDTA intends to pursue the following approaches for Section 200 mitigation:

- On-site, in-kind and within the same watershed
- Off-site, out-of-kind and within the same watershed

MDTA is willing to pursue mitigation banking and in-lieu fee as additional mitigation approaches during the design phase of this project if it is deemed necessary by the USACE in order to satisfy all permit requirements.

In many circumstances, proposed roadway drainage would replace existing roadway drainages that will be affected by the Preferred Alternative. Also, any concrete channels carrying ephemeral systems impacted by the Preferred Alternative will be replaced in-kind with natural channels. For those systems which cannot be replaced in-kind, a mitigation site search was conducted using GIS information, a review of aerial photography, and field reviews. MDTA coordinated with the USACE, EPA, MDE, National Marine Fisheries Service (NMFS), United States Department of Agriculture (USDA), and the Harford County Department of Planning and Zoning (HCDPZ) for existing opportunities and a field reconnaissance and assessment of all identified sites.

A. On-site Mitigation

There are several intermittent and perennial stream systems in the project area that are contained within concrete channels. In an effort to improve the quality of these systems, all concrete channels containing intermittent and perennial streams will be replaced with natural channels as part of the design for the Preferred Alternative. **Table IV-1** identifies all of the perennial and intermittent concrete lined systems that will be replaced with natural channels during design. Also, the ephemeral channels that will be replaced in-kind are listed in the table.

WUS ID	Hydrologic Regime	Length (Linear Feet)	Area (Square Feet)
WUS 23A	Perennial	79.0	419.8
WUS 25B	Perennial	14.5	27.9
WUS 13E	Perennial	401.8	1976.1
WUS 14E	Perennial	916	8696.6
WUS 7F-ff	Perennial	17.7	144.9
WUS 5F-ka	Perennial	22.4	67.2
WUS 5F-bb	Perennial	144.2	5964.4

Table IV-1. Replacement of Perennial and Intermittent Concrete Lined Channels

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	Hydrologic Regime	Length (Linear Feet)	Area (Square Feet)
WUS 24B	Perrenial	238.0	512.2
WUS 4D	Perrenial	397.3	2864.4
Total Perrenial		**2,230.9**	**25,560.9**
WUS 39A-a	Intermittent	236.1	610.4
WUS 17D-a	Intermittent	23.3	107.8
WUS 8E	Intermittent	97.8	525.3
WUS 9E	Intermittent	60.4	250.2
WUS 14E-d	Intermittent	20.1	103.6
Total Intermittent		**437.6**	**1,597.4**
WUS 36A	Ephemeral	46.5	150.6
WUS 13C	Ephemeral	105.2	368.7
WUS 1D	Ephemeral	347.8	2293.3
WUS 2D	Ephemeral	175.6	748.0
WUS 2D-a	Ephemeral	124.0	388.5
WUS 2D-b	Ephemeral	4.3	16.1
WUS 20E-1	Ephemeral	117.2	252.4
WUS 20E-2	Ephemeral	106.5	235.5
WUS 11F	Ephemeral	73.0	239.4
Total Ephemeral		**1,100.1**	**4,692.5**
Total		**3,768.7**	**31,850.7**

indicated in **Table IV-1**, MDTA will be able to mitigate for over 2,660 linear feet of perennial and intermittent stream impacts by implementing natural channels in the design of the Preferred Alternative.

1. Carsins Run

The Carsins Run site is located where I-95 crosses Carsins Run just north of the I-95/MD 22 interchange and is located in the Swann Creek watershed (**Figure IV-1**). This perennial system was channelized under I-95 when this portion of I-95 was initially constructed in the 1960's. The existing stream flows through a concrete channel, where the bottom of the channel has been washed out, portions of the concrete bank have failed and the box culvert blocks fish passage.

Approximately 739 feet of stream is targeted for restoration. The improvements will be accommodated by removing the concrete flume and fish blockage and increasing channel sinuosity. Additional restoration of floodplain and wetlands may be feasible depending on further studies and coordination between highway designers and the preliminary mitigation design team. Wetlands restoration or enhancement at this location is considered an additional potential benefit associated with improved floodplain access. Wetland functions and values within this system will be primarily beneficial for water quality conditions versus wildlife habitat.

The total on-site mitigation available is presented in **Table IV-2**.

2. Gray's Run

The Gray's Run site is located on-site where I-95 crosses Gray's Run under Structure H-X832C, a two (2) cell rectangular concrete box culvert located just north of Stepney Road along I-95, and is located in the Gray's Run watershed (**Figure IV-2**). This perennial system was channelized under I-95 when this portion of I-95 was initially constructed in the 1960's. The existing stream's base flow currently runs through both culvert cells. The downstream end of the culvert is moderately disconnected from the stream channel and maintenance crews occasionally must replace the riprap channel protection at the culvert outlet to prevent the development of a vertical drop from the culvert invert to the stream. The current culvert configuration presents a significant blockage to fish passage.

Approximately 1,043 feet of stream is targeted for restoration. The improvements will be accommodated by removing the fish blockage. The improvements should also improve habitat suitability for resident fish species as well as for migratory fish species, such as blueback herring and alewife. Additional restoration of floodplain and wetlands may be feasible depending on further studies and coordination between highway designers and the preliminary mitigation design team. Wetlands restoration or enhancement at this location is considered an additional potential benefit associated with improved floodplain access. Wetland functions and values within this system will be primarily beneficial for water quality conditions versus wildlife habitat.

As previously described, Gray's Run crosses I-95 within a two cell rectangular concrete box culvert. The conceptual restoration approach to Grays Run is to utilize the river-right culvert cell for baseflow and construct a bankfull bench across the left cell since the stream is over-widened in this area. This could be accomplished by raising the invert of the left culvert cell at both the upstream and downstream ends to the elevation of the bankfull stage while also installing a bankfull bench both upstream and downstream of the culvert. A detailed culvert hydrologic and hydraulic study would need to be performed to ensure that the proposed modification to the culvert cell would not adversely impact the frequency of flooding. The bankfull bench would continue the full length of the restored channel and transition into the existing floodplain where possible. The bench would be planted with live stakes and other shade and wet tolerant vegetation. An inner berm feature could be constructed in the baseflow channel to decrease the width to depth ratio and allow for better fish passage in the stream at the low flow stage. A preformed scour hole at the downstream end of the culvert and a series of step pools further downstream may be necessary to not only protect the channel from degradation but also to reconnect the culvert to the stream in a way that allows fish to migrate upstream with less difficulty. A study of the use of concrete baffles installed within the existing culvert to provide cover / resting areas for fish can be performed if determined to be beneficial to the project.

The final restoration design would attempt to utilize reference reach data to determine flow conditions (velocities and depths) that occur in those reaches during the migratory-fish spawning period (March 1-June 15 for river herring). This flow data will then be applied to designing the low-flow (right) cell of the culvert crossing, to ensure passable flow conditions for the migrating fish during this time of year. The goal is to provide a stable channel-form that is able to transport the available water and sediment delivered from its watershed, while improving habitat for flora and fauna and successful passage for migratory fish.

3. Winter's Run

The existing structure carrying I-95 over Winter's Run restricts flow in this area and cuts off an existing equestrian trail (**Figure IV-3**). The existing structure will be replaced with a wider, longer, and elevated span that will span the entire Winter's Run stream and remove all existing piers out of the stream. Also, the design of the new crossing will include removal of the center island in the stream and the existing concrete slope along Winter's Run Road/Fashion Way to widen the available floodplain and restore the natural flow of the stream. A retaining wall would be used to replace the concrete slope. This would allow for additional floodplain enhancement.

Table IV-2. On-site Stream and Wetland Mitigation Quantities

	Replace Concrete Channels*	**Carsins Run**	**Gray's Run**	**Winter's Run**	**Total**
Stream Mitigation					
Intermittent (l.f. / s.f.)	440 / 1,600	0 / 0	0 / 0	0/0	440 / 1,600
Perennial (l.f. / s.f.)	2,230 / 25,600	739 / 10,773	1,043 / 16,358	1,916/110,333	4,012 / 52,731
Total Streams (l.f. / s.f.)	**2,670 / 27,200**	**739 / 10,773**	**1,043 / 16,358**	1,916/110,333	**6,368 / 164,664**
Floodplain Creation/Enhancement					
Floodplain Creation/Enhancement	**0**	**0**	**0**	4.29	**4.29**

*Includes mitigation proposed for WUS 14E

B. Off-site Mitigation Sites

1. Gonzalez Property

The Gonzalez property is located along MacPhail Road in Harford County in the Bynum Run watershed (**Figure IV-4**). Approximately 2,425 linear feet of Bynum Run flows through the property. Based on USACE, NMFS and MDE field visit and comments, MDTA has determined that the entire portion of Bynum Run has potential for stream restoration, floodplain creation and enhancement, and riparian creation and enhancement. An important aspect of the stream restoration includes removal and replacement of the existing driveway crossing which will allow for unimpeded stream flow underneath the driveway crossing.

The low-head culvert driveway crossing of Bynum Run to access the Gonzalez property has failed. The crossing is preventing continual flow of Bynum Run downstream. The failed crossing

has led to siltation and bank erosion upstream and excessive bank erosion and scouring downstream. The site will also require floodplain creation and enhancement and riparian buffer creation and enhancement due to the damage that has occurred from the failed driveway crossing blocking the stream. Construction of a floodplain can utilize the existing sediment that has accumulated upstream. This sediment source should be composed of material that is greater than 70% sand and gravel for floodplain construction or reconstruction. The fine particles from this source should be deposited in an upland area. Additionally, a partially exposed sanitary-sewer crosses the main stem of Bynum Run, located in the most downstream assessment-reach. A conceptual restoration approach to address this issue is to provide cover over the pipe by raising the stream invert in this location, which can be accomplished by providing a grade control structure that will mitigate evacuation of channel material over the sewer line. If practicable, it will be designed for maintaining unimpeded fish passage as well. This concept also applies to the unnamed-tributary upstream of the ford on this property.

2. Pollard Property

The Pollard property is located immediately off of MD 152, opposite Old Mountain Road on the north side of I-95 in Harford County, Maryland. The property is approximately 13 acres. Half of the property consists of an abandoned sand/gravel surface-mine that formed a large circular depression in the middle of the property. The central portion of the abandoned mine area has a significant wetland system composed of open water and non-tidal wetlands (**Figure IV-5**). The crescent shaped wetland is approximately 1.5 acres, with half of it consisting of open water. Much of the wetland is surrounded by common reed grass (*Phragmites australis)*, which extends toward MD 152. Existing hydrology seems strongly surface driven, but the gleying and mottling of the soil at depth indicates an active water table. This is not surprising considering the highly permeable nature of the surrounding soil and its basin topography. The surrounding land on the property is upland with the exception of two large ponds (one on the east side of the property and the other on the west side). The pond to the west may be a relic farm pond, while the east pond may be a relic from past mining operations (based on viewing the soils map aerial photography, circa 1970).

The center portion of the property could provide approximately 6.5 acres of wetland creation and restoration. Wetland functions and values within this system will be primarily beneficial for wildlife habitat.

The total off-site mitigation available is presented in **Table IV-3.**

Table IV-3. Off-Site Stream and Wetland Mitigation Quantities

	Gonzalez	Pollard	Total
Stream Mitigation			
Intermittent (l.f. / s.f.)	0	0	0
Perennial (l.f. / s.f.)	2,425 / 81,150	0	2,425 / 81,150
Total Streams (l.f. / s.f.)	**2,425 / 81,150**	**0**	**2,425 / 81,150**
Floodplain Creation/Enhancement and Riparian Buffer Enhancement/Creation			
Floodplain	0.67	0	0.67
Riparian Buffer	5.46	0	5.46
Total Floodplain and Riparian Buffer (acres)	**6.13**	**0**	**6.13**
Wetland Mitigation			
POW	**0**	**1**	**1**
PEM	**0**	**3**	**3**
PSS	**0**	**0**	**0**
PFO	**0**	**2.5**	**2.5**
Total Wetlands (acres)	**0**	**6.5**	**6.5**

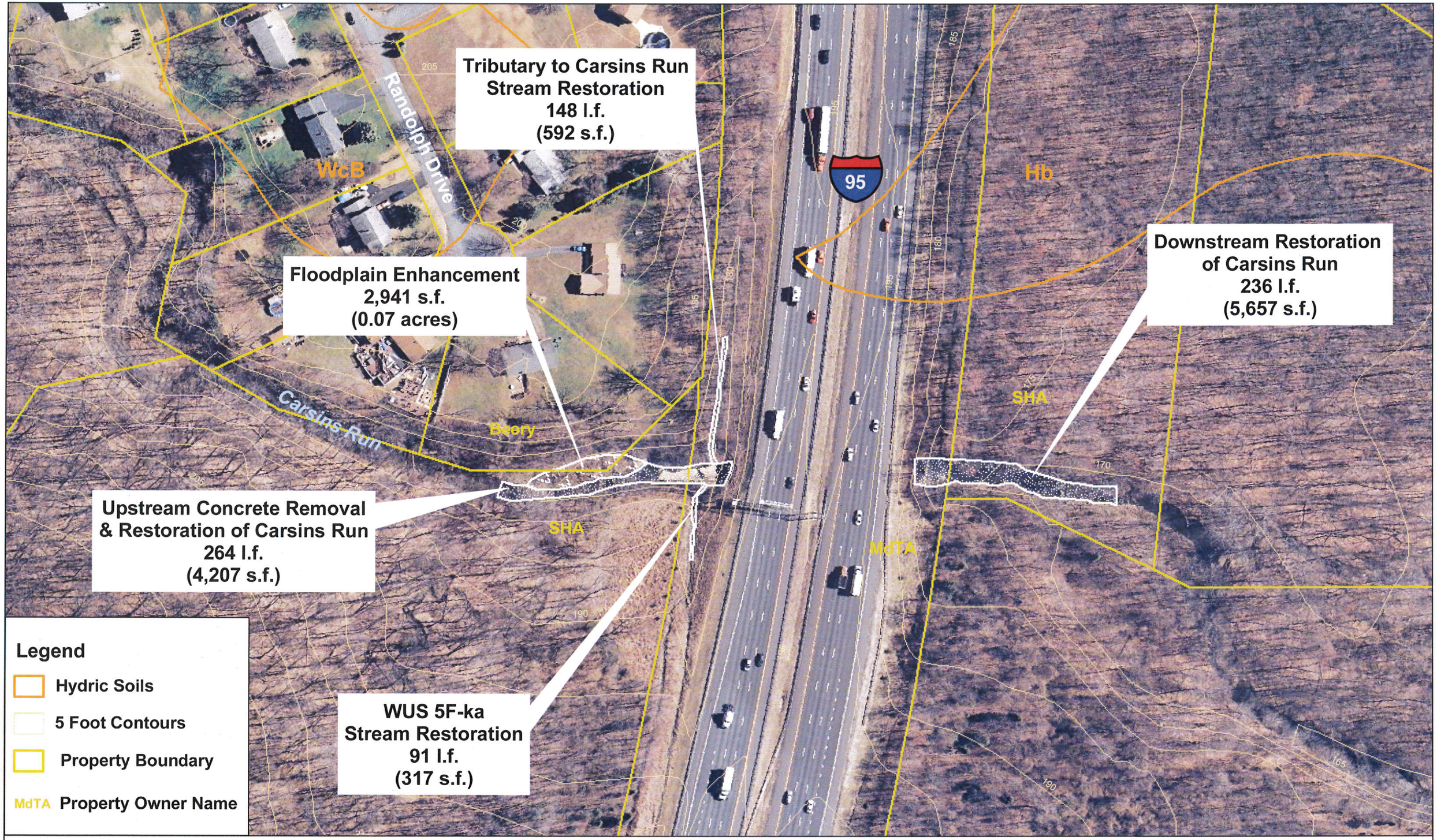

Figure IV-1: Carsins Run Site

Scale
1 inch = 100 feet

Figure IV-2: Gray's Run Site

Scale
1 inch = 200 feet

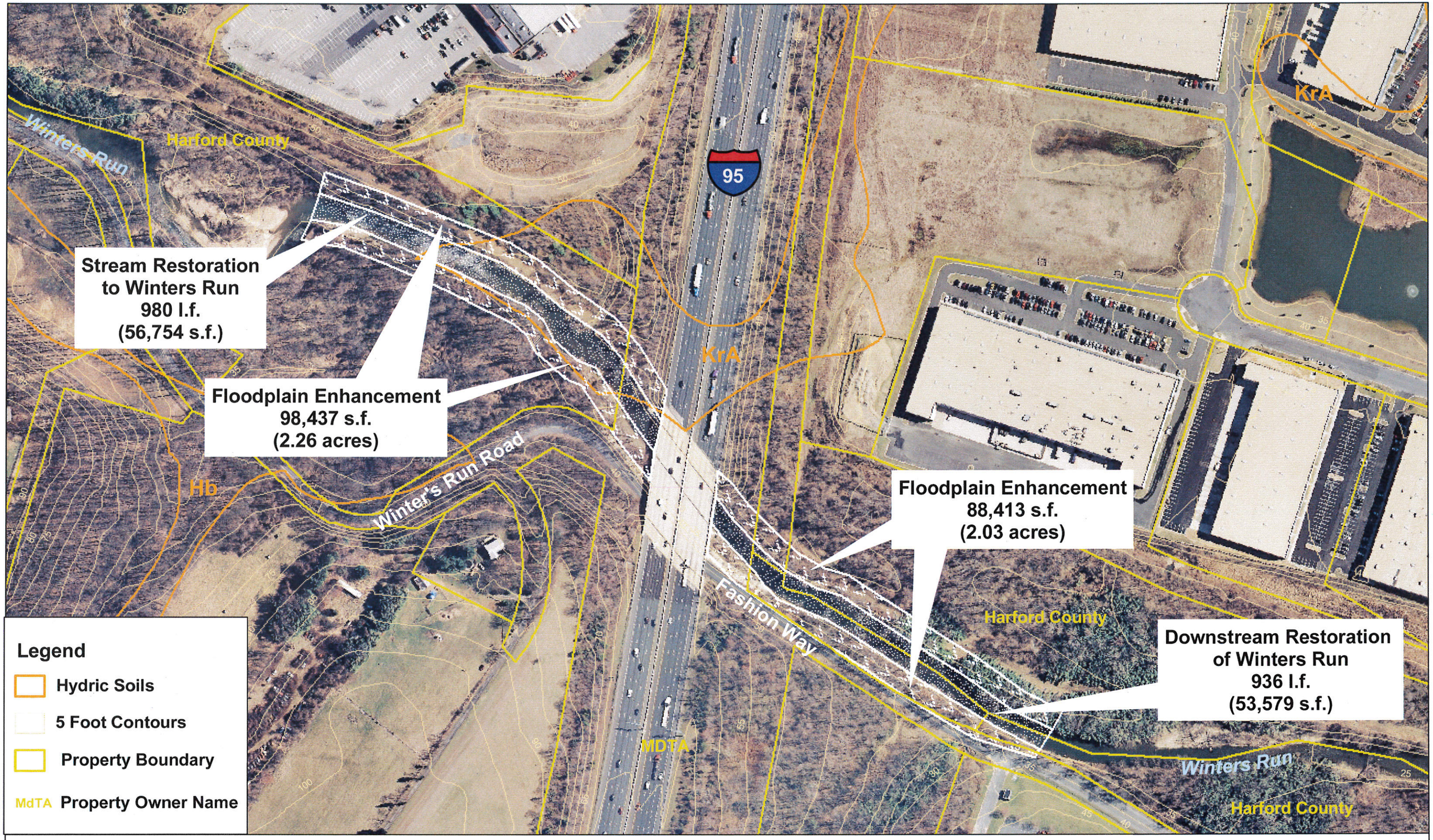

Figure IV-3: Winters Run Site

Scale
1 inch = 200 feet

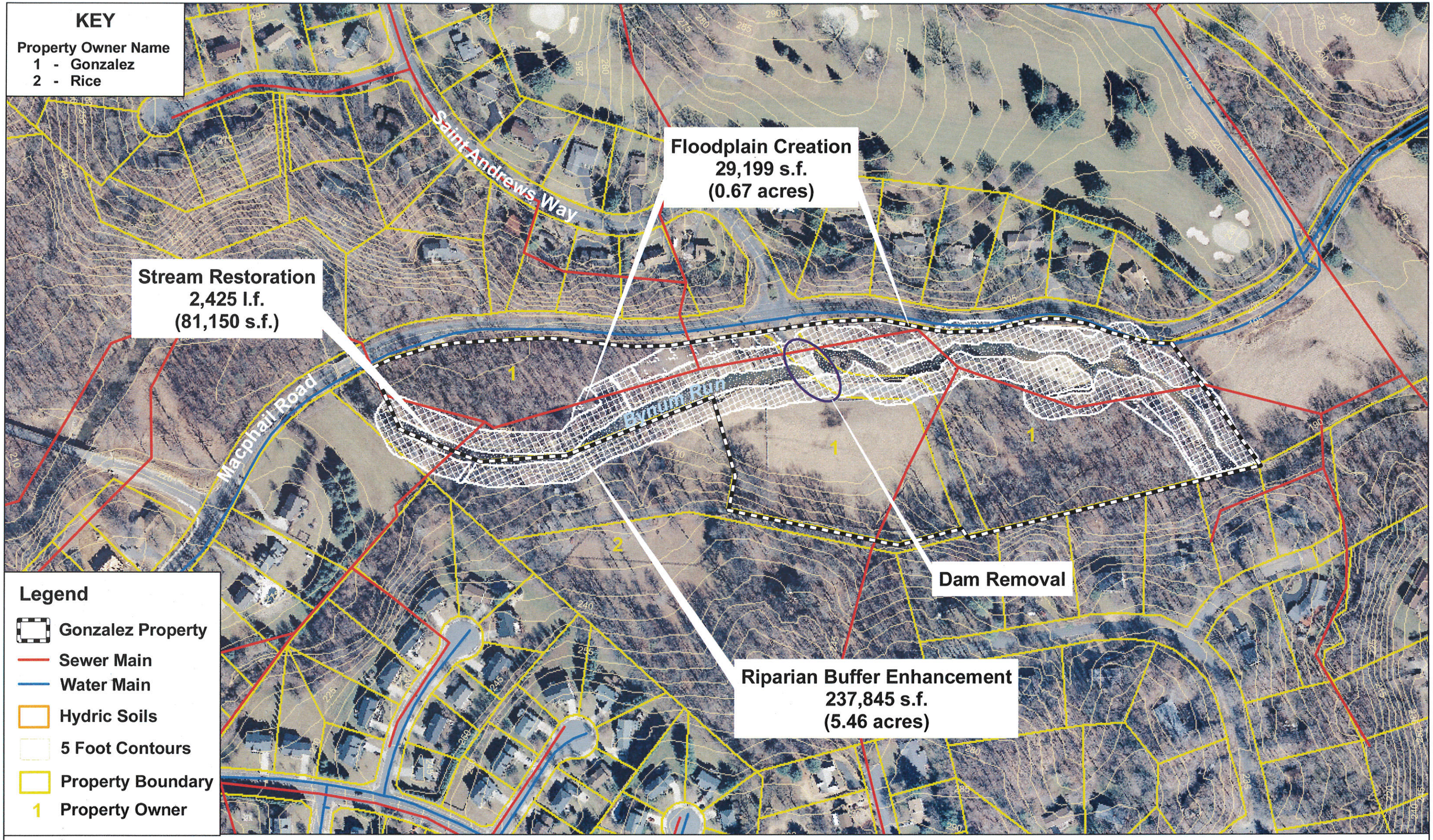

Figure IV-4: Gonzalez Property

Scale
1 inch = 200 feet

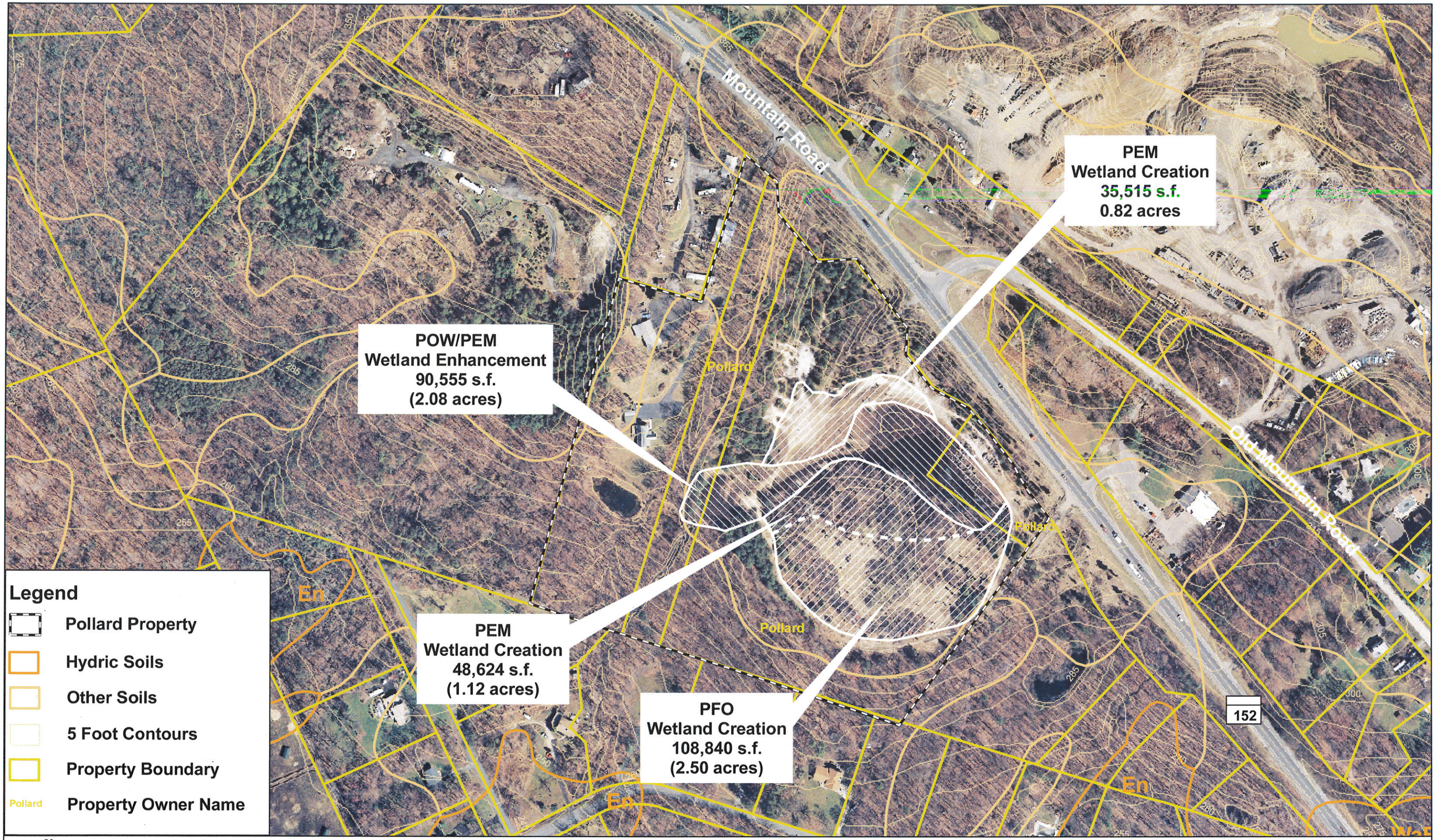

Figure IV-5: Pollard Property

Scale
1 inch = 200 feet