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Post-Restoration Vegetation Monitoring Plan

West Branch of Bloody Brook
Bloody Brook Voluntary Cleanup Program
Onondaga County, New York

February 2017, Revised May 2017

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1.0 Introduction

This *Post-Restoration Vegetation Monitoring Plan* (VMP) has been prepared to summarize the monitoring activities to be performed to evaluate the success of the vegetation planting at the Bloody Brook site. The remediation, including construction and restoration activities completed from 2014 through 2016, was conducted in accordance with a Voluntary Cleanup Agreement (VCA) between Lockheed Martin and the New York State Department of Environmental Conservation (NYSDEC) (Index #: D7-0001-01-09, effective July 20, 2002). The remediation included the West Branch of Bloody Brook (WBBB) and Bloody Brook from below the confluence of the West and Middle Branches of Bloody Brook and adjacent property located between the New York State Thruway (Thruway) and Onondaga Lake Parkway (approximately 5,000 foot long section of stream) in the Town of Salina and a portion of the Village of Liverpool, Onondaga County, New York, as shown on Figure 1.[1]

The required activities discussed herein pertain specifically to vegetative survival and wetland habitat development. Other aspects related to the site remediation that require post-remediation monitoring, including biological monitoring, culvert monitoring, and stream bed and stream bank erosion, will be detailed in the Site Management Plan (SMP).

1.1 Site Description

The WBBB site was broken into four distinct areas based on land use and characteristics as shown on Figure 2 and described below**.**

- Wooded Area – This portion of the site extends from the Thruway south (downstream) approximately 1,050 feet. This undeveloped area is irregularly shaped and relatively wide (i.e., greater than 150 feet) and includes three wetlands. The wooded area is entirely within the Onondaga County Bloody Brook Drainage District (Drainage District) easement and is owned by the Town of Salina. The Drainage District easement provides Onondaga County personnel permanent access to Bloody Brook for various projects to improve and maintain drainage. Storm water drainage from the surrounding development enters the WBBB from the west via a drainage channel at the southern end of the wooded area.

- Residential Area – The residential area surrounds the wooded area commencing at the Thruway and extending downstream of the wooded area with residential properties abutting the Drainage District easement along the WBBB to the downstream side of Floradale Road.

[1] The term “site” in the VCA is defined as: a portion of the banks, surface waters and sediments of the West and Middle Branches of Bloody Brook located in the Town of Salina with a portion of the site located in the Village of Liverpool and commences downstream of Interstate 90, the New York State Thruway, and extends generally southward past the confluence of the West Branch and the Middle Branch of Bloody Brook creating Bloody Brook, and ends on the upstream side of Onondaga Lake Parkway. After examining data developed during remedial investigation work in the Middle Branch, NYSDEC determined that no further action was required for that branch of Bloody Brook. For this reason, the “site” in this document relates only to those areas within the VCA site where the remedial program continues to be implemented and remedial action is being performed.

- Apartment Complex Area – The apartment complex area is located on Pearl Street and Town Gardens Drive between the residential properties along Floradale Road and the commercial properties along Old Liverpool Road.

- Commercial Area – The commercial area extends from commercial properties located along Old Liverpool Road to Onondaga Lake Parkway.

2.0 Summary of Vegetation Restoration Activities

Sections 2.1 through 2.3 below summarize the construction and restoration activities related to vegetation disturbance (including tree removal) and vegetation replacement (including seed, emergent plant, tree, and shrub planting). The tree removal and vegetation replacement activities were completed in accordance with the NYSDEC approved work plans listed below.

- *2014 Wooded Area Tree Removal Work Plan* (January 2014)
- *2014 Construction Work Plan* (March 2014)
- *2014 Revised Restoration Work Plan* (August 2014)
- *2014 Tree Removal Work Plan for 2015 Construction Season* (November 2014)
- *Tree Removal Work Plan and Waste Characterization Soil Sampling Plan for the 2016 Construction Season* (October 2015)
- *2015 Construction and Restoration Work Plan* (February 2015)
- *2016 Construction and Restoration Work Plan* (March 2016)

Section 2.4 discusses deviations from the proposed work based on field changes made during construction activities. All field changes were approved by NYSDEC prior to implementation.

2.1 Pre-Construction Tree Removal

Tree surveys and subsequent tree removals were completed prior to starting the site excavation activities. Trees were removed from all areas of the site, and new trees were planted as described below. The tree removals and replacements were completed in accordance with the NYSDEC approved work plans listed above.

2.2 Wooded Area

The disturbed land located in the wooded area is within the Drainage District easement which is owned by the Town of Salina and managed by Onondaga County. The remedial activities within the wooded area included disturbance of wetlands, upland areas outside of the wetlands, and removal of trees. Restoration of the wooded area included seeding and planting of wetlands and upland areas and replacement of forest and shrub habitat. Emergent wetlands were seeded with a wetland seed mix, and emergent plants were planted. Forested and shrub/scrub wetlands were also seeded with a wetland seed mix to provide an emergent wetland cover as the trees and shrubs grow. To provide a natural look to the wetland forested and shrub/scrub plantings, trees and shrubs were placed in random with no identical tree or shrub placed directly next to its equal. The upland areas were seeded with riparian and meadow seed mixes. Upland forested areas were planted with a woodland seed mix, and trees were planted with a shrub understory. The proposed and as planted plant quantities by habitat area are provided in Table 1. Upland and wetland seed mixes are provided in Attachment A. Proposed planting details are presented in the August 2014 *Revised Restoration Work Plan* (2014 Revised RWP).

2.3 Residential, Apartment Complex, and Commercial Areas

Condition of lawns, vegetation cover, trees, and landscaping features within residential properties, the apartment complex, and commercial properties were documented as part of a preconditions survey. As part of the remedial activities, the vegetation cover was disturbed and trees removed. Residential properties, the apartment complex, and commercial properties were restored as close

as practical to pre-existing conditions with consideration for input from the property owner and typically included the placement of sod and/or grass seed, trees, shrubs, and other plantings similar to what was removed from the property.

In the Drainage District easement within the residential, apartment complex, and commercial areas (i.e., outside of the wooded area), it was proposed to restore and seed the area with a Northeastern U.S. Roadside Native Mix (ERNMX-105) (Attachment A). However, based on a request from Onondaga County Department of Water Environment Protection (OCDWEP), a field change was implemented in September 2015 that included planting low maintenance ground cover along the top of the banks in portions of this area. Details of this field change are provided in Section 2.4.

At the request of the property owner, the remediation has not been completed for the apartment complex area outside of the brook. To accommodate the property owner, Lockheed Martin has scheduled remediation activities to be completed spring 2017.

2.4 Field Changes to Vegetation Restoration Activities

Final restoration and planting was completed in accordance with the NYSDEC approved *2014 Revised RWP* and other work plans listed above in Section 2.0 with the following field changes.

1. The size of trees to be planted in the wooded area was changed from 2.5 to 3 inches to a mix of 1.5 to 2.5 and 2.5 to 3 inches. Portions of the site have limited access and finished grades that make planting the larger 2.5 to 3 inch trees difficult, due to the larger root balls. This field change was approved by NYSDEC on November 12, 2014.

2. Approved by NYSDEC on November 12, 2014, the number of trees to be planted in the wooded area including habitat area UPF-2 was changed from 1,066 to 270 due to the following reasons:

    - Trees previously existing on the site and preserved were not taken into consideration in the number of trees proposed in the *2014 Revised RWP*;

    - The estimate for the quantity of trees in the *2014 Revised RWP* was based on a standard tree per acre density for planting a new forest plantation of seedlings in large open areas. Such plantations are managed by thinning every 10 to 15 years. In addition, large planting stocks, with a mix of 1.5 to 2.5 inch and 2.5 to 3 inch trees, are being used instead of seedlings, which were proposed to be used in the *2014 Revised RWP*. Therefore, the trees are being planted on 14 to 16 foot centers more closely resembling an older forest; and

    - The revised quantity of trees was also reduced to reflect the elongated shape of the habitat plots.

3. On May 20, 2015, a field change was approved by NYSDEC regarding a proposed method of controlling Phragmites. Activities related to this field change will be completed during monitoring activities discussed in this VMP, with details provided in Section 3.1.6 below.

4. On July 24, 2015, a field change was approved by NYSDEC regarding the approved plantings for habitats RIP and UPF-1. At that time, 23 Black Cherry trees had been planted in these two habitats (15 in RIP and 8 in UPF-1). While little to no mortality had been observed in the other plantings, the Black Cherry trees experienced an approximately 50 percent mortality rate. The

nursery supplying the stock had been consulted, and they recommended not replacing these with new Black Cherry trees as they seem to not be well suited to these two habitats.

In an effort to maintain the biodiversity of the plantings in RIP and UPF-1, it was proposed that the Black Cherry trees that are failing be replaced with other approved species which are already thriving at the site. The numbers reported below allow for replacement of all Black Cherry trees should that be needed.

- RIP: Fifteen planted Black Cherry to be replaced with: four Red Maple; four Sugar Maple; four Pin Oak; and three Eastern Hemlock; and

- UPF-1: Eight planted Black Cherry to be replaced with: two Sugar Maple, two American Beach, two White Pine, and two Eastern Hemlock.

5. On September 22, 2015, a field change was approved by NYSDEC that allowed the planting of low maintenance ground cover vegetation along the Bloody Brook Drainage District easement downstream of the wooded area between the top of the stone lined brook side bank and private properties that measure 4 feet or less in width. This field change was implemented at the request of OCDWEP in order to keep these areas easily accessible to Onondaga County personnel for brook maintenance. The field change specified that areas between the top of stone and the private property that measure 4 feet or greater in width be seeded with the previously approved grass seed mix and areas between the top of stone and the private property that measure 4 feet or less in width be seeded with annual rye (for temporary cover and soil stabilization) and selected low maintenance ground cover plants. Following the one year lifespan of the rye grass, the selected low maintenance ground cover vegetation, listed below, should be established.

    - Lowbush Blueberry (*Vaccinium angustifolium*)
    - Barren Strawberry (*Waldsteinia fragarioides*)
    - Three-Toothed Cinquefoil (*Sibbaldiopsis tridentata*)
    - Moss Phlox (*Phlox subulata*)
    - Horizontal Juniper (*Juniperus horizontalis*)

6. On September 22, 2015, NYSDEC approved a field change allowing the adaptive management in the palustrine shrub/scrub area adjacent to the NYS Thruway (PSS-1). The *2014 Revised RWP* called for a specific planting plan for PSS-1 to include: *Cornus amomum, Cephalanthus occidentalis, Sambucus canadensis, Alnus incana, and Aronia arbutifolia*. PSS-1 was completed and planted during fall 2014 and has since become established. In the interim, it was noted that the groundwater inflow to this area is more persistent than originally anticipated. To accommodate these conditions, a field change was implemented to allow for the introduction of several native obligate wetland species that will better tolerate the regular inundation of PSS-1. In support of the above management scope, the following plants:

    - Silky Dogwood *(Cornus amomum)*
    - Elderberry *(Sambucus Canadensis)*
    - Speckled Alder *(Alnus incana)*
    - Red Chokeberry *(Aronia arbutifolia)*

if deceased, will be replaced with:

- Leatherleaf *(Chamaedaphne, calyculta)*

- Button Bush *(Cephalanthus occidentalis)*
- Smooth Alder *(Alnus serrulata)*
- Fetterbush *(Leucothoe racemose)*
- Silky Willow *(Salix Sericea)*
- Mountain Holly *(Nemopanthus mucronata)*

No more than 20 percent of any one of the above will be used as replacement species to maintain biodiversity within PSS-1, and the plants will be planted at the same density described in the *2014 Revised RWP*.

3.0 Vegetation Monitoring

Vegetation monitoring for each area (i.e., wooded, residential, apartment complex, and commercial areas) will be completed as described below on an annual basis and will include an on-site inspection to be completed by a qualified person (e.g., biologist). Monitoring will continue for between one and five years, pursuant to approved work plans and property-specific access/restoration agreements between Lockheed Martin and the property owner. Section 5 below provides an anticipated schedule for this monitoring.

3.1 Wooded Area

Vegetation monitoring in the wooded area, which includes three wetlands and habitat area UPF-2, will be completed in accordance with the 2014 Revised RWP and the June 6, 2014 United States Army Corps of Engineers (USACE) Nationwide Permit (NWP) 38 to perform remediation activities in the WBBB and adjacent wetlands (USACE NWP 38). Monitoring in this area will be completed on an annual basis for five years. The information collected during the on-site inspection will be used to calculate the percent survival of the targeted plant species and the percent vegetation cover in the different habitat areas in order to assess the progression of development and natural sustainability of the wetlands and habitat areas. Target plant species include all planted shrubs and trees.

The site vegetation inspections will include inspections of the vegetative cover, trees, and shrubs for each of the wetland and upland habitat types. Figures 3 through 12 show the plantings for all of the habitat areas in the wooded area and habitat area UPF-2. The vegetative cover in these areas will be inspected to ensure that germination is covering all areas and that no large bare spots exist. The plot and transect procedures that will be used, in accordance with the 2014 Revised RWP and the January 1987 *Corps of Engineers Wetland Delineation Manual*, are described below.

Planted trees and shrubs will be counted and inspected to ensure they are developing, and dead trees and shrubs will be flagged. If survival rate is determined to be less than 80 percent of the proposed number to be planted, corrective measures will be proposed including tree and shrub replacements. In areas where trees, shrubs, and/or plants in excess of what had been proposed were planted, the proposed number will be used to determine percent survival. Field forms for each of the habitat areas with planted trees and shrubs are provided in Attachment B. If determined necessary, the use of a different species as replacements that would be expected to have a higher survival rate in the particular habitat area will be proposed for the replacement. Corrective measures will also be proposed if invasive species are present in any habitat area at a density greater than 5 percent.

Following each inspection, a summary report will be prepared and submitted to NYSDEC for approval detailing the extent of vegetation cover, target plant species survival, discussion of any issues, and proposed corrective actions, as needed. Section 5 of this VMP provides additional details on the summary reports.

3.1.1 Plot Procedure

The 10-foot by 10-foot permanent plots have been marked at the corners with 1-inch PVC pipes extending at least 4 feet above the ground surface. The three PEM monitoring plots are identified on Figure 3. The percent cover of foliage of each species of herbaceous vegetation in the square will be

recorded with bare ground included as a cover type. The average percent cover for the entire plot will be calculated, and photos will also be taken of each plot.

3.1.2 Transect Procedure

Permanent transects have been established across PSS-1, PSS-2, and PFO-1 as shown in the Figure 3. Moving from the habitat edge, each tree and shrub that has a canopy extending into the 2-foot wide transect will be recorded. In addition, the approximate area of canopy (as projected on the ground) will be recorded. The area of coverage for each species with bare ground included as a cover type will be summed and expressed as a percent coverage of the total transect area. The data set will include a species frequency count, a coverage area for each individual, a total coverage (square feet) for each species, and a relative coverage as a percent cover. In PFO-1, trees and understory shrubs will be presented separately. Photos will also be taken of each transect.

3.1.3 Habitat Area Monitoring

PEM-1 and PEM-2 (Palustrine Emergent) – For these two wetland areas containing only emergent plants and wetland habitat seed mix (Figures 7 and figure 11), the plot procedure as described in the 2014 Revised RWP and above will be used to estimate percent cover. If vegetative cover does not appear to be approaching 80 percent during the annual monitoring events, corrective actions will be proposed.

PSS-1, PSS-2 (Palustrine Shrub/Scrub), and PFO-1 (Palustrine Forested) – For these three wetland areas, containing both trees and shrubs as well as wetland habitat seed mix (Figures 5, 8, and 10), the transect procedure, as described in the 2014 Revised RWP and above will be used to estimate percent cover. Additionally, the habitat area will be walked, and any dead trees or shrubs will be flagged. A count of the dead trees and shrubs in the areas will be compiled to calculate the percent survival for the targeted species. Corrective measures will be proposed when the survival percentage of target trees and shrubs is less than 80 percent, when invasive species are present at a density greater than 5 percent, or when vegetative cover does not appear to be approaching 80 percent in the particular habitat area.

UPF-1 and UPF-2 (Forested Upland) – For these two upland areas, containing both trees and shrubs as well as forested floor seed mix (Figure 6 and Figure 12), the habitat area will be walked, and any dead trees or shrubs will be flagged for later replacement. A count of the dead trees and shrubs in the areas will be compiled to calculate the percent survival for the targeted species. Corrective measures will be proposed when the survival percentage of target trees and shrubs is less than 80 percent, or when invasive species are present at a density greater than 5 percent. Shrubs in these habitat areas were planted and surveyed in groups of three with each plant counted as an individual shrub as summarized on Table 1.

To monitor the success of the seed mix, vegetation cover will be monitored in each habitat area by a walkthrough including a visual inspection. If the vegetative cover does not appear to be approaching 80 percent in a particular habitat area, corrective measures will be proposed to and approved by NYSDEC prior to being implemented.

RIP-1 (Riparian) – For the riparian habitat, containing trees, shrubs, and a riparian habitat seed mix (Figure 4), the habitat area will be walked, and any dead trees or shrubs will be flagged for later replacement. A count of the dead trees and shrubs in the areas will be compiled to calculate the percent survival for the targeted species. Corrective measures will be proposed when the survival

percentage of target trees and shrubs is less than 80 percent (using the proposed number planted for total), or when invasive species are present at a density greater than 5 percent. Shrubs in these habitat areas were planted and surveyed in groups of three with each plant counted as an individual shrub as summarized on Table 1.

To monitor the success of the seed mix, vegetation cover will be monitored by a walkthrough including a visual inspection. If the vegetative cover does not appear to be approaching 80 percent in a particular habitat area, corrective measures will be proposed to and approved by NYSDEC prior to being implemented.

USS-1 (Shrub/Scrub Upland) - For the upland shrub/scrub habitat, containing shrubs and a forest floor habitat seed mix (Figure 9), the habitat area will be walked, and any dead shrubs will be flagged for later replacement. A count of the dead shrubs in the areas will be compiled to calculate the percent survival for the targeted species. Corrective measures will be proposed when the survival percentage of target trees and shrubs is less than 80 percent (using the proposed number planted for total), or when invasive species are present at a density greater than 5 percent.

To monitor the success of the seed mix, vegetation cover will be monitored by a walkthrough including a visual inspection. If the vegetative cover does not appear to be approaching 80 percent in a particular habitat area, corrective measures will be proposed to and approved by NYSDEC prior to being implemented.

MOW-1, MOW-2, and LAWN (Upland Meadow and Lawn) - For these areas, either an upland meadow or cool season lawn seed mix were used (Figure 1). Visual inspections will entail a walkthrough of the areas to confirm the seed mix was successful, and there are no large bare spots. If bare spots larger than 1 square foot are observed during monitoring, conditions in the area will be evaluated (e.g., multiple bare spots, soil compaction, etc.) to determine if corrective measures should be proposed.

3.1.4 Wetlands Groundwater and Surface Water Level Monitoring

During restoration activities in the wetland areas, three weirs were installed to allow for adjustment of the height of water retained in the wetlands. Adjustments will be made as needed after NYSDEC approval. Groundwater levels in the wetlands will be monitored using shallow piezometers installed in four locations at the edge of inundation in the constructed wetlands. Surface water will be monitored using four staff gauges installed in each of the three constructed wetlands. The approximate locations of the piezometers and staff gauges are shown on Figure 3.

3.1.5 Wetlands Photographic Monitoring

Progress in germination and growth of vegetation will be monitored using panoramic photographs from five permanent photo points established in uplands surrounding the constructed wetlands. The locations of the permanent photo points are shown in Figure 3.

3.1.6 Phragmites Removal

During construction activities, a Bloody Brook Phragmites Control Procedure was developed and approved by the NYSDEC to control the growth and spread of Phragmites adjacent to the restored wooded area of the site. In accordance with the procedure, Phragmites were removed in June 2015 and light-proof tarps were placed over the area. In spring 2017 (after about two years of the tarps

remaining in place), the tarps will be removed, and the previously covered areas will be seeded with a PA New England Province riparian seed mix (i.e., ERNMX-253) (Attachment A) at a rate of 20 pounds per acre. Following application of the seed mix, the area will be monitored along with the adjacent restored portion of the wooded area as discussed in the previous sections.

3.2 Residential, Apartment Complex, and Commercial Areas

All residential, apartment complex, and commercial plantings will be visually inspected until they are successfully established for a period of between one and five years, in accordance with the property-specific access/restoration agreements between Lockheed Martin and the property owner. Plantings will be replaced as needed, with consideration for input from the homeowner.

4.0 Vegetation Replacement

After each habitat area is inspected as described above, the habitat areas and dead trees and shrubs will be evaluated to determine replacement activities. The replacement activities will be summarized in the summary report. Replacements will be planted during the fall planting season, assuming stock availability and favorable site/weather conditions. If necessary, replacements will be made during the following spring planting season. Per the 2014 Revised RWP, some dead vegetation (including plant shrubs and trees) will be left as standing wood habitat, with the replacement tree being planted nearby.

An assessment of the species that had the highest success will be completed during each inspection, and replacement shrubs or trees, as needed, will be selected from those determined to be the most successful. If a tree or shrub species does not survive at acceptable rates, the cause of the high mortality rate will be evaluated. For example if a tree or shrub species has a low survival rate due to altered habitat conditions, replacement shrubs and trees will be selected based on the existing habitat conditions from the list of species already being planted at the site. If a native species not already being planted at the site is determined to be a better alternative, that alternative native species may be proposed to be planted at the site. Any replacement plantings needed at the site will be proposed to and approved by the NYSDEC prior to the corrective action being implemented. For example, if a species of tree or shrub has died due to inappropriate habitat conditions (e.g., too wet or too dry), the proposed replacement species will be based on a tree or shrub that is better adapted for survival in the existing habitat conditions. If the tree or shrub appears to have died for no particular reason, that tree or shrub would be replaced by the same species. This practice of replacement species was implemented with Field Changes approved on July 24, 2015 and September 22, 2015 as summarized in Section 2.4 of the VMP (numbers 4 and 6).

If invasive wetland plants, shrubs, or trees are present at a density greater than 5 percent cover, corrective measures will be proposed to and approved by NYSDEC prior to the actions being implemented. The Field Change approved on May 20, 2015 (see number 3 under VMP Section 2.4) proposes actions to be implemented to reduce the spread of Phragmites from adjacent property into the recently planted wetland areas.

Invasive ground cover vegetation such as Creeping Charlie (*Glechoma hederacea*) and Garlic mustard (*Alliaria petiolata*) may be controlled using manual removal methods including pulling or digging (depending on growth stage and extent of spread). After assessing the extent of an invasive plant species, appropriate control measures will be proposed to NYSDEC for approval before implementation.

5.0 Vegetation Monitoring Summary Reports and Proposed Schedule

Within 60 days after the monitoring event, a Vegetation Monitoring Summary Report (VMSR) will be submitted to the NYSDEC that provides an assessment of the development of the wetlands and habitat area as well as tree and shrub survival. VMSRs will include completed field forms; photographic documentation of observed vegetative and hydrological conditions; recommendations for replacement of planting as needed; and any activities proposed or completed to correct any restoration failures or issues discovered during the monitoring activities.

NYSDEC will be notified two weeks prior to these field activities, which are anticipated to begin during the spring 2017:

- April 2017 – first annual monitoring event, weather permitting.
- June 2017 – remove light proof tarps from previous Phragmities area and plant seed, weather permitting.
- June/July 2017 – first annual VMSR submitted to NYSDEC for review.
- September/October 2017 – implement proposed corrective actions including re-plantings, as determined in the 2017 VMSR.

Future monitoring events are anticipated to follow the same schedule through the year 2021.

Tables

Table 1: Plant and Seed Quantity by Habitat Area

				As Proposed		As Planted
Habitat Area Name	Common Name	Scientific Name	Common name	Size	Quantity	Quantity
		Trees				
PFO 1	Wetland forest	*Acer rubrum*	Red maple	2.5-3 in	See Note 1	24
16,829 sf		*Quercus palustris*	Pin oak	2.5-3 in	See Note 1	24
(0.3863 a)		*Salix niger*	Black willow	2.5-3 in	See Note 1	18
		Betula nigra	River birch	2.5-3 in	See Note 1	13
		Quercus bicolor	Swamp white oak	2.5-3 in	See Note 1	5
						84
		Shrubs and Seed Mix				
		Cornus amomum	Silky dogwood	Live stakes	108	104
		Alnus incana	Speckled alder	3 gal	45	47
		Sambucus canadensis	Elderberry	3 gal	57	57
		Cephalanthus occidentalis	Buttonbush		NA	1
					210	209
		Wetland Habitat (PA New England Province FACW Mix)	ERNMX-251	20#/acre		
		Shrubs and Seed Mix				
PSS 1	Shrub wetland	*Cornus amomum*	Silky dogwood	Live stakes	20	19
3,533 sf		*Cephalanthus occidentalis*	Buttonbush	3 gal	15	15
(0.0811 a)		*Sambucus canadensis*	Elderberry	3 gal	15	16
		Alnus incana	Speckled alder	3 gal	20	20
		Aronia arbutifolia	Red chokeberry	3gal	10	10
					80	80
		Wetland Habitat (PA New England Province FACW Mix)	ERNMX-251	20#/acre		
		Shrubs and Seed Mix				
PSS 2	Shrub wetland	*Cornus amomum*	Silky dogwood	Live stakes	52	53
8,628 sf		*Salix exigua*	Sandbar willow	Live stakes	25	25
(0.1981 a)		*Salix discolor*	Pussy willow	3 gal	40	41
		Sambucus canadensis	Elderberry	3 gal	30	30
		Lindera benzoin	Spice bush	3 gal	30	30
		Aronia arbutifolia	Red chokeberry	3gal	20	20
					197	199
		Wetland Habitat (PA New England Province FACW Mix)	ERNMX-251	20#/acre		
		Emergents and Seed Mix				
PEM 1	Marsh	*Typha latifolia*	Broadleaf cattail	Rhizomes	200	150
16,426 sf		*Iris versicolor*	Blue flag iris	6 in. pot	20	19
(0.3771 a)		*Scirpus cyperinus*	Woolgrass	4 in. pot	35	30
		Juncus effusus	Softrush	4 in. pot	35	30
		Onoclea sensibilis	Sensitive fern	4 in. pot	35	36
					325	265
		Wetland Habitat (PA New England Province FACW Mix)	ERNMX-251	20#/acre		

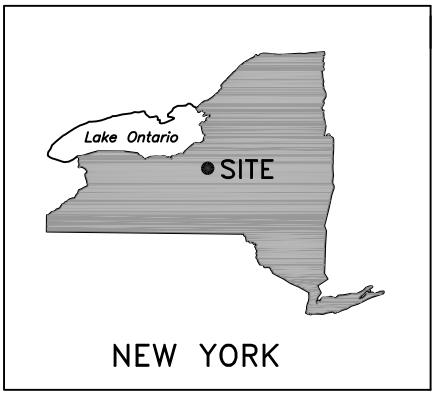
				As Proposed		As Planted
Habitat Area Name	Common Name	Scientific Name	Common name	Size	Quantity	Quantity
		Emergents and Seed Mix				
PEM 2	Marsh	*Typha latifolia*	Broadleaf cattail	Rhizomes	100	120
11,406 sf		*Iris versicolor*	Blue flag iris	6 in. pot	10	10
(0.2618 a)		*Scirpus cyperinus*	Woolgrass	4 in. pot	15	15
		Juncus effusus	Softrush	4 in. pot	15	15
		Onoclea sensibilis	Sensitive fern	4 in. pot	15	15
					155	175
		Wetland Habitat (PA New England Province FACW Mix)	ERNMX-251	20#/acre		
		Trees				
RIP	Stream banks	*Acer rubrum*	Red maple	2.5-3 in	See Note 1	30
51,520 sf		*Acer saccharum*	Sugar maple	2.5-3 in	See Note 1	16
(1.183 a)		*Fagus grandifolia*	American beech	2.5-3 in	See Note 1	7
		Quercus palustris	Pin oak	2.5-3 in	See Note 1	13
		Tsuga canadensis	Eastern hemlock	2.5-3 in	See Note 1	19
		Prunus serotina	Black cherry	2.5-3 in	See Note 1	12
		Pinus strobus	White pine	NA	0	7
						104
		Shrubs and Seed Mix				
		Viburnum dentatum	Northern arrowwood	3 gal	170	252
		Viburnum lentago	Nannyberry	3 gal	170	153
		Cornus racemosa	Grey dogwood	3 gal	175	144
					515	549
		Riparian Habitat (PA New England Province Riparian Mix)	ERNMX-253	@20#/ac		
		Trees				
UPF 1	Upland forest	*Acer saccharum*	Sugar maple	2.5-3 in	See Note 1	13
8,675 sf		*Fagus grandifolia*	American beech	2.5-3 in	See Note 1	7
(0.1992 a)		*Prunus serotina*	Black cherry	2.5-3 in	See Note 1	8
		Pinus strobus	White pine	2.5-3 in	See Note 1	3
		Tsuga canadensis	Eastern hemlock	2.5-3 in	See Note 1	10
		Quercus palustris	Pin oak	NA	0	1
						42
		Shrubs and Seed Mix				
		Viburnum dentatum	Northern arrowwood	3 gal	40	30
		Viburnum lentago	Nannyberry	3 gal	40	30
		Cornus racemosa	Grey dogwood	3 gal	30	30
					110	90
		Forest Floor Habitat (Partially Shaded Area Roadside Mix)	ERNMX-140	@20#/ac		

				As Proposed		As Planted
Habitat Area Name	Common Name	Scientific Name	Common name	Size	Quantity	Quantity
		Trees				
UPF 2	Upland forest	*Acer saccharum*	Sugar maple	2.5-3 in	See Note 1	5
10,500 sf		*Fagus grandifolia*	American beech	2.5-3 in	See Note 1	0
(0.2410 a)		*Prunus serotina*	Black cherry	2.5-3 in	See Note 1	4
		Pinus strobus	White pine	2.5-3 in	See Note 1	7
		Tsuga canadensis	Eastern hemlock	2.5-3 in	See Note 1	8
						24
		Shrubs and Seed Mix				
		Cornus racemosa	Grey dogwood	3 gal	40	60
		Viburnum lentago	Nannyberry	3 gal	25	36
		Viburnum dentatum	Northern arrowwood	3 gal	40	42
					105	138
		Forest Floor Habitat (Partially Shaded Area Roadside Mix)	ERNMX-140	@20#/ac		
		Shrubs and Seed Mix				
USS	Shrub upland	*Cornus racemosa*	Grey dogwood	3 gal	35	19
3,291 sf		*Viburnum lentago*	Nannyberry	3 gal	40	20
(0.07555 a)					75	39
		Forest Floor Habitat (Partially Shaded Area Roadside Mix)	ERNMX-140	@20#/ac		
MOW 1	Meadow					
28,471 sf		Upland Meadow (Northeastern U.S. Roadside Native Mix)	ERNMX-105	@20#/ac		As proposed
(0.6536 a)						
MOW 2	Meadow					
7,735 sf		Upland Meadow (Northeastern U.S. Roadside Native Mix)	ERNMX-105	@20#/ac		As proposed
(0.1776 a)						
MOW 3,	Meadow					
13,068 sf		Upland Meadow (Northeastern U.S. Roadside Native Mix)	ERNMX-105	@20#/ac		As proposed
(0.3000 a)						
MOW 4,	Meadow					
2,945 sf		Upland Meadow (Northeastern U.S. Roadside Native Mix)	ERNMX-105	@20#/ac		As proposed
(0.0676 a)						
MOW 5,	Meadow					
2,204 sf		Upland Meadow (Northeastern U.S. Roadside Native Mix)	ERNMX-105	@20#/ac		As proposed
(0.0506 a)						
Lawn	Lawn					
18,452 sf		Cool season lawn mix		@30#/ac		As proposed
(0.4236 a)						

Notes:

1. Per the November 12, 2014 NYSDEC approved field changes, the total number of trees planted was reduced, and the size of some of the trees planted was smaller than had been proposed (see Section 2.4). As such, the "As Proposed" for tree species reported in this table do not reflect final approved.

Figures



0' 2000' 4000'

APPROXIMATE SCALE

REFERENCE:

1. NYSDOT 7.5 MIN TOPOGRAPHIC MAP OF SYRACUSE WEST, QUADRANGLE 1990, SCALE: 1" = 2000'.

AECOM

LOCKHEED MARTIN CORPORATION

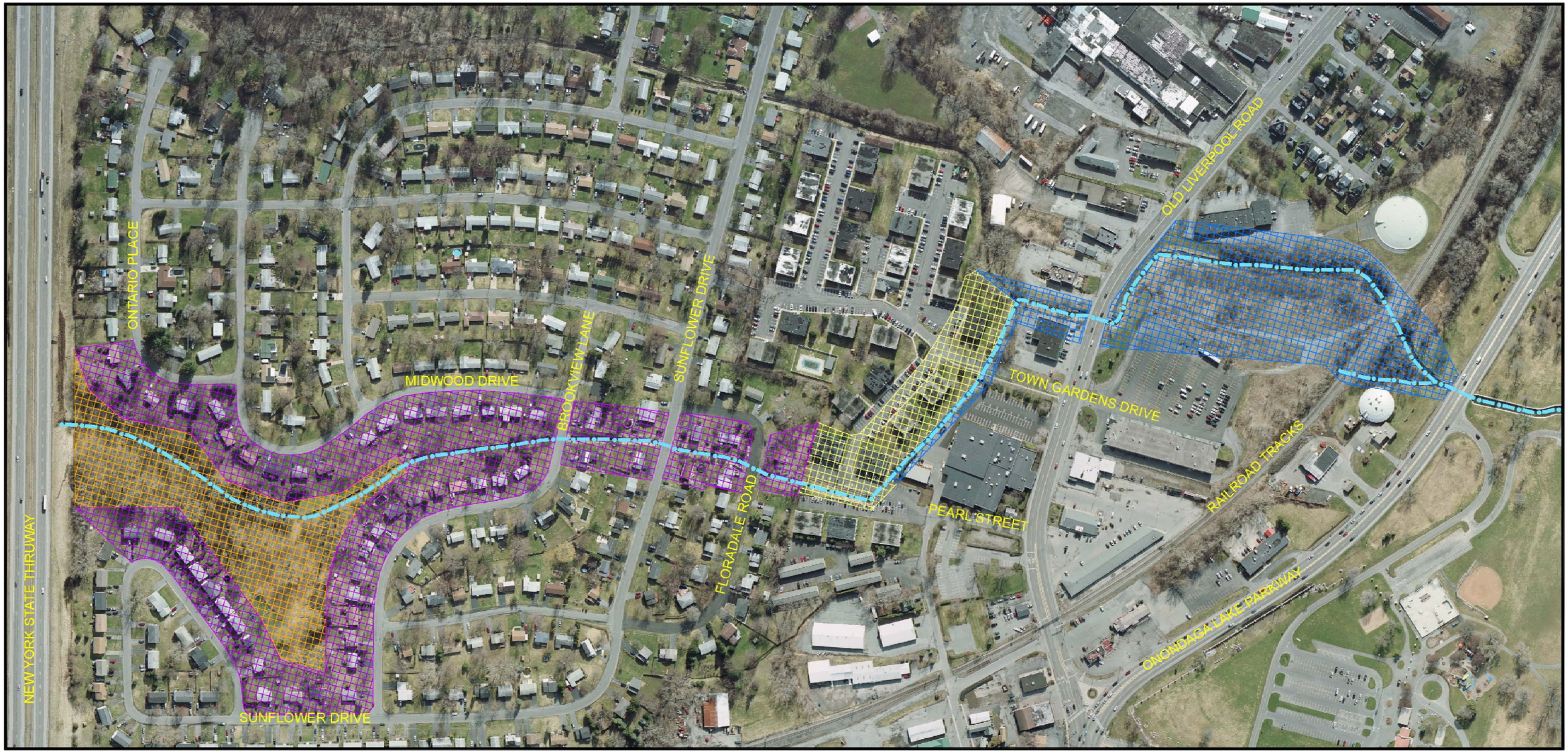
SITE LOCATION MAP

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
A1FIG1.dwg	—	60194430	11 / 2013	1

Plotted By: bookasr
Layout-Sheet Name: LAYOUT1
Plot File Date Created: Nov/04/2013 12:05 PM

Filename: N:\MARKETING\PROPOSALS\LOCKHEED MARTIN – BLOODY BROOK\CAD\A1FIG1.DWG



Legend

- CURRENT BROOK ALIGNMENT
- WOODED AREA
- RESIDENTIAL AREA
- APARTMENT COMPLEX AREA
- COMMERICAL-LIGHT INDUSTRIAL AREA

0' 1,200' 2,400'

APPROXIMATE SCALE

AECOM

LOCKHEED MARTIN CORPORATION

SITE AREA MAP

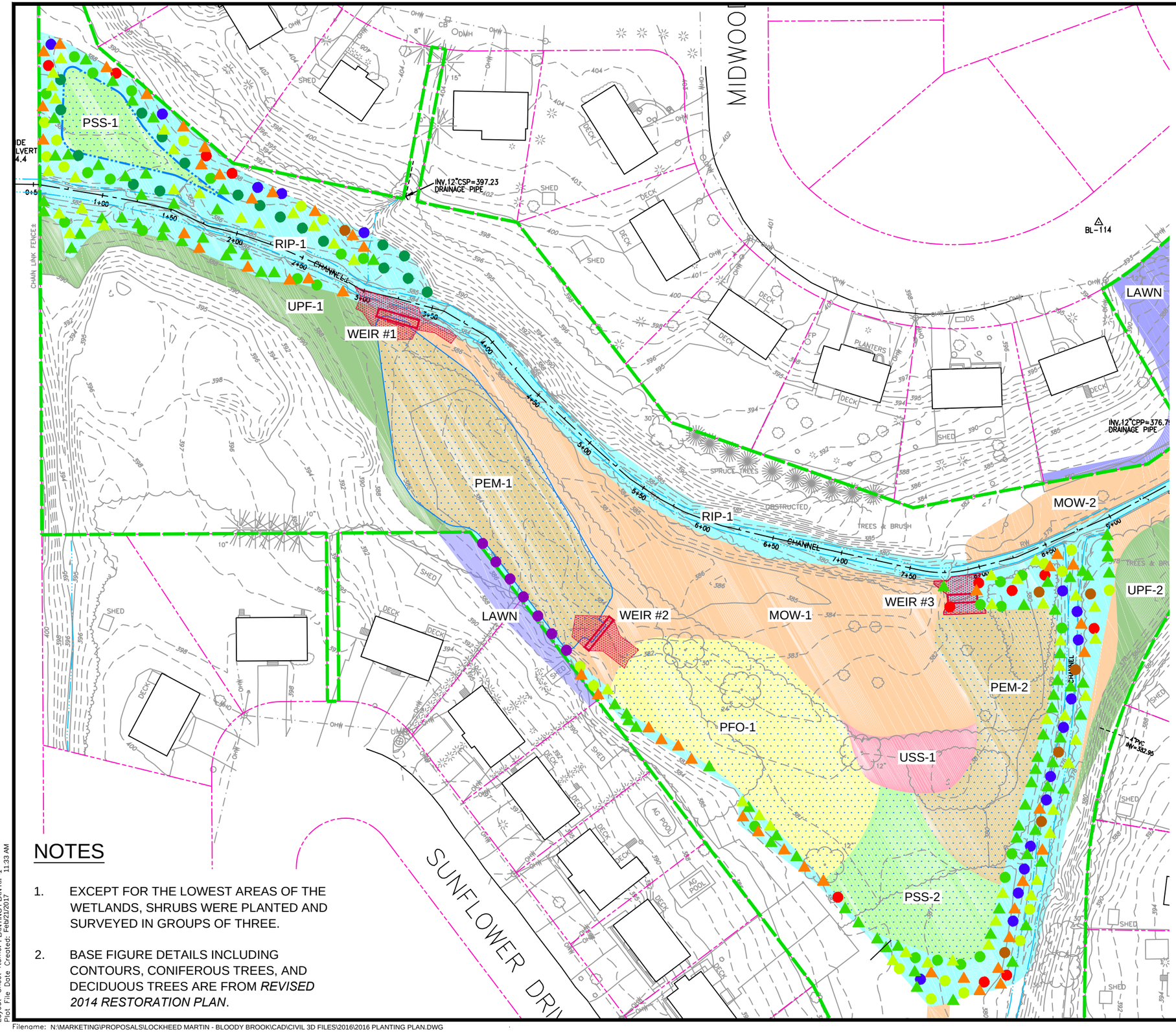
WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
SiteAreaMap.dwg	---	60194430	03 / 2014	2

Plotted By: bookasr
Layout-Sheet Name: FIGURE
Plot File Date Created: Mar/25/2014 4:32 PM

Filename: N:\MARKETING\PROPOSALS\LOCKHEED MARTIN – BLOODY BROOK\CAD\SITEAREAMAP.DWG


ONTARIO PLACE
MIDWOOD DRIVE
CRANBERRY DRIVE
BROOKVIEW LANE
SUNFLOWER DRIVE
NEW YORK STATE THRUWAY
MATCHLINE TO SHEET 2 OF 3
6"x8" WIDE BOX CULVERT INV.=384.4
INV.12"CSP=397.23 DRAINAGE PIPE
INV.12"CPP=376.79 DRAINAGE PIPE
GABION LINED CHANNEL
30"CMP INV=377.90 DRAINAGE PIPE
PSS TRANSECT 1
PFO TRANSECT 1
PSS TRANSECT 2
WEIR #1
WEIR #2
WEIR #3
PEM PLOT 1
PEM PLOT 2
PEM PLOT 3
PHOTO-1
PHOTO-2
PHOTO-3
PHOTO-4
PHOTO-5
LEGEND
BLOODY BROOK DRAINAGE DISTRICT EASEMENT
PROPERTY BORDER
TOPOGRAPHIC CONTOUR LINE (PRE-EXCAVATION)
PROPOSED BLOODY BROOK CENTERLINE
STREAM/WATER EDGE
UNDERGROUND DRAIN LINE
OVERHEAD WIRES
RETAINING WALL
GUARD RAIL
UTILITY MANHOLE
DRAINAGE MANHOLE
SANITARY MANHOLE
RAILROAD TRACKS
CATCH BASIN
DRAINAGE STRUTURES
FLAG POLE
CULVERT
NYS PLANE COORDINATE SYSTEM EASTING
NYS PLANE COORDINATE SYSTEM NORTHING
AERIAL SURVEY GROUND CONTROL POINT
CHANNEL CENTERLINE SURVEY STATION
TOPOGRAPHIC SPOT ELEVATION
CONIFEROUS TREE
DECIDUOUS TREE
LIGHT POLE
UTILITY POLE / GUY WIRE
WETLAND ELEVATION CONTROL WEIR LOCATION
RIP RAP
WETLAND
WETLAND PIEZOMETER LOCATION
WETLAND MONITORING STAFF GAUGE
WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)
PSS PALUSTRINE SHRUB / SCRUB
PFO PALUSTRINE FORESTED
PEM PALUSTRINE EMERGENT
UPF FORESTED UPLAND
USS SHRUB / SCRUB UPLAND
MOW UPLAND MEADOW
RIP RIPARIAN (PSS / PFO)
LAWN LAWN
TREES
AMERICAN BEECH
BLACK CHERRY
BLACK WILLOW
EASTERN HEMLOCK
PIN OAK
RED MAPLE
RIVER BIRCH
SUGAR MAPLE
SWAMP WHITE OAK
WHITE PINE
SHRUBS
BUTTONBUSH
ELDERBERRY
GREY DOGWOOD
NANNYBERRY
NORTHERN ARROWWOOD
PUSSY WILLOW
RED CHOKEBERRY
SANDBAR WILLOW
SILKY DOGWOOD
SPECKLED ALDER
SPICE BUSH
EMERGENTS
BLUE FLAG IRIS
BROADLEAF CATTAIL
SENSITIVE FERN
SOFTRUSH
WOOLGRASS
0' 50' 100'
APPROXIMATE SCALE
NOTES
1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.
REFERENCES:
1. BASE MAP SOURCE: IANUZI & ROMANS, P.C. AND CT MALE ASSOCIATES P.C.
AECOM
LOCKHEED MARTIN CORPORATION
POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS
WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK
FILE NAME: 2016 Planting Plan.dwg
DRN RNB
PROJECT NO. 60515902
DATE 2 / 2017
FIGURE NO. 3



LEGEND

PSS	PALUSTRINE SHRUB / SCRUB
PFO	PALUSTRINE FORESTED
PEM	PALUSTRINE EMERGENT
UPF	FORESTED UPLAND
USS	SHRUB / SCRUB UPLAND
MOW	UPLAND MEADOW
RIP	RIPARIAN (PSS / PFO)
LAWN	LAWN

TREES

- AMERICAN BEECH
- BLACK CHERRY
- EASTERN HEMLOCK
- PIN OAK
- RED MAPLE
- SUGAR MAPLE
- WHITE PINE

SHRUBS

- GREY DOGWOOD
- NANNYBERRY
- NORTHERN ARROWWOOD

0’ 70’ 140’

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR RIP-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	4

Plotted By: bookasr
Layout–Sheet Name: PLANTING PLAN RIP-1
Plot File Date Created: Feb/21/2017 11:33 AM

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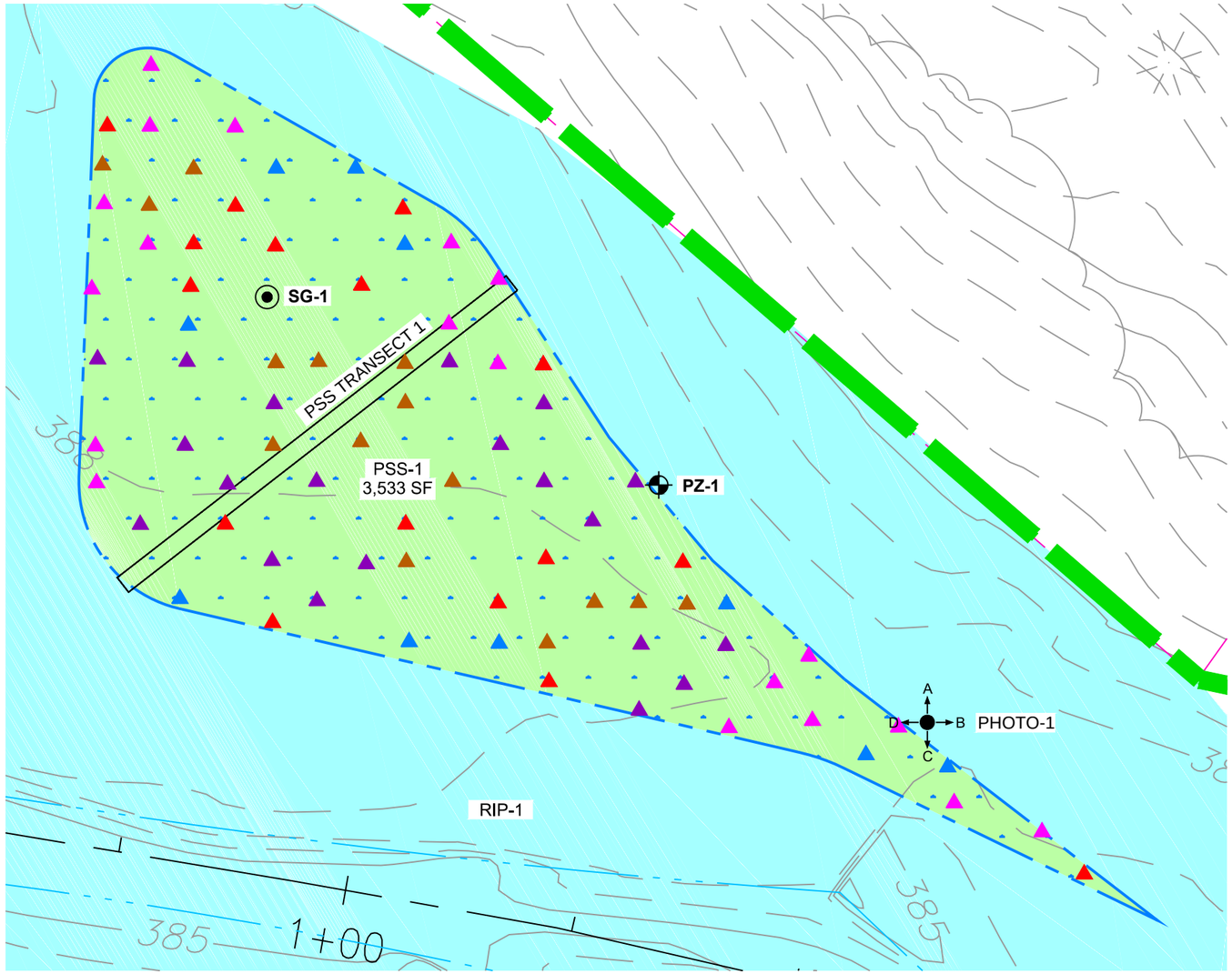

LEGEND

- PZ-1 — WETLAND PIEZOMETER LOCATION
- SG-1 — WETLAND MONITORING STAFF GAUGE
- PHOTO-1 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)
- PSS — PALUSTRINE SHRUB / SCRUB
- RIP — RIPARIAN (PSS / PFO)

SHRUBS

- BUTTONBUSH
- ELDERBERRY
- RED CHOKEBERRY
- SILKY DOGWOOD
- SPECKLED ALDER

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0' 15' 30'

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR PSS-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	5

Plotted By: bookasr
Layout–Sheet Name: PLANTING PLAN PSS-1
Plot File Date Created: Feb/21/2017 11:30 AM

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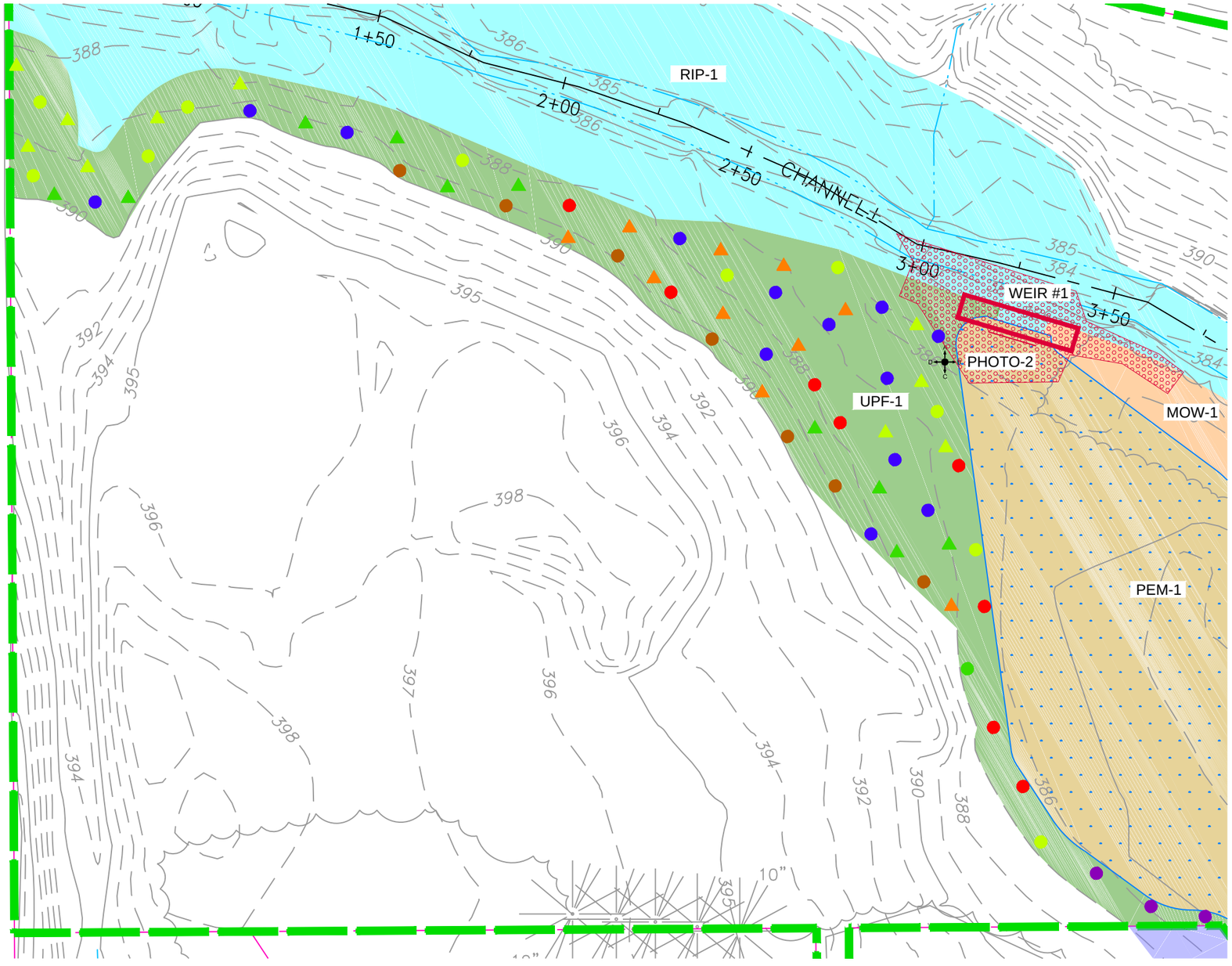

LEGEND

PHOTO-2 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)

- PEM — PALUSTRINE EMERGENT
- UPF — FORESTED UPLAND
- MOW — UPLAND MEADOW
- RIP — RIPARIAN (PSS / PFO)

TREES

- AMERICAN BEECH
- BLACK CHERRY
- EASTERN HEMLOCK
- PIN OAK
- SUGAR MAPLE
- WHITE PINE

SHRUBS

- GREY DOGWOOD
- NANNYBERRY
- NORTHERN ARROWWOOD

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0’ 15’ 30’ 60’

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR UPF-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	6

Plotted By: bookasr
Layout–Sheet Name: PLANTING PLAN UPF-1
Plot File Date Created: Feb/21/2017 11:33 AM

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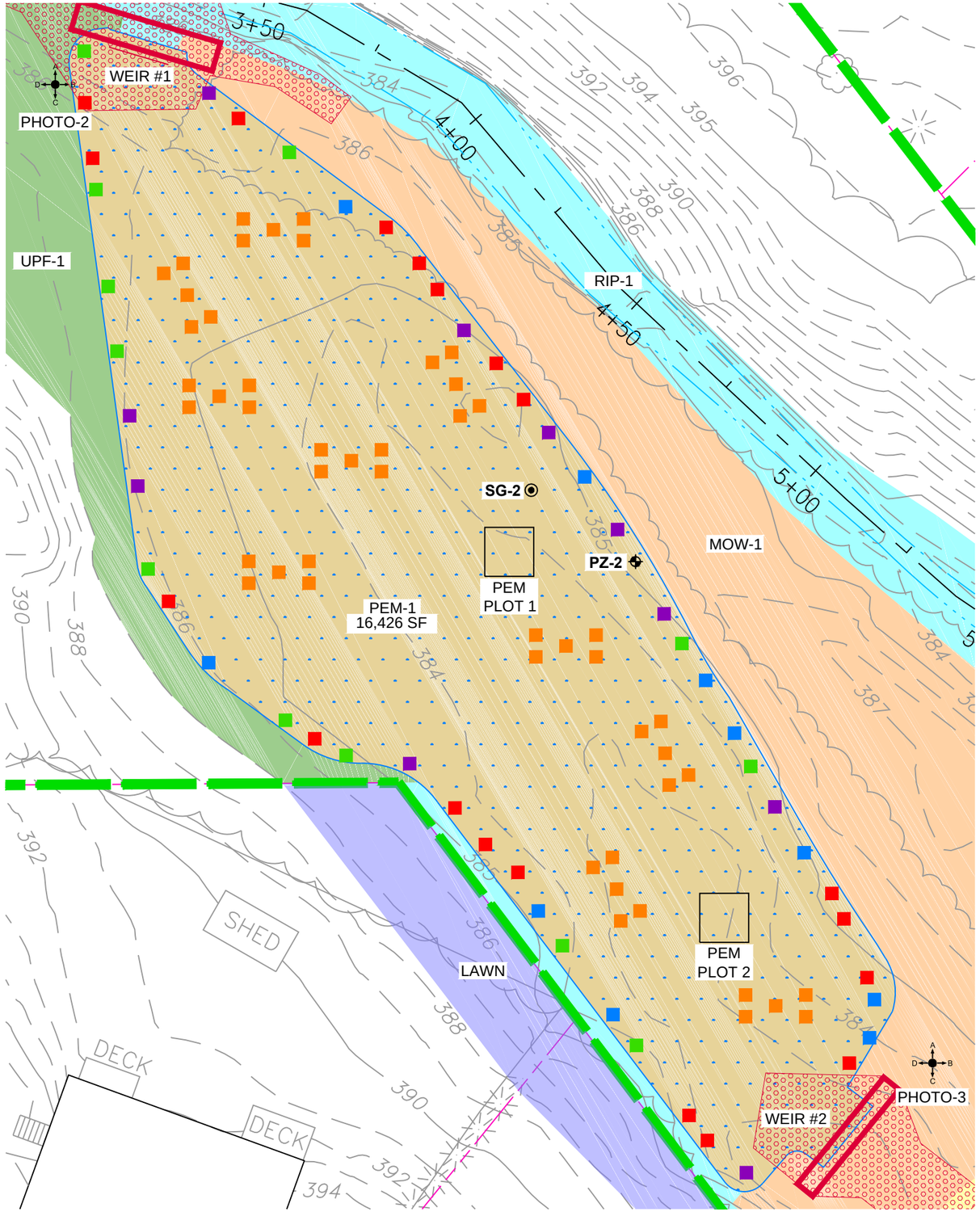

LEGEND

- **PZ-2** — WETLAND PIEZOMETER LOCATION
- **SG-2** — WETLAND MONITORING STAFF GAUGE
- PHOTO-2 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)
- PEM — PALUSTRINE EMERGENT
- UPF — FORESTED UPLAND
- MOW — UPLAND MEADOW
- RIP — RIPARIAN (PSS / PFO)
- LAWN — LAWN

EMERGENTS

- BLUE FLAG IRIS
- BROADLEAF CATTAIL
- SENSITIVE FERN
- SOFTRUSH
- WOOLGRASS

NOTES

1. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0' 25' 50'

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR PEM-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	7

Plotted By: bookasr
Layout–Sheet Name: PLANTING PLAN PEM-1
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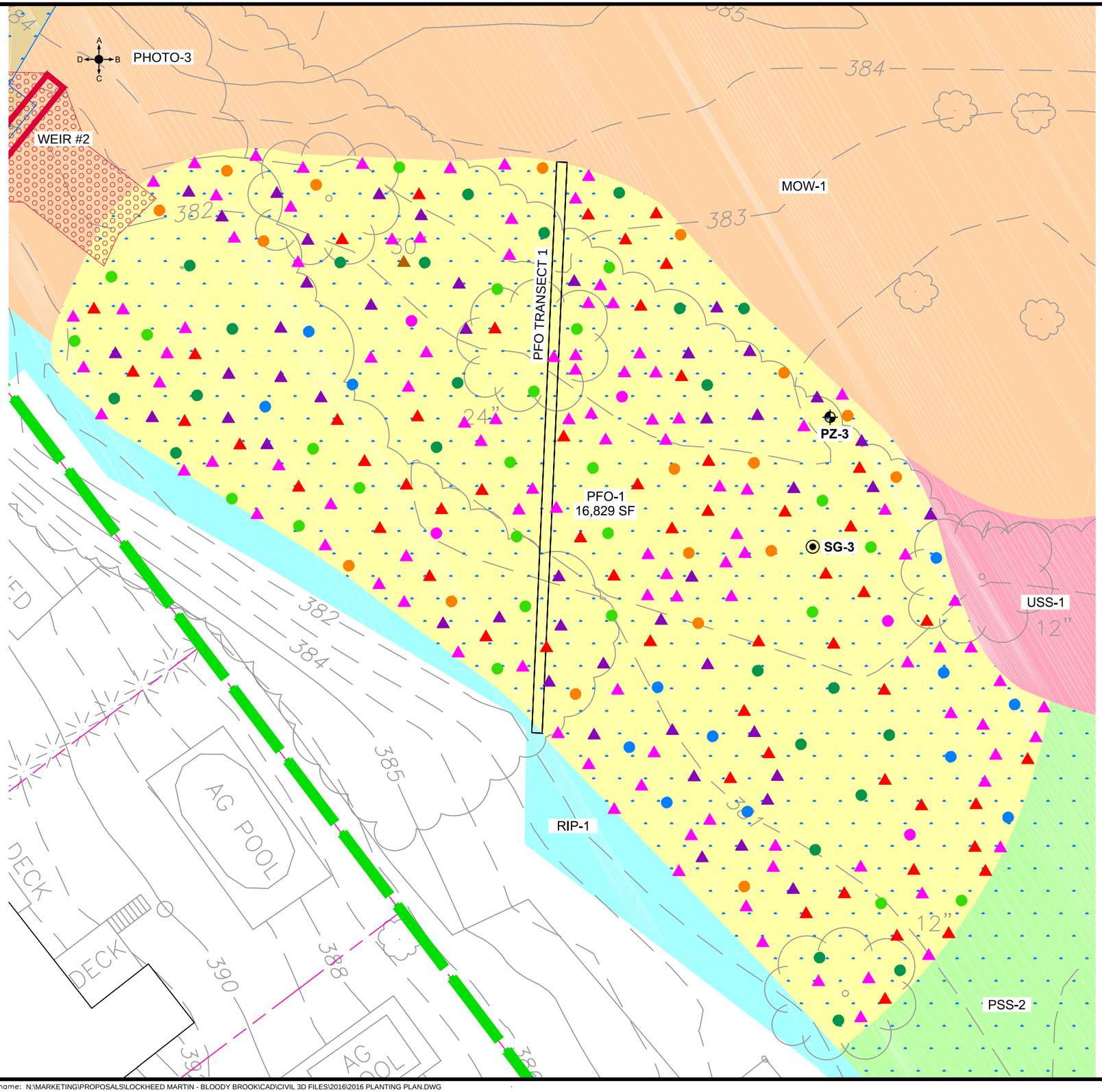

LEGEND

- PZ-3 — WETLAND PIEZOMETER LOCATION
- SG-3 — WETLAND MONITORING STAFF GAUGE
- PHOTO-3 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)
- PSS — PALUSTRINE SHRUB / SCRUB
- PFO — PALUSTRINE FORESTED
- USS — SHRUB / SCRUB UPLAND
- MOW — UPLAND MEADOW
- RIP — RIPARIAN (PSS / PFO)

TREES

- BLACK WILLOW
- PIN OAK
- RED MAPLE
- RIVER BIRCH
- SWAMP WHITE OAK

SHRUBS

- BUTTONBUSH
- ELDERBERRY
- SILKY DOGWOOD
- SPECKLED ALDER

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0’ 10’ 20’ 40’

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR PFO-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	8

Plotted By: bookasr
Layout-Sheet Name: PLANTING PLAN PFO-1
Plot File Date Created: 2/21/2017 11:30 AM

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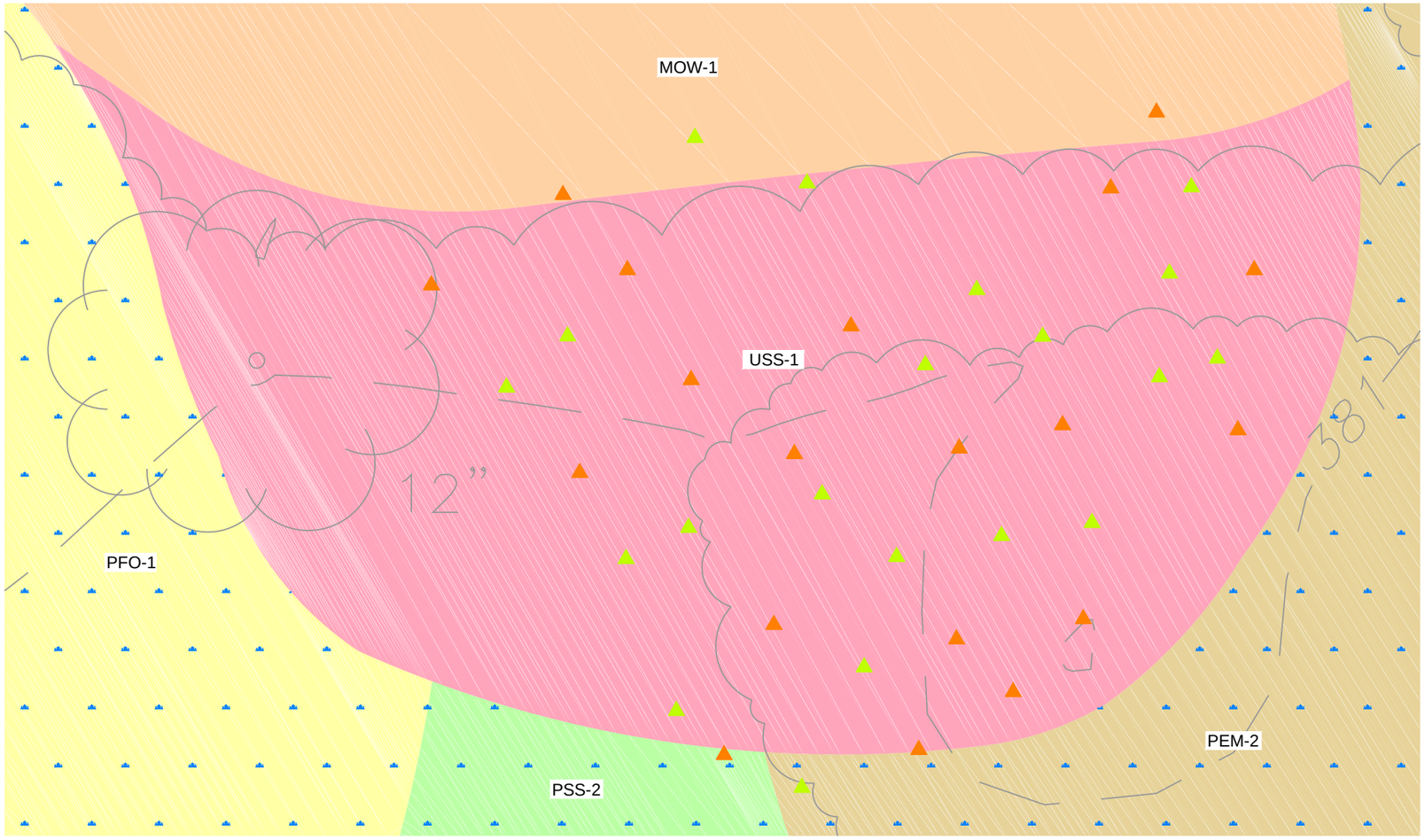

LEGEND

PSS	PALUSTRINE SHRUB / SCRUB
PFO	PALUSTRINE FORESTED
PEM	PALUSTRINE EMERGENT
USS	SHRUB / SCRUB UPLAND
MOW	UPLAND MEADOW

SHRUBS

- GREY DOGWOOD
- NANNYBERRY

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.

2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0’ 10’ 20’

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR USS-1

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	9

Plotted By: bookasr
Layout–Sheet Name: PLANTING PLAN USS-1
Plot File Date Created: Feb/21/2017 11:35 AM

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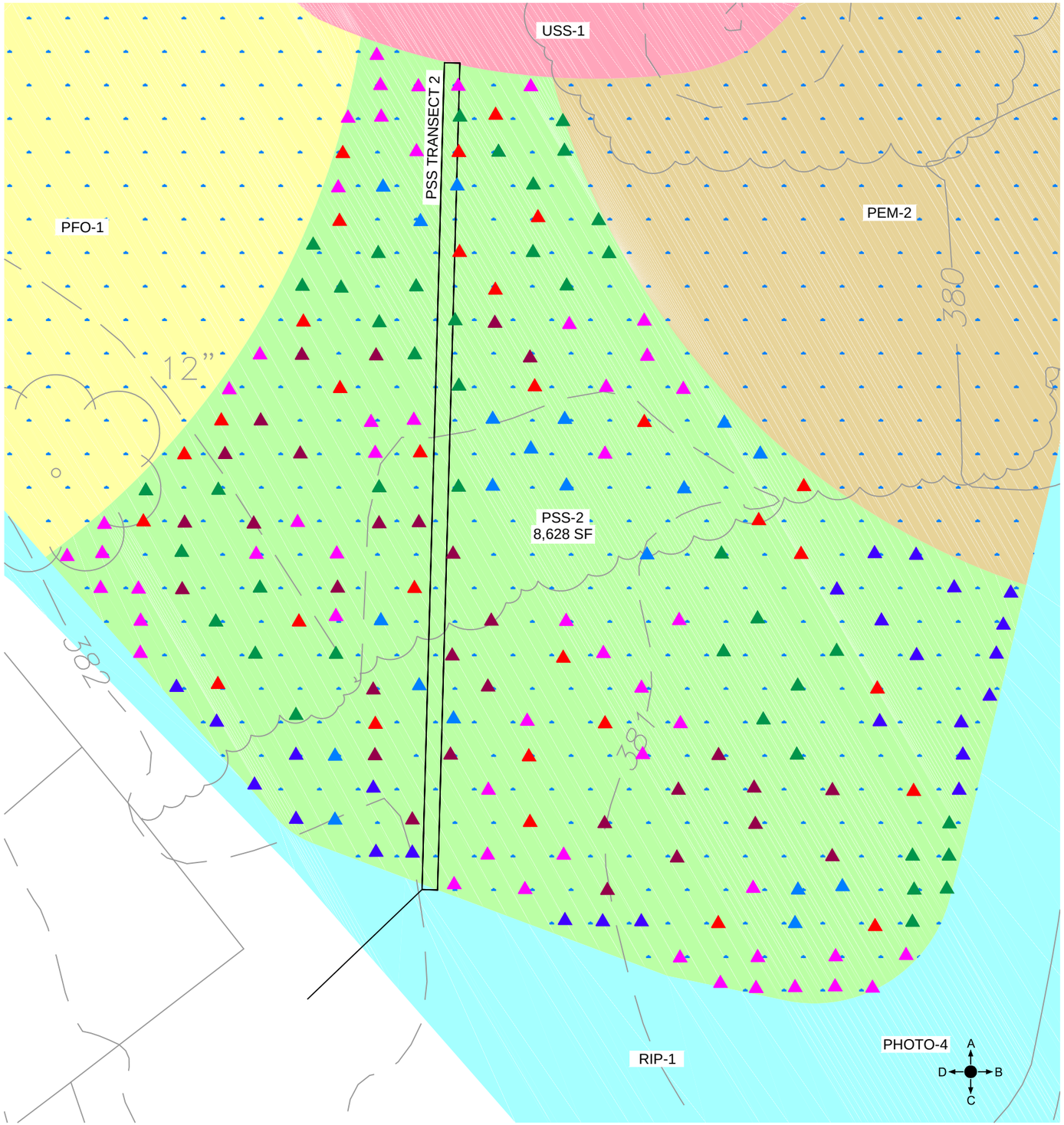

LEGEND

PHOTO-4 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)

PSS	PALUSTRINE SHRUB / SCRUB
PFO	PALUSTRINE FORESTED
PEM	PALUSTRINE EMERGENT
USS	SHRUB / SCRUB UPLAND
RIP	RIPARIAN (PSS / PFO)

SHRUBS

- ELDERBERRY
- PUSSY WILLOW
- RED CHOKEBERRY
- SANDBAR WILLOW
- SILKY DOGWOOD
- SPICE BUSH

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0' 15' 30'

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR PSS-2

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	10

Plotted By: bookasr
Layout-Sheet Name: PLANTING PLAN PSS-2
Plot File Date Created: Feb/21/2017 11:31 AM

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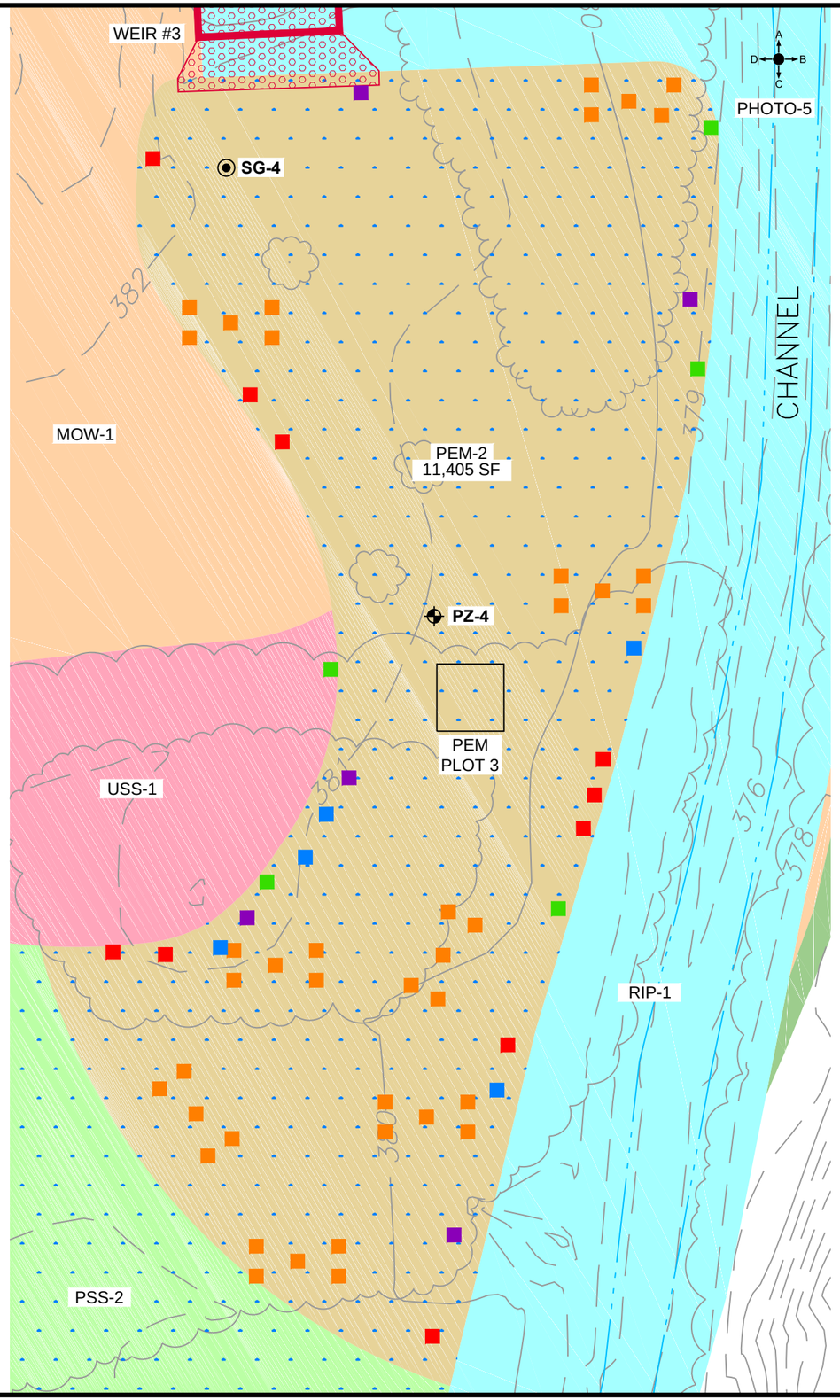

LEGEND

- PZ-4 — WETLAND PIEZOMETER LOCATION
- SG-4 — WETLAND MONITORING STAFF GAUGE
- PHOTO-5 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)
- PSS — PALUSTRINE SHRUB / SCRUB
- PEM — PALUSTRINE EMERGENT
- USS — SHRUB / SCRUB UPLAND
- MOW — UPLAND MEADOW
- RIP — RIPARIAN (PSS / PFO)

EMERGENTS

- BLUE FLAG IRIS
- BROADLEAF CATTAIL
- SENSITIVE FERN
- SOFTRUSH
- WOOLGRASS

NOTES

1. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0’ 10’ 20’ 40’

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR PEM-2

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	11

Plotted By: bookasr
Layout--Sheet Name: PLANTING PLAN PEM-2
Plot File Date Created: Feb/21/2017 11:30 AM

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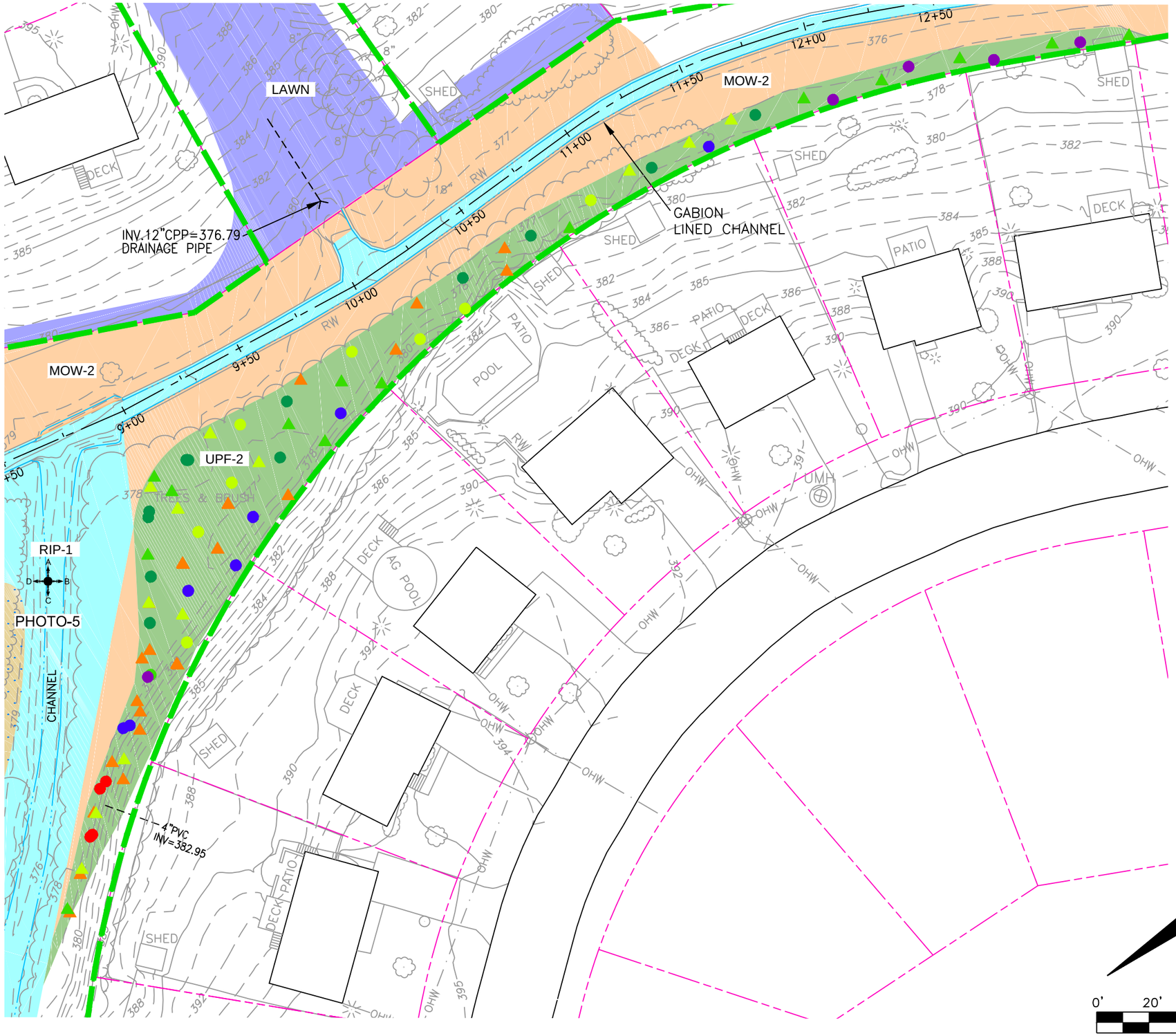

LEGEND

PHOTO-5 — WETLAND MONITORING PHOTOGRAPH LOCATION (MULTIPLE VIEWS)

- UPF — FORESTED UPLAND
- MOW — UPLAND MEADOW
- RIP — RIPARIAN (PSS / PFO)
- LAWN — LAWN

TREES

- BLACK CHERRY
- EASTERN HEMLOCK
- PIN OAK
- RED MAPLE
- SUGAR MAPLE
- WHITE PINE

SHRUBS

- GREY DOGWOOD
- NANNYBERRY
- NORTHERN ARROWWOOD

NOTES

1. EXCEPT FOR THE LOWEST AREAS OF THE WETLANDS, SHRUBS WERE PLANTED AND SURVEYED IN GROUPS OF THREE.
2. BASE FIGURE DETAILS INCLUDING CONTOURS, CONIFEROUS TREES, AND DECIDUOUS TREES ARE FROM *REVISED 2014 RESTORATION PLAN*.

0' 20' 40' 80'

AECOM

LOCKHEED MARTIN CORPORATION

POST REMEDIATION VEGETATION MONITORING PLAN
FINAL PLANTING LOCATIONS FOR UPF-2

WEST BRANCH OF BLOODY BROOK
ONONDAGA COUNTY, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE
2016 Planting Plan.dwg	RNB	60515902	2 / 2017	12

Plotted By: bookasr
Layout-Sheet Name: PLANTING PLAN UPF-2
Plot File Date Created: Feb/21/2017 11:34 AM

Filename: N:\MARKETING\PROPOSALS\LOCKHEED MARTIN - BLOODY BROOK\CAD\CIVIL 3D FILES\2016\2016 PLANTING PLAN.DWG

Attachment A

Proposed Seed Mixtures

PA New England Province Riparian Mix

ERNMX # ERNMX-253
Seeding Rate Approximately 20 lb per acre
Mix Type Wet Meadow & Wetland Sites

- 14% Little Bluestem, Fort Indiantown Gap-PA Ecotype (Schizachyrium scoparium, Fort Indiantown Gap-PA Ecotype)
- 14% Indiangrass, PA Ecotype (Sorghastrum nutans, PA Ecotype)
- 10% Riverbank Wildrye, PA Ecotype (Elymus riparius, PA Ecotype)
- 10% Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)
- 9% Deertongue, 'Tioga' (Panicum clandestinum (Dichanthelium c.), 'Tioga')
- 8% Big Bluestem, 'Niagara' (Andropogon gerardii, 'Niagara')
- 7% Fox Sedge, PA Ecotype (Carex vulpinoidea, PA Ecotype)
- 2% Switchgrass, 'Shelter' (Panicum virgatum, 'Shelter')
- 2% Boneset, PA Ecotype (Eupatorium perfoliatum, PA Ecotype)
- 2% Soft Rush (Juncus effusus)
- 2% Swamp Milkweed, PA Ecotype (Asclepias incarnata, PA Ecotype)
- 2% Autumn Bentgrass, PA Ecotype (Agrostis perennans, PA Ecotype)
- 2% Wild Senna, VA & WV Ecotype (Senna hebecarpa (Cassia h.), VA & WV Ecotype)
- 2% Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)
- 2% Blue Vervain, PA Ecotype (Verbena hastata, PA Ecotype)
- 2% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)
- 1% Wild Bergamot, PA Ecotype (Monarda fistulosa, PA Ecotype)
- 1% Redtop Panicgrass, PA Ecotype (Panicum rigidulum (P. stipitatum), PA Ecotype)
- 1% Joe Pye Weed, PA Ecotype (Eupatorium fistulosum, PA Ecotype)
- 1% Flat Topped White Aster, PA Ecotype (Aster umbellatus (Doellingeria umbellata), PA Ecotype)
- 1% Purplestem Aster, PA Ecotype (Aster puniceus (Symphyotrichum puniceum), PA Ecotype)
- 1% Zigzag Aster, PA Ecotype (Aster prenanthoides (Symphyotrichum p.), PA Ecotype)
- 1% New England Aster (Aster novae-angliae (Symphyotrichum n.))
- 1% New York Ironweed, PA Ecotype (Vernonia noveboracensis, PA Ecotype)
- 1% Many Leaved Bulrush, PA Ecotype (Scirpus polyphyllus, PA Ecotype)
- 1% Spotted Joe Pye Weed, PA Ecotype (Eupatorium maculatum (Eupatoriadelphus maculatus), PA Ecotype)

Total: 100%

Northeastern U.S. Roadside Native Mix

ERNMX # ERNMX-105
Seeding Rate Approximately 20 lb per acre, or 1/2 lb per 1,000 sq ft
Mix Type Upland & Meadow Sites

- 24% Big Bluestem, 'Prairie View'-IN Ecotype (Andropogon gerardii, 'Prairie View'-IN Ecotype)
- 20% Sideoats Grama, 'Butte' (Bouteloua curtipendula, 'Butte')
- 19% Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)
- 5% Broomsedge, MO Ecotype (Andropogon virginicus, MO Ecotype)
- 5% Blackeyed Susan, Coastal Plain NC Ecotype (Rudbeckia hirta, Coastal Plain NC Ecotype)
- 4% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)
- 4% Purple Coneflower (Echinacea purpurea)
- 3% Ohio Spiderwort, PA Ecotype (Tradescantia ohiensis, PA Ecotype)
- 2% Swamp Milkweed, PA Ecotype (Asclepias incarnata, PA Ecotype)
- 2% Wild Senna, VA & WV Ecotype (Senna hebecarpa (Cassia h.), VA & WV Ecotype)
- 2% Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)
- 2% Zigzag Aster, PA Ecotype (Aster prenanthoides (Symphyotrichum p.), PA Ecotype)
- 2% Blue False Indigo, Southern WV Ecotype (Baptisia australis, Southern WV Ecotype)
- 2% Flat Topped White Aster, PA Ecotype (Aster umbellatus (Doellingeria umbellata), PA Ecotype)
- 1% Wild Bergamot, PA Ecotype (Monarda fistulosa, PA Ecotype)
- 1% Early Goldenrod, PA Ecotype (Solidago juncea, PA Ecotype)
- 1% New England Aster, PA Ecotype (Aster novae-angliae (Symphyotrichum n.), PA Ecotype)
- 1% Marsh (Dense) Blazing Star (Spiked Gayfeather), PA Ecotype (Liatris spicata, PA Ecotype)

Total: 100%

Partially Shaded Area Roadside Mix

ERNMX # ERNMX-140

Seeding Rate Approximately 20 lb per acre, or 1/2 lb per 1,000 sq ft

Mix Type Woodland Openings, Partially Shaded Sites & Shrubby Sites Associated with Bioengineering

- 20% Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)
- 17% Creeping Red Fescue (Festuca rubra)
- 17% Deertongue, 'Tioga' (Panicum clandestinum (Dichanthelium c.), 'Tioga')
- 10% Autumn Bentgrass, Albany Pine Bush-NY Ecotype (Agrostis perennans, Albany Pine Bush-NY Ecotype)
- 6% Tall White Beardtongue (Penstemon digitalis)
- 5% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)
- 4% Purple Coneflower (Echinacea purpurea)
- 4% Zigzag Aster, PA Ecotype (Aster prenanthoides (Symphyotrichum p.), PA Ecotype)
- 4% Blackeyed Susan, Coastal Plain NC Ecotype (Rudbeckia hirta, Coastal Plain NC Ecotype)
- 3% Marsh (Dense) Blazing Star (Spiked Gayfeather), PA Ecotype (Liatris spicata, PA Ecotype)
- 3% Ohio Spiderwort, PA Ecotype (Tradescantia ohiensis, PA Ecotype)
- 2% Thimbleweed, PA Ecotype (Anemone virginiana, PA Ecotype)
- 2% Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)
- 1% Blue False Indigo, Southern WV Ecotype (Baptisia australis, Southern WV Ecotype)
- 1% Wild Bergamot, PA Ecotype (Monarda fistulosa, PA Ecotype)
- 1% Slender Bushclover, VA Ecotype (Lespedeza virginica, VA Ecotype)

Total: 100%

PA New England Province FACW Mix

ERNMX # ERNMX-251

Seeding Rate Approximately 20 lb per acre

Mix Type Wet Meadow & Wetland Sites

- 24% Fox Sedge, PA Ecotype (Carex vulpinoidea, PA Ecotype)
- 20% Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)
- 10% Lurid (Shallow) Sedge, PA Ecotype (Carex lurida, PA Ecotype)
- 5% Hop Sedge, PA Ecotype (Carex lupulina, PA Ecotype)
- 4% Blue Vervain, PA Ecotype (Verbena hastata, PA Ecotype)
- 3% Green Bulrush, PA Ecotype (Scirpus atrovirens, PA Ecotype)
- 3% Soft Rush (Juncus effusus)
- 2% Swamp Milkweed, PA Ecotype (Asclepias incarnata, PA Ecotype)
- 2% Wood Reedgrass, PA Ecotype (Cinna arundinacea, PA Ecotype)
- 2% Boneset, PA Ecotype (Eupatorium perfoliatum, PA Ecotype)
- 2% Cosmos (Bristly) Sedge, PA Ecotype (Carex comosa, PA Ecotype)
- 2% Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)
- 2% Redtop Panicgrass, PA Ecotype (Panicum rigidulum (P. stipitatum), PA Ecotype)
- 2% Sensitive Fern (Onoclea sensibilis)
- 1% Joe Pye Weed, PA Ecotype (Eupatorium fistulosum, PA Ecotype)
- 1% Pennsylvania Smartweed, PA Ecotype (Polygonum pensylvanicum, PA Ecotype)
- 1% Spotted Joe Pye Weed, PA Ecotype (Eupatorium maculatum (Eupatoriadelphus maculatus), PA Ecotype)
- 1% Northern Long Sedge, PA Ecotype (Carex folliculata, PA Ecotype)
- 1% Slender Mountainmint (Pycnanthemum tenuifolium)
- 1% Flat Topped White Aster, PA Ecotype (Aster umbellatus (Doellingeria umbellata), PA Ecotype)
- 1% Bladder (Star) Sedge, PA Ecotype (Carex intumescens, PA Ecotype)
- 1% Rattlesnake Grass, PA Ecotype (Glyceria canadensis, PA Ecotype)
- 1% Many Leaved Bulrush, PA Ecotype (Scirpus polyphyllus, PA Ecotype)
- 1% Great Blue Lobelia, PA Ecotype (Lobelia siphilitica, PA Ecotype)
- 1% New York Ironweed, PA Ecotype (Vernonia noveboracensis, PA Ecotype)
- 1% Narrowleaf Blue Eyed Grass (Sisyrinchium angustifolium)
- 1% Brown Bulrush, PA Ecotype (Scirpus pendulus, PA Ecotype)
- 1% New England Aster (Aster novae-angliae (Symphyotrichum n.))
- 1% Zigzag Aster, PA Ecotype (Aster prenanthoides (Symphyotrichum p.), PA Ecotype)
- 1% Purplestem Aster, PA Ecotype (Aster puniceus (Symphyotrichum puniceum), PA Ecotype)
- 1% Square Stemmed Monkeyflower, PA Ecotype (Mimulus ringens, PA Ecotype)

Total: 100%

Attachment B

Vegetation Field Monitoring Forms for Habitat Areas

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: RIP-1

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Tree	*Acer rubrum*	Red maple	See Notes 1 and 2	30		
Tree	*Acer saccharum*	Sugar maple	See Notes 1 and 2	16		
Tree	*Fagus grandifolia*	American beech	See Notes 1 and 2	7		
Tree	*Quercus palustris*	Pin oak	See Notes 1 and 2	13		
Tree	*Tsuga canadensis*	Eastern hemlock	See Notes 1 and 2	19		
Tree	*Prunus serotina*	Black cherry	See Notes 1 and 2	12		
Tree	*Pinus strobus*	White pine	See Notes 1 and 2	7		
Total # Trees				**104**		
Shrub	*Viburnum dentatum*	Northern arrowwood	170	252		
Shrub	*Viburnum lentago*	Nannyberry	170	153		
Shrub	*Cornus racemosa*	Grey dogwood	175	144		
Total # Shrubs			**515**	**549**		

Notes:

1. Per the November 12, 2014 NYSDEC approved field change, the total number of trees planted was reduced (see Section 2.4). A total of 270 trees was the final approved number to be planted, with no particular habitat area having a definitive approved quantity.

2. Percent survival will be based on 270 trees for all areas. If the total number of surviving trees is less than 80% of 270 trees (i.e., 216 trees), the monitoring results for all areas will be evaluated to determine the most beneficial area to plant additional trees. A recommendation will be provided in the monitoring summary report, as needed.

3. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.

4. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: PSS-1

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Shrub	*Cornus amomum*	Silky dogwood	20	19		
Shrub	*Cephalanthus occidentalis*	Buttonbush	15	15		
Shrub	*Sambucus canadensis*	Elderberry	15	16		
Shrub	*Alnus incana*	Speckled alder	20	20		
Shrub	*Aronia arbutifolia*	Red chokeberry	10	10		
Total # Shrubs			**80**	**80**		

Notes:

1. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.
2. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: UPF-1

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Tree	*Acer saccharum*	Sugar maple	See Note 1 and 2	13		
Tree	*Fagus grandifolia*	American beech	See Note 1 and 2	7		
Tree	*Prunus serotina*	Black cherry	See Note 1 and 2	8		
Tree	*Pinus strobus*	White pine	See Note 1 and 2	3		
Tree	*Quercus palustris*	Pin oak	See Note 1 and 2	1		
Tree	*Tsuga canadensis*	Eastern hemlock	See Note 1 and 2	10		
Total # Trees				**42**		
Shrub	*Viburnum dentatum*	Northern arrowwood	40	30		
Shrub	*Viburnum lentago*	Nannyberry	40	30		
Shrub	*Cornus racemosa*	Grey dogwood	30	30		
Total # Shrubs			**110**	**90**		

Notes:

1. Per the November 12, 2014 NYSDEC approved field change, the total number of trees planted was reduced (see Section 2.4). A total of 270 trees was the final approved number to be planted, with no particular habitat area having a definitive approved quantity.

2. Percent survival will be based on 270 trees for all areas. If the total number of surviving trees is less than 80% of 270 trees (i.e., 216 trees), the monitoring results for all areas will be evaluated to determine the most beneficial area to plant additional trees. A recommendation will be provided in the monitoring summary report, as needed.

3. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.

4. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: PFO-1

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Tree	*Acer rubrum*	Red maple	See Note 1 and 2	24		
Tree	*Quercus palustris*	Pin oak	See Note 1 and 2	24		
Tree	*Salix niger*	Black willow	See Note 1 and 2	18		
Tree	*Betula nigra*	River birch	See Note 1 and 2	13		
Tree	*Quercus bicolor*	Swamp white oak	See Note 1 and 2	5		
Total # Trees				**84**		
Shrub	*Cornus amomum*	Silky dogwood	108	104		
Shrub	*Alnus incana*	Speckled alder	45	47		
Shrub	*Sambucus canadensis*	Elderberry	57	57		
Shrub	*Cephalanthus occidentalis*	Buttonbush	NA	1		
Total # Shrubs			**210**	**209**		

Notes:

1. Per the November 12, 2014 NYSDEC approved field change, the total number of trees planted was reduced (see Section 2.4). A total of 270 trees was the final approved number to be planted, with no particular habitat area having a definitive approved quantity.

2. Percent survival will be based on 270 trees for all areas. If the total number of surviving trees is less than 80% of 270 trees (i.e., 216 trees), the monitoring results for all areas will be evaluated to determine the most beneficial area to plant additional trees. A recommendation will be provided in the monitoring summary report, as needed.

3. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.

4. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: USS-1

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Shrub	*Cornus racemosa*	Grey dogwood	35	19		
Shrub	*Viburnum lentago*	Nannyberry	40	20		
Total # Shrubs			**75**	**39**		

Notes:

1. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.
2. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: PSS-2

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Shrub	*Cornus amomum*	Silky dogwood	52	53		
Shrub	*Salix exigua*	Sandbar willow	25	25		
Shrub	*Salix discolor*	Pussy willow	40	41		
Shrub	*Sambucus canadensis*	Elderberry	30	30		
Shrub	*Lindera benzoin*	Spice bush	30	30		
Shrub	*Aronia arbutifolia*	Red chokeberry	20	20		
Total # Shrubs			**197**	**199**		

Notes:

1. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.
2. Surveyed planting locations are provided on Figures 4 through 12.

Post-Remediation Vegetation Monitoring
West Branch of Bloody Brook - (WBBB)
Onondaga, New York

Habitat Area: UPF-2

Date:

Weather: **Inspector(s):**

Planting Type	Species	Common Name	Number Proposed	Number Planted	Number Survived	Comments/Notes
Tree	*Acer saccharum*	Sugar maple	See Note 1 and 2	5		
Tree	*Fagus grandifolia*	American beech	See Note 1 and 2	0		
Tree	*Prunus serotina*	Black cherry	See Note 1 and 2	4		
Tree	*Pinus strobus*	White pine	See Note 1 and 2	7		
Tree	*Tsuga canadensis*	Eastern hemlock	See Note 1 and 2	8		
Total # Trees				**24**		
Shrub	*Viburnum dentatum*	Northern arrowwood	40	42		
Shrub	*Cornus racemosa*	Grey dogwood	40	60		
Shrub	*Viburnum lentago*	Nannyberry	25	36		
Total # Shrubs			**105**	**138**		

Notes:

1. Per the November 12, 2014 NYSDEC approved field change, the total number of trees planted was reduced (see Section 2.4). A total of 270 trees was the final approved number to be planted, with no particular habitat area having a definitive approved quantity.

2. Percent survival will be based on 270 trees for all areas. If the total number of surviving trees is less than 80% of 270 trees (i.e., 216 trees), the monitoring results for all areas will be evaluated to determine the most beneficial area to plant additional trees. A recommendation will be provided in the monitoring summary report, as needed.

3. Percent survival for shrubs will be based on the total number of shrubs proposed in each area. Any additional shrubs planted will not be counted in the total number planted when determining the survival rate.

4. Surveyed planting locations are provided on Figures 4 through 12.