ALTERNATIVE ENVIRONMENTALLY SENSITIVE AREA REPORT (AESA# 22-0004)

Curve Development; CO/ Bear Land Consultants
Barrel Strap Residential Project Site

September 2023

For compliance with:

City of Denton Environmentally Sensitive Areas Assessment
(AESA# 22-0004)

Prepared by:

Integrated Environmental Solutions, LLC
301 W. Eldorado Parkway, Ste. 101
McKinney, Texas 75069

Prepared for:

Curve Development; C/O Bear Land Consultants
208 S Johnson Street; Suite 101
McKinney, Texas, 75069

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INTRODUCTION AND AUTHORITY/ PURPOSE AND NEED FOR ACTION

Integrated Environmental Solutions, LLC (IES) was retained by Curve Development; C/O Bear Land Consultants for environmental services for the Barrel Strap Residential project site. This Alternative Environmentally Sensitive Area (AESA) Report is being submitted to the City of Denton under the Denton Development Code (DDC) Section 2.8.4 to request approval for impacts to Environmentally Sensitive Areas (ESA). This AESA Report proposes mitigation measures for multiple impact areas required to construct roadways, lots, and associated infrastructure for the proposed residential development.

DESCRIPTION OF OVERALL DEVELOPMENT

The proposed Barrel Strap Residential project site is approximately 14.4 acres in size located at the southwestern corner of Hickory Creek Road and Barrel Strap Road in the City of Denton, Denton County, Texas (**Appendix A - Figure 1**).

The proposed development will consist of a 50-lot residential development and all associated infrastructure including sidewalks, interior roads, necessary utilities, and sewer lines. The development impact area is approximately 13 acres. The current zoning for the tract is Residential (R7), which allows for the proposed development.

EXISTING SITE DESCRIPTION

The project site was characterized as a fallow agricultural property currently used for oil and gas production. Recent aerial photography also indicates that the eastern portion was utilized for construction activities resulting in a large surface disturbance and residual gravel areas. Much of the project site was dominated by grasses and forbs such as Bermudagrass (*Cynodon dactylon*), Johnsongrass (*Sorghum halepense*), King Ranch bluestem (*Bothriochloa ischaemum*), prairie three-awn (*Aristida oligantha*), silver bluestem (*Bothriochloa saccharoides*), white heath aster (*Aster ericoides*), common ragweed (*Ambrosia augustifolia*), Canada goldenrod (*Salidago canadensis*), and prairie broomweed (*Xanthocephalum dracunculoides*). Honey mesquite (*Prosopis glandulosa*) and eastern redcedar (*Juniperus virginiana*) were observed sporadically throughout the grassland areas. Two forested areas were observed, one hilltop in the west and one forested riparian corridor in the central region. Both areas were dominated by post oak (*Quercus stellata*) with sugarberry (*Celtis laevigata*), common greenbrier (*Smilax bona-nox*), eastern redcedar, Chinese privet (*Ligustrum sinense*), and poison ivy (*Toxicodendron radicans*) observed in the understory. IES Environmental staff conducted a site visit on 08 November 2021 to confirm ESAs mapped by the City of Denton. Prior to the site visit, IES reviewed the previously mapped and assessed ESAs as depicted on the Official ESA Map of the City of Denton Online Map Viewer. The ESAs, as depicted on the Online Map Viewer, are shown on **Appendix A**, **Figure 2**. ESAs associated with an assessment completed in 2022 were depicted as follows:

> ESA22-0027: The assessment reviewed the status of a section of an unnamed tributary to Bryant Creek bisecting the central region of the project site. The assessment confirmed the 50-foot Riparian Buffer ESA surrounding the drainage as well as the Undeveloped Floodplain ESA surrounding the tributary. The assessment removed the Cross Timbers Upland Habitat on the western side of the property as it did not meet the 10-acre contiguous canopy cover requirement.
>
> Additionally, it was determined that the development in the region extending south of the southern west-to-east boundary was initiated prior to the adoption of the ESA regulations. Therefore, the region to the south is not subject to the ESA protection requirements.

During the site visit, an intermittent stream was identified within the project site, entering via a culvert under Hickory Creek Road and exiting to the south. A 50-foot Riparian Buffer ESA and Floodplain ESA were identified along the stream. The stream previously extended north of the boundary but was channelized and culverted for the construction of Hickory Creek Road. No previous environmental or flood studies were completed with the installation of the Public Infrastructure and were therefore not available for reference in this document. The

onsite stream, and ESAs identified during the site visit are shown in **Appendix A, Figure 3**. The habitat within the ESA is as follows:

Streams

An intermittent stream meanders through the central region of the ESA before exiting the site to the south. The intermittent stream was, on average, 5-feet wide and incised 6 inches to 18 inches. Overall, the stream was in *Good* condition based on the Rapid Stream Assessment Technique (RSAT) performed during the ESA assessment.

Riparian Buffer ESA

The 50-foot Riparian Buffer was identified along the intermittent stream meandering through the central region. Riparian Buffer ESAs to the north, southwest, and southeast of the unassessed ESA were removed through ESA assessments completed in 2016 (ESA15-0006). The Riparian Buffer was dominated by post oak with sugarberry, common greenbrier, eastern redcedar, Chinese privet, and poison ivy observed in the understory. **Table 1** below summarizes the trees measured and identified within the Riparian Buffer and Undeveloped Floodplain ESA. A full tree inventory completed in November 2021 is included as **Appendix B**. Trees were recorded on a Trimble GeoExplorer XT Global Positioning System (GPS) unit capable of sub-meter accuracy.

Table 1. Summary of Trees Identified Within the Riparian Buffer and Undeveloped Floodplain ESA Area.

Tree Species	No. Healthy Trees (total caliper inches)	No. Declining/ Hazard Trees (total caliper inches)
Post oak	137 (1,993.2)	4 (40.5)
Cedar elm	91 (780)	---
Blackjack oak	17 (212.7)	1 (11.5)
Eastern red cedar	7 (57.7)	1 (6.8)
Mexican plum	---	1 (6)
Total Trees	252 (3,043.6)	7 (64.8)

Undeveloped Floodplain ESA

Undeveloped Floodplain ESA was mapped around the stream channel and associated buffer. The ESA is associated with Federal Emergency Management Agency (FEMA) 100-year floodplain Zone A. **Table 1** above summarizes the trees measured and tagged within the Undeveloped Floodplain and Riparian Buffer ESA.

PURPOSE OF AESA

The purpose of this AESA is to propose mitigation for the impacts to the Riparian Buffer and Undeveloped Floodplain ESAs as a result of the proposed residential development construction. The proposed project would involve constructing roads, sidewalks, lot walls, and sewer lines within the limits of the Riparian Buffer and Undeveloped Floodplain ESAs. The existing median opening on Hickory Creek was placed over the northern section of the intermittent stream due to engineering and transportation requirements, resulting in impacts to the ESA that cannot be avoided. Grading required for the construction would be limited to the minimum necessary for the roads, sidewalks, lots, and associated utilities totaling approximately 0.660 acre (39 percent of 1.688-acre total) within the Riparian Buffer ESA and 0.250 acre (31 percent of 0.796-acre total) within the Undeveloped Floodplain ESA. **Appendix A**, **Figure 4** shows the proposed impacts to the ESA.

Engineering constraints and modifications resulting in limited impacts to the ESA include:

Site Access

Barrel Strap Road is a TxDOT operated facility with a posted speed limit of 45 mph. Per Table 2.2 of the TxDOT Access Management Manual, any proposed entrance to Barrel Strap Road would require a spacing of 360 linear feet (LF) from both of the intersections at Hickory Creek Road and Ocean Drive. With a total frontage of

approximately 690 LF, the frontage along Barrel Strap Road does not meet the minimum intersection spacing to warrant an entrance.

Hickory Creek Road east bound lanes were constructed in front of the project site in 2020. The sole median break to the site was constructed over the creek that extended the culvert into the project site. This median break provides the natural north access point for the site as it provides access from both the east and west on Hickory Creek Road. However, as it lines up with the creek, the ESA would be impacted by the access road.

The Nautical Lane entrance must be located a minimum of 400 LF from the Hickory Creek Road intersection and 200 LF from the Ocean Drive intersection. These minimum distances dictate the 95 LF available along Nautical Lane for the second subdivision access point.

Interior Design Layout

The following design constraints were considered in the project design:

- Lot sizes within the development must be a minimum of 50 LF wide and 80 LF deep.
- Residential street intersection spacing cannot be closer than 200 LF apart.
- Residential streets cannot exceed 600 LF without looped access for emergency vehicles.
- Per Table 1.4.6.1 of the Denton Transportation Criteria Manual, a 100 LF minimum distance is required prior to the first intersection for entrances to subdivisions off of an arterial where lots back up to the arterial.

On the east side of the project a looped street network was utilized to avoid a second right-of-way crossing through the ESA.

A variance was requested to extend the 600 LF limit of the cul-de-sac with an emergency access road for connectivity. Another variance was requested to reduce the eastern residential roadway ROW along the ESA to 43.5 LF with a 25 LF pavement section and a 6 LF sidewalk on the ESA side. These designs would reduce the impact to the ESA but were denied by staff.

To comply with the 200 LF intersection limitation, the looped road must line up with the Hickory Creek Road entrance. The four-way intersection at this location is within the northern portion of the ESA, increasing the impact.

Walls were strategically placed throughout the project to minimize the removal of trees and impacts to the ESA. Given the design and environmental constraints, the project design only impacts 0.660 acre of Riparian Buffer ESA and 0.250 acre of Undeveloped Floodplain ESA. Through the strategic placement of walls and removal of one lot that had a high density of trees, the project layout results in 55% tree preservation, which includes all trees in the ESA.

NOTIFICATION AND REVIEW

This AESA Report explains the mitigation measures for impacts to the ESA that will be provided to the City of Denton for formal notification of the activity and review of the proposed restoration activity.

AFFECTED ENVIRONMENT AND SUMMARY OF IMPACTS

Appendix A, Figure 5 shows the observed Riparian Buffer and Undeveloped Floodplain associated with the stream channel through the central region. The total Riparian Buffer ESA covers 1.688 acres, and the Undeveloped Floodplain ESA covers 0.796 acre within the property boundary.

The project is proposing to construct roads, sidewalks, lot walls, and a sewer line within the on-site Riparian Buffer and Undeveloped Floodplain ESAs. All vegetation within the impact area will be permanently removed during the initial construction; however, the impacts will be limited to the extent necessary to fulfill the needs of the residential development. The proposed impacts from the construction of the roads, sidewalks, lot walls and associated infrastructure are limited to 0.660 acre in the Riparian Buffer ESA and 0.250 acre in the Undeveloped Floodplain ESA. The total impacts and site plan are shown on **Appendix A, Figure 5**.

Based on the tree inventory completed in November 2021 by IES, tree species within the impact area include blackjack oak (*Quercus marilandica*), cedar elm, eastern red cedar, Mexican plum (*Prunus mexicana*), and post oak. The understory within the riparian buffer was overgrown with Chinese privet. Herbaceous cover was limited, but when present, it consisted of scatted Virginia wildrye and coralberry near the drainage. The trees to be removed are described in **Table 2**. The proposed trees to be removed within the ESA total 1,030.3-caliper inches from 77 trees, which were all identified as healthy. The 77 healthy trees make up approximately 31 percent of the total healthy trees within the on-site ESA.

Table 2. Identified Trees Within the Proposed ESA Impact Area.

ID #	DBH (caliper inches)	Common Name	Scientific Name	Condition	Multi-Trunk
1026	12.6	post oak	*Quercus stellata*	Healthy	No
1034	8.7	cedar elm	*Ulmus crassifolia*	Healthy	No
1036	19.2	post oak	*Quercus stellata*	Healthy	No
1058	7.4	cedar elm	*Ulmus crassifolia*	Healthy	No
1059	9.3	cedar elm	*Ulmus crassifolia*	Healthy	No
1107	16	cedar elm	*Ulmus crassifolia*	Healthy	No
1108	24.2	post oak	*Quercus stellata*	Healthy	No
1113	13.8	blackjack oak	*Quercus marilandica*	Healthy	No
1114	10.6	blackjack oak	*Quercus marilandica*	Healthy	No
1115	7.7	blackjack oak	*Quercus marilandica*	Healthy	No
1116	10.9	post oak	*Quercus stellata*	Healthy	No
1117	7.6	eastern red cedar	*Juniperus virginiana*	Healthy	No
1118	20.7	post oak	*Quercus stellata*	Healthy	No
1119	16.5	post oak	*Quercus stellata*	Healthy	No
1120	23	post oak	*Quercus stellata*	Healthy	No
1121	12.5	post oak	*Quercus stellata*	Healthy	No
1122	8.7	cedar elm	*Ulmus crassifolia*	Healthy	No
1123	7	cedar elm	*Ulmus crassifolia*	Healthy	No
1124	21.1	post oak	*Quercus stellata*	Healthy	No
1125	8.8	cedar elm	*Ulmus crassifolia*	Healthy	No
1126	8.5	cedar elm	*Ulmus crassifolia*	Healthy	No
1127	6.2	post oak	*Quercus stellata*	Healthy	No
1128	15.7	post oak	*Quercus stellata*	Healthy	No
1129	12.4	post oak	*Quercus stellata*	Healthy	No
1135	29.4	post oak	*Quercus stellata*	Healthy	No
1136	13	eastern red cedar	*Juniperus virginiana*	Healthy	No
1137	11.1	cedar elm	*Ulmus crassifolia*	Healthy	No
1138	11.3	cedar elm	*Ulmus crassifolia*	Healthy	No
1153	8.9	cedar elm	*Ulmus crassifolia*	Healthy	No
1154	8.3	cedar elm	*Ulmus crassifolia*	Healthy	No
1155	23.1	post oak	*Quercus stellata*	Healthy	No
1156	10	cedar elm	*Ulmus crassifolia*	Healthy	No
1157	6.2	cedar elm	*Ulmus crassifolia*	Healthy	No
1158	6	cedar elm	*Ulmus crassifolia*	Healthy	No
1159	25.6	post oak	*Quercus stellata*	Healthy	No
1160	27.6	post oak	*Quercus stellata*	Healthy	No
1161	12.3	post oak	*Quercus stellata*	Healthy	No
1177	7.9	post oak	*Quercus stellata*	Healthy	No
1178	20.6	post oak	*Quercus stellata*	Healthy	No
1179	25.5	post oak	*Quercus stellata*	Healthy	No
1180	7.6	cedar elm	*Ulmus crassifolia*	Healthy	No
1181	6.2	cedar elm	*Ulmus crassifolia*	Healthy	No
1183	17.7	post oak	*Quercus stellata*	Healthy	No
1184	13	post oak	*Quercus stellata*	Healthy	No
1189	13	blackjack oak	*Quercus marilandica*	Healthy	No
1190	14	post oak	*Quercus stellata*	Healthy	No
1191	9.9	post oak	*Quercus stellata*	Healthy	No
1192	17.4	post oak	*Quercus stellata*	Healthy	No
1193	10	post oak	*Quercus stellata*	Healthy	No
1194	15.4	post oak	*Quercus stellata*	Healthy	No
1195	12.4	post oak	*Quercus stellata*	Healthy	No
1196	10.9	cedar elm	*Ulmus crassifolia*	Healthy	No
1197	7.3	eastern red cedar	*Juniperus virginiana*	Healthy	No
1198	16	post oak	*Quercus stellata*	Healthy	No
1199	9.8	eastern red cedar	*Juniperus virginiana*	Healthy	No
1200	15.6	post oak	*Quercus stellata*	Healthy	No

ID #	DBH (caliper inches)	Common Name	Scientific Name	Condition	Multi-Trunk
1201	22.1	post oak	*Quercus stellata*	Healthy	No
1202	8.5	cedar elm	*Ulmus crassifolia*	Healthy	No
1203	6	cedar elm	*Ulmus crassifolia*	Healthy	No
1204	8.4	cedar elm	*Ulmus crassifolia*	Healthy	No
1205	6.5	post oak	*Quercus stellata*	Healthy	No
1206	8.9	cedar elm	*Ulmus crassifolia*	Healthy	No
1207	13.8	blackjack oak	*Quercus marilandica*	Healthy	No
1208	8.2	cedar elm	*Ulmus crassifolia*	Healthy	No
1209	17	post oak	*Quercus stellata*	Healthy	No
1210	14.5	post oak	*Quercus stellata*	Healthy	No
1211	12.9	post oak	*Quercus stellata*	Healthy	No
1212	7.8	post oak	*Quercus stellata*	Healthy	No
1213	24.3	post oak	*Quercus stellata*	Healthy	No
1214	15.6	post oak	*Quercus stellata*	Healthy	No
1215	13.4	post oak	*Quercus stellata*	Healthy	No
1216	10.3	cedar elm	*Ulmus crassifolia*	Healthy	No
1217	13.7	blackjack oak	*Quercus marilandica*	Healthy	No
1246	33.6	post oak	*Quercus stellata*	Healthy	No
1247	9.8	cedar elm	*Ulmus crassifolia*	Healthy	No
1248	7.9	cedar elm	*Ulmus crassifolia*	Healthy	No
1347	15	post oak	*Quercus stellata*	Healthy	No
Total	1,030.3				

MITIGATION ACTIVITIES

The impact to the Riparian Buffer and Undeveloped Floodplain ESA shown in **Appendix A**, **Figure 5** is primarily limited to the northern reach where impacts are required to construct necessary roadways for the residential development. A minimum of 100 LF spacing from Hickory Creek Road was required for the interior subdivision road, restricting practical modifications to the site plan. Relatively small, additional impacts are necessary in the southern region to construct lot walls, a sewer line, and a stormwater outfall. Vegetation will be removed during the initial grading for the development. The walls will be constructed entirely within the DIA with no construction traffic or clearing occurring on the mitigation area side of the walls. A pre-construction meeting will be held to notify contractors of ESA mitigation area limits and a visual barrier such as a temporary chain link fence will be installed to ensure construction remains within the DIA boundary. A special conditions narrative clarifying the construction methodology and preservation of trees near retaining walls, rip rap, and grading has been included in **Appendix D**. No additional adverse impacts to the southernmost portion of the stream or the remainder of the ESAs are expected from the construction.

Following the residential development construction, a contractor will be instructed by Curve Development; C/O Bear Land Consultants to remove invasive, understory Chinese privet growth from the unimpacted ESA portions as well as non-graded areas surrounding the ESAs. Following the Chinese privet management, the remaining ESAs will be seeded with native grasses and a diverse range of native saplings and shrubs will be planted to increase species richness within the oak-dominated grove. Once the Chinese privet has been removed and the area has been revegetated, the resulting AESA will provide additional native habitat while also aiding in stormwater management for the residential development. In addition, all appropriate best management practices (BMPs) will be in place as required by the General Construction Permit and site-specific Stormwater Pollution Prevention Plan, which may include the installation of silt fencing or a rock check dam prior to construction activity discharges to the ESA.

PROPOSED IMPROVEMENT OF UNAFFECTED AREAS

A two-phase mitigation plan executed over a year-long period is proposed to effectively restore and improve the unimpacted area. A contractor, such as IES, will be contracted to complete the privet removal, plantings, and monitoring. In the first stage, the developer is proposing to mechanically remove Chinese privet, an invasive species, from the understory of the non-impacted ESA portions as well as from non-graded areas surrounding the ESA to help prevent the reintroduction of Chinese privet. The removal approach is a targeted mechanism to eliminate invasive species and will result in no ground disturbing activities that could harm overstory trees. The initial privet removal will occur the first winter after construction has commenced to reduce sprouting. Following

privet removal, as an erosion and sediment control measure and seeding strategy, the mitigation area will be hydromulched at 2,000 pounds per acre of wood fiber mulch with tackifier. **Figure 1** illustrates that invasive Chinese privet currently dominates the canopy understory within the ESA. Mechanical removal will consist of the use of a hydro-axe for most of the area, supplemented with hand clearing to remove Chinese privet immediately surrounding existing trees. The hydro-axe will remove the aboveground portion of the Chinese privet plant but does not remove the root system and sprouting will occur. The regrowth will be spot treated with triclopyr, a pesticide from the City's Integrated Pest Management list, the following spring at the recommended label rate. An additional spot treatment of seedlings will be conducted if necessary. Debris from the privet removal will be collected and disposed of outside of the mitigation area. The eradication of Chinese privet will open the understory and improve opportunities for diverse native species to thrive with limited invasive competition. A successful eradication will allow for no more than 5 percent of remaining Chinese privet understory cover prior to the mitigation area planting. Seedlings and regrowth will be monitored and removed seasonally within the mitigation area as needed to ensure Chinese privet remains eradicated. Once the Chinese privet has been successfully removed, a range of native saplings, shrubs, and herbaceous vegetation will be planted within the remaining portion of the on-site ESA to replace the removed caliper inches in the impacted area and increase diversity.

The ESA is currently dominated by oak trees, which provide cover and stability but lack diversity as well as age stratification. A diverse tree population is beneficial for sustaining a variety of wildlife, supporting ecosystem services, and facing stressors such as climate change, insect blight, disease, and pollutants. **Table 3** indicates that the oak grove has the most trees in the 7-to-10-inch DBH range, as opposed to a normal, healthy forest which generally has the greatest density at the smallest size class. Currently, as the forest ages and older trees fall, there are too few smaller trees to replace those that could be naturally lost. The ESA atypical stratification is likely a result of Chinese privet understory growth outcompeting young saplings for sunlight and nutrients. Planting a range of young saplings after Chinese privet removal will allow the mitigation area to have a healthy age stratification and ensure efficient ecological function in future years.

Table 3. Age Stratification and Density of Healthy Trees Identified in Mitigation Area During Inventory.

	Less than 7" DBH	7-10" DBH	11-17" DBH	18" and Greater DBH	Total
Quantity	20	82	62	18	182
Density (trees/acre)	19	78	59	17	173

The unimpacted Riparian Buffer ESA (approximately 1.028 acre) and Undeveloped Floodplain ESA (approximately 0.546 acre) areas encompass a combined total of 1.057 acre as a result of overlap and will be planted with native trees, shrubs, and grasses. The riparian corridor planting area will be planted with species that mimic the natural riparian woodlands of the East Cross Timbers ecosystem. Containerized (i.e., 5-gallon) trees will be planted in the ESA to achieve a final density of at least 230 live stems per acre. The mitigation area currently contains 173 healthy trees per acre that have a 6-inch DBH or greater. The planting effort will equate to no less than 71 individuals to reach a density of 230 live stems per acre to ensure canopy coverage while avoiding overcrowding. Trees removed within the ESA impact area will be included in the tree mitigation plan fund and will be replaced at a rate of 0.92 to 1. There will be no more than 30 percent of any single tree species planted within the mitigation area. Planting will occur during late fall to mid-winter following Chinese privet removal and planting of herbaceous ground cover. Trees may be overplanted (i.e., greater than 71 individuals) to help ensure the long-term survivability of the woody species within the mitigation area. Hardwood trees to be planted are listed in **Table 4**. No oak saplings will be planted because numerous mature oak trees are already present in the mitigation area and are likely to take seed once the understory of Chinese privet is removed.

Native shrubs will also be planted at a density of 230 live stems per acre and will be planted throughout the site based on requirements for sunlight, drainage, etc. Shrubs will be overplanted (no less than 243 individuals) to allow for expected mortality (**Table 5**).

Figure 1. The photographs illustrated above depict the understory of invasive Chinese Privet throughout the mitigation area.

Table 4. Number of Trees to be Planted in Mitigation Area.

Common Name	Scientific Name	# of Live Stems to be Planted
Pecan	*Carya illinoinensis*	19
Cedar elm	*Ulmus crassifolia*	17
American elm	*Ulmus americana*	17
Green ash	*Fraxinus pennsylvanica*	18

Table 5. Number of Shrubs to be Planted in Mitigation Area.

Common Name	Scientific Name	# of Live Stems to be Planted
Coralberry	*Symphoricarpos orbiculatus*	48
Possumhaw holly	*Ilex decidua*	48
Rough leaf dogwood	*Cornus drummondii*	37
Mexican Plum	*Prunus mexicana*	37
Buttonbush	*Cephalanthus occidentalis*	37
Little leaf sumac	*Rhus microphylla*	36

A seed mixture will be seeded throughout the unimpacted ESA portion once the understory has been cleared of Chinese privet to provide a protective ground cover and functional understory strata. The seed mix is intended to aid in rebuilding the stream bank buffer zone. The seed mix will include native species such as Virginia wildrye (*Elymus virginicus*), Canada wildrye (*Elymus canadensis*), inland sea oats (*Chasmanthium latifolium*), and purpletop tridens (*Tridens flavus*). The native seed mix will contain a minimum of 30 percent Virginia wildrye, 15 percent Canada wildrye, 20 percent inland sea oats, and 15 percent purpletop tridens. The proposed seeding goal is to develop an AESA with a quality, diverse, functioning habitat that will not need additional maintenance beyond the initial seeding.

The seed mix will be sown at the recommended amount of 9 pounds per acre in the spring following the Chinese privet management. As the mitigation area is within a riparian buffer that is predominantly an oak grove, shade tolerant species have been selected for planting. The initial seeding will be implemented in conjunction with the hydromulching and involves applying a mixture of water, wood fiber mulch, soil stabilizer, and seed to prevent erosion and provide an optimal environment conducive to plant growth. Areas where the initial seeding fails will be reseeded.

While the entire region will be planted with shrubs and seeded, due to the dynamic nature of the riparian ecosystem, full coverage of understory species is not expected, and a 40 to 50 percent coverage rate of shrubs and grasses will be considered successful. Data to determine vegetation coverage rates during site visits will be manually collected using appropriate vegetation monitoring and classification techniques, such as total count and point-intercept methods. An initial site visit by IES staff will be performed following the completion of the seeding and prior to the first annual monitoring event. IES will perform additional site visits as necessary during the first annual monitoring period.

PUBLIC ACCESS TRAIL AND ADDITONAL PLANTINGS

A public trail system currently exists to the north of the project site and coordination with the Homeowners association (HOA) to establish a public trail system to the south is ongoing. As part of the mitigation plan to maximize access and utilization, an Americans with Disabilities Act (ADA) compliant connecting trail segment will be constructed within the ESA to the west of the drainage channel **Appendix A**, **Figure 6**. Construction of the public trail is a permitted use within the ESA subject to the approval of Environmental Services. The trail has been designed to avoid tree removal and the surrounding area will be restored once the trail segment is complete. Restoration within the trail buffer will include seeding the native seed mix outlined above for the mitigation areas throughout the construction zone. The hydromulching techniques utilized throughout the mitigation area will be maintained throughout the trail buffer restoration area and reseeding will take place as necessary to ensure 40 to 50 percent coverage. The trail and surrounding 30-foot buffer will be placed in a public use easement to maximize access and utilization.

In addition to the ESA mitigation area plantings, the contractor will seed the southern region between the ESA and Ocean Drive with the native seed mixture detailed above. Portions of the southern region will be graded to install the public access trail and sewer lines. Following construction, the southern region extending to Ocean Drive will be seeded, providing a diverse understory in the currently maintained oak grove.

COMPLIANCE WITH AUTHORITIES

The City of Denton is the authority over compliance with this AESA mitigation plan. Once the Curve Barrel residential development has been constructed and the AESA mitigation activities have been completed, the City of Denton will be notified that the mitigation activities have been completed.

ANNUAL REPORTING

The applicant will prepare an annual report each year for three consecutive years, beginning 12 months following the mitigation activities implementation, for the purposes of describing the cumulative mitigation work that has been performed during the reporting period, and to report on the current survivability of the seeding, sapling planting, and preserved forest, as well as the effectiveness of the Chinese privet removal. These annual reports will be submitted to the City for review and comment.

The first two annual reports will contain action items that may include, re-seeding the seed mixtures as needed, removing weeds and invasives from within the seeded areas, re-planting saplings, or removal of construction debris within the ESA.

Upon completion of the 3-year monitoring and reporting period, the City of Denton Environmental Services shall inspect the plantings and determine whether a 90 percent tree and shrub survival rate and 90 percent ground coverage has been established and has a reasonable chance of sustained cover. If it is determined that the 90 percent survival rate and ground coverage has been met, and there is no evidence of an increase in invasive plant species, the City will issue the final project acceptance. After city inspection, if more than 10 percent of the total mitigation area coverage is found to be diseased or not having a reasonable chance of sustained cover, or invasive plants have reestablished, the applicant shall be notified to reseed, replant, or clear the problematic areas. If the applicant does not take remedial steps to bring the property into compliance, the City may use all legal remedies to enforce this provision.

If changes need to be made to the mitigation plan during the 3-year monitoring period, the City of Denton will be notified prior to making the plan modifications.

MAINTENANCE PLAN

Riparian Buffer Woods will be maintained differently than all other common area lots. The following specifications will be used for future maintenance contractors that are contracted by the current and future owners and managers of the site. This approach is specified separately due to the environmentally sensitive nature of the riparian corridor.

- Mowing – Mowing will be conducted along a 3-foot buffer along the trail only. No mowing will be allowed anywhere in this common area lot other than along the 3-foot buffer of the trail. Mowing will only occur on an as needed basis, not more than weekly during the growing season. The grass will not be mowed lower than three inches in height.
- Edging – Edging will only occur along the trail and at the same interval of the mowing. There will be no edging around trees, walls, rock riprap, culvert outfalls, or any other features in this common area lot.
- Leaf Removal – There will be no leaf removal in this common area lot.
- Fertilizer and Pesticide – There will be no fertilizer or pesticide in this common area lot.
- Tree Removal – No trees will be cut, trimmed, thinned, raised, or altered without the approval of the City of Dentons specific written permission.
- Trash Removal – Trash removal will be conducted on a quarterly basis. Trash will be removed by hand from individuals walking in this common area lot. There will be no vehicles (i.e., ATV, Side-by-Sides, cars, trucks, tractors, or motorized vehicles) used to aid in the trash removal. All trash identified will be picked up by hand and placed in trash bags that will be removed from the site on the day of collection. Trash removed from this common area lot will be disposed of in an approved landfill.
- Invasive Species Management – Invasive species shall be managed on an annual basis through an arboricultural consultant. Invasive species will be cut at the base by hand with pruners, hand saw, or chain saw in a manner that does not disturb the soil surface. All invasive plants cut from this common area lot will be removed from the site and disposed of in a City of Denton approved landscape waste recycling facility. Herbicide will be used on a spot treatment (stump treatment) basis using the labeled rate, temperature, and seasonality, of an approved herbicide for that particular invasive species. Invasive species are to be defined by species identified published by the USDA Invasive Species Profiles List: Invasive Species Profiles List | National Invasive Species Information Center.
- Any ground disturbing activity, such as erosion control or maintenance associated with infrastructure surrounding this common area lot will only occur after designs have been approved by the City of Denton.

In the event that the property is sold in the future, the new owners must adhere to the maintenance plan in order to retain the natural state and integrity of the ecosystem.

Regions between the mitigation area and DIA will remain vegetated and Chinese privet may be removed to further prevent re-establishment within the mitigation area. Mowing, fertilizer application, and ground disturbing activities will be minimized within the region between the mitigation area and DIA to serve as a protective buffer.

CRITERIA FOR APPROVAL

The following lists the criteria for approval of an AESA Plan and the project aspects that meet each criterion.

1. Create, expand, and/ or improve non-impacted areas.

   The proposed AESA plans to mitigate the impacts to the Riparian Buffer ESA by removing Chinese privet, an invasive species, which improves opportunities for diverse, native vegetation to thrive throughout the existing buffer. Native seed mixtures will be planted to provide a protective ground cover and functional understory strata. In addition, planting a range of native hardwood sapling species to achieve a final density of no less than 230 live stems per acre will diversify the current oak-dominated grove and increase species richness as well as community productivity.

2. Improve encroached habitat and the surrounding environment.

   The impacted area will be mitigated by removing Chinese privet throughout the remainder of the on-site ESA as well as from non-graded areas surrounding the ESA to prevent reseeding. Impacts will be further mitigated by planting native trees and grasses to improve ecosystem diversity and overall health.

3. Create continuity.

   The impacted area and proposed AESA are located within a larger mapped Undeveloped Floodplain ESA which extends south along the continuation of the drainage. The impact area is a fraction of the overall ESA on site, and the undisturbed ESA on site will be improved.

4. Maximize access and utilization.

   An ADA compliant pathway will be constructed within the ESAs along the western side of the tributary and a public access easement will be created for the trail and surrounding 30-foot buffer, allowing residents and the public to utilize the amenity. This will maximize open space within the residential complex and allow for community access to the trail system.

5. Create a conservation easement.

   As most of the ESA will remain intact and improvements will be made to remove invasive species and increase the native habitat, the ESA designation will remain and therefore be subject to use restrictions set forth in the DDC. The mitigation area will be placed in a drainage easement.

6. High quality development.

   The AESA has been designed to minimize the impacts to the ESA necessary to meet the design standards and infrastructure necessary for the overall development. The AESA proposes to mitigate for the impacts by removing invasive understory growth from within and surrounding the remaining ESA, as well as planting native saplings and seeding throughout unimpacted region to increase diversity and provide native ground cover. As Chinese privet currently dominates the ESA understory, the proposed improvements in the unimpacted region will allow native species to reestablish and enrich the overall quality of the region. As such, the proposed development meets the criteria for approval for an AESA.

SUMMARY

The proposed impact areas include 0.660 acre within the Riparian Buffer ESA and 0.250 acre within the Undeveloped Floodplain ESA, resulting from the construction of roadways, sidewalks, lots, and utilities necessary for the residential development. The 1.028-acre Riparian Buffer and 0.546-acre Floodplain ESA mitigation areas for

the impact areas will consist of removing invasive Chinese privet from the remaining on-site ESA understory, planting native saplings to increase diversity, and seeding the buffer with native grasses to provide a protective, native ground cover.

ANNUAL REPORTING CONTACTS

Developer/Owner:
Curve Development
C/O Bear Land Consultants
208 S. Johnson Street, Suite 101
McKinney, Texas 75069
Contact: Mr. Jared Helmberger, P.E.
Phone: 469-834-9979
Email: Jared@oxlandadvisors.com

Environmental Scientist:
Integrated Environmental Solutions
301 W Eldorado Parkway, Suite. 101
McKinney, Texas 75069
Contact: Rudi Reinecke
Phone: 972-562-7672
Email: rreinecke@intenvsol.com

Engineer:
Spiars Engineering & Surveying
3575 Lone Star Circle, Suite 434
Fort Worth, Texas 76177
Contact: Jordan Huneycutt, P.E.
Phone: 972-422-0077
Email: Jordan.huneycutt@spiarsengineering.com

Appendix A

Figures

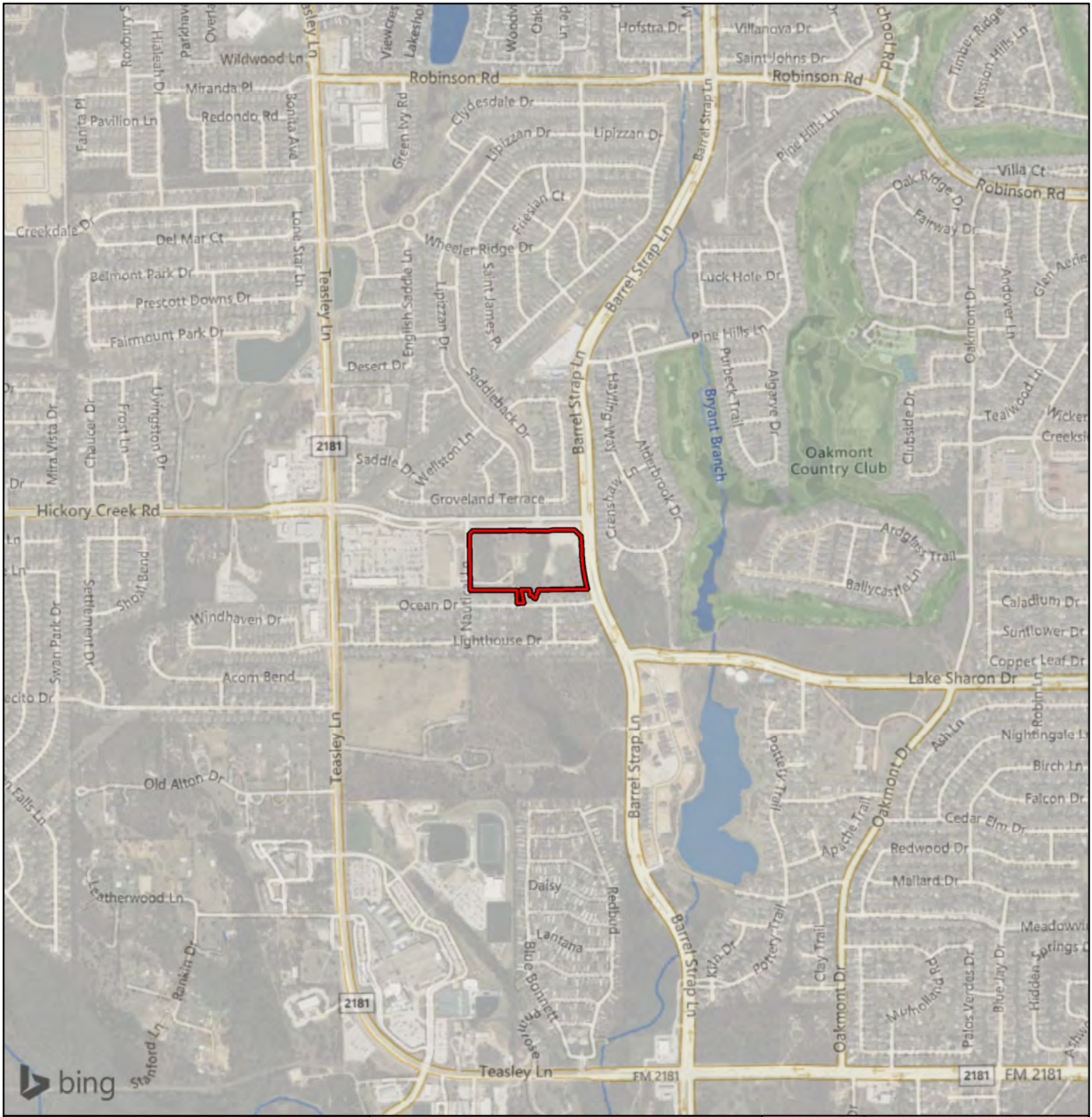


Figure 1.
General Location Map

Barrel Strap Residential
City of Denton
Denton County, Texas

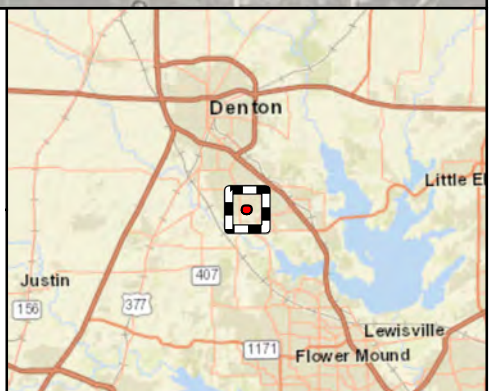
Project Site

1 in = 1,250 feet

Feet
0 1,250

N
W E
S

File Ref. 04.336.003
Date: 10/3/2022



Area of Detail

Scale: 1 inch equals 10 miles

Figure 2.
City Mapped **Environmentally Sensitive Areas (ESAs)**

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 150 feet

Feet
0 150

N
W E
S

File Ref. 04.352.003
Date: 10/3/2022

Project Site

City of Denton ESA Habitats

- Cross Timbers Upland (Not Assessed or Assessment Expired)
- Water related (Not Assessed or Assessment Expired)
- Floodplain Habitat
- Riparian Buffer

Date Prepared:	03 October 2022
Project Name:	Barrel Strap Residential
City Project Number:	AESA#22-0004
Prepared By:	Integrated Environmental Solutions 301 W Eldorado Parkway Suite 101 McKinney, TX 75070 972/562-7672
Developer:	Mr. Jared Helmberger, P.E. Curve Development Bear Land Consultants 208 S. Johnson St, Suite 103 McKinney, Tx 75069

Figure 3.
Onsite ESA Determinations
and Aquatic Features

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 150 feet

Feet
0 150

N
W E
S

File Ref. 04.336.003
Date: 10/3/2022

ESA Data Form Locations

Unnamed Tributary to Bryant Creek

Onsite ESA Determinations

Cross Timbers Upland - Designation Removed

Water related - Designation Removed

Floodplain - Confirmed

Riparian Buffer - Confirmed

Date Prepared:	03 October2022
Project Name:	Barrel Strap Residential
City Project Number:	AESA#22-0004
Prepared By:	Integrated Environmental Solutions 301 W Eldorado Parkway Suite 101 McKinney, TX 75070 972/562-7672
Developer:	Mr. Jared Helmberger, P.E. Curve Development Bear Land Consultants 208 S. Johnson St, Suite 103 McKinney, Tx 75069

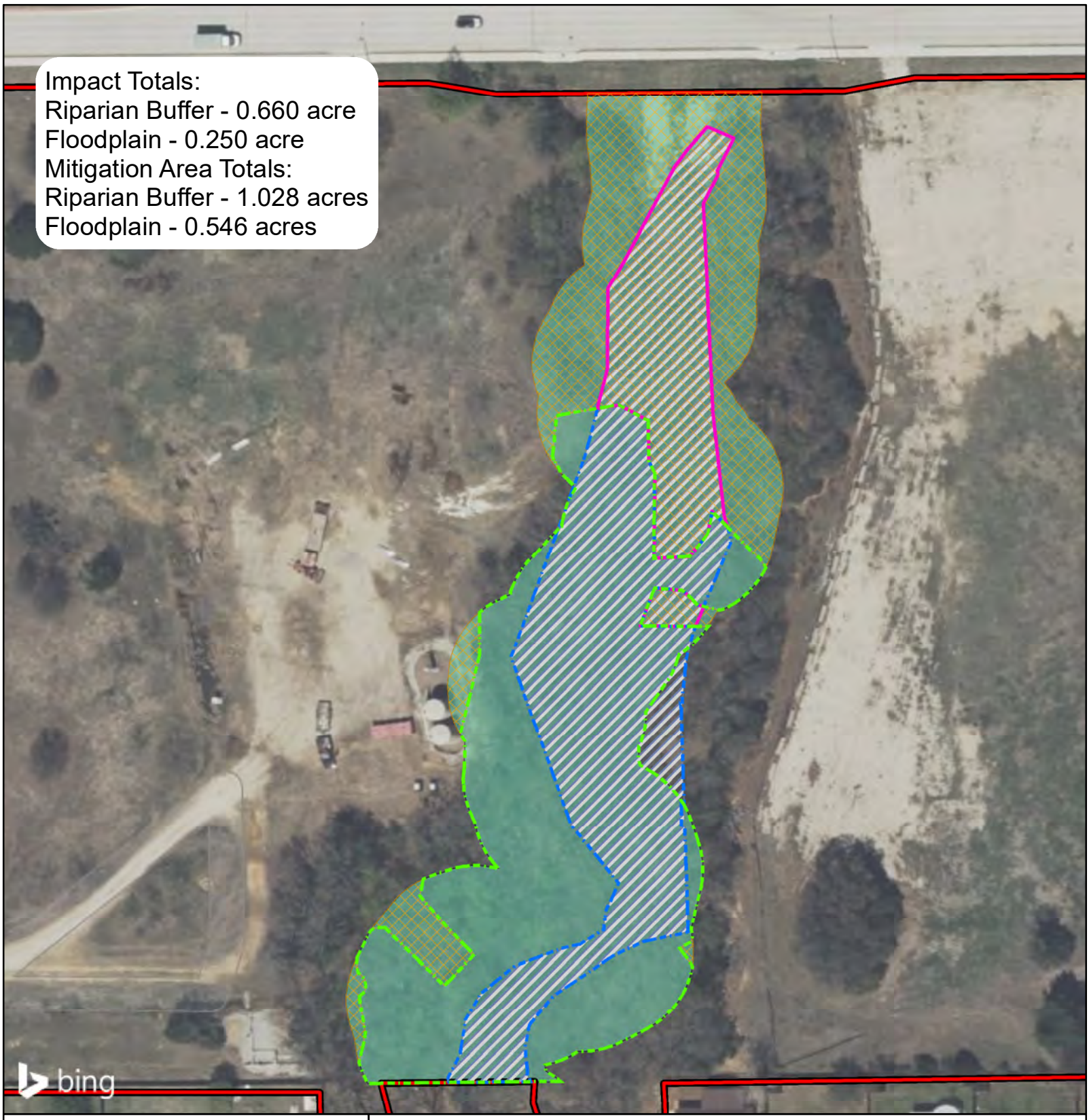


Figure 4.
Proposed ESA Impacts

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 75 feet

Feet
0 75

N
W E
S

File Ref. 04.336.003
Date: 4/17/2023

Project Site
Riparian Buffer ESA
Undeveloped Floodplain ESA

Direct/ Permanent Impacts
Riparian Buffer
Floodplain

Mitigation Area
Floodplain
Riparian Buffer

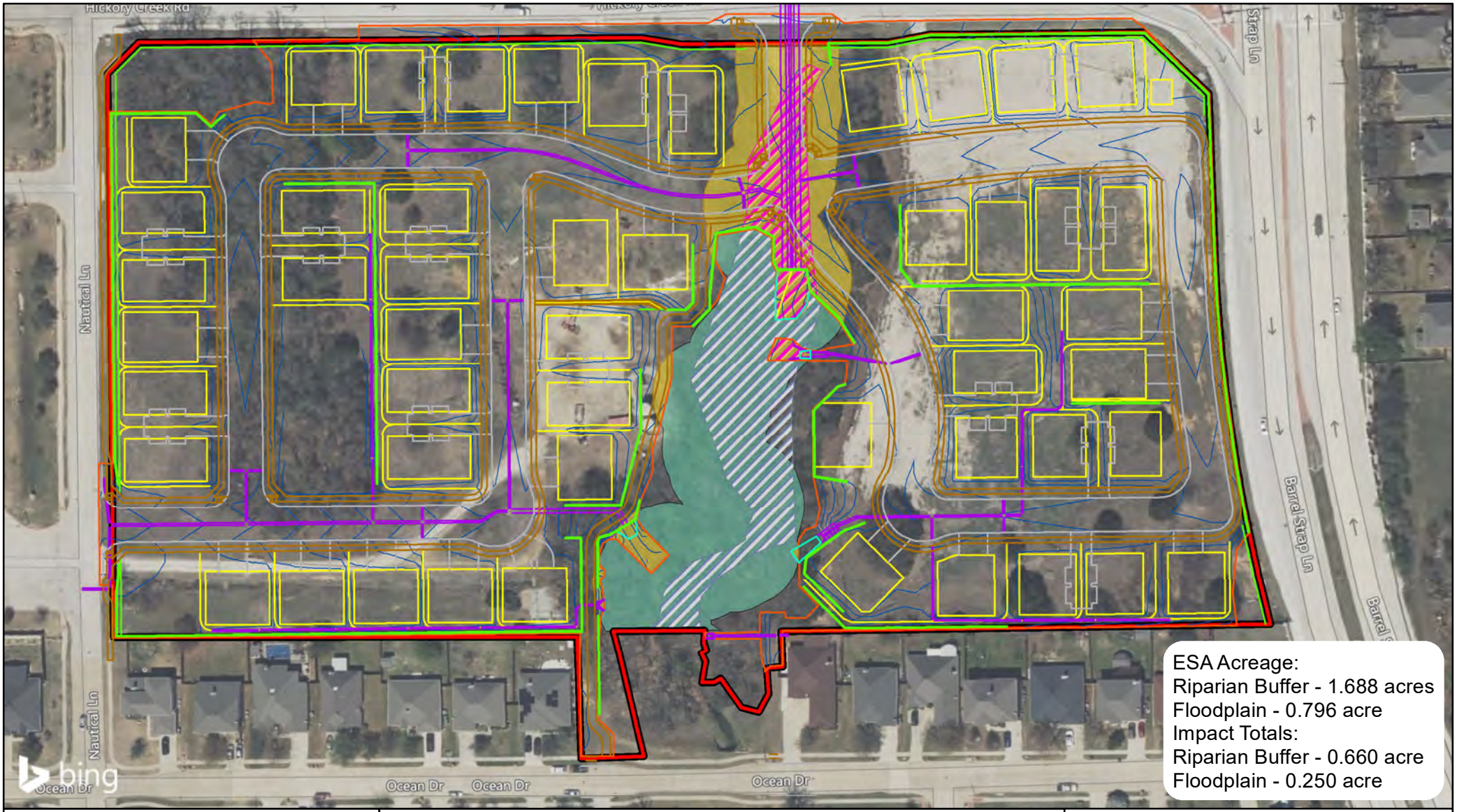


Figure 5.
Site Plan and Impacts Map

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 130 feet

Feet
0 130

N
W E
S

File Ref. 04.336.003
Date: 5/19/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Direct/ Permanent Impacts

- Floodplain
- Riparian Buffer

Site Plan

- Development Impact Area
- Pavement
- Pad/ Lot
- Riprap
- Sidewalk
- Stormwater
- Wall
- Grading

Date Prepared: 17 May 2023
Project Name: Barrel Strap Curve
City Project Number: AESA- 22-0004
Prepared By: Integrated Environmental Solutions
301 W Eldorado Parkway
Suite 101
McKinney, TX 75070
972/562-7672
Developer: Mr. Jared Helmberger, P.E.
Curve Development
Bear Land Consultants
208 S. Johnson St, Suite 103
McKinney, Tx 75069

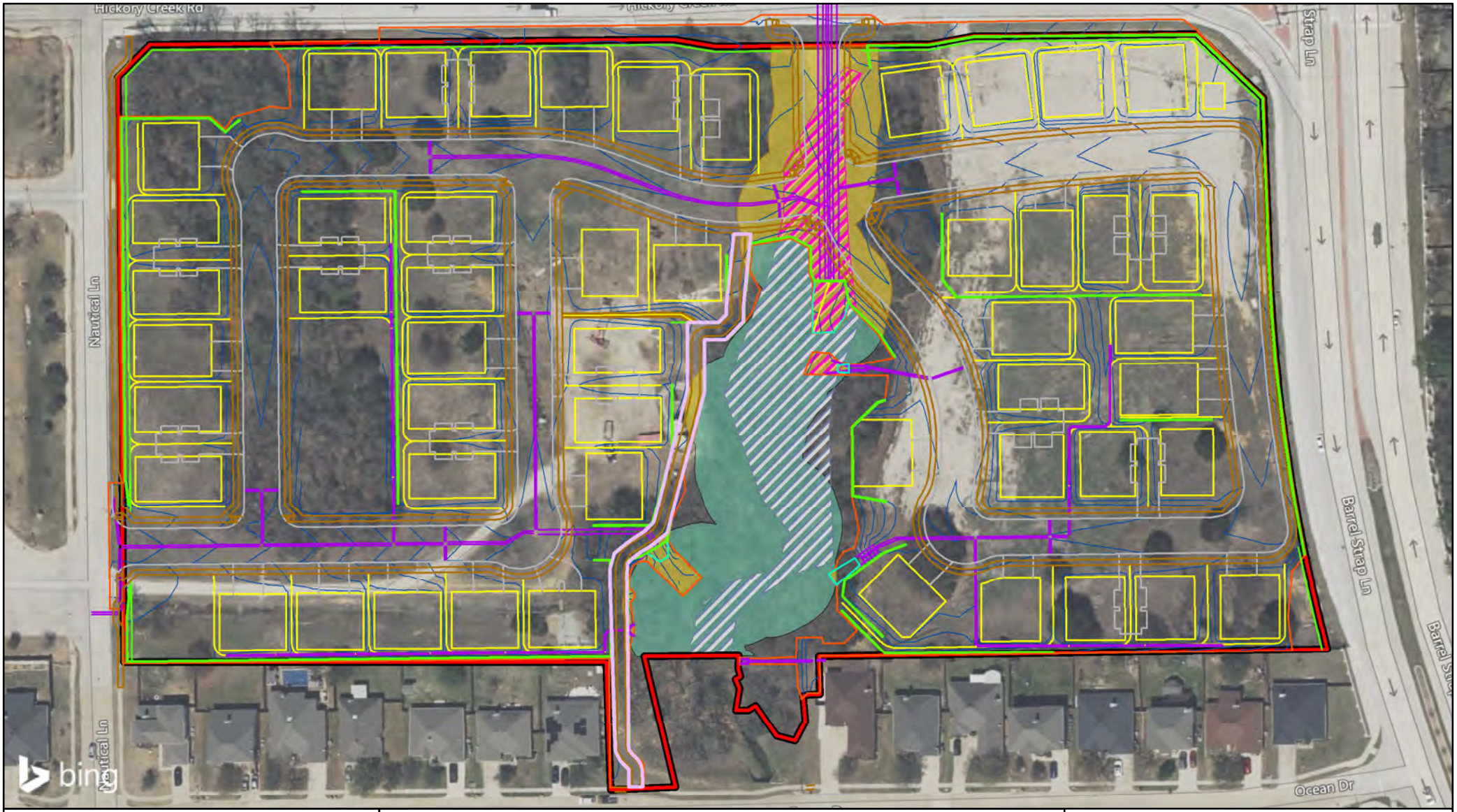


Figure 6.
Public Access Trail

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 125 feet

Feet
0 125

N
W E
S

File Ref. 04.336.003
Date: 5/19/2023

Survey Area
Riparian Buffer ESA
Floodplain ESA

Direct/ Permanent Impacts
Floodplain
Riparian Buffer

Site Plan
Development Impact Area
Pavement
Pad/ Lot
Riprap
Sidewalk
Stormwater
Public Trail
Wall
Grading

Date Prepared: 17 May 2023
Project Name: Barrel Strap Curve
City Project Number: AESA- 22-0004
Prepared By: Integrated Environmental Solutions
301 W Eldorado Parkway
Suite 101
McKinney, TX 75070
972/562-7672
Developer: Mr. Jared Helmberger, P.E.
Curve Development
Bear Land Consultants
208 S. Johnson St, Suite 103
McKinney, Tx 75069

Appendix B

ESA Assessment Forms

Project Number: ESA 21-0027

Floodplain ESA Assessment Form

Environmental Services and Sustainability

A Floodplain ESA Assessment Form is to be completed for each feature identified as potentially to exist on the Official ESA Map. Features of substantially similar characteristics and location may be grouped together on one form. More information about Undeveloped Floodplains and assessing this feature may be found on the City of Denton webpage.

Property Address or Property ID:	5013 Hickory Creek Rd, Denton, TX 76210 **R** 38056, 259880	**Feature ID(s):**	Data Point 2

Property ID can be found through Denton Central Appraisal District *Provide a unique ID for each feature when multiple features are assessed*

Hydrologic Segment Information:

Name:	Unnamed Tributary to Bryant Branch	**Width**	5'	**Order**	1st
When available, stream segment name.		*Approximate stream width.*		*Stream order.*	

Assessment Conclusion:

Select one of the following.

☑ IS an ESA. Based upon this assessment the area is an Undeveloped Floodplain ESA. I recommend the Official ESA Map be updated to confirm the ESA designation in this area.

☐ NOT an ESA. Based upon this assessment the floodplain is developed. I recommend the Official ESA Map be updated to remove the ESA designation from this area.

Assessment Comments:

Provide a summary of details found in the field to support the conclusion selected above.

The floodplain area is relatively natural with dominance from native species of trees, saplings, vines, and ground cover and minimal exotic, invasive species encroachment.

Attachments Provided:

Required:	☑ overall site map ☑ current map of feature ☑ proposed map of feature ☑ soils map ☑ photographs representative of feature
Other:	FEMA FIRM, aerial photography

Field Assessor:

Name of Field Assessor: Shae Kipp

Affiliation of Field Assessor (Organization): Integrated Environmental Solutions, LLC

Date the assessment was performed: 30 November 2021

I certify that the information provided here is an accurate description of the area(s) assessed.	Shae Kipp Digitally signed by Shae Kipp Date: 2022.03.31 11:39:18 -05'00'

Environmental Services Representative:

I concur with the description of this ESA and conclusion of this assessment.	

Section 1. General Information

General Land Use:

Provide description of land hydrologically influencing feature. Select all that apply and provide more details as appropriate.

☑ Forest	Briefly describe: young forest
☐ Agricultural:	☐ Pasture ☐ Fallow ☐ Crop, crop type:
☐ Residential:	☐ Low Intensity ☐ High Intensity
☑ Commercial/Industrial	
☐ Recreational	
☐ Other:	

Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

Callisburg fine sandy loam, 1 to 3 percent slopes	
Konsil fine sandy loam, 1 to 3 percent slopes	
Gasil fine sandy loam, 1 to 3 percent slopes	

Section 2. Floodplain Conditions

Are there modifications (cut/fill) of the floodplain?	☐ yes *(answer question below)* ☑ no
Describe:	
Are there structures in the floodplain?	☐ yes *(answer question below)* ☑ no
Describe:	

Waterway present: ☑ yes *(complete the table below and Riparian Buffer ESA form)* ☐ no

Waterway	☑ natural ☐ channelized ☐ impounded
Sinuosity	☑ meandering ☐ braided ☐ straight

Section 3. Soil Erosion and Deposition

Is there evidence of sheet flow across the floodplain?	☑ yes (answer question below) ☐ no
Active sheet flow erosion is:	☐ slight ☑ moderate ☐ severe
Is there evidence of concentrated flow?	☑ yes (answer question below) ☐ no
Active concentrated flow erosion is:	☐ slight ☑ moderate ☐ severe

Does the floodplain slope to the waterway or is a natural levee present?

☑ toward ☐ natural levee. Complete the table below.

Does natural levee create conditions for water-related habitat?	☐ yes *(complete Water-Related Habitat form)* ☑ no

Section 4. Brief Vegetation Survey

List all vegetative species covering >10% of the feature area.

Scientific name	*Common name*	*% Cover*
Quercus stellata	Post oak	50
Celtis laevigata	Sugarberry	20
Ligustrum sinese	Chinese privet	15

Project Number: ESA 21-0027

Riparian Buffer ESA Assessment Form

Environmental Services and Sustainability

A Riparian Buffer ESA Assessment Form is to be completed for each feature identified as potentially to exist on the Official ESA Map. Additionally, any feature identified onsite that potentially has characteristics of a riparian buffer is to be identified, described and documented through this form. Features of substantially similar characteristics and location may be grouped together on one form. More information about riparian buffers and assessing this feature may be found on the City of Denton webpage.

Property Address or Property ID:	5013 Hickory Creek Rd, Denton, TX 76210 **R** 38056, 259880	**Feature ID:**	Data Point 4

Property ID can be found through Denton Central Appraisal District — *Provide a unique ID when multiple features are assessed*

Hydrologic Segment Information:

Name:	**Width:**	**Order:**
Unnamed Tributary to Bryant Branch	5'	1st
When available, stream or tributary to segment name	*Approximate stream width*	*Stream order*

Assessment Conclusion:

Select one of the following.

- [x] IS an ESA. Based upon this assessment the area is a Riparian Buffer ESA. I recommend the Official ESA Map be updated to confirm the ESA designation in this area.
- [ ] NOT an ESA. Based upon this assessment the area is not a Riparian Buffer ESA. I recommend the Official ESA Map be updated to remove the ESA designation from this area.

Assessment Comments:

Provide a summary and discussion of details found in the field to support the conclusion selected above. Include a discussion of the Rapid Stream Assessment Techniques and the final verbal score (Section 5).

Unnamed tributary of Bryant Creek was confirmed to be present in the field. The creek was flowing at the time of the evaluation and conditions on site indicated that flow would be least seasonal rather than ephemeral. The riparian vegetation was dominated by a post oak forest with a relatively open under story dominated by sugarberry saplings and Chinese privet shrubs. The RSAT scored the stream as "Good" with a final verbal score of 33.

Attachments Provided:

Required:	[x] overall site map [x] current map of feature [x] proposed map of feature [x] soils map [x] photographs representative of feature
Other:	FEMA FIRM, aerial photographs

Field Assessor:

Name of Field Assessor: Shae Kipp

Affiliation of Assessor (Organization): Integrated Environmental Solutions, LLC

Date the assessment was performed: 30 November 2021

I certify that the information provided here is an accurate description of the area(s) assessed.

Shae Kipp Digitally signed by Shae Kipp Date: 2022.03.31 11:39:43 -05'00'

Environmental Services Representative:

I concur with the description of this ESA and conclusion of this assessment.

Section 1. General Information

General Land Use:

Provide description of land hydrologically influencing feature. Select all that apply and provide more details as appropriate.

☑ Forest	Briefly describe:
☐ Agricultural:	☐ Pasture ☐ Fallow ☐ Crop, crop type:
☑ Residential:	☐ Low Intensity ☑ High Intensity
☑ Commercial/Industrial	
☐ Recreational	
☐ Other:	

Potential pollutants from current drainage area:

☑ urban/suburban landscape maintenance	■ urban/suburban parking lots or roads
☐ intensive agricultural use	☐ grazing animals have access to water feature
☐ water feature has steep slopes	☐ plant or animal species of concern present
☐ water feature used for recreation	☐ waterway a drinking water source/adjacent to well
☐ other:	

Proposed construction activity in the drainage area of the water feature:

☐ Low impact potential (parks, low density residential)
■ High impact potential (high density residential, commercial development)
☐ Gas well plat

Benefit(s) current Riparian Buffer offers to the water feature:

■ intercepts sediment	☐ provides fish habitat
■ intercepts nutrients	■ improves wildlife habitat
☐ intercepts pesticides	■ stabilizes streambank
■ intercepts other pollutants	■ unique aesthetics / privacy
☐ other:	

Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

Callisburg fine sandy loam, 1 to 3 percent slopes	
Konsil fine sandy loam, 1 to 3 percent slopes	

Section 2. System Conditions

Stream Bank:

Evidence of frequent water level changes	☐ yes ☑ no		
Slope of bank	.6 %		
Soil class	☐ clay ☐ sand ☑ loam ☐ gravel ☐ ledge		
Active erosion	☑ slight ☐ moderate ☐ severe		
Existing plant cover	☐ little to none ☐ moderate ☑ well vegetated		
Dominant cover	☐ cement ☐ bare ☐ grass ☐ shrub ☑ young forest ☐ mature forest		
Large leaning trees	☐ yes ☑ no		
Invasive exotics present	☑ yes ☐ no	If yes, species: Chinese privet	% infestation: .15

Top of Bank:

Existing plant cover	☐ little to none ☐ moderate ☑ well vegetated		
Dominant cover	☐ cement ☐ bare ☐ grass ☐ shrub ☑ young forest ☐ mature forest		
Invasive exotics present	☑ yes ☐ no	If yes, species: Chinese privet	% infestation: .15

Above the Bank:

Slope	.10 %		
Direction of slope	☑ toward the water feature ☐ away from water feature		
Runoff flow	☐ sheet flow across the land ☑ concentrated flow		
Active erosion	☑ slight ☐ moderate ☐ severe		
Existing plant cover	☐ little to none ☐ moderate ☑ well vegetated		
Dominant cover	☐ cement ☐ bare ☐ grass ☐ shrub ☑ young forest ☐ mature forest		
Invasive exotics present	☑ yes ☐ no	If yes, species: Chinese privet	% infestation: .15

Section 3. Brief Vegetation Survey

List all vegetative species where feature occurs for species covering >10% of the feature area and provide hydrophytic vegetation indicator of the species.

Bank:

Scientific name	*Common name*	*% Cover*	*Indicator*
Quercus stellata	Post oak	85	FACU
Celtis laevigata	Sugarberry	10	FAC

Bank Hydrophytic Vegetation Indicator: 1 : 1
(*Number of plant species that are OBL, FACW and FAC to number of plant species that are FACU and UPL*)

Buffer:

Scientific name	*Common name*	*% Cover*	*Indicator*
Quercus stellata	Post oak	85	FACU
Celtis laevigata	Sugarberry	10	FAC

Buffer Hydrophytic Vegetation Indicator: 1 : 1
(*Number of plant species that are OBL, FACW and FAC to number of plant species that are FACU and UPL*)

Section 4. Hydrology and Hydric Soils Indicators

Hydrology Indicators:

Primary	*Secondary*
☐ inundated	☐ oxidized root channels in upper 12”
☐ soil saturated in upper 12”	☐ water-stained leaves
☐ water marks	☐ county soil survey
☐ drift lines	☐ fac-neutral test
☐ sediment deposits	
☐ evidence of drainage pattern	
Comments: No concave depressions - does not flood for long periods	

Hydric Soil Indicators:

☐ histosol	☐ concretions
☐ histic epipendon	☐ high surface organic content
☐ sulfidic odor	☐ organic streaking in sandy soils
☐ aquic moisture regime	☐ listed on local hydric soil list
☐ reducing conditions	☐ listed on national hydric soil list
☐ gleyed or low chroma colors	☐ other:
Comments: No hydric soils	

Section 5. Rapid Stream Assessment Techniques (RSAT)

The Rapid Stream Assessment Techniques is adapted from the Texas Commission on Environmental Quality's Surface Water Quality Monitoring Procedures, Chapter 9. Physical Habitat of Aquatic Systems. To complete the RSAT provide a score for each table, as applicable. Sum Tables 1 – 6 scores and provide the average using a whole number. Complete Table 7 with these scores. Provide a total RSAT score and a verbal score. Please note, the order of tables 4 and 5 were switched at Version 5 of this form.

Table 1: Channel Stability

Indicative of hydrological flow regime alteration and general condition of physical / aquatic habitat and provides insight into the past, present, and possible future changes in stream channel morphometry.

	Score Selection:				*Score*
	Excellent (11 – 9)	*Good (8 – 6)*	*Fair (5 – 3)*	*Poor (2 – 0)*	
Stability of bank network	> 80% is stable, no evidence of bank sloughing or failure	71-80% is stable, infrequent signs of bank sloughing, slumping or failure	50-70% is stable, some signs of bank sloughing, slumping or failure	< 50% is stable, recent or frequent signs of bank sloughing, slumping	7
Stream bends at study site or immediate vicinity of study site	Very stable: outer bank height is slightly above stream level, bank overhang minimal	Stable: outer bank height 2-3 ft. above stream level, bank overhang slight to moderate	Unstable: outer bank height is substantially above stream level, substantial bank overhang	Highly unstable: outer bank height significantly above stream level, overhangs large and deep.	7
Exposed tree roots	Old, large, and woody exposed roots, generally 0-1 recent large tree falls / stream mile	Old and large exposed roots, some smaller young roots, 2- 3 recent large tree falls / stream mile	Young exposed tree roots are common, 4-5 recent large tree falls per stream mile	No trees exist, or young exposed tree roots are abundant, 6 or more recent large tree falls per stream mile.	7
Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank	dominant	present	compromised	severely compromised or nonexistent.	4
Channel crossing section shape	generally, V or U-shaped	"wide" U	generally trapezoid shaped	wide trapezoid to rectangle shape	7
Table 1 score (average of points given, rounded to nearest whole number)					6

Table 2: Channel Scouring and Sediment Deposition

Relates to the level of uncontrolled storm water runoff, sediment load, and transport and degradation of in-stream habitat.

	Score Selection:				*Score*
	Excellent (8 – 7)	*Good (6 – 5)*	*Fair (4 – 3)*	*Poor (2 – 0)*	
Riffle embeddedness with sand/silt	small stream order: <25% embeddedness larger stream order: <35% embeddedness	25 – 49% 35 – 59%	50 – 79% 60 – 85%	>75% >85%	1
Potential for deep pools 2 ft or greater, substrate condition	High number of pools Pool substrate <30% sand/silt	Moderate number 30-59% sand/silt	Low number 60-80% sand/silt	Few, if any >80% sand/silt	6
Frequency of streak marks and/or banana-shaped deposits	Absent	Uncommon	Common	Very Common	8
Fresh, large sand deposits in channel and on overbank areas	Rare or absent	Uncommon, fresh localized deposits along top of low banks	Common, fresh deposits along top of low banks	Large deposits in channel and along major portion of overbank area	6
Frequency and condition of point bars	Few, small, stable, and vegetated	Small and stable, well vegetated, moderate fresh sand	Large and unstable, high amount of fresh sand	Moderate to large, unstable, high amount of fresh sand	7
Table 2 score (average of points given, rounded to nearest whole number)					6

Table 3: Physical In-Stream Habitat

Relates to the ability of the stream to meet basic physical requirements necessary for the support of a well-balanced aquatic community (i.e, water temperature, water velocity, substrate type and quality).

	Score Selection:				Score
	Excellent (8 – 7)	*Good (6 – 5)*	*Fair (4 – 3)*	*Poor (2 – 0)*	
Percent wetted perimeter of channel bottom during base flow events	>85%	61 – 85%	40 – 60%	<40%	6
Frequency of diverse habitat (riffles, runs and pools) and flow when water is present	Highly diverse habitat and flows	Good mix of habitat types and relatively diverse flows	Low diversity of habitat types, depth and flow relatively uniform	One habitat type dominates, velocity and flow uniform	1
Percent of riffle composition from larger material (cobble or gravel)	>50%	49 – 25%	24 – 5%	Dominated by sand or silt	1
Typical base flow riffle depth (non-stormwater base flows)	>6”	5.9 – 4.0”	3.9 – 2.0”	<2”	4
Typical depth of large pools	>24”	24 – 18”	18 – 12”	<12”	8
Channel alterations at study site	No evidence	Minor	Moderate	Extensive	8
Summer afternoon water temperature (estimated using tree canopy coverage)	<82 degrees F	82 – 89	89 – 94	>94	8
Table 3 score (average of points given, rounded to nearest whole number)					5

Table 4: Riparian Habitat

Provides insight into changes in stream energetics, temperature regimes, and both aquatic and terrestrial habitat conditions.

	Score Selection:				Score
	Excellent (7 – 6)	*Good (5 – 4)*	*Fair (3 – 2)*	*Poor (1 – 0)*	
Width of forested buffer along both banks	Wide (>200 ft)	> 100 ft along major portion of both banks	Predominantly wooded, major gaps in one or both banks	Mostly non-woody vegetation with narrow riparian zones	7
Canopy coverage	small stream order: >80% large stream order: >60%	79 – 65% 59 – 45%	64 – 45% 44 – 30%	<45% <30%	7
Table 4 score (average of points given, rounded to nearest whole number)					7

Is the water feature actively flowing?

☑ Yes, surface water is flowing and there are connects pools. Complete Tables 5 and 6.

☐ No, standing water, waterway is dry, or there are dry beds are seen between pools. Skip Tables 5 and 6.

Table 5: Water Quality

Indicative of watershed perturbations and general level of human activity, point and nonpoint source pollutant loadings, and aquatic habitat conditions.

	Score Selection:				Score
	Excellent (8 – 7)	*Good (6 – 5)*	*Fair (4 – 3)*	*Poor (2 – 0)*	
Percent substrate fouling on underside of cobble	Minimal, 0 – 10%	Light, 11 – 20%	Moderate, 21 – 50%	High, >50%	1
Total Dissolved Solids	350 – 399 mg/L	400 – 449	450 – 500	>500	6
Water odor	No odor	Slight organic odor	Slight – moderate organic odor	Strong organic odor	7
Table 5 score (average of points given, rounded to nearest whole number)					5

Table 6: Biological Indicators

Considered to be the best overall indication of stream health and the level of watershed perturbation.

	Score Selection:				Score
	Excellent (8 – 7)	*Good (6 – 5)*	*Fair (4 – 3)*	*Poor (2 – 0)*	
Macroinvertebrate community diversity	High diversity of good water quality indicator species. Few snails, leeches, aquatic worms.	Good diversity of good water quality indicator species. Mayflies and caddisflies present.	Low diversity of good water quality indicator species.	Low diversity, predominantly pollution-tolerant species.	4
Number of organisms	High to moderate	Moderate	Moderate to low	Very low number	4
Table 6 score (average of points given, rounded to nearest whole number)					4

Table 7: RSAT Summary

	Score – flow	Score – no flow
1. Channel Stability	6	
2. Channel Scouring/Deposition	6	
3. Physical In-Stream Habitat	5	
4. Riparian Habitat	7	
5. Water Quality	5	
6. Biological Indicators	4	
Total Score:	33	
Verbal Score from Total Score:	☐ Excellent (42-50) ☑ Good (30-41) ☐ Fair (16-29) ☐ Poor (<16)	☐ Excellent (29-34) ☐ Good (20-28) ☐ Fair (11-19) ☐ Poor (<11)

APPENDIX C

Tree Inventory Data

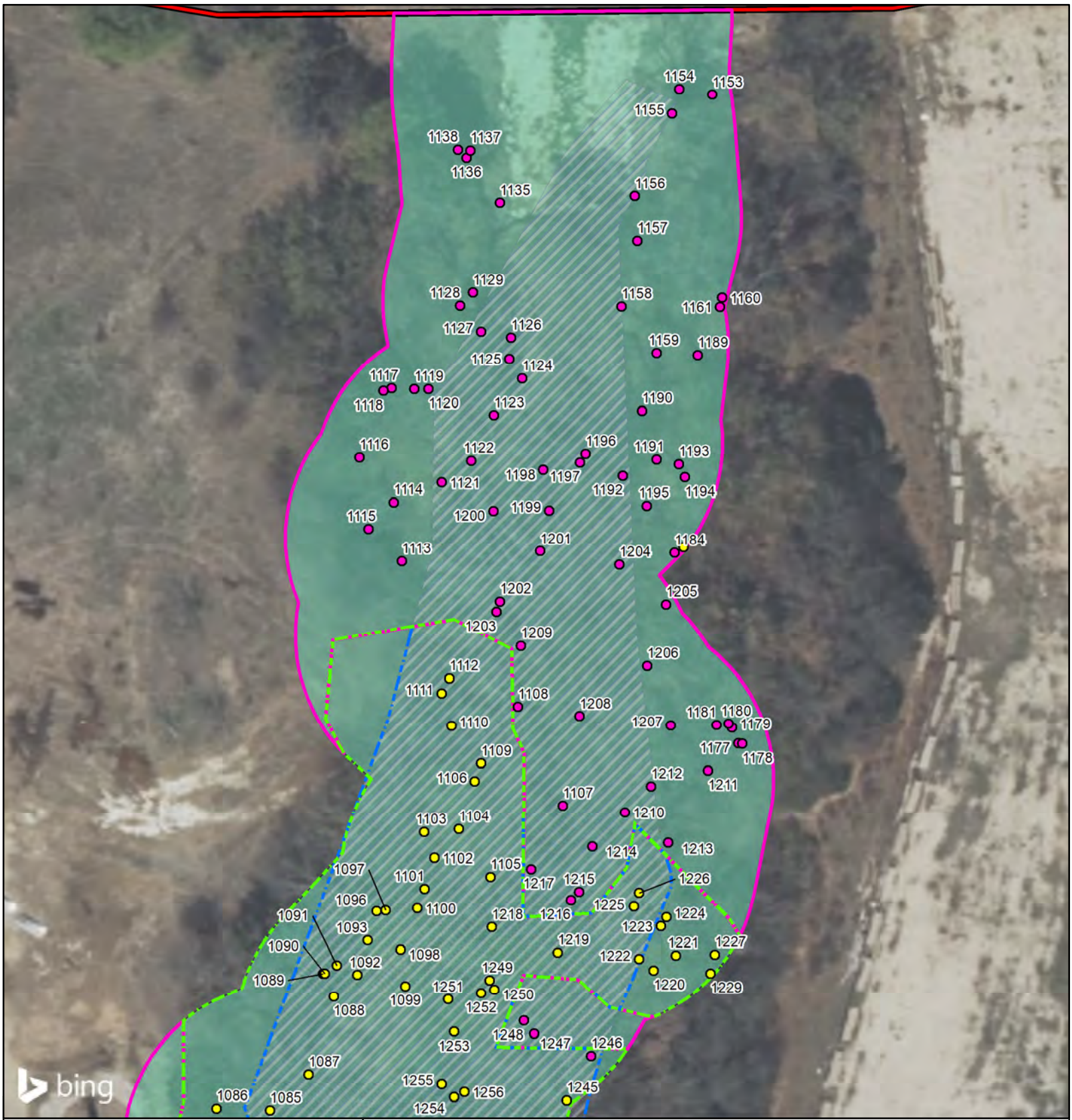


Figure 1A. Tree Inventory Overview

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 38 feet

Feet
0 38

N
W E
S

File Ref. 04.336.003
Date: 5/10/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA
- Impact Area

Mitigation Areas

- Riparian Buffer
- Floodplain
- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area

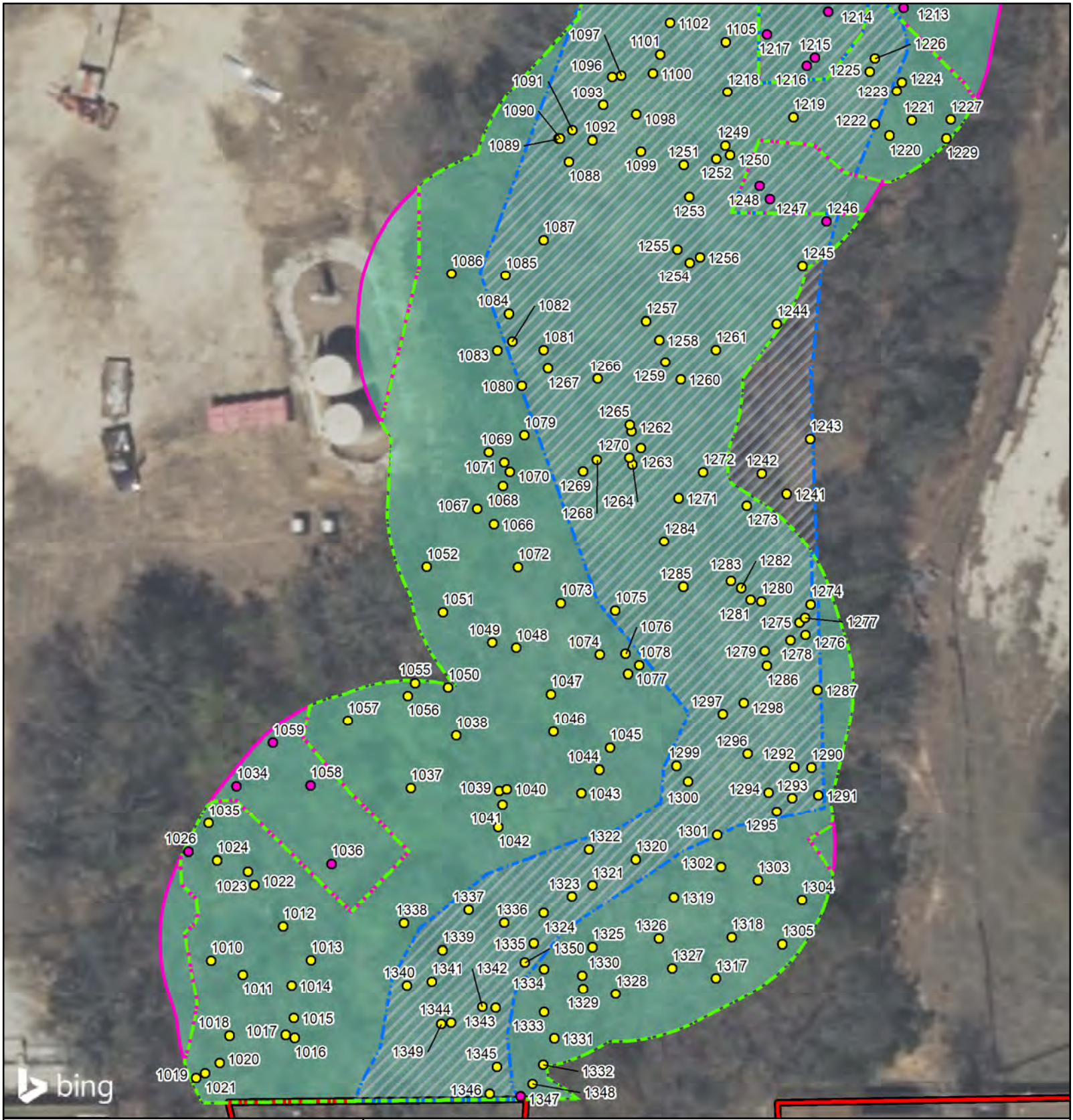


Figure 1B. Tree Inventory Overview

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 38 feet

Feet
0 38

N
W E
S

File Ref. 04.336.003
Date: 5/10/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA
- Impact Area

Mitigation Areas

- Riparian Buffer
- Floodplain
- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area

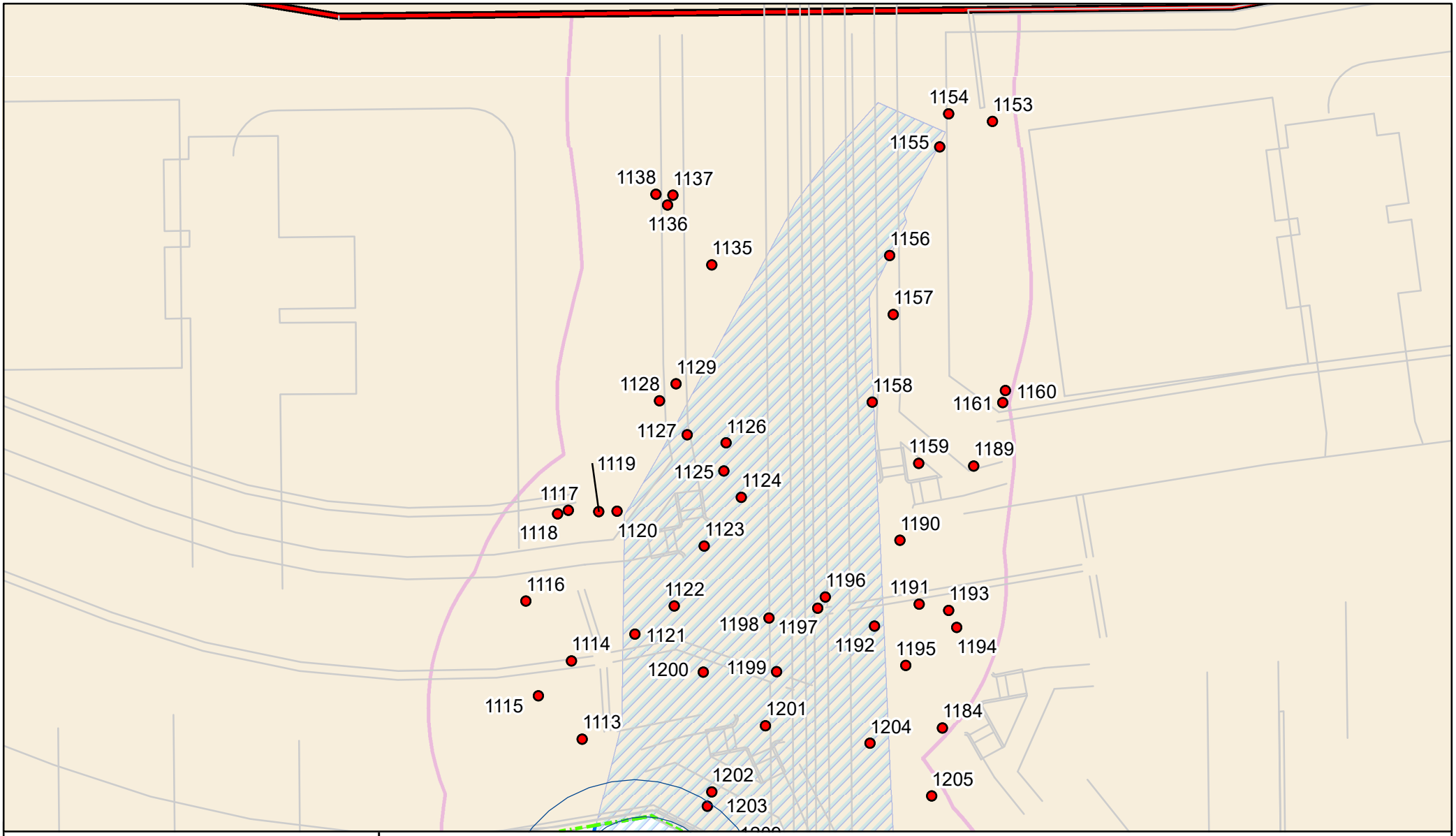


Figure 2A. Tree Inventory

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 30 feet

Feet
0 30

N
W E
S

File Ref. 04.336.003
Date: 4/18/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Mitigation Areas

- Floodplain
- Riparian Buffer

- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area
- Critical Root Zones
- Site Plan Structures
- Grading Area

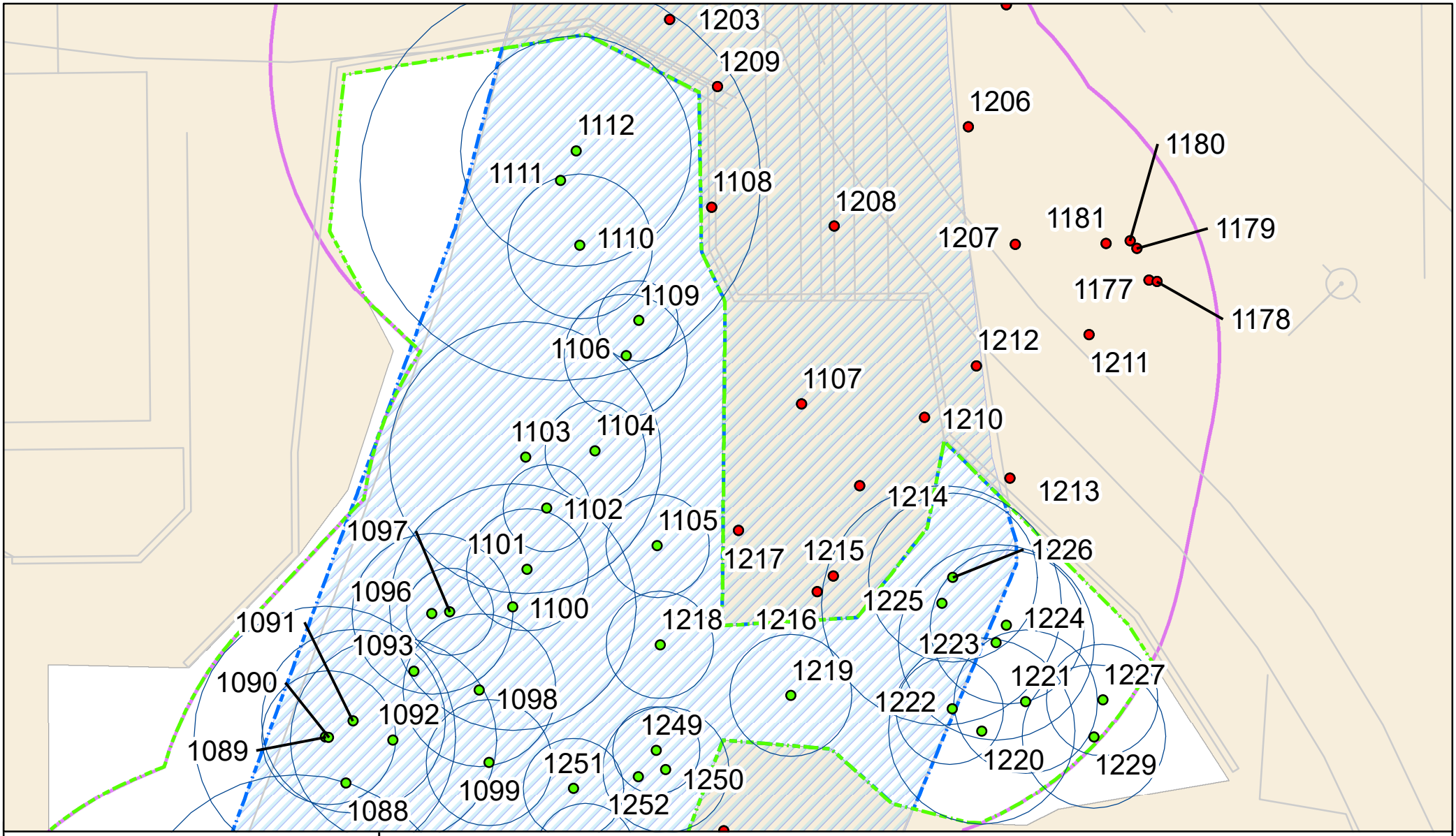


Figure 2B. Tree Inventory

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 20 feet

Feet
0 20

N
W E
S

File Ref. 04.336.003
Date: 4/18/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Mitigation Areas

- Floodplain
- Riparian Buffer

- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area
- Critical Root Zones
- Site Plan Structures
- Grading Area

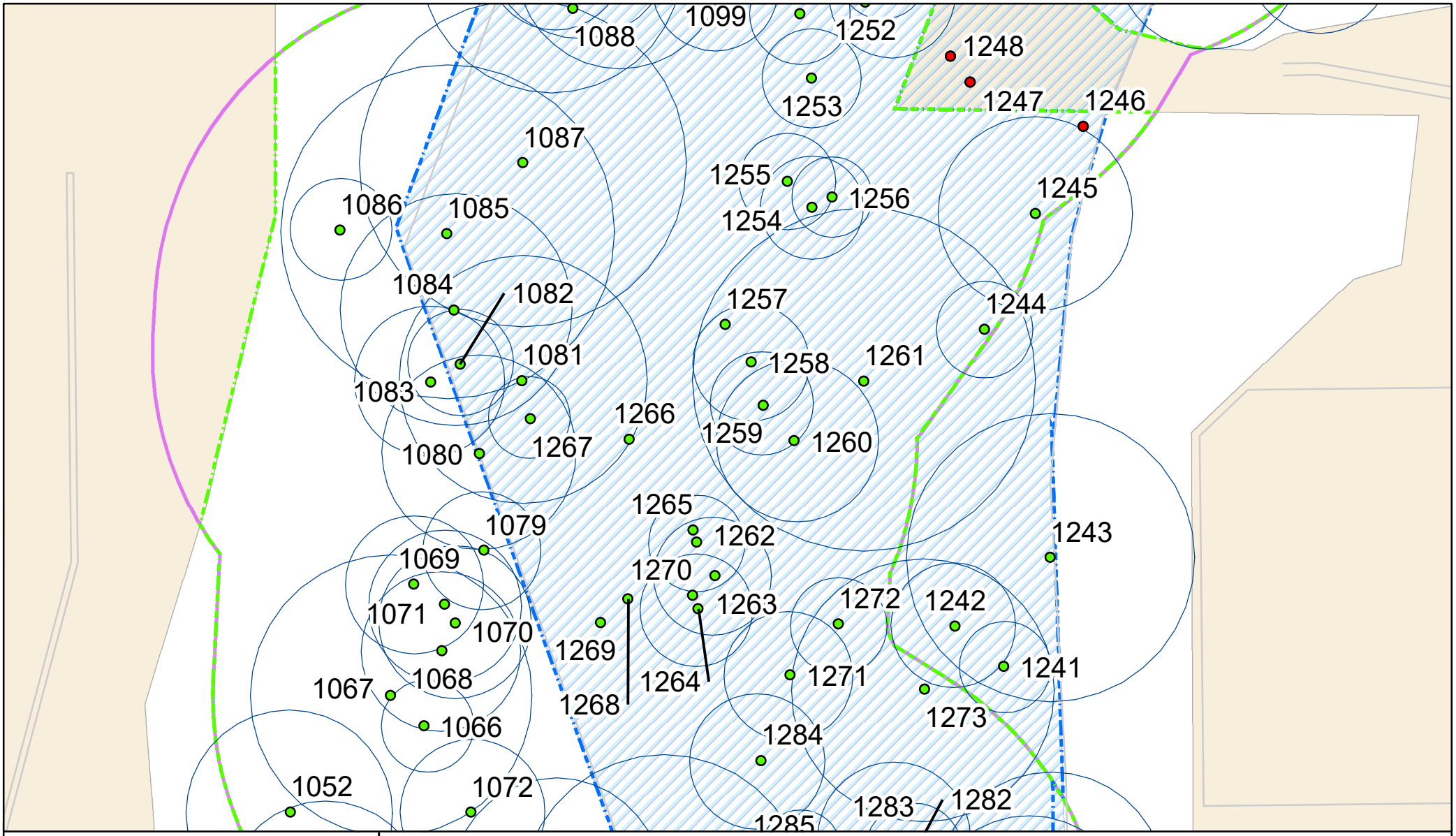


Figure 2C. Tree Inventory

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 20 feet

Feet
0 20

N
W E
S

File Ref. 04.336.003
Date: 5/10/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Mitigation Areas

- Floodplain
- Riparian Buffer

- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area
- Critical Root Zones
- Site Plan Structures
- Grading Area

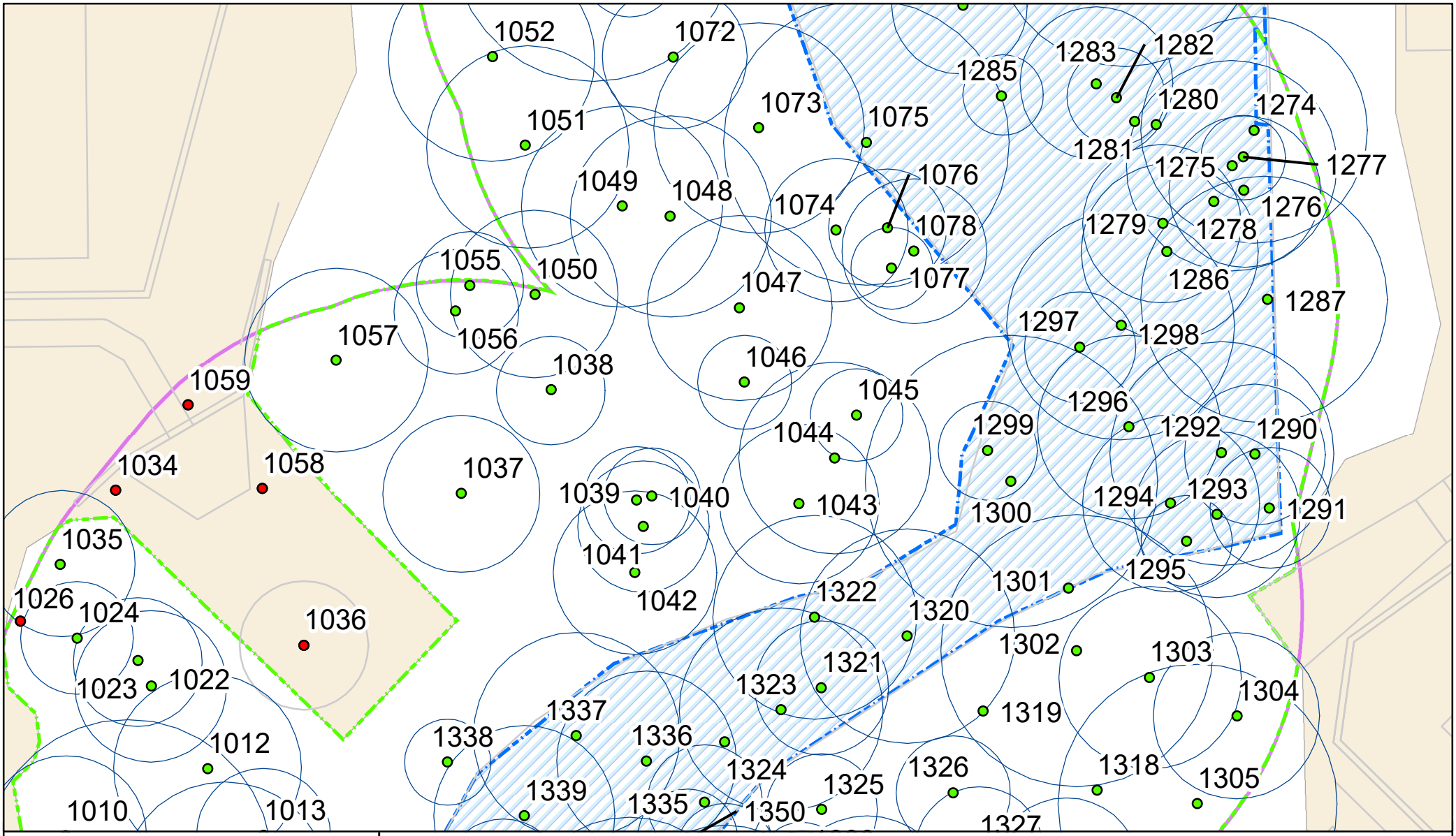


Figure 2D. Tree Inventory

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 20 feet

Feet
0 20

N
W E
S

File Ref. 04.336.003
Date: 5/10/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Mitigation Areas

- Floodplain
- Riparian Buffer

- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area
- Critical Root Zones
- Site Plan Structures
- Grading Area

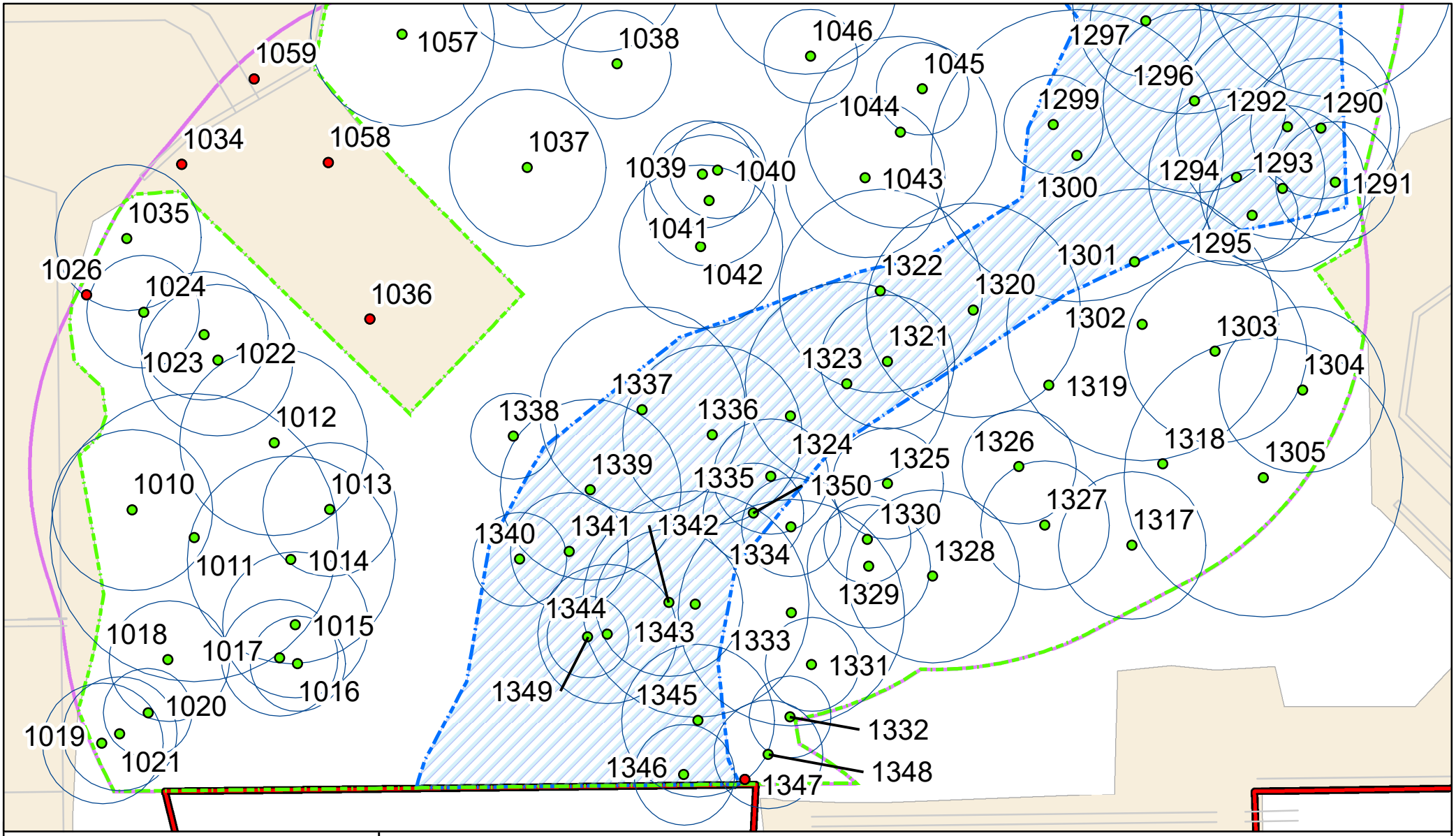


Figure 2E. Tree Inventory

Barrel Strap Residential
City of Denton
Denton County, Texas

1 in = 20 feet

Feet
0 20

N
W E
S

File Ref. 04.336.003
Date: 4/18/2023

- Survey Area
- Riparian Buffer ESA
- Floodplain ESA

Mitigation Areas

- Floodplain
- Riparian Buffer

- Trees within the Unaffected Riparian Buffer
- Trees within the Proposed Impact Area
- Critical Root Zones
- Site Plan Structures
- Grading Area

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1010	12.0	post oak	12	No	Healthy	0	61-90			
1011	21.5	post oak	22	Yes	Healthy	0	61-90			
1012	14.0	post oak	14	No	Healthy	0	61-90			
1013	10.0	post oak	10	No	Healthy	0	61-90			
1014	15.5	post oak	16	No	Healthy	0	61-90			
1015	10.9	post oak	11	No	Healthy	0	61-90			
1016	7.1	cedar elm	7	No	Healthy	0	61-90			
1017	8.7	post oak	9	No	Healthy	0	61-90			
1018	9.0	post oak	9	No	Healthy	0	61-90			
1019	9.0	post oak	9	No	Healthy	0	61-90			
1020	6.6	post oak	7	No	Healthy	0	61-90			
1021	8.5	post oak	9	No	Healthy	0	61-90			
1022	11.3	post oak	11	No	Healthy	0	61-90			
1023	7.6	cedar elm	8	No	Healthy	0	61-90			
1024	8.4	cedar elm	8	No	Healthy	0	61-90			
1026	12.6	post oak	13	No	Healthy	0	61-90			
1034	8.7	cedar elm	9	No	Healthy	0	61-90			
1035	9.7	post oak	10	No	Healthy	0	61-90			
1036	19.2	post oak	19	Yes	Healthy	0	61-90			
1037	11.7	cedar elm	12	No	Healthy	0	61-90			
1038	8.1	cedar elm	8	No	Healthy	0	61-90			
1039	8.0	cedar elm	8	No	Healthy	0	61-90			
1040	7.2	cedar elm	7	No	Healthy	0	61-90			
1041	9.8	cedar elm	10	No	Healthy	0	61-90			
1042	12.2	cedar elm	12	No	Healthy	0	61-90			
1043	11.9	cedar elm	12	No	Healthy	0	61-90			
1044	14.3	post oak	14	No	Healthy	0	61-90			
1045	6.9	cedar elm	7	No	Healthy	0	61-90			
1046	7.0	cedar elm	7	No	Healthy	0	61-90			
1047	13.8	post oak	14	No	Healthy	0	61-90			
1048	14.9	post oak	15	No	Healthy	0	61-90			
1049	14.7	post oak	15	No	Healthy	0	61-90			
1050	12.5	cedar elm	13	No	Healthy	0	61-90			
1051	15.1	post oak	15	No	Healthy	0	61-90			
1052	15.4	post oak	15	No	Healthy	0	61-90			
1055	8.0	post oak	8	No	Healthy	0	61-90			
1056	9.3	cedar elm	9	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1057	13.7	post oak	14	No	Healthy	0	61-90			
1058	7.4	cedar elm	7	No	Healthy	0	61-90			
1059	9.3	cedar elm	9	No	Healthy	0	61-90			
1066	6.9	cedar elm	7	No	Healthy	0	61-90			
1067	21.0	post oak	21	No	Healthy	0	61-90			
1068	11.9	post oak	12	No	Healthy	0	61-90			
1069	10.3	post oak	10	No	Damaged	0	61-90	Trunk	Trunk	Trunk
1070	12.3	cedar elm	12	No	Healthy	0	61-90			
1071	11.4	post oak	11	No	Damaged	0	61-90	Trunk & Branches	Trunk & Branches	Trunk & Branches
1072	10.8	cedar elm	11	No	Healthy	0	61-90			
1073	15.7	post oak	16	No	Healthy	0	61-90			
1074	10.7	post oak	11	No	Healthy	0	61-90			
1075	21.3	post oak	21	No	Healthy	0	61-90			
1076	8.8	cedar elm	9	No	Healthy	0	61-90			
1077	6.1	cedar elm	6	No	Healthy	0	61-90			
1078	10.8	cedar elm	11	No	Healthy	0	61-90			
1079	8.8	cedar elm	9	No	Healthy	0	61-90			
1080	14.5	post oak	15	No	Healthy	0	61-90			
1081	18.5	post oak	19	No	Healthy	0	61-90			
1082	7.9	post oak	8	No	Healthy	0	61-90			
1083	11.2	post oak	11	No	Healthy	0	61-90			
1084	17.3	post oak	17	No	Healthy	0	61-90			
1085	24.9	post oak	25	No	Healthy	0	61-90			
1086	7.6	eastern red cedar	8	No	Healthy	0	61-90			
1087	24.4	post oak	24	Yes	Healthy	0	61-90			
1088	9.2	post oak	9	No	Healthy	0	61-90			
1089	19.5	post oak	20	No	Healthy	0	61-90			
1090	10.0	post oak	10	No	Healthy	0	61-90			
1091	13.7	post oak	14	No	Healthy	0	61-90			
1092	15.4	post oak	15	No	Healthy	0	61-90			
1093	6.5	post oak	7	No	Healthy	0	61-90			
1096	12.0	post oak	12	No	Healthy	0	61-90			
1097	18.4	post oak	18	No	Healthy	0	61-90			
1098	11.4	post oak	11	Yes	Healthy	0	61-90			
1099	17.5	post oak	18	No	Healthy	0	61-90			
1100	9.1	cedar elm	9	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1101	6.5	post oak	7	No	Healthy	0	61-90			
1102	7.5	cedar elm	8	No	Healthy	0	61-90			
1103	20.3	post oak	20	No	Healthy	0	61-90			
1104	6.5	cedar elm	7	No	Healthy	0	61-90			
1105	7.7	cedar elm	8	No	Healthy	0	61-90			
1106	9.2	cedar elm	9	No	Healthy	0	61-90			
1107	16.0	cedar elm	16	No	Healthy	0	61-90			
1108	24.2	post oak	24	No	Healthy	0	61-90			
1109	6.0	Mexican plum	6	No	Damaged	95	61-90			
1110	10.8	post oak	11	No	Damaged	90	61-90			
1111	29.9	post oak	30	No	Healthy	0	61-90			
1112	17.2	post oak	17	No	Healthy	0	61-90			
1113	13.8	blackjack oak	14	No	Healthy	0	61-90			
1114	10.6	blackjack oak	11	No	Healthy	0	61-90			
1115	7.7	blackjack oak	8	No	Healthy	0	61-90			
1116	10.9	post oak	11	No	Healthy	0	61-90			
1117	7.6	eastern red cedar	8	No	Healthy	0	61-90			
1118	20.7	post oak	21	No	Healthy	0	61-90			
1119	16.5	post oak	17	No	Healthy	0	61-90			
1120	23.0	post oak	23	No	Healthy	0	61-90			
1121	12.5	post oak	13	No	Healthy	0	61-90			
1122	8.7	cedar elm	9	No	Healthy	0	61-90			
1123	7.0	cedar elm	7	No	Healthy	0	61-90			
1124	21.1	post oak	21	No	Healthy	0	61-90			
1125	8.8	cedar elm	9	No	Healthy	0	61-90			
1126	8.5	cedar elm	9	No	Healthy	0	61-90			
1127	6.2	post oak	6	No	Healthy	0	61-90			
1128	15.7	post oak	16	No	Healthy	0	61-90			
1129	12.4	post oak	12	No	Healthy	0	61-90			
1135	29.4	post oak	29	No	Healthy	0	61-90			
1136	13.0	eastern red cedar	13	No	Healthy	0	61-90			
1137	11.1	cedar elm	11	No	Healthy	0	61-90			
1138	11.3	cedar elm	11	No	Healthy	0	61-90			
1153	8.9	cedar elm	9	No	Healthy	0	61-90			
1154	8.3	cedar elm	8	No	Healthy	0	61-90			
1155	23.1	post oak	23	No	Healthy	0	61-90			
1156	10.0	cedar elm	10	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1157	6.2	cedar elm	6	No	Healthy	0	61-90			
1158	6.0	cedar elm	6	No	Healthy	0	61-90			
1159	25.6	post oak	26	No	Healthy	0	61-90			
1160	27.6	post oak	28	No	Healthy	0	61-90			
1161	12.3	post oak	12	No	Healthy	0	61-90			
1177	7.9	post oak	8	No	Healthy	0	61-90			
1178	20.6	post oak	21	No	Healthy	0	61-90			
1179	25.5	post oak	26	No	Healthy	0	61-90			
1180	7.6	cedar elm	8	No	Healthy	0	61-90			
1181	6.2	cedar elm	6	No	Healthy	0	61-90			
1183	17.7	post oak	18	No	Healthy	0	61-90			
1184	13.0	post oak	13	No	Healthy	0	61-90			
1189	13.0	blackjack oak	13	No	Healthy	0	61-90			
1190	14.0	post oak	14	No	Healthy	0	61-90			
1191	9.9	post oak	10	No	Healthy	0	61-90			
1192	17.4	post oak	17	No	Healthy	0	61-90			
1193	10.0	post oak	10	No	Healthy	0	61-90			
1194	15.4	post oak	15	No	Healthy	0	61-90			
1195	12.4	post oak	12	No	Healthy	0	61-90			
1196	10.9	cedar elm	11	No	Healthy	0	61-90			
1197	7.3	eastern red cedar	7	No	Healthy	0	61-90			
1198	16.0	post oak	16	No	Healthy	0	61-90			
1199	9.8	eastern red cedar	10	No	Healthy	0	61-90			
1200	15.6	post oak	16	No	Healthy	0	61-90			
1201	22.1	post oak	22	No	Healthy	0	61-90			
1202	8.5	cedar elm	9	No	Healthy	0	61-90			
1203	6.0	cedar elm	6	No	Healthy	0	61-90			
1204	8.4	cedar elm	8	No	Healthy	0	61-90			
1205	6.5	post oak	7	No	Healthy	0	61-90			
1206	8.9	cedar elm	9	No	Healthy	0	61-90			
1207	13.8	blackjack oak	14	No	Healthy	0	61-90			
1208	8.2	cedar elm	8	No	Healthy	0	61-90			
1209	17.0	post oak	17	No	Healthy	0	61-90			
1210	14.5	post oak	15	No	Healthy	0	61-90			
1211	12.9	post oak	13	No	Healthy	0	61-90			
1212	7.8	post oak	8	No	Healthy	0	61-90			
1213	24.3	post oak	24	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1214	15.6	post oak	16	No	Healthy	0	61-90			
1215	13.4	post oak	13	No	Healthy	0	61-90			
1216	10.3	cedar elm	10	No	Healthy	0	61-90			
1217	13.7	blackjack oak	14	No	Healthy	0	61-90			
1218	8.0	cedar elm	8	No	Healthy	0	61-90			
1219	9.1	cedar elm	9	No	Healthy	0	61-90			
1220	13.9	blackjack oak	14	No	Healthy	0	61-90			
1221	10.7	blackjack oak	11	No	Healthy	0	61-90			
1222	8.0	post oak	8	No	Damaged	0	61-90	Trunk		
1223	14.6	blackjack oak	15	No	Healthy	0	61-90			
1224	11.5	blackjack oak	12	No	Damaged	0	61-90	Trunk	Trunk	
1225	17.9	post oak	18	No	Healthy	0	61-90			
1226	12.6	blackjack oak	13	No	Healthy	0	61-90			
1227	8.3	cedar elm	8	No	Healthy	0	61-90			
1229	10.7	blackjack oak	11	No	Healthy	0	61-90			
1241	6.8	eastern red cedar	7	No	Damaged	0	61-90	Trunk & Branches	Trunk & Branches	Trunk & Branches
1242	9.3	post oak	9	No	Healthy	0	61-90			
1243	21.5	post oak	22	No	Healthy	0	61-90			
1244	7.2	cedar elm	7	No	Healthy	0	61-90			
1245	14.5	post oak	15	No	Healthy	0	61-90			
1246	33.6	post oak	34	No	Healthy	0	61-90			
1247	9.8	cedar elm	10	No	Healthy	0	61-90			
1248	7.9	cedar elm	8	No	Healthy	0	61-90			
1249	6.5	cedar elm	7	No	Healthy	0	61-90			
1250	9.4	cedar elm	9	No	Healthy	0	61-90			
1251	9.4	cedar elm	9	No	Healthy	0	61-90			
1252	7.5	cedar elm	8	No	Healthy	0	61-90			
1253	7.4	cedar elm	7	No	Healthy	0	61-90			
1254	7.7	cedar elm	8	No	Healthy	0	61-90			
1255	7.2	cedar elm	7	No	Healthy	0	61-90			
1256	6.0	cedar elm	6	No	Healthy	0	61-90			
1257	7.5	cedar elm	8	No	Healthy	0	61-90			
1258	8.7	cedar elm	9	No	Healthy	0	61-90			
1259	7.7	post oak	8	No	Healthy	0	61-90			
1260	12.1	blackjack oak	12	No	Healthy	0	61-90			
1261	25.6	post oak	26	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1262	7.2	cedar elm	7	No	Healthy	0	61-90			
1263	8.8	cedar elm	9	No	Healthy	0	61-90			
1264	8.3	cedar elm	8	No	Healthy	0	61-90			
1265	8.5	cedar elm	9	No	Healthy	0	61-90			
1266	6.5	cedar elm	7	No	Healthy	0	61-90			
1267	6.1	cedar elm	6	No	Healthy	0	61-90			
1268	7.4	cedar elm	7	No	Healthy	0	61-90			
1269	8.1	cedar elm	8	No	Healthy	0	61-90			
1270	8.7	cedar elm	9	No	Healthy	0	61-90			
1271	9.6	cedar elm	10	No	Healthy	0	61-90			
1272	7.0	cedar elm	7	No	Healthy	0	61-90			
1273	19.6	post oak	20	No	Healthy	0	61-90			
1274	16.9	blackjack oak	17	No	Healthy	0	61-90			
1275	12.0	blackjack oak	12	No	Healthy	0	61-90			
1276	15.7	blackjack oak	16	No	Healthy	0	61-90			
1277	6.3	eastern red cedar	6	No	Healthy	0	61-90			
1278	11.3	blackjack oak	11	No	Healthy	0	61-90			
1279	11.8	post oak	12	No	Healthy	0	61-90			
1280	10.6	post oak	11	No	Healthy	0	61-90			
1281	9.0	cedar elm	9	No	Healthy	0	61-90			
1282	7.3	cedar elm	7	No	Healthy	0	61-90			
1283	11.4	cedar elm	11	No	Healthy	0	61-90			
1284	10.1	cedar elm	10	No	Healthy	0	61-90			
1285	6.0	cedar elm	6	No	Healthy	0	61-90			
1286	13.2	cedar elm	13	No	Healthy	0	61-90			
1287	18.4	post oak	18	No	Healthy	0	61-90			
1290	10.5	post oak	11	No	Healthy	0	61-90			
1291	9.0	post oak	9	No	Healthy	0	61-90			
1292	16.7	post oak	17	No	Healthy	0	61-90			
1293	12.4	post oak	12	No	Healthy	0	61-90			
1294	13.2	post oak	13	No	Healthy	0	61-90			
1295	6.8	cedar elm	7	No	Healthy	0	61-90			
1296	13.7	post oak	14	No	Healthy	0	61-90			
1297	8.3	cedar elm	8	No	Healthy	0	61-90			
1298	17.0	post oak	17	No	Healthy	0	61-90			
1299	7.4	cedar elm	7	No	Healthy	0	61-90			
1300	21.8	post oak	22	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1301	9.1	post oak	9	No	Healthy	0	61-90			
1302	12.7	post oak	13	No	Healthy	0	61-90			
1303	13.6	cedar elm	14	No	Healthy	0	61-90			
1304	12.4	post oak	12	No	Healthy	0	61-90			
1305	20.8	post oak	21	No	Healthy	0	61-90			
1317	11.0	post oak	11	No	Healthy	0	61-90			
1318	19.0	post oak	19	No	Healthy	0	61-90			
1319	20.3	post oak	20	No	Healthy	0	61-90			
1320	16.0	post oak	16	Yes	Healthy	0	61-90			
1321	10.0	post oak	10	No	Healthy	0	61-90			
1322	15.2	post oak	15	No	Healthy	0	61-90			
1323	9.9	post oak	10	No	Healthy	0	61-90			
1324	16.5	post oak	17	No	Healthy	0	61-90			
1325	8.3	post oak	8	No	Healthy	0	61-90			
1326	8.5	post oak	9	No	Healthy	0	61-90			
1327	9.6	blackjack oak	10	No	Healthy	0	61-90			
1328	12.5	post oak	13	No	Healthy	0	61-90			
1329	12.9	post oak	13	No	Healthy	0	61-90			
1330	6.5	post oak	7	No	Healthy	0	61-90			
1331	7.0	post oak	7	No	Healthy	0	61-90			
1332	6.1	post oak	6	No	Healthy	0	61-90			
1333	9.2	post oak	9	No	Healthy	0	61-90			
1334	7.4	post oak	7	No	Healthy	0	61-90			
1335	8.6	post oak	9	No	Healthy	0	61-90			
1336	13.4	post oak	13	No	Healthy	0	61-90			
1337	15.4	post oak	15	No	Healthy	0	61-90			
1338	6.4	cedar elm	6	No	Healthy	0	61-90			
1339	13.5	post oak	14	No	Healthy	0	61-90			
1340	7.0	cedar elm	7	No	Healthy	0	61-90			
1341	8.8	cedar elm	9	No	Healthy	0	61-90			
1342	11.0	post oak	11	No	Healthy	0	61-90			
1343	16.9	post oak	17	Yes	Healthy	0	61-90			
1344	10.4	post oak	10	No	Healthy	0	61-90			
1345	11.4	post oak	11	No	Healthy	0	61-90			
1346	7.5	cedar elm	8	No	Healthy	0	61-90			
1347	15.0	post oak	15	No	Healthy	0	61-90			
1348	8.1	post oak	8	No	Healthy	0	61-90			

Curve Barrel Strap Project Site - Tree Inventory within Confirmed ESA
Denton, Denton County, Texas

Tree Number	Diameter at Breast Height (Inches)	Species	Canopy Radius (Feet)	Multiple Trunks	General Condition	% Dead Branches	Lean	Dead/ Missing Bark	Sapwood Damage/ Decay	Heartwood Damage/ Decay
1349	6.1	eastern red cedar	6	No	Healthy	0	61-90			
1350	7.5	post oak	8	No	Healthy	0	61-90			

APPENDIX D

ESA Tree Preservation – Special Conditions Narrative

ESA Tree Preservation – Special Conditions Narrative

Cyrene at Hickory Creek

9-6-23

For further clarification on the preservation of some of the trees within the AESA at Cyrene at Hickory Creek, the following list shall add some extra detail to the specific conditions of each tree. The following trees shall be a part of the precon meeting on site to specifically verify the existing conditions and special care for each tree.

List of ESA trees:

1111-ESA – preserved

1) The ESA fence shall be carefully installed around the location of this tree
2) The proposed retaining wall will work outside the esa fence to the north and east of this tree

1225-ESA – preserved

1) This tree is located close to the rip rap outfall
2) All riprap located within the CRZ shall be hand placed and verified in field

1226-ESA - preserved

1) This tree is located close to the rip rap outfall
2) All riprap located within the CRZ shall be hand placed and verified in field

1228-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1229-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1232-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1234-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1219-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1250-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1291-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1304-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1305-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1306-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1312-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1348-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1019-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1021-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1011-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1010-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1035-DIA – preserved

2) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1057-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1053-DIA – preserved

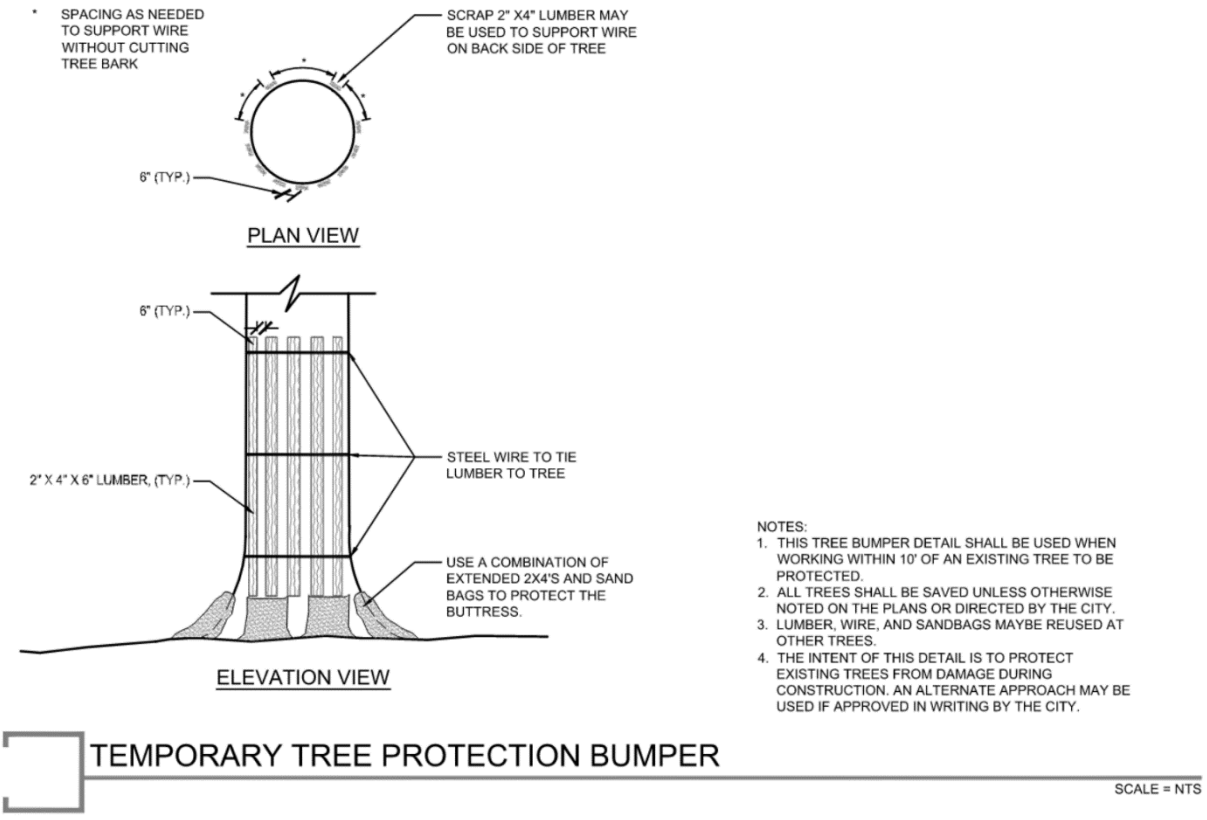
1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

1095-DIA – preserved

1) This this is close a proposed esa fence. The fence shall be carefully installed per plans and any grading in area next to CRZ shall be hand graded

Temporary Tree Protection Bumper:

All tress listed above will receive the temporary tree protection bumper as detailed below in the exhibit

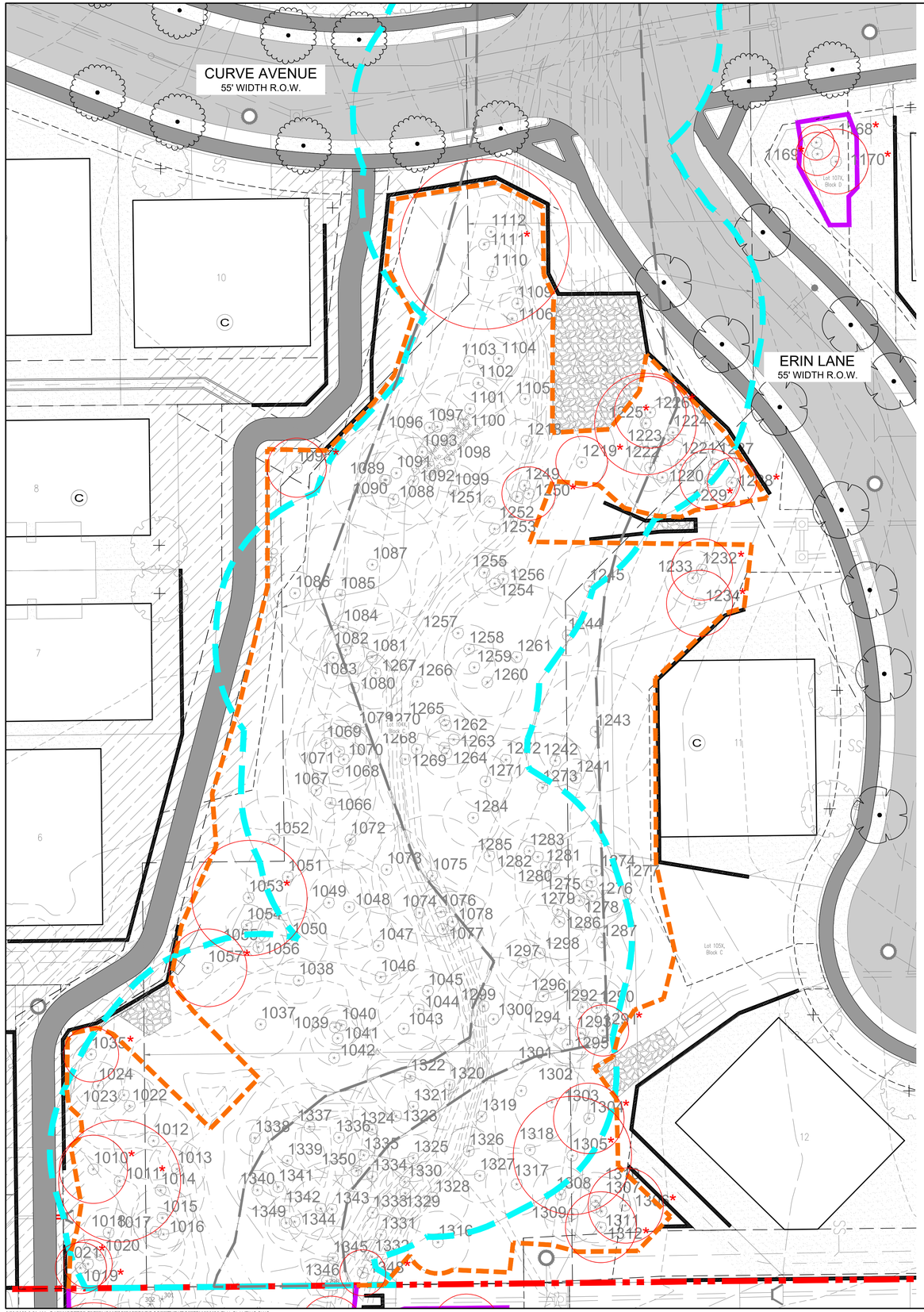


General Notes:

All of the trees listed above are to be verified in field for the exact conditions surrounding the tree.

These measures along with instructing the contractors on the importance of these trees is crucial to the success of the overall project.

-Curve Development
9-6-23



LINETYPES:

- PROPERTY BOUNDARY
- 6' MASONRY WALL WITH COLUMNS
- RETAINING WALL (REF. TO CIVIL PLANS)
- UTILITY EASEMENT, PEDESTRIAN EASEMENT, FLOOD EASEMENT
- WALL EASEMENT
- SWALE
- OHE — OVERHEAD ELECTRIC LINES
- EROSION CONTROL/ ESA FENCING
- ESA BOUNDARY
- TREE PROTECTION FENCING
- * TREES REQUIRING ADDITIONAL PROTECTION MEASURES

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KEY MAP

NOT FOR CONSTRUCTION

PROJECT

BARREL STRAP RESIDENTIAL

CYRENE AT HICKORY CREEK LLC

5013 HICKORY CREEK RD

DENTON, TX 76210

LANDDESIGN PROJ.#
8522003

REVISION / ISSUANCE

NO.	DESCRIPTION	DATE
	1ST CITY REVIEW	01.31.2023
	2ND CITY REVIEW	03.14.2023
	3RD CITY REVIEW	05.30.2023
	4TH CITY REVIEW	07.11.2023
	5TH CITY REVIEW	08.01.2023

DESIGNED BY: CC
DRAWN BY: DS
CHECKED BY: KM

SCALE
VERT: N/A
HORZ: 1"=20'
0 10' 20' 40'

NORTH

SHEET TITLE
ADDITIONAL PROTECTION TREE EXHIBIT

SHEET NUMBER