



## **MEMORANDUM**

**DATE:** June 21, 2024  
**TO:** File  
**FROM:** Christi Upton, Environmental Compliance Coordinator  
**SUBJECT:** ESA24-0001 Hunter Ranch Sewer

Per a request from Hillwood Development for a sanitary sewer project serving the area, the Official ESA Map will be updated to reflect the current conditions found in the field.

### **Property Location:**

The study site is generally along Roark Branch within the Hunter Ranch MPC and the Cole Ranch MPC then east to State Highway 377.

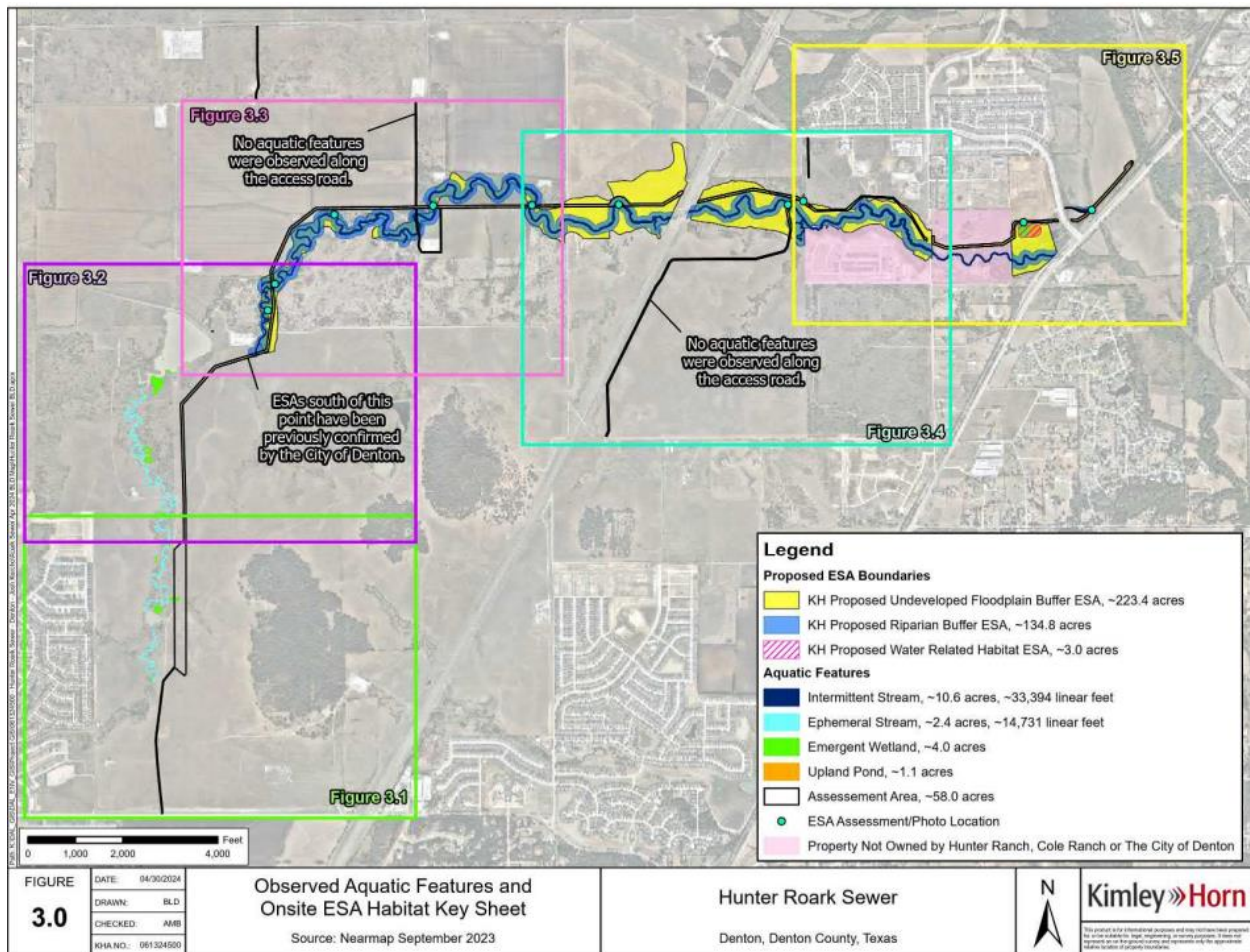
### **Findings:**

Roark Branch and its tributaries are intermittent streams with a riparian habitat of variable widths due to farming activities, easement clearings, roads and other previous land disturbances prior to the adoption of the ESA code and permitted activities per the code. Overall the habitat conditions are described as fair to good. Overall, the 1% floodplain was found to be in its natural state.

A wetland was found to have developed on the former Birch property south of the Vintage Village development.

## **OUR CORE VALUES**

Inclusion • Collaboration • Quality Service • Strategic Focus • Fiscal Responsibility



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# 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<br>Property ID: | N/A<br>R 65059 | Feature ID: | Stream 1 (S1)<br>Riparian Buffer 1 (RB1) |
|-------------------------------------|----------------|-------------|--|

Property ID can be found through Denton Central Appraisal District

Provide a unique ID when multiple features are assessed

**Hydrologic Segment Information:**

|       |                   |        |   |        |   |
|-------|-------------------|--------|---|--------|---|
| Name: | Unnamed tributary | Width: | 6 | Order: | 3 |
|-------|-------------------|--------|---|--------|---|

When available, stream or tributary to segment name

Approximate stream width

Stream order

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

S1 is an intermittent stream that flows generally west to east onsite. It meanders north and south as it moves to the east. A field that was previously utilized for agriculture is located west of this segment of the stream. There is a thick forest in the riparian area surrounding the stream. There are several horizontal gas well located onsite.

**Attachments Provided:**

|           |   |  |   |
|-----------|---|--|---|
| Required: | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| Other:    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

**Field Assessor:**

|   |                          |
|---|--------------------------|
| Name of Field Assessor:                 | Alex Brown               |
| Affiliation of Assessor (Organization): | Kimley-Horn & Associates |
| Date the assessment was performed:      | November 9, 2023         |

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:28:45 -06'00'

**Environmental Services Representative:**

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.06 13:17:39 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Potential pollutants from current drainage area:

|  |  |
|--|--|
| <input checked="" type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads              |
| <input type="checkbox"/> intensive agricultural use                      | <input type="checkbox"/> grazing animals have access to water feature      |
| <input type="checkbox"/> water feature has steep slopes                  | <input type="checkbox"/> plant or animal species of concern present        |
| <input type="checkbox"/> water feature used for recreation               | <input type="checkbox"/> waterway a drinking water source/adjacent to well |
| <input type="checkbox"/> 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:

|  |  |
|--|--|
| <input type="checkbox"/> intercepts sediment         | <input type="checkbox"/> provides fish habitat       |
| <input type="checkbox"/> intercepts nutrients        | <input type="checkbox"/> improves wildlife habitat   |
| <input type="checkbox"/> intercepts pesticides       | <input type="checkbox"/> stabilizes streambank       |
| <input type="checkbox"/> intercepts other pollutants | <input type="checkbox"/> unique aesthetics / privacy |
| <input type="checkbox"/> other:                      |  |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|  |  |
|--|--|
| 43 - Frio clay loam, 0 to 1 percent slopes, frequently flooded |  |
| 68 - Sanger clay, 3 to 5 percent slopes                        |  |
| 22 - Burleson clay, 1 to 3 percent slopes                      |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 2 %   |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Large leaning trees                      | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Invasive exotics present                 | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: chinese privet % infestation: 10   |

### Top of Bank:

|                          |   |
|--------------------------|---|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: chinese privet % infestation: 10   |

**Above the Bank:**

|                          |  |
|--------------------------|--|
| Slope                    | 2 %  |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature  |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow  |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe   |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated   |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:  |

**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 |
|------------------------|----------------------|---------|-----------|
| Celtis laevigata       | hackberry            | 15      | FAC       |
| Fraxinus pennsylvanica | green ash            | 20      | FAC       |
| Ulmus crassifolia      | cedar elm            | 20      | FAC       |
| Ligustrum sinense      | Chinese privet       | 10      | UPL       |
| Smilax rotundifolia    | roundleaf greenbrier | 10      | FAC       |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |

**Bank Hydrophytic Vegetation Indicator:** 4 : 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 |
|------------------------|----------------------|---------|-----------|
| Celtis laevigata       | hackberry            | 15      | FAC       |
| Fraxinus pennsylvanica | green ash            | 20      | FAC       |
| Ulmus crassifolia      | cedar elm            | 20      | FAC       |
| Ligustrum sinense      | chinese privet       | 10      | UPL       |
| Smilax rotundifolia    | roundleaf greenbrier | 10      | FAC       |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 4 : 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:**

|   |  |
|---|--|
| <b>Primary</b>  | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 5     |
| 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.   | 8     |
| Channel crossing section shape   | generally, V or U-shaped   | "wide" U  | generally trapezoid shaped   | wide trapezoid to rectangle shape  | 8     |
| Table 1 score (average of points given, rounded to nearest whole number)                 |  |   |  |  | 7     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 4            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 6            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 4            |
| 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 | 4            |
| 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             | 4            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |



**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| Percent wetted perimeter of channel bottom during base flow events                    | >85%                             | 61 – 85%   | 40 – 60%  | <40%  | 5     |
| 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 | 6     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| 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"  | 7     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 7     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 6     |
| Table 3 score (average of points given, rounded to nearest whole number)              |                                  |  |   |   | 6     |



**Table 4: Riparian Habitat**

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

|  | <i>Score Selection:</i>  |  |   |  | Score |
|--|--------------------------|--|---|--|-------|
|  | <i>Excellent (7 – 6)</i> | <i>Good (5 – 4)</i>                        | <i>Fair (3 – 2)</i>                                   | <i>Poor (1 – 0)</i>                                    |       |
| 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 | 4     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 5     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 5     |

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**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.

|  | <i>Score Selection:</i>  |                     |                                |                     | Score |
|--|--------------------------|---------------------|--------------------------------|---------------------|-------|
|  | <i>Excellent (8 – 7)</i> | <i>Good (6 – 5)</i> | <i>Fair (4 – 3)</i>            | <i>Poor (2 – 0)</i> |       |
| Percent substrate fouling on underside of cobble                         | Minimal, 0 – 10%         | Light, 11 – 20%     | Moderate, 21 – 50%             | High, >50%          | 4     |
| Total Dissolved Solids   | 350 – 399 mg/L           | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                          |                     |                                |                     | 6     |

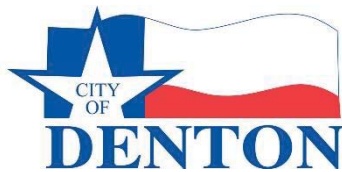
**Table 6: Biological Indicators**

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

|  | <i>Score Selection:</i>   |   |  |  | Score |
|--|---|---|--|--|-------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>   | <i>Fair (4 – 3)</i>                                    | <i>Poor (2 – 0)</i>                                      |       |
| 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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 1     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 2     |

**Table 7: RSAT Summary**

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



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|                                     |                        |             |  |
|-------------------------------------|------------------------|-------------|--|
| Property Address or<br>Property ID: | N/A<br>R 67440, R67540 | Feature ID: | Stream 1 (S1)<br>Riparian Buffer 2 (RB2) |
|-------------------------------------|------------------------|-------------|--|

Property ID can be found through Denton Central Appraisal District

Provide a unique ID when multiple features are assessed

**Hydrologic Segment Information:**

|       |                   |        |   |        |   |
|-------|-------------------|--------|---|--------|---|
| Name: | Unnamed tributary | Width: | 6 | Order: | 3 |
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When available, stream or tributary to segment name

Approximate stream width

Stream order

**Assessment Conclusion:**

Select one of the following.

- ☒ 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.
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S1 is an intermittent stream that flows generally west to east onsite. It meanders north and south as it moves to the east. A field that is utilized for agriculture is located north of this segment of the stream. The area surrounding the stream is primarily grassland with scattered clumps of trees. There are several horizontal gas well located onsite.

**Attachments Provided:**

|           |   |  |   |
|-----------|---|--|---|
| Required: | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| Other:    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

**Field Assessor:**

|   |                          |
|---|--------------------------|
| Name of Field Assessor:                 | Alex Brown               |
| Affiliation of Assessor (Organization): | Kimley-Horn & Associates |
| Date the assessment was performed:      | November 9, 2023         |

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:29:39 -06'00'

**Environmental Services Representative:**

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.06 13:21:20 -06'00'

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|--|---|
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| <input type="checkbox"/> Residential:          | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial |   |
| <input type="checkbox"/> Recreational          |   |
| <input type="checkbox"/> Other:                |   |

### Potential pollutants from current drainage area:

|   |  |
|---|--|
| <input type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads                    |
| <input type="checkbox"/> intensive agricultural use           | <input checked="" type="checkbox"/> grazing animals have access to water feature |
| <input type="checkbox"/> water feature has steep slopes       | <input type="checkbox"/> plant or animal species of concern present              |
| <input type="checkbox"/> water feature used for recreation    | <input type="checkbox"/> waterway a drinking water source/adjacent to well       |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment         | <input type="checkbox"/> provides fish habitat                |
| <input checked="" type="checkbox"/> intercepts nutrients        | <input checked="" type="checkbox"/> improves wildlife habitat |
| <input checked="" type="checkbox"/> intercepts pesticides       | <input checked="" type="checkbox"/> stabilizes streambank     |
| <input checked="" type="checkbox"/> intercepts other pollutants | <input type="checkbox"/> unique aesthetics / privacy          |
| <input type="checkbox"/> other:                                 |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| 67 - Sanger clay, 1 to 3 percent slopes         |  |
| 68 - Sanger clay, 3 to 5 percent slopes         |  |
| 56 - Medlin-Sanger clay, 5 to 15 percent slopes |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 50 %  |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input type="checkbox"/> moderate <input checked="" type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |  |
|--------------------------|--|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated   |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:  |

**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 5 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**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 |
|--------------------------------|--------------------|---------|-----------|
| <i>Celtis laevigata</i>        | hackberry          | 10      | FAC       |
| <i>Panicum dichotomiflorum</i> | panicgrass         | 20      | FAC       |
| <i>Iva annua</i>               | annual marsh elder | 20      | FAC       |
| <i>Xanthium strumarium</i>     | rough cocklebur    | 20      | FAC       |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |

**Bank Hydrophytic Vegetation Indicator:** 4 : 0

(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 |
|--------------------------------|--------------------|---------|-----------|
| <i>Celtis laevigata</i>        | hackberry          | 10      | FAC       |
| <i>Panicum dichotomiflorum</i> | panicgrass         | 20      | FAC       |
| <i>Iva annua</i>               | annual marsh elder | 20      | FAC       |
| <i>Xanthium strumarium</i>     | rough cocklebur    | 20      | FAC       |
| <i>Gleditsia triacanthos</i>   | honey locust       | 15      | FACU      |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |
|                                |                    |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 4 : 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:**

|   |  |
|---|--|
| <i>Primary</i>  | <i>Secondary</i>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 2     |
| 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.               | 5     |
| 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. | 3     |
| Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank | dominant   | present   | compromised  | severely compromised or nonexistent.   | 6     |
| 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)                 |  |   |  |  | 5     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 4            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 4            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 4            |
| 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 | 5            |
| 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             | 5            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |



**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| Percent wetted perimeter of channel bottom during base flow events                    | >85%                             | 61 – 85%   | 40 – 60%  | <40%  | 4     |
| 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 | 5     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| 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"  | 5     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 6     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 3     |
| Table 3 score (average of points given, rounded to nearest whole number)              |                                  |  |   |   | 4     |

**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 | 1     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 1     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 1     |

---

**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%          | 4     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

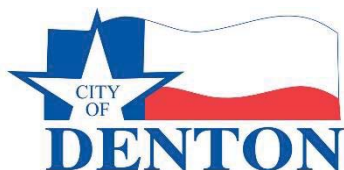
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 1     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 2     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 5  |   |
| 2. Channel Scouring/Deposition | 4  |   |
| 3. Physical In-Stream Habitat  | 4  |   |
| 4. Riparian Habitat            | 1  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 2  |   |
| Total Score:                   | 22   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input checked="" type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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<br>Property ID:                                | N/A<br>R 67440, R67540 | Feature ID:   | Stream 2 (S2)<br>Riparian Buffer 3 (RB3) |
| Property ID can be found through Denton Central Appraisal District |                        | Provide a unique ID when multiple features are assessed |  |

**Hydrologic Segment Information:**

|   |                   |                          |   |              |   |
|---|-------------------|--------------------------|---|--------------|---|
| Name:   | Unnamed tributary | Width:                   | 4 | Order:       | 2 |
| When available, stream or tributary to segment name |                   | Approximate stream width |   | Stream order |   |

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

S2 is an intermittent stream that flows generally south to north onsite. An unimproved road borders the stream to the south. The majority of the area around the stream is glassland with small clusters of trees. There are several horizontal gas well located onsite.

**Attachments Provided:**

|           |   |  |   |
|-----------|---|--|---|
| Required: | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| Other:    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

**Field Assessor:**

|   |                          |
|---|--------------------------|
| Name of Field Assessor:                 | Alex Brown               |
| Affiliation of Assessor (Organization): | Kimley-Horn & Associates |
| Date the assessment was performed:      | November 9, 2023         |

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:30:32  
-06'00'

**Environmental Services Representative:**

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad,  
ou=Department Users and Groups, ou=Utilities,  
ou=Water and Wastewater, cn=Christi Upton,  
email=Christi.Upton@cityofdenton.com  
Date: 2024.03.06 13:22:56 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Potential pollutants from current drainage area:

|   |  |
|---|--|
| <input type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads                  |
| <input type="checkbox"/> intensive agricultural use           | <input type="checkbox"/> grazing animals have access to water feature          |
| <input type="checkbox"/> water feature has steep slopes       | <input checked="" type="checkbox"/> plant or animal species of concern present |
| <input type="checkbox"/> water feature used for recreation    | <input type="checkbox"/> waterway a drinking water source/adjacent to well     |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment         | <input type="checkbox"/> provides fish habitat            |
| <input checked="" type="checkbox"/> intercepts nutrients        | <input type="checkbox"/> improves wildlife habitat        |
| <input checked="" type="checkbox"/> intercepts pesticides       | <input checked="" type="checkbox"/> stabilizes streambank |
| <input checked="" type="checkbox"/> intercepts other pollutants | <input type="checkbox"/> unique aesthetics / privacy      |
| <input type="checkbox"/> other:                                 |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| 67 - Sanger clay, 1 to 3 percent slopes |  |
| 68 - Sanger clay, 3 to 5 percent slopes |  |
|   |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 45 %  |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |   |
|--------------------------|---|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 5 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**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 |
|-------------------------|----------------------|---------|-----------|
| Gleditsia triacanthos   | honey locust         | 15      | FAC       |
| Prosopis glandulosa     | mesquite             | 20      | FACU      |
| Ulmus crassifolia       | cedar elm            | 10      | FAC       |
| Cynodon dactylon        | bermudagrass         | 30      | FACU      |
| Ambrosia artemisiifolia | ragweed              | 15      | FACU      |
| Monarda punctata        | beebalm              | 10      | UPL       |
| Eryngium leavenworthii  | Leavenworth's eryngo | 10      | UPL       |
|                         |                      |         |           |
|                         |                      |         |           |
|                         |                      |         |           |

**Bank Hydrophytic Vegetation Indicator:** 2 : 4

(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 |
|------------------|--------------------|---------|-----------|
| Cynodon dactylon | bermudagrass       | 15      | FACU      |
| Iva annua        | annual marsh elder | 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  |
|---|--|
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**Section 5. Rapid Stream Assessment Techniques (RSAT)**

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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.

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|  | 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  | 4     |
| 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.               | 5     |
| 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. | 2     |
| Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank | dominant   | present   | compromised  | severely compromised or nonexistent.   | 3     |
| Channel crossing section shape   | generally, V or U-shaped   | "wide" U  | generally trapezoid shaped   | wide trapezoid to rectangle shape  | 6     |
| Table 1 score (average of points given, rounded to nearest whole number)                 |  |   |  |  | 4     |



**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 3            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 4            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 4            |
| 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 | 4            |
| 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             | 5            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| Percent wetted perimeter of channel bottom during base flow events                    | >85%                             | 61 – 85%   | 40 – 60%  | <40%  | 4     |
| 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 | 5     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| Typical base flow riffle depth (non-stormwater base flows)                            | >6"                              | 5.9 – 4.0"   | 3.9 – 2.0"  | <2"   | 3     |
| Typical depth of large pools  | >24"                             | 24 – 18"   | 18 – 12"  | <12"  | 4     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 5     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 2     |
| Table 3 score (average of points given, rounded to nearest whole number)              |                                  |  |   |   | 4     |

**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 | 1     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 1     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 1     |

---

**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%          | 5     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

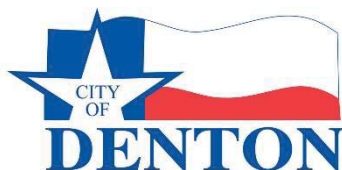
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 1     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 2     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 4  |   |
| 2. Channel Scouring/Deposition | 4  |   |
| 3. Physical In-Stream Habitat  | 4  |   |
| 4. Riparian Habitat            | 1  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 2  |   |
| Total Score:                   | 21   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input checked="" type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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<br>Property ID: | N/A<br>R 67467 | Feature ID: | Stream 1 (S1)<br>Riparian Buffer 4 (RB4) |
|-------------------------------------|----------------|-------------|--|

Property ID can be found through Denton Central Appraisal District

Provide a unique ID when multiple features are assessed

## Hydrologic Segment Information:

|       |                   |        |   |        |   |
|-------|-------------------|--------|---|--------|---|
| Name: | Unnamed tributary | Width: | 7 | Order: | 3 |
|-------|-------------------|--------|---|--------|---|

When available, stream or tributary to segment name

Approximate stream width

Stream order

## Assessment Conclusion:

Select one of the following.

- ☒ 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).

S1 is an intermittent stream that flows generally west to east onsite. A field utilized for agricultural bordered the riparian area to the north. The majority of the area around the stream is grassland with small clusters of trees. There are several horizontal gas well located onsite.

## Attachments Provided:

|           |   |  |   |
|-----------|---|--|---|
| Required: | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| Other:    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

## Field Assessor:

Name of Field Assessor: Alex Brown

Affiliation of Assessor (Organization): Kimley-Horn & Associates

Date the assessment was performed: November 9, 2023

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:31:21 -06'00'

## Environmental Services Representative:

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.06 13:24:31 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input type="checkbox"/> Forest                   | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Potential pollutants from current drainage area:

|  |  |
|--|--|
| <input checked="" type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads                  |
| <input type="checkbox"/> intensive agricultural use                      | <input type="checkbox"/> grazing animals have access to water feature          |
| <input type="checkbox"/> water feature has steep slopes                  | <input checked="" type="checkbox"/> plant or animal species of concern present |
| <input type="checkbox"/> water feature used for recreation               | <input type="checkbox"/> waterway a drinking water source/adjacent to well     |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment | <input type="checkbox"/> provides fish habitat            |
| <input type="checkbox"/> intercepts nutrients           | <input type="checkbox"/> improves wildlife habitat        |
| <input type="checkbox"/> intercepts pesticides          | <input checked="" type="checkbox"/> stabilizes streambank |
| <input type="checkbox"/> intercepts other pollutants    | <input type="checkbox"/> unique aesthetics / privacy      |
| <input type="checkbox"/> other:                         |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| 67 - Sanger clay, 1 to 3 percent slopes |  |
| 68 - Sanger clay, 3 to 5 percent slopes |  |
|   |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 8 %   |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |  |
|--------------------------|--|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated   |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:  |

**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 3 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**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 |
|-----------------------|------------------|---------|-----------|
| Gleditsia triacanthos | honey locust     | 10      | FAC       |
| Maclura pomifera      | osage-orange     | 10      | FACU      |
| Celtis laevigata      | hackberry        | 10      | FAC       |
| Eleocharis palustris  | common spikerush | 5       | OBL       |
| Conyza canadensis     | horseweed        | 10      | FACU      |
| Xanthium strumarium   | rough cocklebur  | 5       | FAC       |
| Andropogon virginicus | bluestem         | 5       | FACU      |
| Cynodon dactylon      | bermudagrass     | 30      | FACU      |
|                       |                  |         |           |
|                       |                  |         |           |

**Bank Hydrophytic Vegetation Indicator:** 4 : 4

(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 |
|-----------------------|-----------------|---------|-----------|
| Cynodon dactylon      | bermudagrass    | 40      | FACU      |
| Gleditsia triacanthos | honey locust    | 10      | FAC       |
| Xanthium strumarium   | rough cocklebur | 5       | FAC       |
| Andropogon virginicus | bluestem        | 10      | FACU      |
| Helenium amarum       | sneezeweed      | 10      | FACU      |
| Maclura pomifera      | osage-orange    | 10      | FACU      |
| Celtis laevigata      | hackberry       | 15      | FAC       |
|                       |                 |         |           |
|                       |                 |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 3 : 4

(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:**

|   |  |
|---|--|
| <b>Primary</b>  | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |



**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 3     |
| 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.               | 6     |
| 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. | 2     |
| Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank | dominant   | present   | compromised  | severely compromised or nonexistent.   | 7     |
| 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)                 |  |   |  |  | 5     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 4            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 4            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 4            |
| 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 | 4            |
| 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             | 2            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| 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 | 5     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| 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"  | 4     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 6     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 3     |
| 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 | 1     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 1     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 1     |

---

**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%          | 5     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

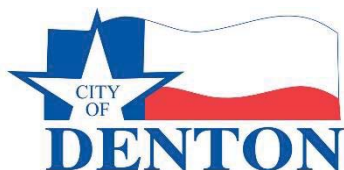
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 3     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 3     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 5  |   |
| 2. Channel Scouring/Deposition | 4  |   |
| 3. Physical In-Stream Habitat  | 5  |   |
| 4. Riparian Habitat            | 1  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 3  |   |
| Total Score:                   | 24   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input checked="" type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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<br>Property ID:                                | N/A<br>R 67467, R67472, R65056 | Feature ID:   | Stream 1 (S1)<br>Riparian Buffer 5 (RB5) |
| Property ID can be found through Denton Central Appraisal District |                                | Provide a unique ID when multiple features are assessed |  |

**Hydrologic Segment Information:**

|   |                   |                          |    |              |   |
|---|-------------------|--------------------------|----|--------------|---|
| Name:   | Unnamed tributary | Width:                   | 10 | Order:       | 3 |
| When available, stream or tributary to segment name |                   | Approximate stream width |    | Stream order |   |

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

S1 is an intermittent stream that flows generally west to east onsite. A field utilized for agricultural bordered the riparian area to the northwest and southeast. The majority of the area around the stream is thick riparian forest. There are several horizontal gas well located onsite.

**Attachments Provided:**

|           |   |  |   |
|-----------|---|--|---|
| Required: | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| Other:    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

**Field Assessor:**

Name of Field Assessor: Alex Brown  
Affiliation of Assessor (Organization): Kimley-Horn & Associates  
Date the assessment was performed: November 9, 2023

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:32:12 -06'00'

**Environmental Services Representative:**

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.06 15:49:30 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Potential pollutants from current drainage area:

|  |  |
|--|--|
| <input checked="" type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads                  |
| <input type="checkbox"/> intensive agricultural use                      | <input type="checkbox"/> grazing animals have access to water feature          |
| <input type="checkbox"/> water feature has steep slopes                  | <input checked="" type="checkbox"/> plant or animal species of concern present |
| <input type="checkbox"/> water feature used for recreation               | <input type="checkbox"/> waterway a drinking water source/adjacent to well     |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment   | <input type="checkbox"/> provides fish habitat                |
| <input checked="" type="checkbox"/> intercepts nutrients  | <input checked="" type="checkbox"/> improves wildlife habitat |
| <input checked="" type="checkbox"/> intercepts pesticides | <input checked="" type="checkbox"/> stabilizes streambank     |
| <input type="checkbox"/> intercepts other pollutants      | <input type="checkbox"/> unique aesthetics / privacy          |
| <input type="checkbox"/> other:                           |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|  |  |
|--|--|
| 67 - Sanger clay, 1 to 3 percent slopes                        |  |
| 34 - Frio clay loam, 0 to 1 percent slopes, frequently flooded |  |
| 22 - Burleson clay, 1 to 3 percent slopes                      |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 5 %   |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input checked="" type="checkbox"/> little to none <input type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: chinese privet % infestation: 50   |

### Top of Bank:

|                          |  |
|--------------------------|--|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated   |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: chinese privet % infestation: 50  |



**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 3 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**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 |
|------------------------|----------------------|---------|-----------|
| Ulmus crassifolia      | cedar elm            | 50      | FAC       |
| Fraxinus pennsylvanica | green ash            | 15      | FAC       |
| Ligustrum sinense      | chinese privet       | 40      | UPL       |
| Ulmus americana        | american elm         | 10      | FAC       |
| Smilax rotundifolia    | roundleaf greenbrier | 10      | FAC       |
| Nekemias arborea       | peppervine           | 10      | FAC       |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |
|                        |                      |         |           |

**Bank Hydrophytic Vegetation Indicator:** 5 : 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 |
|-----------------------|----------------------|---------|-----------|
| Ligustrum sinense     | chinese privet       | 70      | UPL       |
| Gleditsia triacanthos | honey locust         | 10      | FAC       |
| Ulmus crassifolia     | cedar elm            | 50      | FAC       |
| Carya illinoensis     | pecan                | 20      | FAC       |
| Smilax rotundifolia   | roundleaf greenbrier | 10      | FAC       |
|                       |                      |         |           |
|                       |                      |         |           |
|                       |                      |         |           |
|                       |                      |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 4 : 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:**

|   |  |
|---|--|
| <b>Primary</b>  | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 3     |
| 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.               | 6     |
| 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. | 2     |
| Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank | dominant   | present   | compromised  | severely compromised or nonexistent.   | 7     |
| 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)                 |  |   |  |  | 5     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 4            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 4            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 4            |
| 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 | 4            |
| 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             | 2            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| 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 | 5     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| 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"  | 4     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 6     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 3     |
| 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 | 1     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 1     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 1     |

---

**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%          | 5     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

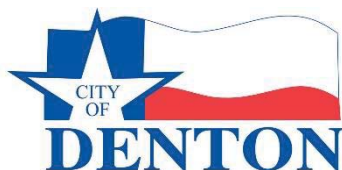
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 3     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 3     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 5  |   |
| 2. Channel Scouring/Deposition | 4  |   |
| 3. Physical In-Stream Habitat  | 5  |   |
| 4. Riparian Habitat            | 1  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 3  |   |
| Total Score:                   | 24   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input checked="" type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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](#).

|   |                               |
|---|-------------------------------|
| <b>Property Address or Property ID:</b> | <b>Feature ID:</b>            |
| R 65052                                 | S1<br>Riparian Buffer 6 (RB6) |

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

**Hydrologic Segment Information:**

|              |               |               |
|--------------|---------------|---------------|
| <b>Name:</b> | <b>Width:</b> | <b>Order:</b> |
|              | 15            | 3             |

When available, stream or tributary to segment name  
Approximate stream width  
Stream order

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

S1 is an intermittent stream that flows generally west to east onsite. Riparian forest directly borders the stream, and a field utilized for agriculture bordered the riparian area to the north and south.

**Attachments Provided:**

|                  |  |   |  |
|------------------|--|---|--|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map | <input checked="" type="checkbox"/> current map of feature                | <input type="checkbox"/> proposed map of feature |
| <b>Other:</b>    | <input checked="" type="checkbox"/> soils map        | <input checked="" type="checkbox"/> photographs representative of feature |  |

**Field Assessor:**

|   |                            |
|---|----------------------------|
| Name of Field Assessor:                 | Alex M. Brown              |
| Affiliation of Assessor (Organization): | Kimley-Horn and Associates |
| Date the assessment was performed:      | November 16, 2023          |

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

**Alex M. Brown**  
Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:54:35 -06'00'

**Environmental Services Representative:**

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

**Christi Upton**  
Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.07 11:02:45 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Potential pollutants from current drainage area:

|  |  |
|--|--|
| <input checked="" type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads                    |
| <input type="checkbox"/> intensive agricultural use                      | <input checked="" type="checkbox"/> grazing animals have access to water feature |
| <input type="checkbox"/> water feature has steep slopes                  | <input type="checkbox"/> plant or animal species of concern present              |
| <input type="checkbox"/> water feature used for recreation               | <input type="checkbox"/> waterway a drinking water source/adjacent to well       |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment   | <input checked="" type="checkbox"/> provides fish habitat |
| <input type="checkbox"/> intercepts nutrients             | <input type="checkbox"/> improves wildlife habitat        |
| <input checked="" type="checkbox"/> intercepts pesticides | <input checked="" type="checkbox"/> stabilizes streambank |
| <input type="checkbox"/> intercepts other pollutants      | <input type="checkbox"/> unique aesthetics / privacy      |
| <input type="checkbox"/> other:                           |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| Ponder loam, 1 to 3 percent slopes                        |  |
| Frio clay loam, 0 to 1 percent slopes, frequently flooded |  |
|   |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 30 %  |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge   |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input checked="" type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |   |
|--------------------------|---|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: Chinese privet % infestation: 10   |



**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 2 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input checked="" type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

**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 |
|-------------------------|----------------------|---------|-----------|
|                         |                      |         | UPL       |
| Smilax rotundifolia     | roundleaf greenbrier | 10      | FAC       |
| Ulmus crassifolia       | cedar elm            | 15      | FAC       |
|                         |                      |         |           |
| Sideroxylon lanuginosum | gum bumelia          | 10      | FACU      |
|                         |                      |         |           |
|                         |                      |         |           |
|                         |                      |         |           |

**Bank Hydrophytic Vegetation Indicator:** 2 : 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 |
|----------------------|------------------|---------|-----------|
| Ulmus crassifolia    | cedar elm        | 50      | FAC       |
| Prosopis glandulosa  | mesquite         | 10      | UPL       |
| Juniperus virginiana | eastern redcedar | 10      | UPL       |
| Cynodon dactylon     | bermuda grass    | 50      | FACU      |
| Ligustrum sinense    | Chinese privet   | 10      | UPL       |
|                      |                  |         |           |
|                      |                  |         |           |
|                      |                  |         |           |
|                      |                  |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 1 : 4

(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:**

|   |  |
|---|--|
| <b>Primary</b>  | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 5     |
| 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.               | 4     |
| 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. | 5     |
| Presence of highly erosion-resistant plant/soil matrix or material in bottom 1/3 of bank | dominant   | present   | compromised  | severely compromised or nonexistent.   | 6     |
| Channel crossing section shape   | generally, V or U-shaped   | "wide" U  | generally trapezoid shaped   | wide trapezoid to rectangle shape  | 6     |
| Table 1 score (average of points given, rounded to nearest whole number)                 |  |   |  |  | 5     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 5            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 3            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 5            |
| 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 | 5            |
| 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             | 5            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 5            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| Percent wetted perimeter of channel bottom during base flow events                    | >85%                             | 61 – 85%   | 40 – 60%  | <40%  | 2     |
| 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 | 3     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 5     |
| Typical base flow riffle depth (non-stormwater base flows)                            | >6"                              | 5.9 – 4.0"   | 3.9 – 2.0"  | <2"   | 2     |
| Typical depth of large pools  | >24"                             | 24 – 18"   | 18 – 12"  | <12"  | 3     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 6     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 5     |
| Table 3 score (average of points given, rounded to nearest whole number)              |                                  |  |   |   | 4     |

**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 | 2     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 4     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 3     |

---

**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%          | 5     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

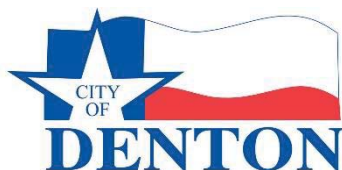
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 2     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 2     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 5  |   |
| 2. Channel Scouring/Deposition | 5  |   |
| 3. Physical In-Stream Habitat  | 4  |   |
| 4. Riparian Habitat            | 3  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 2  |   |
| Total Score:                   | 25   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input checked="" type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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](#).

|   |                               |
|---|-------------------------------|
| <b>Property Address or Property ID:</b> | <b>Feature ID:</b>            |
| R 64803                                 | S1<br>Riparian Buffer 7 (RB7) |

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

**Hydrologic Segment Information:**

|                   |               |               |
|-------------------|---------------|---------------|
| <b>Name:</b>      | <b>Width:</b> | <b>Order:</b> |
| Unnamed tributary | 20            | 3             |

When available, stream or tributary to segment name  
Approximate stream width  
Stream order

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

This was an assessment of 2 segments of intermittent stream S1 whose riparian buffer ESA areas intersect the Roark site boundary. The majority of the area around the stream segments is dense riparian forest.

**Attachments Provided:**

|                  |   |  |   |
|------------------|---|--|---|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map  | <input checked="" type="checkbox"/> current map of feature | <input checked="" type="checkbox"/> proposed map of feature |
| <b>Other:</b>    | <input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |  |   |

**Field Assessor:**

Name of Field Assessor: Alex M. Brown  
Affiliation of Assessor (Organization): Kimley-Horn and Associates  
Date the assessment was performed: 11-15-2023

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

**Alex M. Brown**  
Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:51:35 -06'00'

**Environmental Services Representative:**

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

**Christi Upton**  
Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.07 11:11:51 -06'00'

## Section 1. General Information

### General Land Use:

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

|  |  |
|--|--|
| <input checked="" type="checkbox"/> Forest       | Briefly describe:  |
| <input type="checkbox"/> Agricultural:           | <input type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input checked="" type="checkbox"/> Residential: | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                  |
| <input type="checkbox"/> Commercial/Industrial   |  |
| <input type="checkbox"/> Recreational            |  |
| <input type="checkbox"/> Other:                  |  |

### Potential pollutants from current drainage area:

|  |  |
|--|--|
| <input checked="" type="checkbox"/> urban/suburban landscape maintenance | <input type="checkbox"/> urban/suburban parking lots or roads              |
| <input type="checkbox"/> intensive agricultural use                      | <input type="checkbox"/> grazing animals have access to water feature      |
| <input type="checkbox"/> water feature has steep slopes                  | <input type="checkbox"/> plant or animal species of concern present        |
| <input type="checkbox"/> water feature used for recreation               | <input type="checkbox"/> waterway a drinking water source/adjacent to well |
| <input type="checkbox"/> 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:

|  |  |
|--|--|
| <input type="checkbox"/> intercepts sediment         | <input type="checkbox"/> provides fish habitat       |
| <input type="checkbox"/> intercepts nutrients        | <input type="checkbox"/> improves wildlife habitat   |
| <input type="checkbox"/> intercepts pesticides       | <input type="checkbox"/> stabilizes streambank       |
| <input type="checkbox"/> intercepts other pollutants | <input type="checkbox"/> unique aesthetics / privacy |
| <input type="checkbox"/> other:                      |  |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| Frio clay loam, 0-1% slopes, frequently flooded |  |
|   |  |
|   |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Slope of bank                            | 60 %  |
| Soil class                               | <input type="checkbox"/> clay <input type="checkbox"/> sand <input type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge  |
| Active erosion                           | <input type="checkbox"/> slight <input checked="" type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input checked="" type="checkbox"/> little to none <input type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input checked="" type="checkbox"/> bare <input type="checkbox"/> grass <input type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |   |
|--------------------------|---|
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: Chinese privet % infestation: 80   |



**Above the Bank:**

|                          |  |
|--------------------------|--|
| Slope                    | 15 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature  |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow  |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe   |
| Existing plant cover     | <input type="checkbox"/> little to none <input type="checkbox"/> moderate <input checked="" type="checkbox"/> well vegetated   |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input checked="" type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: Chinese privet % infestation: 80  |

**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 |
|-------------------------|----------------------|---------|-----------|
| Smilax rotundifolia     | roundleaf greenbrier | 15      | FAC       |
| Ulmus crassifolia       | cedar elm            | 20      | FAC       |
|                         |                      |         |           |
| Sideroxylon lanuginosum | gum bumelia          | 10      | FACU      |
|                         |                      |         |           |
|                         |                      |         |           |
|                         |                      |         |           |

**Bank Hydrophytic Vegetation Indicator:** 2 : 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 |
|---------------------|----------------------|---------|-----------|
| Ligustrum sinense   | Chinese privet       | 50      | UPL       |
| Ulmus crassifolia   | cedar elm            | 25      | FAC       |
| Smilax rotundifolia | roundleaf greenbrier | 10      | FAC       |
| Nekemias arborea    | peppervine           | 5       | FAC       |
|                     |                      |         |           |
|                     |                      |         |           |
|                     |                      |         |           |
|                     |                      |         |           |

**Buffer Hydrophytic Vegetation Indicator:** 3 : 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:**

|   |  |
|---|--|
| <b>Primary</b>  | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                  | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits            |  |
| <input type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>                                      |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 4     |
| 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.               | 6     |
| 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. | 6     |
| 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  | 6     |
| Table 1 score (average of points given, rounded to nearest whole number)                 |  |   |  |  | 5     |

**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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | N/A          |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 7            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 7            |
| 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 | 7            |
| 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) |   |   |   |  | 7            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| 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 | 5     |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 4     |
| 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"  | 4     |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 6     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 3     |
| 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 | 5     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 4     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 5     |

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**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%          | 5     |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| 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) |                   |                     |                                |                     | 6     |

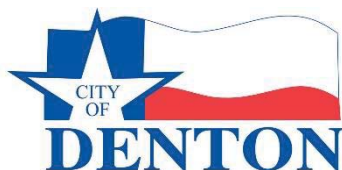
**Table 6: Biological Indicators**

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. | 2     |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | 3     |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | 3     |

**Table 7: RSAT Summary**

|                                | Score – flow   | Score – no flow   |
|--------------------------------|--|---|
| 1. Channel Stability           | 5  |   |
| 2. Channel Scouring/Deposition | 7  |   |
| 3. Physical In-Stream Habitat  | 5  |   |
| 4. Riparian Habitat            | 5  |   |
| 5. Water Quality               | 6  |   |
| 6. Biological Indicators       | 3  |   |
| Total Score:                   | 31   |   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input checked="" type="checkbox"/> Good (30-41)<br><input type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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](#).

|   |  |
|---|--|
| <b>Property Address or Property ID:</b>   | <b>Feature ID:</b>   |
| R 64685   | Riparian Buffer 8 (BR8)  |
| <small>Property ID can be found through Denton Central Appraisal District</small> | <small>Provide a unique ID when multiple features are assessed</small> |

**Hydrologic Segment Information:**

|  |   |                             |
|--|---|-----------------------------|
| <b>Name:</b> unnamed tributary                                     | <b>Width:</b> 3                         | <b>Order:</b>               |
| <small>When available, stream or tributary to segment name</small> | <small>Approximate stream width</small> | <small>Stream order</small> |

**Assessment Conclusion:**

Select one of the following.

- ☒ 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).

Intermittent stream located in the eastern portion of the study area. The stream is surrounded by a thin but dense riparian area and maintained pasture beyond that area.

**Attachments Provided:**

|                  |  |   |   |
|------------------|--|---|---|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map | <input checked="" type="checkbox"/> current map of feature                | <input checked="" type="checkbox"/> proposed map of feature |
| <b>Other:</b>    | <input checked="" type="checkbox"/> soils map        | <input checked="" type="checkbox"/> photographs representative of feature |   |

**Field Assessor:**

|   |                            |
|---|----------------------------|
| Name of Field Assessor:                 | Alex M. Brown              |
| Affiliation of Assessor (Organization): | Kimley-Horn and Associates |
| Date the assessment was performed:      | 11-16-2023                 |

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

**Alex M. Brown** Digitally signed by Alex M. Brown  
Date: 2024.01.09 13:37:57 -06'00'

**Environmental Services Representative:**

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

**Christi Upton** Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad, ou=Department Users and Groups, ou=Utilities, ou=Water and Wastewater, cn=Christi Upton, email=Christi.Upton@cityofdenton.com  
Date: 2024.03.07 11:14:06 -06'00'

## Section 1. General Information

### General Land Use:

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

|  |   |
|--|---|
| <input checked="" type="checkbox"/> Forest     | Briefly describe: riparian forested area  |
| <input type="checkbox"/> Agricultural:         | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:          | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial |   |
| <input type="checkbox"/> Recreational          |   |
| <input type="checkbox"/> Other:                |   |

### Potential pollutants from current drainage area:

|   |  |
|---|--|
| <input type="checkbox"/> urban/suburban landscape maintenance | <input checked="" type="checkbox"/> urban/suburban parking lots or roads   |
| <input type="checkbox"/> intensive agricultural use           | <input type="checkbox"/> grazing animals have access to water feature      |
| <input type="checkbox"/> water feature has steep slopes       | <input type="checkbox"/> plant or animal species of concern present        |
| <input type="checkbox"/> water feature used for recreation    | <input type="checkbox"/> waterway a drinking water source/adjacent to well |
| <input type="checkbox"/> 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:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> intercepts sediment         | <input type="checkbox"/> provides fish habitat                |
| <input type="checkbox"/> intercepts nutrients                   | <input checked="" type="checkbox"/> improves wildlife habitat |
| <input checked="" type="checkbox"/> intercepts pesticides       | <input type="checkbox"/> stabilizes streambank                |
| <input checked="" type="checkbox"/> intercepts other pollutants | <input type="checkbox"/> unique aesthetics / privacy          |
| <input type="checkbox"/> other:                                 |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|  |  |
|--|--|
| Lewisville clay loam, 3 to 5 percent slopes              |  |
| Frio clay loam, 0 to 1 percent slopes frequently flooded |  |
|  |  |

## Section 2. System Conditions

### Stream Bank:

|  |   |
|--|---|
| Evidence of frequent water level changes | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no   |
| Slope of bank                            | 10 %  |
| Soil class                               | <input checked="" type="checkbox"/> clay <input type="checkbox"/> sand <input checked="" type="checkbox"/> loam <input type="checkbox"/> gravel <input type="checkbox"/> ledge                                      |
| Active erosion                           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover                     | <input type="checkbox"/> little to none <input checked="" type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover                           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input type="checkbox"/> young forest <input type="checkbox"/> mature forest |
| Large leaning trees                      | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no   |
| Invasive exotics present                 | <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, species: % infestation:   |

### Top of Bank:

|                          |   |
|--------------------------|---|
| Existing plant cover     | <input type="checkbox"/> little to none <input checked="" type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input checked="" type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: Chinese privet % infestation: 20   |



**Above the Bank:**

|                          |   |
|--------------------------|---|
| Slope                    | 2 %   |
| Direction of slope       | <input checked="" type="checkbox"/> toward the water feature <input type="checkbox"/> away from water feature   |
| Runoff flow              | <input checked="" type="checkbox"/> sheet flow across the land <input type="checkbox"/> concentrated flow   |
| Active erosion           | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe  |
| Existing plant cover     | <input type="checkbox"/> little to none <input checked="" type="checkbox"/> moderate <input type="checkbox"/> well vegetated  |
| Dominant cover           | <input type="checkbox"/> cement <input type="checkbox"/> bare <input type="checkbox"/> grass <input checked="" type="checkbox"/> shrub <input checked="" type="checkbox"/> young forest <input checked="" type="checkbox"/> mature forest |
| Invasive exotics present | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no If yes, species: Chinese privet % infestation: 20   |

**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 |
|-------------------|----------------|------------|-----------|
| Ligustrum sinense | Chinese privet | 20         | UPL       |
| Ulmus americana   | American elm   | 50         | FAC       |
|                   | Chinese privet | form error |           |
|                   |                |            |           |
|                   |                |            |           |
|                   |                |            |           |
|                   |                |            |           |
|                   |                |            |           |
|                   |                |            |           |

**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 |
|-----------------------|----------------|------------|-----------|
| Lingustrum sinense    | Chinese privet | 30         | UPL       |
| Ulmus americana       | American elm   | 50         | FAC       |
| Gleditsia triacanthos | honey locust   | 10         | FACU      |
|                       |                | form error | UPL       |
|                       |                |            |           |
|                       |                |            |           |
|                       |                |            |           |
|                       |                |            |           |
|                       |                |            |           |

**Buffer Hydrophytic Vegetation Indicator:** 1 : 2

(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:**

|  |  |
|--|--|
| <b>Primary</b>   | <b>Secondary</b>   |
| <input type="checkbox"/> inundated                               | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input type="checkbox"/> soil saturated in upper 12"             | <input type="checkbox"/> water-stained leaves                |
| <input checked="" type="checkbox"/> water marks                  | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                             | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits                       |  |
| <input checked="" type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>   |  |

**Hydric Soil Indicators:**

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> Assumed hydric                      |  |

**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  | 9     |
| 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.               | 9     |
| 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. | 4     |
| 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  | 3     |
| 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.

|  | <i>Score Selection:</i>   |   |   |  | <i>Score</i> |
|--|---|---|---|--|--------------|
|  | <i>Excellent (8 – 7)</i>  | <i>Good (6 – 5)</i>                                       | <i>Fair (4 – 3)</i>                           | <i>Poor (2 – 0)</i>  |              |
| Riffle embeddedness with sand/silt                                       | small stream order:<br><25% embeddedness<br><br>larger stream order:<br><35% embeddedness | 25 – 49%<br><br>35 – 59%                                  | 50 – 79%<br><br>60 – 85%                      | >75%<br><br>>85%   | 4            |
| Potential for deep pools 2 ft or greater, substrate condition            | High number of pools<br><br>Pool substrate <30% sand/silt                                 | Moderate number<br><br>30-59% sand/silt                   | Low number<br><br>60-80% sand/silt            | Few, if any<br><br>>80% sand/silt                                  | 2            |
| Frequency of streak marks and/or banana-shaped deposits                  | Absent  | Uncommon  | Common  | Very Common  | 6            |
| 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 | 3            |
| 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             | 5            |
| Table 2 score (average of points given, rounded to nearest whole number) |   |   |   |  | 4            |

**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).

|   | <i>Score Selection:</i>          |  |   |   | Score |
|---|----------------------------------|--|---|---|-------|
|   | <i>Excellent (8 – 7)</i>         | <i>Good (6 – 5)</i>                                    | <i>Fair (4 – 3)</i>   | <i>Poor (2 – 0)</i>                                   |       |
| Percent wetted perimeter of channel bottom during base flow events                    | >85%                             | 61 – 85%   | 40 – 60%  | <40%  | 4     |
| 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 | N/A   |
| Percent of riffle composition from larger material (cobble or gravel)                 | >50%                             | 49 – 25%   | 24 – 5%   | Dominated by sand or silt                             | 7     |
| Typical base flow riffle depth (non-stormwater base flows)                            | >6"                              | 5.9 – 4.0"   | 3.9 – 2.0"  | <2"   | N/A   |
| Typical depth of large pools  | >24"                             | 24 – 18"   | 18 – 12"  | <12"  | N/A   |
| Channel alterations at study site   | No evidence                      | Minor  | Moderate  | Extensive   | 4     |
| Summer afternoon water temperature (estimated using tree canopy coverage)             | <82 degrees F                    | 82 – 89  | 89 – 94   | >94   | 4     |
| 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 | 2     |
| Canopy coverage  | small stream order: >80% | 79 – 65%                                   | 64 – 45%  | <45%   | 1     |
|  | large stream order: >60% | 59 – 45%                                   | 44 – 30%  | <30%   |       |
| Table 4 score (average of points given, rounded to nearest whole number) |                          |  |   |  | 2     |

---

**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%          | N/A   |
| Total Dissolved Solids   | 350 – 399 mg/L    | 400 – 449           | 450 – 500                      | >500                | N/A   |
| Water odor   | No odor           | Slight organic odor | Slight – moderate organic odor | Strong organic odor | N/A   |
| Table 5 score (average of points given, rounded to nearest whole number) |                   |                     |                                |                     | N/A   |

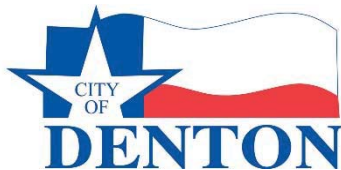
**Table 6: Biological Indicators**

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. | N/A   |
| Number of organisms  | High to moderate  | Moderate  | Moderate to low  | Very low number  | N/A   |
| Table 6 score (average of points given, rounded to nearest whole number) |   |   |  |  | N/A   |

**Table 7: RSAT Summary**

|                                | Score – flow  | Score – no flow  |
|--------------------------------|---|--|
| 1. Channel Stability           |   | 6  |
| 2. Channel Scouring/Deposition |   | 4  |
| 3. Physical In-Stream Habitat  |   | 5  |
| 4. Riparian Habitat            |   | 2  |
| 5. Water Quality               |   |  |
| 6. Biological Indicators       |   |  |
| Total Score:                   |   | 17   |
| Verbal Score from Total Score: | <input type="checkbox"/> Excellent (42-50)<br><input type="checkbox"/> Good (30-41)<br><input type="checkbox"/> Fair (16-29)<br><input type="checkbox"/> Poor (<16) | <input type="checkbox"/> Excellent (29-34)<br><input type="checkbox"/> Good (20-28)<br><input checked="" type="checkbox"/> Fair (11-19)<br><input type="checkbox"/> Poor (<11) |



# 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<br>Property ID: | 179366, 162989, 242497<br>R 259355, 179363, 179365, 3457 | Feature ID(s): | Undeveloped Floodplain 1 |
|-------------------------------------|--|----------------|--------------------------|

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: | Roark Branch | Width | 10 | Order | 3 |
|-------|--------------|-------|----|-------|---|

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.

Undeveloped floodplain ESAs east of US Highway 35. Located surrounding intermittent stream S1.

**Attachments Provided:**

|           |  |
|-----------|--|
| Required: | <input checked="" type="checkbox"/> overall site map <input checked="" type="checkbox"/> current map of feature <input checked="" type="checkbox"/> proposed map of feature<br><input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |
| Other:    |  |

**Field Assessor:**

|  |                            |
|--|----------------------------|
| Name of Field Assessor:  | Alex M. Brown              |
| Affiliation of Field Assessor (Organization):  | Kimley-Horn and Associates |
| Date the assessment was performed:   | 11-15-2023                 |
| I certify that the information provided here is an accurate description of the area(s) assessed. |                            |

**Environmental Services Representative:**

|  |   |
|--|---|
| I concur with the description of this ESA and conclusion of this assessment. | <b>Christi Upton</b><br><small>Digitally signed by Christi Upton<br/>DN: dc=com, dc=cityofdenton, dc=codad,<br/>ou=Department Users and Groups, ou=Utilities,<br/>ou=Water and Wastewater, cn=Christi Upton,<br/>email=Christi.Upton@cityofdenton.com<br/>Date: 2024.03.07 11:15:50 -06'00'</small> |
|--|---|

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| Sanger clay, 3 to 5 percent slopes                        |  |
| Frio clay loam, 0 to 1 percent slopes, frequently flooded |  |
| Ponder loam, 1 to 3 percent slopes                        |  |

## Section 2. Floodplain Conditions

|   |   |
|---|---|
| Are there modifications (cut/fill) of the floodplain? | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no |
| Describe:   |   |
| Are there structures in the floodplain?               | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no |
| Describe:   |   |

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

|           |   |
|-----------|---|
| Waterway  | <input checked="" type="checkbox"/> natural <input type="checkbox"/> channelized <input type="checkbox"/> impounded |
| Sinuosity | <input checked="" type="checkbox"/> meandering <input type="checkbox"/> braided <input type="checkbox"/> straight   |

## Section 3. Soil Erosion and Deposition

|  |  |
|--|--|
| Is there evidence of sheet flow across the floodplain? | <input checked="" type="checkbox"/> yes (answer question below) <input type="checkbox"/> no                  |
| Active sheet flow erosion is:                          | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe |
| Is there evidence of concentrated flow?                | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no                  |
| Active concentrated flow erosion is:                   | <input type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> 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? | <input type="checkbox"/> yes (complete Water-Related Habitat form) |
|   | <input checked="" type="checkbox"/> 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      | 10      |
| Prosopis glandulosa   | mesquite      | 10      |
| Panicum virgatum      | switchgrass   | 70      |
| Bouteloua dactyloides | buffalo grass | 30      |
|                       |               |         |
|                       |               |         |
|                       |               |         |
|                       |               |         |
|                       |               |         |
|                       |               |         |



**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](#).

|   |  |   |                          |
|---|--|---|--------------------------|
| <b>Property Address or Property ID:</b>   | <b>R</b> 64685, 132660, 748084, 64803, | <b>Feature ID(s):</b>   | Undeveloped Floodplain 2 |
| <small>Property ID can be found through Denton Central Appraisal District</small> |  | <small>Provide a unique ID for each feature when multiple features are assessed</small> |                          |

**Hydrologic Segment Information:**

|   |              |  |   |                              |   |
|---|--------------|--|---|------------------------------|---|
| <b>Name:</b>  | Roark Branch | <b>Width</b>                             | 8 | <b>Order</b>                 | 3 |
| <small>When available, stream segment name.</small> |              | <small>Approximate stream width.</small> |   | <small>Stream order.</small> |   |

**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.

Undeveloped floodplain surrounding intermittent stream S1 east of US Highway 35 on the Hunter Roarke Sewer site. This area had no fill, structures or modifications and was occupied by native grasses and trees.

**Attachments Provided:**

|                  |  |
|------------------|--|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map <input checked="" type="checkbox"/> current map of feature <input checked="" type="checkbox"/> proposed map of feature<br><input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |
| <b>Other:</b>    |  |

**Field Assessor:**

|  |                            |
|--|----------------------------|
| Name of Field Assessor:  | Alex M. Brown              |
| Affiliation of Field Assessor (Organization):  | Kimley-Horn and Associates |
| Date the assessment was performed:   | 11/15/2023                 |
| I certify that the information provided here is an accurate description of the area(s) assessed. |                            |

**Environmental Services Representative:**

|  |   |
|--|---|
| I concur with the description of this ESA and conclusion of this assessment. | <b>Christi Upton</b><br><small>Digitally signed by Christi Upton<br/>DN: dc=com, dc=cityofdenton, dc=codad,<br/>ou=Department Users and Groups, ou=Utilities,<br/>ou=Water and Wastewater, cn=Christi Upton,<br/>email=Christi.Upton@cityofdenton.com<br/>Date: 2024.03.07 11:16:36 -06'00'</small> |
|--|---|

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest                | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural:         | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input checked="" type="checkbox"/> Residential:          | <input checked="" type="checkbox"/> Low Intensity <input type="checkbox"/> High Intensity                             |
| <input checked="" type="checkbox"/> Commercial/Industrial |   |
| <input type="checkbox"/> Recreational                     |   |
| <input type="checkbox"/> Other:                           |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |  |
|---|--|
| Ponder loam, 1 to 3 percent slopes                        |  |
| Frio clay loam, 0 to 1 percent slopes, frequently flooded |  |
| Lewisville clay loam, 3 to 5 percent slopes               |  |

## Section 2. Floodplain Conditions

|   |   |
|---|---|
| Are there modifications (cut/fill) of the floodplain? | <input checked="" type="checkbox"/> yes (answer question below) <input type="checkbox"/> no |
| Describe:   | grading from previous construction/agriculture  |
| Are there structures in the floodplain?               | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no |
| Describe:   |   |

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

|           |   |
|-----------|---|
| Waterway  | <input checked="" type="checkbox"/> natural <input type="checkbox"/> channelized <input type="checkbox"/> impounded |
| Sinuosity | <input checked="" type="checkbox"/> meandering <input type="checkbox"/> braided <input type="checkbox"/> straight   |

## Section 3. Soil Erosion and Deposition

|  |  |
|--|--|
| Is there evidence of sheet flow across the floodplain? | <input checked="" type="checkbox"/> yes (answer question below) <input type="checkbox"/> no                  |
| Active sheet flow erosion is:                          | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe |
| Is there evidence of concentrated flow?                | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no                  |
| Active concentrated flow erosion is:                   | <input type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> 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? | <input type="checkbox"/> yes (complete Water-Related Habitat form)<br><input type="checkbox"/> no |
|---|---|

## Section 4. Brief Vegetation Survey

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

| Scientific name     | Common name    | % Cover |
|---------------------|----------------|---------|
| Lingustrum sinense  | Chinese privet | 95      |
| Prosopis glandulosa | mesquite       | 20      |
| Ulmus americana     | American elm   | 15      |
| Sorghum halepense   | Johnson grass  | 20      |
| Panicum virgatum    | switchgrass    | 10      |
|                     |                |         |
|                     |                |         |
|                     |                |         |
|                     |                |         |
|                     |                |         |

**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](#).

|   |                          |
|---|--------------------------|
| <b>Property Address or Property ID:</b> | <b>Feature ID(s):</b>    |
| R 268553                                | Undeveloped Floodplain 3 |

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:**

|              |              |              |
|--------------|--------------|--------------|
| <b>Name:</b> | <b>Width</b> | <b>Order</b> |
| Roark Branch | 3            | 1            |

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.

This form describes the undeveloped floodplain ESA area located east of I-35 on site. This area surrounds stream 1 and stream 2 and appeared to be occupied by native herbaceous and woody vegetation. These areas did not contain fill or appear modified.

**Attachments Provided:**

|                  |  |   |   |
|------------------|--|---|---|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map | <input checked="" type="checkbox"/> current map of feature                | <input checked="" type="checkbox"/> proposed map of feature |
|                  | <input checked="" type="checkbox"/> soils map        | <input checked="" type="checkbox"/> photographs representative of feature |   |
| <b>Other:</b>    |  |   |   |

**Field Assessor:**

Name of Field Assessor: Alex M. Brown

Affiliation of Field Assessor (Organization): Kimley-Horn and Associates

Date the assessment was performed: 11-15-2023

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

**Environmental Services Representative:**

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

**Christi Upton**

Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad,  
ou=Department Users and Groups, ou=Utilities,  
ou=Water and Wastewater, cn=Christi Upton,  
email=Christi.Upton@cityofdenton.com  
Date: 2024.03.07 11:17:13 -06'00'

## Section 1. General Information

### General Land Use:

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

|   |   |
|---|---|
| <input checked="" type="checkbox"/> Forest        | Briefly describe:   |
| <input checked="" type="checkbox"/> Agricultural: | <input checked="" type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input type="checkbox"/> Residential:             | <input type="checkbox"/> Low Intensity <input checked="" type="checkbox"/> High Intensity                             |
| <input type="checkbox"/> Commercial/Industrial    |   |
| <input type="checkbox"/> Recreational             |   |
| <input type="checkbox"/> Other:                   |   |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|   |   |
|---|---|
| Arents, hilly, occasionally flooded         | Frio clay loam, 0 to 1 percent slopes, frequently flooded |
| Lewisville clay loam, 3 to 5 percent slopes |   |
| Ponder loam, 1 to 3 percent slopes          |   |

## Section 2. Floodplain Conditions

|   |   |
|---|---|
| Are there modifications (cut/fill) of the floodplain? | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no |
| Describe:   |   |
| Are there structures in the floodplain?               | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no |
| Describe:   |   |

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

|           |   |
|-----------|---|
| Waterway  | <input checked="" type="checkbox"/> natural <input type="checkbox"/> channelized <input type="checkbox"/> impounded |
| Sinuosity | <input checked="" type="checkbox"/> meandering <input type="checkbox"/> braided <input type="checkbox"/> straight   |

## Section 3. Soil Erosion and Deposition

|  |  |
|--|--|
| Is there evidence of sheet flow across the floodplain? | <input checked="" type="checkbox"/> yes (answer question below) <input type="checkbox"/> no                  |
| Active sheet flow erosion is:                          | <input checked="" type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe |
| Is there evidence of concentrated flow?                | <input type="checkbox"/> yes (answer question below) <input checked="" type="checkbox"/> no                  |
| Active concentrated flow erosion is:                   | <input type="checkbox"/> slight <input type="checkbox"/> moderate <input type="checkbox"/> severe            |

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

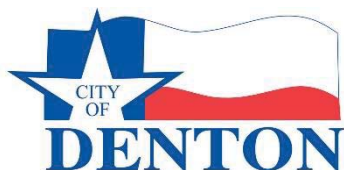
☒ toward ☐ natural levee. Complete the table below.

|   |  |
|---|--|
| Does natural levee create conditions for water-related habitat? | <input type="checkbox"/> yes (complete Water-Related Habitat form) |
|   | <input checked="" type="checkbox"/> no                             |

## Section 4. Brief Vegetation Survey

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

| Scientific name     | Common name    | % Cover |
|---------------------|----------------|---------|
| Sorghum halepense   | Johnson grass  | 50      |
| Ulmus crassifolia   | American elm   | 30      |
| Lingustrum sinense  | Chinese privet | 50      |
| Prosopis glandulosa | mesquite       | 20      |
| Panicum virgatum    | switchgrass    | 10      |
|                     |                |         |
|                     |                |         |
|                     |                |         |
|                     |                |         |
|                     |                |         |



## Water-Related Habitat Assessment Form

Environmental Services and Sustainability

A Water-Related Habitat Assessment Form is to be completed for each feature identified as potentially existing on the Official ESA Map. Additionally, any feature identified onsite that potentially has characteristics of a water-related habitat 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 water-related habitats and assessing this feature may be found on the [City of Denton webpage](#).

|  |                |   |           |
|--|----------------|---|-----------|
| <b>Property Address or Property ID:</b>                            | <b>R 64685</b> | <b>Feature ID:</b>                                      | <b>W1</b> |
| Property ID can be found through Denton Central Appraisal District |                | Provide a unique ID when multiple features are assessed |           |

### Type of Water-Related Habitat

Select the type. Complete assessment Section 1 and the appropriate section below.

- ☒ Isolated and Adjacent Wetland(s) (Section 2) ☐ Bottomland Hardwood Forest (Section 3)  
☐ Spring(s) (Section 4) ☐ Deep Water Habitat (Section 5)

### Assessment Conclusion:

Select one of the following.

- ☒ IS an ESA. Based upon this assessment the area is a Water-Related Habitat. 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 Water-Related Habitat. 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 wetland is bordered to the south by forest and to the north by a road and residential housing construction. A small portion of the emergent wetland identified during a previous delineation visit intersects the study area. This area is occupied by native hydric vegetation.

### Attachments Provided:

|                  |  |
|------------------|--|
| <b>Required:</b> | <input checked="" type="checkbox"/> overall site map <input checked="" type="checkbox"/> current map of feature <input checked="" type="checkbox"/> proposed map of feature<br><input checked="" type="checkbox"/> soils map <input checked="" type="checkbox"/> photographs representative of feature |
| <b>Other:</b>    |  |

### Field Assessor:

Name of Field Assessor: Alex M. Brown  
Affiliation of Assessor (Organization): Kimley-Horn and Associates  
Date the assessment was performed: 11-15-2023

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

**Alex M. Brown**

Digitally signed by Alex M. Brown  
Date: 2024.01.09 12:55:58  
-06'00'

### Environmental Services Representative:

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

**Christi Upton**

Digitally signed by Christi Upton  
DN: dc=com, dc=cityofdenton, dc=codad,  
ou=Department Users and Groups, ou=Utilities,  
ou=Water and Wastewater, cn=Christi Upton,  
email=Christi.Upton@cityofdenton.com  
Date: 2024.03.07 11:17:53 -06'00'

## Section 1. General Information

### General Land Use

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

|  |  |
|--|--|
| <input checked="" type="checkbox"/> Forest       | Briefly describe:  |
| <input type="checkbox"/> Agricultural:           | <input type="checkbox"/> Pasture <input type="checkbox"/> Fallow <input type="checkbox"/> Crop, crop type: |
| <input checked="" type="checkbox"/> Residential: | <input type="checkbox"/> Low Intensity <input checked="" type="checkbox"/> High Intensity                  |
| <input type="checkbox"/> Commercial/Industrial   |  |
| <input type="checkbox"/> Recreational            |  |
| <input type="checkbox"/> Other:                  |  |

### Soil Map Unit Name(s):

Provide soil classification types where feature occurs.

|                                     |  |
|-------------------------------------|--|
| Arents, hilly, occasionally flooded |  |
|                                     |  |
|                                     |  |

## Section 2. Isolated and Adjacent Wetland(s)

### Hydrology Indicators

|  |  |
|--|--|
| <i>Primary</i>   | <i>Secondary</i>   |
| <input checked="" type="checkbox"/> inundated                    | <input type="checkbox"/> oxidized root channels in upper 12" |
| <input checked="" type="checkbox"/> soil saturated in upper 12"  | <input type="checkbox"/> water-stained leaves                |
| <input type="checkbox"/> water marks                             | <input type="checkbox"/> county soil survey                  |
| <input type="checkbox"/> drift lines                             | <input type="checkbox"/> fac-neutral test                    |
| <input type="checkbox"/> sediment deposits                       |  |
| <input checked="" type="checkbox"/> evidence of drainage pattern |  |
| <b>Comments:</b>   |  |

### Hydric Soil Indicators

|  |  |
|--|--|
| <input type="checkbox"/> histosol                    | <input type="checkbox"/> concretions                         |
| <input type="checkbox"/> histic epipendon            | <input type="checkbox"/> high surface organic content        |
| <input type="checkbox"/> sulfidic odor               | <input type="checkbox"/> organic streaking in sandy soils    |
| <input type="checkbox"/> aquic moisture regime       | <input type="checkbox"/> listed on local hydric soil list    |
| <input type="checkbox"/> reducing conditions         | <input type="checkbox"/> listed on national hydric soil list |
| <input type="checkbox"/> gleyed or low chroma colors | <input type="checkbox"/> other:                              |
| <b>Comments:</b> assumed hydric                      |  |

### 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.

| Scientific name     | Common name | % Cover | Indicator |
|---------------------|-------------|---------|-----------|
| Prosopis glandulosa | mesquite    | 20      | FACU      |
| Iva annua           | sumpweed    | 60      | FAC       |
| Panicum virgatum    | switchgrass | 10      | FAC       |
| Typha latifolia     | cattail     | 10      | OBL       |
|                     |             |         |           |
|                     |             |         |           |
|                     |             |         |           |
|                     |             |         |           |
|                     |             |         |           |

Hydrophytic Vegetation Indicator: 3 : 1

(Number of plant species that are OBL, FACW and FAC to number of plant species that are FACU and UPL)

---

### Section 3. Bottomland Hardwood Forest

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

Bottomland hardwood forests are deciduous forested wetlands and river bottoms with alluvial soil deposition. Periodic to constant wet conditions support certain species of trees such as pecan, Texas hickory, American elm, Chinkapin oak, Chittamwood, Green ash, Black walnut, Indigo bush, Texas persimmon, Shumard oak, sycamore, and Carolina buckthorn.

#### Old growth canopy trees

| Scientific name | Common name | % Cover |
|-----------------|-------------|---------|
| N/A             |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |

#### Re-growth canopy trees

| Scientific name | Common name | % Cover |
|-----------------|-------------|---------|
| N/A             |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |

#### Small trees / understory trees

| Scientific name | Common name | % Cover |
|-----------------|-------------|---------|
| N/A             |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |

#### Understory vegetation – shrub / vine / forb / grass

| Scientific name | Common name | % Cover |
|-----------------|-------------|---------|
| N/A             |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
| N/A             |             |         |

#### Forest floor conditions:

Select all that apply.

☐ Standing dead timber   ☐ Fallen dead timber   ☐ Detritus / leaf litter   ☐ fungi

#### Comments:

N/A

## Section 4. Spring(s)

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

### Brief Vegetation Survey:

| Scientific name | Common name | % Cover |
|-----------------|-------------|---------|
| N/A             |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |
|                 |             |         |

### Comments:

N/A

## Section 5. Deep Water Habitat

Deep water habitats are permanently flooded lands lying below the deep water boundaries of wetlands. The boundary between wetland and deep water habitat in the riverine and lacustrine systems lies at a depth of 2 meters (6.6 feet) below low water; however, if emergent, shrubs or trees grow beyond this depth at any time, their deep water edge is the boundary.

### Functions

|   |   |
|---|---|
| <input type="checkbox"/> intercept sediment   | <input type="checkbox"/> provide fish habitat     |
| <input type="checkbox"/> intercept nutrients  | <input type="checkbox"/> evidence of wildlife use |
| <input type="checkbox"/> intercept pesticides | <input type="checkbox"/> unique aesthetics        |

### Impairments

|  |   |
|--|---|
| <input type="checkbox"/> trash or litter / evidence of dumping | <input type="checkbox"/> livestock has access |
|--|---|

### Vegetation in water and on bank

|  |  |
|--|--|
| <input checked="" type="checkbox"/> submerged aquatic vegetation | <input type="checkbox"/> moist soil grasses and forbs  |
| <input type="checkbox"/> floating-leaf                           | <input checked="" type="checkbox"/> tree cover (shade) |
| <input checked="" type="checkbox"/> emergent vegetation          |  |

### Brief Vegetation Survey:

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

| Scientific name     | Common name | % Cover |
|---------------------|-------------|---------|
| Iva annua           | sumpweed    | 10      |
| Typha latifolia     | catitail    | 10      |
| Prosopis glandulosa | mesquite    | 15      |
|                     |             |         |
|                     |             |         |
|                     |             |         |
|                     |             |         |
|                     |             |         |
|                     |             |         |

### Comments:

Emergent wetland surrounding pond. Identified first during previous delineation.