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Scope of services

The objectives of this project are to complete the following tasks.

1. Complete a GPS inventory of all street trees and planting sites along ?? centerline miles of (municipality name) streets and ?? acres of parkland/public property.
2. An inventory report.

Tree inventory

Walk each street, park/cemetery or property (as provided by the municipality). Inspect and assess the trees, and digitally collect management information for each tree. The following are the specifications for completion of both inventory tasks; the complete street inventory and the park/cemetery inventory.

1. Trees to be inventoried.
    a. Complete GPS street tree inventory -- all street trees and planting sites located within street right of way.
        i. The (municipality) will provide a shapefile of street right-of-way widths.
        ii. Measurement of the ROW can be made by starting at the centerline of the street and pacing one-half the ROW width.
        iii. Border trees -- trees with half the tree trunk growing within the (municipality) right of way (ROW) shall be inventoried.
        iv. Trees in question should be verified with (municipality) official.

    b. Complete inventory parks, cemetery or properties – GPS inventory of all trees located within the property boundaries.
        i. Location of trees
            1. The (municipality) will provide a shapefile of parks/public properties to be inventoried.
            2. All specified trees located on mowed areas within the park, cemetery or property boundaries as identified by the (municipality).
            3. Margin trees – all specified trees at the very margin of the mowed areas of the park, cemetery or property.
            4. Border trees -- trees with half the tree trunk growing within the (municipality) property shall be inventoried.
            5. Trees in question should be verified with (municipality) official.

ii. Tree tags – a reference tree may be tree tagged with a numbered tag attached to select trees to assist with tree inventory identification.

2. Level of inspection for each tree (both inventories) as defined by the International Society of Arboriculture (ISA) Tree Risk Assessment BMP with work prioritization.
    a. ISA Tree Risk Assessment Level 2 -- A walk-around visual inspection and assessment of the health and structure of the tree from the ground and surrounding site culminating into a management recommendation. The assessment will include the digital collection of the inventory data and the use of hand tools such as a sounding mallet, probing tool and binoculars to further evaluate the defects present in root crown, trunk and crown of the tree. A complete ISA tree risk assessment and rating will not be completed.

3. Management recommendations & definitions – recommendations will be assigned one of the following work needs and priority.
    a. Management recommendations/Work need
        i. Tree removals
            1. Trees with readily obvious, major health and structural defects present identified per the level of inspection methods will be considered for removal. If one-third of a tree's live crown must be removed to remove defect tree parts or reduce the risk of whole tree failure, the tree will be recommended for removal.
        ii. Pruning needs
            1. Prune train young -- a young tree that can be pruned from the ground needs structural pruning to promote desirable growth habits in trees.
            2. Prune mature small tree – a small-sized tree that has reached maturity, slowed growth and can be pruned from the ground.
            3. Prune mature large tree – a large tree that has reached maturity.
            4. Prune reduce – A large tree with structural defects present that require reduction pruning to reduce the risk of trunk or scaffold branch failure.
            5. Prune safety – a tree with any of the following defects present:
                a. Defective limbs 4 inches or larger in diameter.
                b. Clearance conflicts.
                c. Limbs over street being struck by vehicles.
                d. Limbs hanging into sight line of pedestrians over sidewalks.
                e. Limbs resting on streetlights, buildings or blocking traffic control signs or devices.

iii. Management priority -- each tree that has had removal or safety pruning recommendations will be assigned a management priority based on the targets present, occupancy rates and consequences of failure.
    1. Highest
    2. Medium
    3. Lowest
iv. Stumps -- tree stump requiring removal.

b. Work priorities -- Trees recommended for removal or prune safety will be assigned a work priority to facilitate work planning and the efficient allocation of resources. The actual definition will be provided to the contractor by the client. The priority assignment will be a numeric scale of highest to lowest priority. This is not a complete ISA tree risk assessment.
c. Planting site specifications
    i. NCFS U&CF basic planting site standards guidance of approved equivalent.

4. Tree inventory data fields
    a. Each tree/planting site will have the following data collected.
        1. Tree data
            a. Street, address or property name (optional)
            b. Management unit
            c. Open space property. A reference tree may be tagged with a numbered tag attached to select trees to assist with tree inventory location identification.
            d. Tree genus, species and common name -- each tree will be identified to genus and species, and a common name will be provided.
            e. DBH (diameter breast height) -- diameter in inches at 4½ feet above grade measured with a diameter tape or Biltmore stick
            f. Health – tree biological health or tree growth indicators such as the condition of foliage and twigs expressed as:
                i. Good -- normal or vigorous for the species including shoot growth, wound wood development, foliar color and density, and absence of dieback, or damaging pests or diseases.
                ii. Fair -- deficiency in several categories; below normal shoot growth, wound wood development, foliar color and density, or presence of dieback, or a damaging pest or disease.
                iii. Poor -- below normal or deficiency in most categories; shoot growth, wound wood development, foliar color and density, or presence of dieback, or damaging pests or diseases.
                iv. Very Poor -- major deficiencies in all categories such as shoot growth, wound wood development, foliar color

and density, or presence of major dieback, or damaging pests or diseases.
v. Dead -- no living tissues.

g. Structure – tree structure or the condition of mechanical or structural portions of the tree, expressed as:
i. Good -- absence of any significant structural defects although minor defects that are unlikely to fail under normal weather conditions may be present.
ii. Fair -- minor structural defect(s) is present that may fail under storm conditions, or several minor mechanical defects can be found.
iii. Poor -- one or more significant structural defect is present that may fail under normal weather conditions.
iv. Very Poor -- several significant structural defects are present that may fail under normal weather conditions.
v. Most significant defect present and severity; roots, root crown, trunk, trunk/scaffold union, scaffolds, branches

h. Management or work need -- as described above.
i. Priority -- as described above.
j. Overhead utilities -- presence of primary or secondary electrical distribution wires or telephone or street lighting.
k. Site type – type of location the tree is growing in such as lawn area, natural area, border tree, tree lawn or tree pit.
l. Planting area – most limiting dimension of planting area in feet.
m. Other – for trees requiring further inspection.
i. Risk -- for trees that need a full risk assessment (See next section.).
ii. Check ROW -- determine if the tree is in the right of way/on public property.
iii. Limited access.

i. GPS coordinates – GPS coordinates will be collected for each tree using sub-meter high accuracy GPS units, or low accuracy three-meter accuracy units. Alternate – tree location point plotting on georeferenced aerial photography.

5. Quality control
a. All data, as itemized below, will be reviewed digitally for errors, and errors will be corrected. The contractor will provide a brief report verifying the findings and corrections to the (municipality) at the completion of each step.
i. Field quality review of two percent (2%) of all data points collected in the first week of data collection with particular emphasis on trees identified for removal.
ii. Field quality review of one percent (1%) of all data points collected each week after the first week of data collection with particular emphasis on trees identified for removal.

iii. Cross data collector review (reviewer other than the original data collector) for all data collection personnel.
iv. Office review of 100% of data for data mismatch errors, for example, appropriate tree health or structural condition rating for "removal" maintenance classification; appropriate street for side street versus on-street classification, appropriate diameter size for "train" maintenance classification, and all other similar data reviews that can be completed in the office.
v. Field resolution of data errors identified.
vi. 100% correct species identification; no unknowns in data set.
vii. Visually review and correct mapped tree data for correct locations.

6. GPS accuracy requirements
    a. Mapping-grade GPS equipment specifically designed for urban environment work with sub-meter accuracy and post-processing capability. The equipment shall be designed for decimeter level of precision (4 inches) under the proper satellite and differential correction.
        i. All data will be post-processed to nearest publicly available continuously operating reference stations (CORS) to maximize accuracy.
    b. Alternate – tree location point plotting on georeferenced aerial photography. Provide specifications and accuracy statistics in proposal.

Inventory report

The consultant shall provide an inventory report summarizing the methodologies and urban forest management statistics outlined as follows.

1. Inventory methodologies
2. Management statistics
    a. Species distribution
    b. Diameter distribution
    c. Health distribution
    d. Work need
    e. Tree species exceeding 10% of the total population
        i. Diameter distribution
        ii. Health distribution
        iii. Work need
3. Ecosystem services of trees

Tree inventory management software

An internet-based tree inventory management application designed for urban forest management. Application should provide features to generate tree lists, manage and report work, summarize urban forest/tree inventory management information, and update inventory information with a mobile device in the field.

Project schedule

All proposed work will be completed by ??. The proposer shall provide a project completion schedule for all tasks required for completing the work.

Payment schedule

Item	Estimated Count	Price per tree/site	Extended Price
GPS street tree inventory and report as specified			
Street planting sites			
Park/cemetery GPS tree inventory			
Total			

Tree Inventory Application	Annual Subscription	Multi-year Subscription

Qualifications

Company/firm

The company must demonstrate in a brief narrative and at least five (5) years of experience in completing municipal GPS tree inventories, and providing and servicing tree inventory management software. Please supply three references.

Inventory staff

Staff performing the field inventory work must have the following minimum qualifications. Provide a list of their names and qualifications.

1. International Society of Arboriculture urban forestry professional, certified Arborist or Society of American Foresters certified urban & community forestry credential and three (3) years of experience completing municipal tree inventories.
2. International Society of Arboriculture tree risk assessment qualified