Boone County Purchasing
613 E. Ash Street, Room 111
Columbia, Mo 65201

REQUEST FOR BID (RFB)

Elizabeth Sanders, CPPB
Senior Buyer
(573) 886-4393 – Fax: (573) 886-4390
Email: lsanders@boonecountymo.org

Bid Data

Bid Number: **14-24MAR15**

Commodity Title: Radio Tower Design, Engineering and Fabrication Services

DIRECT ANY BID FORMAT OR SUBMISSION QUESTIONS TO PURCHASING DEPT.

Bid Submission Address and Deadline

Day/Date: Tuesday, March 24, 2015
Time: 2:00 PM (Bids received after this time will be returned unopened)
Location/Mail Address: Boone County Purchasing Department
Boone County Annex Building
613 E. Ash, Room 111
Columbia, Mo 65201
Directions: Annex Building is located at corner of 7th & Ash St.

Bid Opening

Day/Date: Tuesday, March 24, 2015
Time: 2:00 PM, Central Time
Location/Address: Boone County Annex Building
613 E. Ash St, Columbia, MO 65201

Bid Contents

1.0: Introduction and General Conditions of Bidding
2.0: Primary Specifications
3.0: Response Presentation and Review
4.0: Response Form
Attachments: Statement of Bidder's Qualifications
"No Bid" Response Form
Standard Terms and Conditions
Instructions for House Bill 1549
Work Authorization Certification
Individual Bidder Affidavits
Debarment Form
Geotechnical Engineering Report

1. Introduction and General Conditions of Bidding

INVITATION – The County of Boone, through its Purchasing Department, invites responses, which offer to provide the goods and/or services identified on the title page, and described in greater detail in Section 2.

DEFINITIIONS

County – This term refers to the County of Boone, a duly organized public entity. It may also be used as a pronoun for various subsets of the County organization, including, as the context will indicate:
Purchasing – The Purchasing Department, including its Purchasing Director and staff.
Department/s or Office/s – The County Department/s or Office/s for which this Bid is prepared, and which will be the end user/s of the goods and/or services sought.
Designee – The County employee/s assigned as your primary contact/s for interaction regarding Contract performance.

Bidder / Contractor / Supplier – These terms refer generally to businesses having some sort of relations to or with us. The tem may apply differently to different classes of entities, as the context will indicate.
Bidder – Any business entity submitting a response to this Bid. Suppliers, which may be invited to respond, or which express interest in this bid, but which do not submit a response, have no obligations with respect to the bid requirements.
Contractor – The Bidder whose response to this bid is found by Purchasing to meet the best interests of the County. The Contractor will be selected for award, and will enter into a Contract for provision of the goods and/or services described in the Bid.
Supplier – All business/entities which may provide the subject goods and/or services.

Bid – This entire document, including attachments. A Bid may be used to solicit various kinds of information. The kind of information this Bid seeks is indicated by the title appearing at the top of the first page. An "Invitation for Bid" is used when the need is well defined. An "Invitation for Proposal" is used when the County will consider solutions, which may vary significantly from each other or from the County's initial expectations.

Response – The written, sealed document submitted according to the Bid instructions.

BID CLARIFICATION – Questions regarding this Bid should be directed in writing, preferably by fax, to the Purchasing Department. Answers, citing the question asked but not identifying the questioner, will be distributed simultaneously to all known prospective Bidders. Note: written requirements in the Bid or its Addenda are binding, but any oral communications between County and Bidder are not.

Contact- Deadline for bid questions is 5:00 pm, March 17, 2015. Send to Elizabeth Sanders, Boone County Purchasing Department, 613 E. Ash, Room 111, Columbia, Mo 65201. Telephone: 573-886-4393 Facsimile: 573-886-4390

Delivery Terms: FOB- Destination with shipping and handling costs included, delivered to site of tower erection, 2121 County Drive, Columbia, MO 65202.

Bidder Responsibility – The Bidder is expected to be thoroughly familiar with all specifications and requirements of this Bid. Bidder's failure or omission to examine any relevant form, article, site or document will not relieve them from any obligation regarding this Bid. By submitting a Response, Bidder is presumed to concur with all terms, conditions and specifications of this Bid.

Bid Addendum – If it becomes evident that this Bid must be amended, the Purchasing Department will issue a formal written Addendum to all known prospective Bidders. If necessary, a new due date will be established.

AWARD – Award will be made to the Bidder/s whose offer/s provide the greatest value to the County from the standpoint of suitability to purpose, quality, service, previous experience, price, lifecycle cost, ability to deliver, or for any other reason deemed by Purchasing to be in the best interest of the County.

Thus, the result will not be determined by price alone. The County will be seeking the least costly outcome that meets the County needs as interpreted by the County.

CONTRACT EXECUTION – This Bid and the Contractor's Response will be made part of any resultant Contract and will be incorporated in the Contract as set forth, verbatim.

Precedence – In the event of contradictions or conflicts between the provisions of the documents comprising this Contract, they will be resolved by giving precedence in the following order:

1) the provisions of the Contract (as it may be amended);
2) the provisions of the Bid;
3) the provisions of the Bidder's Response.

COMPLIANCE WITH STANDARD TERMS AND CONDITIONS – Bidder agrees to be bound by the County's standard "boilerplate" terms and conditions for Contracts, a sample of which is attached to this Bid.

ITEMS TO BE PROVIDED

1.00 GENERAL:

1.01 Vendor shall provide all resources and services to completely design, engineer, fabricate and deliver a radio tower in accordance with these specifications and all applicable EIA and manufacturer-recommended specifications.

1.02 Vendor shall deliver anchor bolts and anchor bolt template in advance of tower steel to the designated erection site at rear of 2121 County Drive, Columbia, MO 65202.

1.03 Vendor shall deliver complete tower, *less anchor bolts and template*, pre-packaged and knocked down, on flatbed truck(s) to the designated erection site at rear of 2121 County Drive, Columbia, MO 65202 following notification by Owner of foundation construction.

1.04 Knocked down, pre-packaged tower components to be unloaded from flatbed truck(s) by others.

1.05 Owner will secure all necessary construction and zoning permits.

1.06 Owner will furnish a graded road up to the actual tower unloading site.

1.07 All parts, materials and practices will meet at least the minimum generally published and publicly advertised standards of the Vendor.

1.08 Vendor shall warranty tower and include sample printed warranty with Bid Response.

2.00 DESIGN:

2.01 Tower shall be fabricated from steel material and shall be triangular in cross section.

2.02 Tower legs shall be round and fabricated from single solid rod. Composite legs, truss type legs, combination triangular legs, or hollow tube legs are **disallowed.**

2.03 All bracing shall be round solid rod or angle material.

2.04 Solid rod legs shall leave no cavities within the joint flange plates for water to accumulate.

2.05 Tower shall be designed, engineered and fabricated according to ANSI/EIA RS-222-G. However, if any requirement of this specification is more stringent then it shall apply.

2.06 Tower shall be designed assuming basic wind speed of 90 mph with 0" radial ice and 40 mph with 1" of radial ice.

2.07 Tower shall be designed as a Class III Structure.

2.08 Tower shall be designed with a 1.25 Importance Factor.

2.09 Tower shall be designed for Exposure Category C.

2.10 Tower shall be designed for Topographic Category I.

2.11 All tower components shall be hot dip galvanized after fabrication in accordance with ASTM A123.

2.12 All bolts shall conform to ASTM A-325 and shall be galvanized in accordance with ASTM A-153.

2.13 Welds made during fabrication shall be X-ray quality and conform to AISC and AWS standards.

2.14 At its own discretion, Owner may require the contractor to furnish copies of certification of welders employed in fabrication; mill tests of materials used in the structure; or report of X-ray examination of welds by an independent testing laboratory.

2.15 Tower shall be designed and fabricated so that erection may be accomplished using bolts with no field welding, cutting, or drilling required or allowed.

2.16 Vendor to guarantee structural analysis of proposed tower. Vendor agrees to reimburse Owner for professional fees in the event an independent tower engineering firm projects engineering/fabrication/material deficiency(ies) in Vendor's proposed products which causes rejection.

2.17 Tower shall be 175 feet in height from bottom of leg mounting plates to top of structural supporting steel.

2.18 Tower shall have a top-mounted three-sided full height platform attached above structural supporting steel.

2.19 Tower sections from elevation 120' and above to be straight vertical, not tapered.

3.00 LOADING AND ATTACHMENTS

3.01 Tower shall be designed for the following loads:

Item #	Elevation	Quantity	Brand/Make	Model
1	175' (Top Mounted)	1	Tower Mfg	Platform on top of tower
2	175'	3	Alive Telecom	ATC-GD1V40 – on platform corners
3	175'	6	Andrew	7/8" Heliax – two per Item #2 antenna
4	175'	3	Andrew	DB-222 – one centered on each platform face
5	175'	3	Andrew	7/8" Heliax – one per Item #4 antenna
6	175'-178'	3	Radiowaves	SP3-5.2 – one on each platform face
7	175'-178'	3	Andrew	5/8" Heliax – one per item #6 antenna
8	165'	2	Andrew	4' HP Microwave Dishes
9	165'	1	Andrew	6' HP Microwave Dish
10	165'	3	Andrew	EW-52 Elliptical Waveguide
11	150'	2	Andrew	4' HP Microwave Dishes
12	150'	1	Andrew	6' HP Microwave Dish
13	150'	3	Andrew	EW-52 Elliptical Waveguide
14	135'	2	Andrew	4' HP Microwave Dishes
15	135'	1	Andrew	6' HP Microwave Dish
16	135'	3	Andrew	EW-52 Elliptical Waveguide
17	125'	1	Tower Mfg.	Low Profile Cellular Platform
18	125'	12	Amphenol	5960110 Cellular Panel Antennas
19	125'	12	Andrew	1-5/8" Heliax
20	125'	3	Trade/Various	Cellular Tower Top Amps
21	125'	3	Andrew	1-5/8" Heliax
22	100'	3	Alive Telecom	ATC-GD1V40, one per leg
23	100'	3	Andrew	7/8" Heliax – one per item #22 antenna
24	30'-50'	3	Alive Telecom	ATC-GD1V40, one per leg
25	30'-50'	12	Andrew	1/2" Heliax

Item #1. Furnish top mounted nominal 14' platform with 3 x corner pipes for Item #2 antennas, 3 x face mounted nominal 2" pipes for Item #4 antennas, and 3 x face mounted nominal 4-1/2" pipes for Item #6 microwave dishes. Furnish platform with grate flooring, top railing, and toe boards.

Item #3. Each Item #2 antenna is fed with two of Item #3 feedlines.

Item #8 and Item #9. Furnish two microwave dish mounts for this elevation.

Item #11 and Item #12. Furnish two microwave dish mounts for this elevation.

Item #14 and Item #15. Furnish two microwave dish mounts for this elevation.

Item #18. Tower shall be designed for 12 heavy duty panel antennas plus brackets and stiff arms in support of high performance commercial carrier. See antenna specifications.

Item #20. Tower shall be designed for 3 heavy weight tower-top amplifiers in support of high performance commercial carrier.

Item #22. Furnish three whip antenna mounting brackets for attachment of Item #22 antennas to tower legs.

Item #24. Tower shall be designed to support three (one per leg) Item #2 Alive Telecom antennas. Furnish six (two per corner/leg) nominal 2' standoff brackets (upper and lower) to support antennas.

3.02 Furnish exterior climbing ladder with required standoffs.

3.03. Furnish safety cable kit for ladder, no harness.

3.04. Furnish three waveguide support ladders to support ultimate line load of 60 lines (assume initial 51 plus 9 additional ½" Heliax to 125' platform). Distribute waveguide ladders and feedline loads across three faces.

3.05. Furnish construction step bolts on all three legs to the nominal 50' level.

3.06. Furnish a suitable template, to be delivered with anchor bolts, for use by foundation contractor to locate, correctly space, and stabilize mounting bolts while constructing foundation.

4.00 ATTACHMENTS

4.01. Geotechnical analysis is attached for use by Vendor for foundation design. Test boring was taken at center point of tower. Based on soils report, Vendor is requested to offer Owner alternate foundation designs.

5.00 SUBMITTALS

The following items shall be submitted with the Bid Response:

5.01. Plan view and Elevation of proposed tower.

5.02. Tower section drawings showing all members, splice plate or flange details, and any additional information required to identify each component.

5.03. Drawings to include dimensions and weights of sections and weight of complete tower assembly.

5.04. Drawings of miscellaneous details including antenna mounts, top-mounted platform, waveguide ladder components, and standoff brackets.

5.05. Plan view and elevation of foundation. To include reinforcing bar size, quantity and position, concrete quantities and finishing techniques, and all other pertinent information. Vendor is encouraged to offer alternative foundation designs based on local conditions.

5.06. Structural analysis of tower. Such analyses to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of analyses showing calculations and stresses.

5.07. Foundation design. Such design(s) to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of design showing calculations and stresses.

5.08. Submit sample printed warranty with Bid Response.

5.09. Upon award of tower bid, Vendor shall furnish key erection drawings, fabrication and design drawings, all certified by a registered professional engineer, state of registry: Missouri.

3. Response Presentation and Review

RESPONSE CONTENT – In order to enable direct comparison of competing Responses, Bidder must submit Response in strict conformity to the requirements stated herein. Failure to adhere to all requirements may result in Bidder's Response being disqualified as non-responsive. All Responses must be submitted using the provided Response Sheet. Every question must be answered and if not applicable, the section must contain "N/A". Manufacturer's published specifications for the items requested shall be included with the response.

SUBMITTAL OF RESPONSES – Responses MUST be received by the date and time notes on the title page under "Bid Submission Information and Deadline". NO EXCEPTIONS. The County is not responsible for late or incorrect deliveries from the US Postal Service or any other mail carrier.

Advice of Award – If you wish to be advised of the outcome of this Bid, the results may be viewed on the County's web page at www.showmeboone.com.

BID OPENING – On the date and time and at the location specified on the title page, all Responses will be opened in public. Brief summary information from each will be read aloud, and any person present will be allowed, under supervision, to scan any Response. In the event only one bid is received by the date and time of the bid opening, County reserves the right to not open the bid and extend the Closing Date for the purpose of inviting bid responses from more vendors in the interest of establishing competition.

Removal from Vendor Database – If any prospective Bidder currently in our Vendor Database to whom the Bid was sent elects not to submit a Response and fails to reply in writing stating reason for not bidding, that Bidder's name may be removed from our database. Other reasons for removal include unwillingness or inability to show financial responsibility, reported poor performance, unsatisfactory service, or repeated inability to meet delivery requirements.

RESPONSE CLARIFICATION – The County reserves the right to request additional written or oral information from Bidders in order to obtain clarification of their Responses.

Rejection or Correction of Responses – The County reserves the right to reject any or all Responses. Minor irregularities or informalities in any Response which are immaterial or inconsequential in nature, and are neither affected by law nor at substantial variance with Bid conditions, may be waived at our discretion whenever it is determined to be in the County's best interest.

EVALUATION PROCESS – The County's sole purpose in the evaluation process is to determine from among the Responses received which one is best suited to meet the County's needs at the lowest possible cost. Any final analysis or weighted point score does not imply that one Bidder is superior to another, but simply that in our judgment the Contract selected appears to offer the best overall solution for our current and anticipated needs at the lowest possible cost.

Method of Evaluation – The County will evaluate submitted Responses in relation to all aspects of this Bid.

Acceptability – The County reserves the sole right to determine whether goods and/or services offered are acceptable for County use.

Endurance of Pricing – Bidder's pricing must be held until contract execution or 60 days, whichever comes first.

4. Response Form

Company Name: _____
Address: _____
City/Zip: _____
Phone Number: _____
E-Mail: _____
Fax Number: _____

Federal Tax I.D. _____
( ) Corporation
( ) Partnership – Name_____
( ) Individual/Proprietorship – Individual Name _____
( ) Other (Specify) _____

4.00 PRICING

To furnish all resources, materials, and labor to completely design, engineer, fabricate and deliver FOB Destination to Columbia, MO a radio tower in accordance with these bid specifications and all applicable EIA and manufacturer-recommended specifications. **Refer to Primary Specifications.** Quoted cost below shall include key erection drawings, fabrication and design drawings, all certified by a registered professional engineer, state of registry: Missouri. State pricing as listed below:

4.01. Radio tower, designed, engineered, and fabricated per the above stated requirements.

_____ DOLLARS and _____CENTS
(Quoted cost in print)

$_____/LUMP SUM

4.02. Delivery of all items specified in this bid: _____ARO (after receipt of order)

4.03. **With this Bid Response, include the following:**

a. Plan View and Elevation of proposed tower.
b. Tower section drawings showing all members, splice plate or flange details, and any additional information required to identify each component.
c. Drawings to include dimensions and weights of sections and weight of complete tower assembly.
d. Drawings of miscellaneous details including antenna mounts, top-mounted platform, waveguide ladder components, and standoff brackets.
e. Plan view and elevation of foundation. To include reinforcing bar size, quantity and position, concrete quantities and finishing techniques, and all other pertinent information. Vendor may offer additional, alternative foundation designs based on local conditions. *If Vendor elects to submit additional, alternative foundation designs, clearly identify the submittal(s) as ALTERNATIVE 1, 2, etc. and supply all pertinent information, addressing all specifications and requirements listed in this bid.*
f. Structural analysis of tower. Such analyses to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of analyses showing calculations and stresses.

g. Foundation design. Such design(s) to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of design showing calculations and stresses.

h. Submit sample detailed printed warranty.

4.04. **Subcontracting:** If Vendor proposes to use subcontractors for this work, list the names of the firms and the work to be assigned in spaces below.

Subcontractor Name/Address	Work Assigned
_____	_____
_____	_____
_____	_____

4.05. **Debarment and Suspension**: By submission of its Bid Response, Vendor agrees to comply with the provisions of Executive Order 12549, regarding Debarment and Suspension. Specifically, the Vendor certifies that neither he/she nor their principals are 1.) presently debarred, suspended, proposed for debarment, declared ineligible or voluntary excluded from covered transactions by a Federal department or agency, 2) have not with a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain or performing a public transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property; 3.) are not presently indicted for or otherwise criminal or civilly charged by a government entity with commission of any of the offenses stated above and 4.) have not within a three year period preceding this bid had one or more public transactions terminated for cause or default.

4.06. **Certification of Non-Resident/Foreign Contractors**: If the Contractor is a foreign corporation or nonresident Contractor, it is agreed that the Contractor shall procure and maintain during the life of this contract:

A. A certificate of authority to transact business in the State of Missouri from the Secretary of State, unless exempt pursuant to the provisions of Section 351.572 RSMo.

B. A certificate from the Missouri Director of Revenue evidencing compliance with transient employer financial assurance law, unless exempt pursuant to the provisions of Section 285.230 RSMo.

4.07. The undersigned offers to furnish and deliver the articles or services as specified at the prices and terms stated and in strict accordance with all requirements contained in the Request for Bid which have been read and understood, and all of which are made part of this order. By submission of this bid, the vendor certifies that they are in compliance with Section 34.353 and, if applicable, Section 34.359 (Missouri Domestic Products Procurement Act) of the Revised Statutes of Missouri.

Authorized Representative (Sign By Hand):

_____ Date: _____

Print Name and Time of Authorized Representative:

_____

STATEMENT OF BIDDER'S QUALIFICATIONS

Each bidder for the work included in the specifications and plans and the Contract Documents shall submit with their bid the data requested in the following schedule of information. This data must be included in and made a part of each bid document and be contained in the sealed envelope. Failure to comply with this instruction may be regarded as justification for rejecting the Contractor's proposal.

1. Name of Bidder:_____

2. Business Address: _____

3. When Organized: _____

4. When Incorporated: _____ **5.** List federal tax identification number: _____
If not incorporated, state type of business (sole proprietor, partnership, or other)_____

6. Number of years engaged in business under present firm name: _____

7. If you have done business under a different name, please give name and business location under that name: _____

8. Percent of work done by own staff: _____

9. Have you ever failed to complete any work awarded to your company? If so, where and why?_____

10. Have you ever defaulted on a contract? _____If so, give _____

11. List of contracts completed within the last three years for work similar in scope to that described in this bid, including value of each._____

12. List of projects currently in progress: _____

*** Attach additional sheets as necessary ***

"No Bid" Response Form

Boone County Purchasing
613 E. Ash, Room 111
Columbia, MO 65201

Elizabeth Sanders, Senior Buyer
(573) 886-4393 – Fax: (573) 886-4390

"NO BID RESPONSE FORM"

NOTE: COMPLETE AND RETURN THIS FORM ONLY IF YOU DO NOT WANT TO SUBMIT A BID

If you do not wish to respond to this bid request, but would like to remain on the Boone County vendor list **for this service/commodity**, please remove form and return to the Purchasing Department by mail or fax.

If you would like to FAX this "No Bid" Response Form to our office, the FAX number is (573) 886-4390.

Bid: 14-24MAR15 – RADIO TOWER DESIGN, ENGINEERING, FABRICATION SERVICES

Business Name: _____

Address: _____

_____

_____

Telephone: _____

Contact: _____

Date: _____

Reason(s) for not bidding:

_____

_____

_____

Boone County Purchasing
613 E. Ash, Room 111
Columbia, MO 65201

Standard Terms and Conditions

Elizabeth Sanders, Senior Buyer
Phone: (573) 886-4393 – Fax: (573) 886-4390

1. Contractor shall comply with all applicable federal, state, and local laws and failure to do so, in County's sole discretion, shall give County the right to terminate this Contract.

2. Responses shall include all charges for packing, delivery, installation, etc., (unless otherwise specified) to the Boone County Department identified in the Request for Bid and/or Proposal.

3. The Boone County Commission has the right to accept or reject any part or parts of all bids, to waive technicalities, and to accept the offer the County Commission considers the most advantageous to the County. Boone County reserves the right to award this bid on an item-by-item basis, or an "all or none" basis, whichever is in the best interest of the County.

4. Bidders must use the bid forms provided for the purpose of submitting bids, must return the bid and bid sheets comprised in this bid, give the unit price, extended totals, and sign the bid. The Purchasing Director reserves the right, when only one bid has been received by the bid closing date, to delay the opening of bids to another date and time in order to revise specifications and/or establish further competition for the commodity or service required. The one (1) bid received will be retained unopened until the new Closing date, or at request of bidder, returned unopened for re-submittal at the new date and time of bid closing.

5. When products or materials of any particular producer or manufacturer are mentioned in our specifications, such products or materials are intended to be descriptive of type or quality and not restricted to those mentioned.

6. Do not include Federal Excise Tax or Sales and Use Taxes in bid process, as law exempts the County from them.

7. The delivery date shall be stated in definite terms, as it will be taken into consideration in awarding the bid.

8. The County Commission reserves the right to cancel all or any part of orders if delivery is not made or work is not started as guaranteed. In case of delay, the Contractor must notify the Purchasing Department.

9. In case of default by the Contractor, the County of Boone will procure the articles or services from other sources and hold the Bidder responsible for any excess cost occasioned thereby.

10. Failure to deliver as guaranteed may disqualify Bidder from future bidding.

11. Prices must be as stated in units of quantity specified, and must be firm. Bids qualified by escalator clauses may not be considered unless specified in the bid specifications.

12. No bid transmitted by fax machine or e-mail will be accepted.

13. The County of Boone, Missouri expressly denies responsibility for, or ownership of any item purchased until same is delivered to the County and is accepted by the County.

14. The County reserves the right to award to one or multiple respondents. The County also reserves the right to not award any item or group of items if the services can be obtained from a state or other governmental

entities contract under more favorable terms.

15. The County, from time to time, uses federal grant funds for the procurement of goods and services. Accordingly, the provider of goods and/or services shall comply with federal laws, rules and regulations applicable to the funds used by the County for said procurement, and contract clauses required by the federal government in such circumstances are incorporated herein by reference. These clauses can generally be found in the Federal Transit Administration's Best Practices Procurement Manual – Appendix A. Any questions regarding the applicability of federal clauses to a particular bid should be directed to the Purchasing Department prior to bid opening.

16. In the event of a discrepancy between a unit price and an extended line item price, the unit price shall govern.

17. Should an audit of Contractor's invoices during the term of the Agreement, and any renewals thereof, indicate that the County has remitted payment on invoices that constitute an over-charging to the County above the pricing terms agreed to herein, the Contractor shall issue a refund check to the County for any over-charges within 30-days of being notified of the same.

18. **For all titled vehicles and equipment the dealer must use the actual delivery date to the County on all transfer documents** including the Certificate of Origin (COO,) Manufacturer's Statement of Origin (MSO,) Bill of Sale (BOS,) and Application for Title.

19. **Equipment and serial and model numbers -** The contractor is strongly encouraged to include equipment serial and model numbers for all amounts invoiced to the County. If equipment serial and model numbers are not provided on the face of the invoice, such information may be required by the County before issuing payment.

INSTRUCTIONS FOR COMPLIANCE WITH HOUSE BILL 1549

House Bill 1549 addresses the Department of Homeland Security's and the Social Security Administration's E-Verify Program (Employment Eligibility Verification Program) that requires the County to verify "lawful presence" of individuals when we contract for work/service; verify that contractor has programs to verify lawful presence of their employees when contracts exceed $5,000; and a requirement for OSHA safety training for public works projects.

The County is required to obtain certification that the bidder awarded the attached contract participates in a federal work authorization program. To obtain additional information on the Department of Homeland Security's E-Verify program, go to:

http://www.uscis.gov/portal/site/uscis/menuitem.eb1d4c2a3e5b9ac89243c6a7543f6d1a/?vgnextoid=75bce2e261405110VgnVCM1000004718190aRCRD&vgnextchannel=75bce2e261405110VgnVCM1000004718190aRCRD

Please complete and return form *Work Authorization Certification Pursuant to 285.530 RSMo* if your contract amount is in excess of $5,000. **Attach to this form the first and last page of the *E-Verify Memorandum of Understanding* that you completed when enrolling.**

WORK AUTHORIZATION CERTIFICATION
PURSUANT TO 285.530 RSMo
(FOR ALL AGREEMENTS IN EXCESS OF $5,000.00)

County of _____)
)ss
State of _____)

My name is _____. I am an authorized agent of _____ _____(Bidder). This business is enrolled and participates in a federal work authorization program for all employees working in connection with services provided to the County. This business does not knowingly employ any person that is an unauthorized alien in connection with the services being provided. Documentation of participation in a federal work authorization program is attached hereto.

Furthermore, all subcontractors working on this contract shall affirmatively state in writing in their contracts that they are not in violation of Section 285.530.1, shall not thereafter be in violation and submit a sworn affidavit under penalty of perjury that all employees are lawfully present in the United States.

_____
Affiant Date

_____
Printed Name

Subscribed and sworn to before me this ___ day of _____, 20___.

_____
Notary Public

CERTIFICATION OF INDIVIDUAL BIDDER

Pursuant to Section 208.009 RSMo, any person applying for or receiving any grant, contract, loan, retirement, welfare, health benefit, post secondary education, scholarship, disability benefit, housing benefit or food assistance who is over 18 must verify their lawful presence in the United States. Please indicate compliance below. Note: A parent or guardian applying for a public benefit on behalf of a child who is citizen or permanent resident need not comply.

_____1. I have provided a copy of documents showing citizenship or lawful presence in the United States. (Such proof may be a Missouri driver's license, U.S. passport, birth certificate, or immigration documents). Note: If the applicant is an alien, verification of lawful presence must occur prior to receiving a public benefit.

_____2. I do not have the above documents, but provide an affidavit (copy attached) which may allow for temporary 90 day qualification.

_____3. I have provided a completed application for a birth certificate pending in the State of _____. Qualification shall terminate upon receipt of the birth certificate or determination that a birth certificate does not exist because I am not a United States citizen.

_____ _____ _____

Applicant Date Printed Name

AFFIDAVIT
(Only Required for Individual Bidder Certification Option #2)

State of Missouri)
)SS.
County of _____)

I, the undersigned, being at least eighteen years of age, swear upon my oath that I am either a United States citizen or am classified by the United States government as being lawfully admitted for permanent residence.

_____ _____
Date Signature

_____ _____
Social Security Number Printed Name
or Other Federal I.D. Number

On the date above written _____ appeared before me and swore that the facts contained in the foregoing affidavit are true according to his/her best knowledge, information and belief.

_____
Notary Public

My Commission Expires:

(Please complete and return with Bid)

Certification Regarding
Debarment, Suspension, Ineligibility and Voluntary Exclusion
Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 29 CFR Part 98 Section 98.510, Participants' responsibilities. The regulations were published as Part VII of the May 26, 1988, Federal Register (pages 19160-19211).

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS FOR CERTIFICATION)

(1) The prospective recipient of Federal assistance funds certifies, by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective recipient of Federal assistance funds is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

_____

Name and Title of Authorized Representative

_____ _____

Signature Date

CROCKETT
GEOTECHNICAL - TESTING LAB

GEOTECHNICAL ENGINEERING REPORT
FOR
BOONE COUNTY JOINT COMMUNICATIONS

175´ TALL SELF-SUPPORT
911 RADIO TOWER
COLUMBIA, MISSOURI

JANUARY 30, 2015

Crockett GTL Project Number: G14076.1

500 Big Bear Blvd. • Columbia, MO 65202
Phone: 573-447-3981
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CROCKETT
GEOTECHNICAL - TESTING LAB
500 Big Bear Boulevard
Columbia, Missouri 65202
(573) 447-3981

January 30, 2015

Boone County Joint Communications
17 N. 7th Street
Columbia, MO 65201

Attn: Mr. Dave Dunford

Re: Geotechnical Engineering Report
175' Tall Self-Support 911 Radio Tower
Columbia, Missouri
Crockett GTL Project Number: G14076.1

Dear Mr. Dunford.

Crockett Geotechnical - Testing Lab (Crockett GTL) has completed the geotechnical engineering services for the referenced project. This report should be read in its entirety. Our services were performed in general accordance with our emailed proposal scope dated December 18, 2014. This report presents the results of our field explorations, laboratory testing, and recommendations for design and construction of the referenced project.

Please note this is a revised report to replace the report dated January 26, 2015. The revision was made to correct the tower height.

We appreciate the opportunity to be of service and look forward to working with you during the construction phase of this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Shane Steinman, E.I.
Project Manager

Eric H. Lidholm, P.E.
Principal Engineer
Missouri: E-23265

Enclosures
cc: 1 - Client (.PDF)
1 - File

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Geotechnical Engineering Report
175' Tall Self-Support 911 Radio Tower
Columbia, Missouri
Crockett GTL Project Number: G14076.1
January 30, 2015

1 INTRODUCTION

Crockett Geotechnical - Testing Lab (CGTL) has conducted a geotechnical exploration for the proposed development. The purpose of our exploration was to:

- characterize and evaluate the subsurface conditions,
- provide design and construction recommendations for:
  - earthwork
  - foundations
  - seismic considerations

Our services were performed in general accordance with our emailed proposal scope dated December 18, 2014.

2 SITE AND PROJECT INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

Item	Description
Location	A new self-support tower (SST) will be located near existing Boone County Sherriff's office at 2121 County Drive in Columbia, Missouri.
Approximate GPS Coordinates	Latitude: 39.004478° Longitude: -92.308318°
Existing improvements	This tower site is undeveloped.
Current ground cover	Lawn area.
Existing topography	Relatively level at the tower site.

2.2 PROJECT DESCRIPTION

Item	Description
Proposed structures	Self-Support Tower, 175 feet tall
Estimated loads (assumed)	Vertical: 200 kips Shear: 19 kips Moment: N/A Uplift: 150 kips
Grading (approximate)	For this proposal we have assumed site grading to consist of less than approximately 2 feet of fill and up to 10 feet of cut.
Cut and fill slopes	Final slopes are assumed to be no steeper than 3H:1V (Horizontal to Vertical)
Free-standing retaining walls	None.
Below grade areas	None.

3 SUBSURFACE CONDITIONS

3.1 FIELD EXPLORATION AND LABORATORY TESTING

One (1) boring was drilled for this project at the approximate location indicated on the Boring Location Plan included in the Appendix of this report. The boring location was designated by client and was staked in the field by others. The boring elevation was estimated by using the topographic information available on the Boone County Parcel Viewer website. The boring location should be considered accurate only to the degree implied by the means and methods used to define them.

The boring was drilled with a truck mounted drill rig. Representative samples were obtained using thin-walled tube and split-barrel tube sampling procedures.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring log attached to this report includes soil descriptions, consistency evaluations, boring depth, sampling intervals, and groundwater conditions. The boring was backfilled with auger cuttings prior to the drill crew leaving the site.

The field log was prepared by the drill crew. The final boring log included with this report represents the engineer's interpretation of the field log and includes modifications based upon laboratory tests and observation made of the samples. The descriptions of the soil on the final

boring log is in general accordance with the Unified Soil Classification System which is included in the Appendix of this report.

Detailed information regarding the material encountered and the results of field sampling and laboratory testing are shown on the Boring Logs included in the Appendix of this report.

3.2 Encountered Subsurface Conditions

Topsoil was encountered to a depth of about 6-inches. Topsoil thickness should be expected to vary elsewhere on the site.

Below the surficial material was undocumented fill which was underlain by topsoil. The undocumented fill extended to an approximate depth of 9 feet. The underlying buried topsoil was about 1-foot in thickness. The buried topsoil was low strength and extremely brittle.

Underlying the buried topsoil was lean to fat clay that was visually identified as glacial drift. Cobbles and boulders were encountered within the glacial drift from about 22 to 27 feet in depth. The boring terminated within the glacial drift upon achieving split-spoon sampler refusal at a depth of 39.6 feet.

Detailed descriptions of the encountered materials are listed on the boring log included in the Appendix of this report. Strata lines indicate the approximate location of changes in material types. The transition between material types may be gradual.

3.3 Groundwater

Groundwater was not encountered in the boring while drilling, at completion of drilling, or for the short duration the boring was allowed to remain open after the completion of drilling. However, this does not necessarily mean the boring terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials.

Pockets, lenses, and stringers of sand are sometimes encountered in the glacial soils found in the vicinity of the referenced project. These sand pockets are normally discontinuous and often contain water of variable quality and quantity. These sand pockets may be encountered during foundation excavation.

Perched groundwater can develop over low permeability soil or rock strata following periods of heavy or prolonged precipitation. This possibility should be considered when developing design and construction plans and specifications for the project. Groundwater levels depend on seasonal and climatic variations and may be present at different levels in the future. In addition,

without extended periods of observation, accurate groundwater level measurements may not be possible, particularly in low permeability soils.

The boreholes were backfilled prior to departing the project site. Groundwater records are indicated on the boring logs included in the Appendix of this report.

4 GEOTECHNICAL RECOMMEDATIONS

4.1 EARTHWORK

At the completion of stripping and grubbing, we recommend the exposed subgrade be thoroughly evaluated before the start of any fill operations. We recommend the geotechnical engineer be retained to evaluate the bearing material for the foundations and subgrade soils. Subsurface conditions, as identified by the field and laboratory testing programs have been reviewed and evaluated with respect to the proposed project plans known to us at this time.

4.1.1 Existing Undocumented Fill and Buried topsoil

Existing undocumented fill and buried topsoil was encountered to about 10 feet in depth in the boring. The undocumented fill and buried topsoil is not suitable for the support of shallow foundations and should be removed and replaced with new structural fill if a shallow foundation system is utilized to support the proposed self-support tower. The overexcavation should occur under all foundations and should extend at least 5 feet outside of the shallow foundation footprint.

Based upon what was encountered in the boring, it appears then existing undocumented fill would be suitable for reuse as new structural fill if moisture conditioned and recompacted. We recommend the owner establish unit rates for complete removal and replacement of the undocumented fill.

The undocumented fill and buried topsoil could remain in place should a drilled pier foundation system be used.

4.1.2 Site Preparation

All existing utility backfill, and any otherwise unsuitable material should be removed from the construction areas prior to placing structural fill. After stripping and grubbing, the site should be proofrolled to aid in locating loose or soft areas. Proofrolling can be performed with a loaded tandem axle dump truck. Soft, wet, dry and low-density soil should be removed or be moisture conditioned and recompacted in place as structural fill prior to placing new structural fill.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a vertical face height of 1 to 3 feet and should be cut wide enough to accommodate the compaction equipment. We recommend structural fill slopes be overfilled and then cut back to develop an adequately compacted slope face.

4.1.3 Structural Fill Requirements

Compacted structural fill should consist of approved materials free of organic matter and debris. Frozen material should not be used and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted for evaluation prior to use.

Structural Fill Requirements		
Material Type	USCS Classification	Acceptable Uses
Lean Clay and Clayey Sand	CL & SC (LL<40)	All locations
Lean to Fat Clay	CL-CH (40<LL<50)	All locations
Fat Clay	CH (LL≥50+)	All locations
Soil Fill Lift Thickness	9 inches or less when using heavy self-propelled compaction equipment 6-inches or less when using hand guided or light self-propelled equipment	
Soil Compaction Requirements	95% of standard Proctor dry density (ASTM D-698)	
Compaction Moisture Content Requirements • Cohesive • Granular	Optimum moisture content to 4% above the standard Proctor optimum moisture content Workable moisture content. Shall not pump when proofrolled	

4.1.4 Grading and Drainage

Final surrounding grades should be sloped away from the structure on all sides to prevent ponding of water. Collected water should discharge at least 10 feet beyond the footprint of the tower support structure.

4.1.5 Earthwork Construction

In periods of dry weather, the surficial soils may be of sufficient strength to allow fill construction on the stripped and grubbed ground surface. However, unstable subgrade conditions could develop if the soils are wet or subjected to repetitive construction traffic. Should unstable subgrade conditions be encountered, stabilization measures will need to be employed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork/fill placement and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of building floor slabs.

4.2 FOUNDATION RECOMMENDATIONS

The subsurface data obtained from the boring was analyzed to evaluate potential foundation design alternatives. It is our professional opinion the self-support tower can be supported by either a shallow, spread footing foundation system bearing on newly placed compacted structural fil or by a drilled pier foundation system bearing within the native clay. The equipment building can be supported by a shallow foundation system bearing on stiff native clay or compacted structural fill. Design recommendations and construction considerations for shallow foundations follow:

4.2.1 Shallow Foundation Design Recommendations

Shallow Foundation Design Recommendations	
Net allowable bearing pressure – Tower [1]	2,500 psf [1]
Net allowable bearing pressure – Equipment Building [2]	1,500 psf [2]
1. Assumes the existing undocumented fill and buried topsoil has been remediated as described in section 4.1.1 of this report. 2. Assumes equipment building will bear on the undocumented fill.	
Allowable overstress for transient loads (i.e. snow, wind, seismic)	33%
Ultimate passive pressure (equivalent fluid pressure) 1. The sides of the spread footing foundation excavations must be nearly vertical and the concrete should be placed neat against the vertical faces for the passive earth pressure values to be valid. 2. Passive resistance in the frost zone should be neglected. 3. Some movement of the footing will be required to mobilize resistance from passive pressure and sliding friction.	270 pcf
Coefficient of sliding friction	0.32

Shallow Foundation Design Recommendations	
Minimum embedment below finished grade for frost protection	30 inches
Approximate Settlement • Total • Differential 1. Foundation settlement will depend upon the variations within the subsurface soil profile, the towers structural loading conditions, the embedment depth of the footings, the thickness of compacted fill (if any), and the quality of the earthwork operations.	‹ 1 inch ‹ ¾ inch

Uplift resistance for spread footing foundations may be computed as the sum of the effective weight of the foundation element and the effective weight of the soil overlying the foundation. We recommend using a soil unit weight of 120 pounds per cubic foot (pcf) for structural fill overlying the footing placed as described in this section of this report. A unit weight of 150 pcf could be used for reinforced footing concrete. We recommend a minimum factor of safety of 1.5 be utilized for uplift calculations.

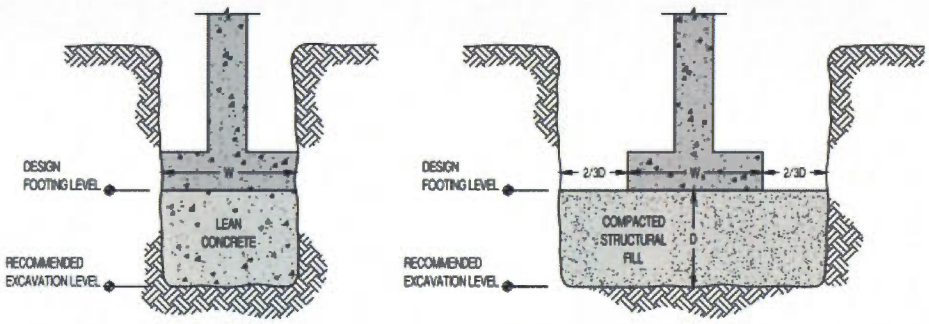
4.2.2 Shallow Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soil at the foundation bearing level become excessively dry, disturbed, saturated, or frozen the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

Although groundwater was not encountered at or above the anticipated shallow foundation bearing elevation, it may be encountered during foundation excavation. In addition, some surface and/or perched groundwater may enter foundation excavations during construction. It is anticipated any water entering foundation excavations from these sources can be removed using sump pumps or gravity drainage.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings should bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well graded

granular material placed in lifts of 9 inches or less in loose thickness and compacted to at least 98 percent of the material's maximum standard effort maximum dry density (ASTM D 698). The lean concrete backfill and overexcavation-and-backfill procedures are described in the diagram below.



LEAN CONCRETE BACKFILL OVEREXCAVATION / BACKFILL

NOTE:
EXCAVATIONS IN SKETCHES SHOWN VERTICAL FOR CONVENIENCE. EXCAVATIONS SHOULD BE SLOPED AS NECESSARY FOR SAFETY.

4.2.3 Drilled Pier Foundation Design Recommendations

The proposed structure can be founded on straight shaft drilled piers bearing in suitable glacial drift. The design parameters provided in the following table are based on the results of field and laboratory testing, published values, and our past experience with similar soil conditions.

Approximate Depth (feet) [1]	Allowable Skin Friction (psf) [2]	Allowable End Bearing Pressure (psf) [3]	Allowable Passive Pressure (psf) [2]	Cohesion (psf)	Strain ε_{50} (in./in) [4]	Lateral Subgrade Modulus (pci) [4]
0 - 3	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore
3 - 9	200 [2]	NR [5]	1,000	1,000	0.012	250
9 - 10	80 [2]	NR [5]	400	400	0.018	50
10 - 28	550 [2]	8,000 [3]	2,750	2,750	0.006	900
28 - 40	800 [2]	12,000	4,000	4,000	0.005	1,300

1. A moist unit weight of 120 psf can be used for soil. CGTL should observe pier excavations to evaluate whether conditions are consistent with those encountered in our boring.
2. The skin friction and passive pressure values are based on a constant (rectangular) pressure distribution for cohesive soils and bedrock.

Skin friction and passive pressure should be neglected within 3 feet of the final grade.
3. Minimum pier length of 4 diameters or 15 feet, whichever is greater, is required. CGTL should be contacted if the pier length is less than four times the pier diameter as modifications to our design parameters may be warranted.
4. Lateral subgrade modulus and strain values are to be utilized with LPILE software.
5. NR = Not Recommended

Drilled piers should have a minimum shaft diameter of 30 inches. The above-indicated cohesion values are ultimate values without factors of safety. The end bearing, skin friction, and passive resistance are allowable parameters with factors of safety. The values given in the above table are based on our boring and past experience with similar material types.

4.2.4 Drilled Pier Foundation Construction Considerations

Cobbles and boulders were encountered in the borehole. Because of this, difficult pier drilling conditions could be encountered. Special drilling techniques may be required to penetrate potential gravel and cobble/boulder zones that could be encountered in the glacial drift materials.

Temporary casing may be needed to advance drilled pier excavations. Temporary casing should also be installed when personnel enter the shafts to clean and/or test the bearing surface.

For proper performance of the drilled pier foundation system, it is critical for the bottom of pier excavations to be cleaned of any water and loose material prior to placing reinforcing steel and concrete. A minimum shaft diameter of at least 30 inches is required for entry of construction and testing personnel, and to facilitate clean-out and possible dewatering of the pier excavation.

Concrete should be placed soon after excavating to minimize bearing surface disturbance. Any water accumulating in the pier excavation should be pumped from the excavation or the water level should be allowed to stabilize and then concrete should be placed using the tremie method.

If concrete will be placed as the temporary casing is being removed, we recommend the concrete mixture be designed with a slump of about 5 to 7 inches to reduce the potential for arching when removing the casing. While removing the casing from a pier excavation during concrete placement, the concrete inside the casing should be maintained at a sufficient level to resist any earth and hydrostatic pressures outside the casing during the entire casing removal procedure.

We recommend a CGTL engineer or their representative be present on a full-time basis during drilling activities to evaluate the materials removed from the drilled pier excavations to determine when adequate capacity has been developed, to observe the base of the drilled pier to

determine that the cuttings have been adequately removed, and also to observe the concreting techniques.

Although obvious signs of harmful gases such as methane, carbon monoxide, etc., were not noted in the boring during the geotechnical drilling operations, gas could be encountered in the drilled shaft excavations during construction. The contractor should check for gas and/or oxygen deficiency prior to any workers entering the excavation for observation and manual cleanup.

4.3 SEISMIC CONSIDERATIONS

The 2012 International Building Code requires the average properties in the upper 100 feet of the subsurface profile a site profile determination extending a depth of 100 feet for seismic site classification. The drilling scope performed for this project had one boring that extended to a maximum depth of approximately 40 feet.

Seismic Site Classification	
Code Used	2012 International Building Code (IBC)
Site Classification	D

Additional exploration to greater depths could be considered to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a more favorable seismic site class.

5 GENERAL COMMENTS

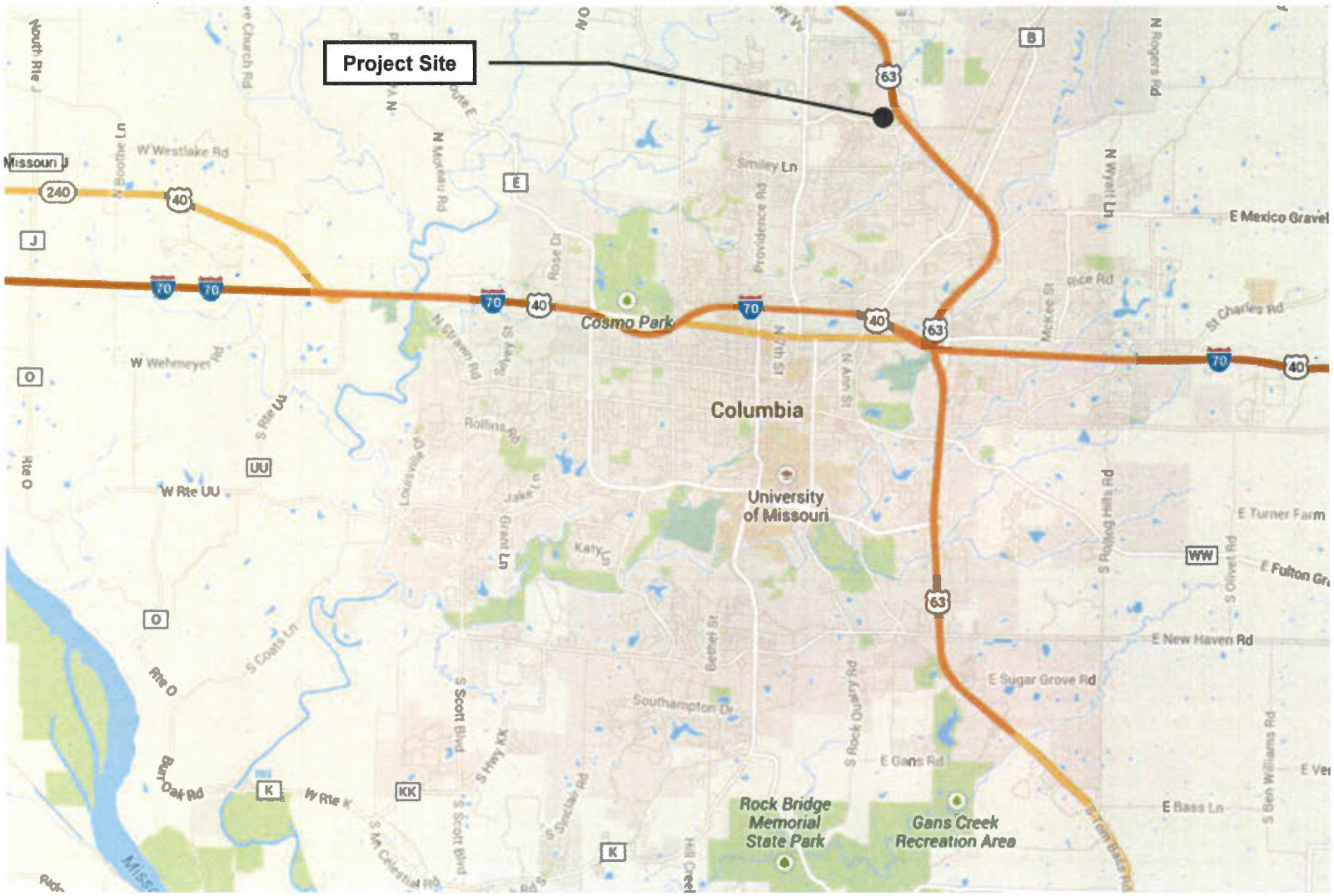
The recommendations provided herein are for the exclusive use of our client. Our recommendations are specific only to the project described herein and are not meant to supersede more stringent requirements of local ordinances or codes. The recommendations are based on subsurface information obtained at our boring locations, sample locations, our understanding of the project as described in this report, and geotechnical engineering practice consistent with the current standard of care. No warranty is expressed or implied. CGTL should be contacted if conditions encountered are not consistent with those described.

CGTL should be provided with a set of final plans and specifications, once they are available, to review whether our recommendations have been understood and applied correctly and to assess the need for additional exploration or analysis. Failure to provide these documents to

CGTL may nullify some or all of the recommendations provide herein. In addition, any changes in the planned project or changes in site conditions may require revised or additional recommendations on our part.

The final part of our geotechnical service should consist of direct observation during construction to observe that conditions actually encountered are consistent with those described in this report and to assess the appropriateness of the analyses and recommendations contained herein. CGTL cannot assume liability or responsibility for the adequacy of recommendations without being retained to observe construction.

APPENDIX



SITE LOCATION MAP

175' TALL SELF-SUPPORT 911 RADIO TOWER
COLUMBIA, MISSOURI

PROJECT NO.: G14076.1

Prepared By:
CROCKETT
GEOTECHNICAL · TESTING LAB
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PROJECT NO.: G14076.1

BORING LOCATION PLAN

175' TALL SELF-SUPPORT 911 RADIO TOWER
COLUMBIA, MISSOURI

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CROCKETT GEOTECHNICAL - TESTING LAB

BORING NUMBER B-1

CLIENT Columbia/Boone County Joint Communications
PROJECT NAME 911 Self Support Radio Tower
PROJECT NUMBER G14076.1
PROJECT LOCATION Columbia, Missouri
DATE STARTED 1/16/15 **COMPLETED** 1/16/15
GROUND ELEVATION 796 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR IPES
GROUND WATER LEVELS:
DRILLING METHOD 4" SSA
AT TIME OF DRILLING — Not Encountered
LOGGED BY Lidholm **CHECKED BY** Lidholm
AT END OF DRILLING — Not Encountered
NOTES Borehole backfilled upon completion
AFTER DRILLING — Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY LENGTH	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	UNC. COMP. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0		0.5 TOPSOIL (6-inches) 795.5										
		UNDOCUMENTED FILL: Fat clay, brown with gray, trace sand and gravel, trace rust stains	ST 1	14		2000			20			
5			ST 2	24		2500	1740	104	23			
		9.0 787.0	ST 3A	12		2000	1590	98	25			
10		10.0 TOPSOIL (12-inches): Dark brown to black, root hairs, friable 786.0	ST 3B	12					22			
		Organic Content = 3.4%										
		LEAN TO FAT CLAY: Brown, trace to with gray, trace to with sand and gravel, trace rust stains, very stiff (glacial drift)	ST 4	22		6500	6510	114	18			
15												
20			SPT 5	18	9-11-14 (25)	5500			20			
		—: with cobbles and occassional boulders from 22' to 27'										
25			SPT 6	17	5-20-50/4"	6500			22			
30			SPT 7	13	17-12-16 (28)	9000			17			
		31.0 765.0										
		LEAN TO FAT CLAY: Dark brown, trace gray, trace to with sand and gravel, very stiff to hard (glacial drift)										
35			SPT 8	18	8-10-13 (23)	9000			22			
		39.6 756.4	SPT 9	10	8-25-50/1"	8000			20			

Split Spoon Sampler Refusal on Apparent Boulder at 39.6 feet.
Bottom of borehole at 39.6 feet.

BORING LOG LEGEND AND NOMENCLATURE

Sample Type	Description
AU	Auger sample, disturbed, obtained from auger cuttings
NR	No recovery or lost sample
RC	Rock core, diamond core bit, nominal 2-inch diameter rock sample (ASTM D 2113)
ST	Thin walled (Shelby) tube sample, relatively undisturbed (ASTM D 1587)
SPT	Split spoon sample, disturbed (ASTM D 1586)
VA	Shear vane (ASYM D 2753)

Grain Size Terminology	
Boulders	Larger than 12-inches
Cobbles	3-inches to 12-inches
Gravel	Retained on #4 sieve to 3-inches
Sand	Retained on #200 sieve but passes #4 sieve
Silt or Clay	Passes #200 sieve

Descriptor	Relative Proportion of Sand and Gravel	Relative Proportion of Fines
Trace	Less than 15% by dry weight	Less than 5% by dry weight
With	15% to 30% by dry weight	5% to 12% by dry weight
Modifier	More than 30% by dry weight	More than 12% by dry weight

Relative Density of Coarse grained Soils	
Descriptive Term	SPT N-Value, Blows/Foot
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50+

Consistency of Fine Grained Soils		
Descriptive Term	SPT N-Value, Blows/Foot	Unconfined Compressive Strength, psf
Very Soft	0 - 2	0 - 500
Soft	2 - 3	500 - 1,000
Medium	4 - 9	1,000 - 2,000
Stiff	10 - 29	2,000 - 4,000
Very Stiff	30 - 49	4,000 - 8,000
Hard	50+	8,000+

USCS Soil Classification System				
Major Divisions			Group Symbol	Group Name
coarse grained soils more than 50% retained on #200 sieve	gravel >50% of coarse fraction retained on #4 (4.75 mm) sieve	clean gravel <5% small than #200 sieve	GW	well-graded gravel, fine to coarse gravel
			GP	poorly graded gravel
		gravel with >12% fines	GM	silty gravel
			GC	clayey gravel
	sand >50% of coarse fraction passes #4 (4.75 mm) sieve	clean sand	SW	well-graded sand, fine to coarse sand
			SP	poorly graded sand
		sand with >12% fines	SM	silty sand
			SC	clayey sand
fine grained soils more than 50% passes #200 sieve	silt and clay liquid limit < 50	inorganic	ML	silt
			CL	clay
		organic	OL	organic silt, organic clay
	silt and clay liquid limit ≥ 50	inorganic	MH	silt of high plasticity, elastic silt
			CH	clay of high plasticity, fat clay
		organic	OH	organic clay, organic silt
highly organic soils			PT	peat

Weathering	Description of Rock Properties
Fresh	No discoloration. Not oxidized.
Slightly weathered	Discoloration or oxidation of most surfaces but or short distance from fractures
Moderately weathered	Discoloration or oxidation extends from fractures, usually throughout. All fractured surfaces are oxidized or discolored.
Severely weathered	Discoloration or oxidation throughout. All fractured surfaces are oxidized or discolored. Surfaces are friable.
Decomposed	Resembles a soil. Partial or complete remnant rock structure may be present.

Rock Quality Designator (RQD)	
RQD, %	Rock Quality
90 - 100	Excellent
75 - 90	Good
50 - 75	Fair
25 - 50	Poor
0 - 25	Very poor

Joint, Bedding, and Foliation Spacing in Rock		
Spacing	Joints	Bedding/Foliation
< 2-inches	Very close	Very thin
2-inches - 1-foot	Close	Thin
1-foot - 3-feet	Moderately Close	Medium
3-feet - 10-feet	Wide	Thick
>10-feet	Very Wide	Very thick