

Appendix H
Application: Topographic and Planimetric Survey--Proposed Military Fitness Center (Tulsa District)

H-1. Purpose and Background

This topographic survey of a proposed fitness center at a military base in Oklahoma was performed under a Tulsa District contract in 2002. It entails typical planimetric and topographic work over a 10 acre \pm site, with extensive above ground and underground utility detailing. The project was controlled relative to existing installation control. The horizontal datum was NAD 83 (Oklahoma North Zone) and the vertical datum was NGVD 29. The target/drawing scale was 1:200, or 1 inch = 16.67 ft. Ground elevations were shot at a 15 m (50 ft) grid spacing and final drawings were delivered in metric format with a 0.25 m contour interval. The Scope of Work below was developed by the Survey Section in the Tulsa District. The contractor who performed the survey was Entz Engineering-Huffman Surveying.

H-2. Scope of Work

CONTRACT NO. DACW56-01-D-1005

TASK ORDER NO. 32

PROPOSED FITNESS CENTER

TOPOGRAPHIC & PLANIMETRIC SURVEY

SCOPE OF WORK

11 FEB 02

I. Scope and Location

A. The intended purpose of this Task order is to obtain a product defining the topographic & planimetric layout of the area known as the Proposed Fitness Center at the site shown on the Government furnished maps. The contractor's effort toward this purpose shall yield a total field-to-finish information package, complete in detail and within the parameters defined by this scope of work, readily available for use by the Government or its agents.

B. The contents of this scope describe specific project requirements to be accomplished under this task order and the end product required of the contractor.

II. Materials Furnished by the Government. The contractor shall be provided with:

A. Site maps indicating the areas to be surveyed.

B. Existing primary survey control description sheets

III. Character and Extent

The general scope of services, specific descriptions, and technical requirements pertaining to the work required of the contractor are outlined below.

IV. Site Specifics for the Fitness Center Area

A. Survey Procedures and Standards.

Appropriate instrumentation and procedures shall be selected to obtain precision requirements necessary to meet or exceed the accuracy standards described below. Total station and GPS shall be considered appropriate for performing the survey. Sufficient control shall be distributed throughout the survey to allow horizontal and vertical positioning to be checked for compliance with stated accuracy standards. The contractor shall use a field crew experienced in performing the surveys as outlined in the scope of work and capable of responding to and completing work assignments within the critical time schedules allotted for this project. All field data acquired in establishing control points shall be illustrated in the field book.

B. Details Required for the Field Survey

1. Survey Control

a. Horizontal Control shall be relative to Oklahoma State Plane Coordinates, NAD83 expressed in Metric Units and based upon specific site control information provided by the Corps of Engineers. Controlling points shall be occupied points, with all angles observed for the closing azimuth and closed and adjusted traverses that will meet or exceed Third Order, Class I Accuracy of 1:10,000. If electronic data collectors are not used, all angular and linear measurements shall be entered into the field book at the time of observation. Latitude and departure computations, both raw and adjusted, shall be submitted to the survey section at the completion of the fieldwork. Computations shall be in a format that will allow government approval and satisfy minimum requirements as specified in the scope of work. Deficiencies shall be recognized and steps taken to obtain additional survey data as required.

b. Vertical Control shall be based on National Geodetic Vertical Datum (NGVD29) expressed in Metric Units based on closed and adjusted level loops that will meet or exceed Third Order. Elevations shall originate and close on benchmarks approved by the government. In addition, level loops shall originate on one benchmark, but be checked into another, separate benchmark.

c. New control stations shall consist of ½" Rebar having a length of 18" and a stamped aluminum cap be set. Each cap shall be identified by designation and the year set. Each control marker shall be referenced with at least three ties and appropriately described on SWT 598 forms for future use. Proper care shall be taken when setting these control points and at least a 2' radius around the control marker site shall be checked for the presence of any underground utilities.

2. Topographic & Planimetric Survey

a. The contractor will locate sufficient topographic and planimetric features to adequately allow design of the proposed new structures, which shall include, but not be limited to the following:

(1) *Buildings and structures within the defined area.*

(2) *Ground surface elevations sufficient to define any contour lines (at a 0.25 meter contour interval) and spot elevations (Note: elevation shots are to be gridded at least every 15 meter intervals; hard surfaces shot to 3 mm and natural ground areas to 3 cm).*

(3) *Type, condition and width of areas of pavement or concrete (streets, parking lots, sidewalks, runways, taxiways, aprons, shoulders, bridges), as well as centerline, curb, gutter and depressed curb locations.*

(4) *Fences*

(5) *Sanitary sewer lines and structures (include pipe materials, sizes, locations, rim and invert elevations, direction of flow, service cleanouts and lateral locations). These utilities shall be shown on a separate illustration and identified by properly numbering the sketch to correspond with the utility in relation to its location and alignment to North.*

(6) *Storm sewer lines and structures (include pipe materials, sizes, locations, rim and invert elevations, direction of flow, type of inlet, catch basin, culvert, etc.) These utilities shall be shown on a separate illustration and identified by properly numbering the sketch to correspond with the utility in relation to its location and alignment to North.*

(7) *Drainage ditches and ponding areas.*

(8) *Location and size of communication and electric lines, including all transformers and number of wires or cables. Provide a detailed sketch of manholes, illustrating the size of ducts, number of wires in each duct, spacing of ducts, and distance from the floor and wall to the centerline of ducts and its alignment to North.*

(9) *Location and size of all water lines and structures.*

(10) *Location and size of all gas lines and oil/water separators.*

(11) *Any trees, type, approximate height and diameter.*

(12) *Any permanent picnic tables or other permanent structures on the site.*

b. A thorough search shall be made for all underground utilities. Contact John Doe at the base (888) 555-1212 to arrange a utility markout. Provide sufficient notice.

C. Survey Data and Deliverables

1. The contractor shall furnish all original field books, records, prints, maps, computation sheets, transcripts, and associated data utilized in the performance of fieldwork. All items described above shall become the property of the government and shall be delivered to the contracting officer prior to the final payment of the contract. Except as required for the proper and efficient performance of the contract, none of such materials shall be retained, copied, or reproduced by the contractor at any time without the expressed permission of the contracting officer.

2. Detailed digital descriptions of all survey control, new or restored shall be furnished and illustrated on SWT 598 forms to assist in rapid recovery at a later date. The descriptions shall contain horizontal and vertical control data, a reference backsight mark with direction and distance to the mark, an appropriate to reach description, at least three reference distance and direction ties to fixed permanent figures in the immediate vicinity and a local sketch.

3. The contractor shall be responsible for preparing maps (AutoCAD 2000 *.dwg and *.dtm files) that depict all topographic features contained within the mapping limits at a 0.25 meter contour interval, showing major contour lines at 1 meter intervals and labeled accordingly as part of the package to be provided to the government. Spot elevations shall be sufficiently distributed throughout the map and shown on all high and low points to clearly define the area. In addition to the described field located features, information to be shown on the drawing shall include any details of utilities found, grid ticks based on the requested datum and labeled on the left and top of each sheet, multiple sheets shall include an index of the drawing oriented north to each sheet, north arrow and reference, contour interval shown, legend of symbols and ground control points plotted on all sheets in respect to their true positions. The map of survey shall be prepared utilizing the latest approved version of the TriService CADD Standards as found at the following site: <http://tsc.wes.army.mil/products/tssds-tsfs/tssds/projects/sds/> and a Cropsmet95 Metadata file (FGDC format) shall be prepared. In addition, an ASCII file shall be provided to the Government.

4. All materials shall be subject to inspection by the contracting officer at any time during the execution of the survey.

D. Discrepancies

The contractor shall notify the government of any discrepancies discovered in prior work or in work under contract that are not readily explainable and in such time that they may be resolved prior to the survey party leaving the field. If, at the discretion of the contracting officer work is found to be in error after the assignment is completed, the contractor shall be liable for all costs in connection with correcting the work.

V. Site Specifics of the Proposed Fitness Center

The general location of the area to be surveyed is just northeast of the Ground Safety Building #999 and bounded by the following: Sixth Street on the north, Avenue H on the east, an alley opposite Building #999 on the south and Avenue G on the West (an area approximately 500 ft by 850 ft) as illustrated on the above provided maps.

VI. Time of Completion

The contractor's performance and time of delivery are of utmost importance, and their endeavor toward the project shall be vigorous and continuous until completion. Work shall be completed and final delivery made to the Government within 20 calendar days from award date of contract.

VII. Inspection

The government may elect to perform independent field surveys in order to check and validate the accuracy and adequacy of the submitted data. The government reserves the right to reject inaccurate and substandard work. In the event such work is rejected, the contractor shall correct and replace rejected portions in a manner satisfactory and without cost to the government. The contractor shall coordinate his operations so as to permit direct contact with project manager purpose of inspection of work and general liaison.

VIII. Access to Work

The contractor shall be liable for and save the Government harmless on account of damages to persons or property in the performance of his work. The contractor must contact Ms. Jane Smyth at the base (918) 555-6000 at least one day in advance for instructions on entering the base.

IX. Commencement of Work

The contractor shall be prepared to begin the first full week after award of delivery order unless otherwise directed by the contracting officer.

X. Safety

General Safety Requirements. The Contractor shall comply with applicable safety regulations defined in the latest version of the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, and shall acquaint himself and his personnel with the safety requirements governing the area in which the work is being done. Total man-hours worked in the by survey and office personnel shall be provided to the project manager at the completion of the project.

XI. Project Manager

The project manager for this survey and mapping project will be Marjorie Ellenberg, Survey Section, 918-669-7574. All correspondence and information pertaining to the project will go through the project manager.

XII. Payment request shall be submitted to the A/E Contracts and Documents Section once each month. The request shall show a breakdown of all the related work tasks and percentage of work completed. Percent claimed will coincide with the progress report. The above should be mailed to:

*Tulsa District, Corps of Engineers
ATTN: A/E Contracts & Documents Section (CESWT-EC-DA)
1645 S. 101st E. Ave.
Tulsa, OK 74128-4629*

XIII. THE CONTRACTOR SHALL REFER TO APPLICABLE PORTIONS OF APPENDIX A FOR GENERAL AND TECHNICAL REQUIREMENTS NOT COVERED BY THIS SCOPE.

H-3. Government Cost Estimate

The following cost estimate was prepared by the Tulsa District. Field work was estimated at 3 days, with an additional 2 days to cover travel, security clearance, and site reconnaissance. In this IDC type contract, overhead is not included in the scheduled hourly rates and must be applied on each Task Order. Profit is computed separately for each Task Order as well. The final negotiated cost for this project was \$7,084.00 with a negotiated time being the same as the government estimate (5 days).

CONTRACT NO. DACW56-01-D-1005 TASK ORDER NO. 0035 MILITARY BASE FITNESS CENTER TOPOGRAPHIC SURVEY & MAPPING COST ESTIMATE			
1. ESTIMATED FIELD TIME			
PERSONNEL IN FIELD CREW			3 Crew
RECON AND ACCESS TO SITE			1 DAYS
ACCOMPLISH REQUIRED SURVEY			3 DAYS
TRAVEL			<u>1</u> DAYS
TOTAL DAYS			5
2. DIRECT LABOR COSTS:			
A) Project Supervisor			
10 Hrs x Rate	\$25.50		\$255.00
B). Registered Land Surveyor			
48 Hrs x Rate	\$23.50		\$1,128.00
C) Instrumentman			
40 Hrs x Rate	\$15.50		\$620.00
D). Rodman/Chainman			
40 Hrs x Rate	\$9.50		\$380.00
E) Cadd Operator			
60 Hrs. X Rate	\$14.00		<u>\$840.00</u>
Total Direct Labor Costs			\$3,223.00
3. OVERHEAD (Direct + G&A)			
115.00% Direct Labor	\$3,223.00		\$3,706.45
4. PROFIT (Direct Labor + Overhead)			
13.50% of L + O.H.	\$6,929.45		\$935.48
5. INDIRECT COSTS			
A). Survey Vehicle			
5 Days x Rate	\$120.00		\$600.00
B). Per Diem			
5 Days x Rate x 3	\$85.00		\$1,275.00
Total In-Direct Cost-----			\$1,875.00
6. TOTAL COST ESTIMATE-----			\$9,739.93

H-4. Survey Procedure

The survey was performed using a Sokkia total station and data collector. Project control was previously established based on NGS control using static DGPS methods.

The following list is a selected portion of the coordinate file from the data collector used on this project. Overall, some 1494 planimetric and topographic points were shot on this project, most of which were ground elevations.

1,2255473.732,599682.977,306.359,ME09	56,2255626.611,599247.060,312.160,COR F3 PED	108,2255666.685,599250.242,312.239,WATER
2,22556469.163,599404.039,311.006,TIE HE-8 BC	57,2255621.554,599236.271,312.409,tre .28 CEDAR	109,2255666.511,599262.140,311.843,WATER
3,2255647.821,599235.695,312.645,FC 3	58,2255609.051,599235.440,312.311,tre .330 CEDAR	110,2255666.284,599276.477,311.564,WATER
4,2255829.328,599264.325,312.088,fc4	59,2255589.216,599255.636,311.676,BUSH	111,2255666.345,599287.181,311.006,WATER
5,2255639.532,599222.247,312.600,G	60,2255590.873,599267.481,311.154,BUSH	112,2255664.983,599287.165,311.032,WV
6,2255754.242,599223.161,312.880,G	61,2255561.930,599288.365,310.249,BLDG COR	113,2255664.450,599287.258,310.961,FIRE H
7,2255664.325,599234.949,312.460,BC	62,2255574.764,599301.457,310.361,BLDG COR	517
8,2255585.068,599359.974,309.180,BC	63,2255563.828,599290.381,311.201,FINISH FLOOR	114,2255666.374,599300.851,310.649,WATER
9,2255827.003,599232.812,312.580,BC	64,2255589.068,599296.552,310.521,tre .170 TREE	115,2255666.305,599313.593,310.347,WATER
10,2255676.776,599287.202,311.089,RESECT	65,2255591.892,599303.640,310.358,BUSH	116,2255666.277,599328.936,310.141,WATER
11,2255659.105,599233.373,312.672,SWBT	66,2255583.999,599306.280,310.337,SPRINKLER PED	117,2255666.097,599344.488,309.931,WATER
12,2255650.759,599233.164,312.756,SWBT	67,2255588.649,599312.394,310.265,tre .230 TREE	118,2255665.640,599359.518,309.674,WV
13,2255639.535,599233.393,312.673,SWBT	68,2255591.176,599321.912,309.987,BUSH	119,2255665.810,599357.218,309.713,WATER
14,2255628.794,599233.059,312.612,SWBT	69,2255575.038,599356.829,309.459,PP 3P LIGHT	120,2255666.915,599359.977,309.733,STORM
15,2255616.364,599232.964,312.533,SWBT	70,2255575.488,599355.958,309.583,GV	SEWER
16,2255599.333,599232.936,312.330,SWBT	71,2255575.419,599357.212,309.488,SWBT	121,2255673.764,599357.429,309.773,WATER
17,2255588.379,599232.897,312.043,SWBT	72,2255575.677,599360.623,309.121,SWBT	122,2255673.630,599359.712,309.747,WV
18,2255580.434,599232.785,311.920,SWBT	73,2255568.731,599357.876,309.268,FIREH 406	123,2255702.587,599357.337,309.919,WATER
19,2255568.234,599233.240,311.940,SWBT	74,2255568.734,599357.118,309.397,WV	124,2255718.758,599357.570,309.830,WATER
20,2255575.028,599233.311,311.991,PP 3PHASE	75,2255573.935,599353.977,309.542,MH	125,2255736.751,599357.770,310.071,WATER
ELEC	76,2255583.201,599354.622,309.638,STOP	126,2255736.552,599359.831,309.966,FIRE H
21,2255593.252,599232.578,312.275,FP	DONTENTER	518
22,2255598.197,599232.561,312.365,FP	77,2255606.193,599352.683,309.595,tre 0.300 CEADR	127,2255743.577,599356.327,310.113,N GAS
23,2255603.224,599232.643,312.399,FP	78,2255610.147,599330.633,309.988,BIRD HOUSE	128,2255729.263,599356.112,309.999,N GAS
24,2255608.187,599232.668,312.445,FP	79,2255612.516,599355.449,309.604,CONTROL V	129,2255716.623,599356.008,309.773,N GAS
25,2255613.155,599232.710,312.536,FP	80,2255613.044,599355.476,309.629,CONTROL V	130,2255701.251,599355.721,309.753,N GAS
26,2255618.305,599232.587,312.593,FP	81,2255613.390,599353.326,309.642,SPRINKLER	131,2255679.544,599355.704,309.762,N GAS
27,2255620.419,599233.906,312.518,PP OUT LIGHT	VALVE	132,2255670.608,599356.430,309.753,N GAS
28,2255620.769,599234.074,312.533,TPED	82,2255612.206,599356.582,309.584,SPRINKLER	133,2255663.328,599356.751,309.707,N GAS
29,2255623.162,599232.804,312.664,FP	VALVE	134,2255664.437,599358.191,309.673,VALVE
30,2255628.055,599232.850,312.677,FP	83,2255614.421,599356.661,309.597,SPRINKLER	135,2255665.730,599358.208,309.669,UNKNO
31,2255633.122,599232.891,312.727,FP	VALVE	WN
32,2255638.277,599232.764,312.778,FP	84,2255623.540,599357.260,309.606,PP	136,2255664.505,599357.423,309.664,PP
33,2255643.022,599232.950,312.778,FP	85,2255646.968,599358.201,309.585,FIRE H 407	SWBT
34,2255648.263,599232.955,312.784,FP	86,2255646.967,599358.071,310.353,BM NE BOLT	137,2255665.757,599358.732,309.644,SWBT
35,2255625.153,599243.954,312.137,WALL PI	87,2255646.948,599357.568,309.636,WV	138,2255666.465,599362.435,309.577,SWBT
36,2255610.806,599247.884,311.918,WALL PI	88,2255649.609,599356.926,309.713,WV	139,2255710.761,599357.898,309.979,PP
37,2255605.751,599247.193,311.863,WALL PT	89,2255652.548,599357.468,309.698,STOP SIGN	140,2255755.029,599358.506,310.026,PP
38,2255604.090,599250.639,311.826,WALL POC	90,2255637.590,599285.525,311.011,tre .055 TREE	141,2255762.061,599358.752,310.066,BUS
39,2255603.938,599253.531,311.797,WALL END	91,2255636.564,599275.837,311.365,BUSH	STOP SIGN
40,2255602.374,599253.682,311.784,WALL PC	92,2255639.382,599267.552,311.602,BUSH	142,2255763.977,599356.738,310.120,N GAS
41,2255602.571,599255.058,311.832,WALL POC	93,2255633.178,599263.948,311.613,BUSH	143,2255763.987,599357.281,310.098,GV
42,2255603.019,599256.379,311.782,WALL PI	94,2255575.001,599236.366,311.883,SEWER MH	144,2255764.089,599359.673,310.084,N GAS
43,2255602.842,599256.494,311.779,WALL END	95,2255652.318,599219.782,313.106,SWBT	145,2255771.313,599356.792,310.290,N GAS
44,2255603.344,599257.620,311.769,WALL END	96,2255659.359,599219.791,313.149,SWBT	146,2255779.741,599356.801,310.291,N GAS
45,2255603.534,599257.548,311.787,WALL PI	97,2255665.806,599219.904,313.161,SWBT	147,2255779.990,599357.782,310.242,WATER
46,2255604.264,599258.772,311.793,WALL POC	98,2255672.264,599219.937,313.022,SWBT	148,2255766.789,599357.470,310.184,WATER
47,2255605.121,599259.842,311.803,WALL PC	99,2255665.624,599211.629,313.463,SWBT	149,2255766.572,599356.806,310.186,N GAS
48,2255606.309,599258.861,311.806,WALL END	100,2255666.414,599226.736,312.893,SWBT	150,2255759.238,599356.624,310.064,N GAS
49,2255608.488,599260.619,311.819,WALL POC	101,2255665.657,599234.146,312.761,TPED	151,2255759.310,599357.223,310.136,WATER
50,2255612.044,599261.917,311.773,WALL PT	102,2255666.501,599234.026,312.726,TPED	152,2255765.628,599358.795,310.063,SWBT
51,2255615.147,599257.495,311.874,WALL PI	103,2255667.284,599217.301,313.263,WV	BOX INGRD
52,2255627.600,599249.367,312.102,WALL END	104,2255667.275,599219.432,313.154,WV	153,2255765.647,599356.703,310.134,SWBT
53,2255626.229,599246.209,312.162,COR F3 PED	105,2255666.201,599218.786,313.135,TV CABLE	BOX INGRD
54,2255627.044,599245.836,312.184,COR F3 PED	106,2255668.374,599221.352,313.034,STORM SEWER	154,2255763.175,599356.609,310.130,SWBT
55,2255627.417,599246.683,312.178,COR F3 PED	107,2255666.878,599236.741,312.710,WATER	BOX INGRD

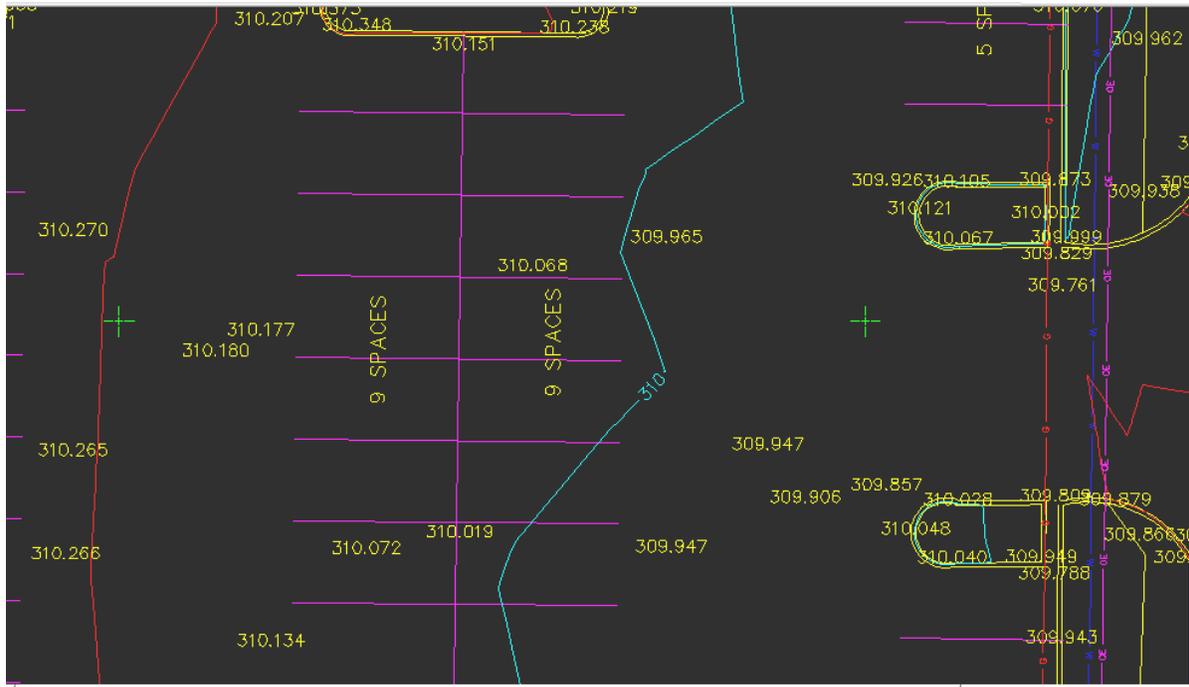
EM 1110-1-1005
1 Jan 07

155,2255763.036,599358.780,310.070,SWBT BOX INGRD
156,2255765.204,599355.522,310.228,MH
157,2255757.687,599351.546,310.208,tre .125 TREE
158,2255753.198,599345.046,310.132,BUSH
159,2255749.863,599336.031,310.295,tre .090 TREE
160,2255756.287,599326.170,310.510,tre .080 TREE
161,2255746.604,599324.402,310.453,tre .080 TREE
162,2255752.655,599319.838,310.563,COR CONC
163,2255751.377,599318.529,310.578,COR CONC
164,2255753.993,599318.521,310.582,COR CONC
165,2255751.849,599317.032,310.619,COR CONC SHELTER
166,2255752.065,599313.384,310.690,COR CONC SHELTER
167,2255748.434,599313.168,310.688,COR CONC SHELTER
168,2255748.188,599316.796,310.612,COR CONC SHELTER
169,2255759.082,599317.446,310.636,BUSH
170,2255759.134,599315.699,310.677,BUSH
171,2255759.613,599308.148,310.802,BUSH
172,2255759.631,599306.100,310.913,BUSH
173,2255749.133,599307.484,310.757,tre .080 TREE
174,2255767.551,599344.391,310.276,CEDAR CLUMP
175,2255767.779,599340.724,310.344,CEDAR CLUMP
176,2255767.978,599335.795,310.565,tre .400 TREE
177,2255767.429,599329.517,310.453,CEDAR CLUMP
178,2255767.326,599325.786,310.428,CEDAR CLUMP
179,2255767.576,599322.405,310.453,CEDAR CLUMP
180,2255767.781,599318.222,310.600,CEDAR CLUMP
181,2255767.949,599315.885,310.640,CEDAR CLUMP
182,2255771.501,599304.631,310.983,BUSH
183,2255769.399,599304.213,310.985,BUSH
184,2255767.229,599304.014,310.925,BUSH
208,2255802.652,599282.355,311.483,UDG ELEC
209,2255802.743,599270.826,311.647,UDG ELEC
210,2255802.853,599257.813,311.984,UDG ELEC
211,2255803.086,599243.161,312.539,UDG ELEC
212,2255802.689,599235.709,312.725,PP
213,2255784.818,599237.991,312.634,ELEC OUT PED
214,2255785.402,599238.828,312.604,UDG ELEC
215,2255794.014,599239.146,312.673,UDG ELEC
216,2255804.630,599239.530,312.566,UDG ELEC
217,2255809.687,599238.906,312.468,UDG ELEC
218,2255813.638,599237.426,312.422,ELEC PED
219,2255809.703,599243.624,312.454,UDG ELEC

220,2255821.031,599258.363,312.158,UDG ELEC
221,2255828.349,599268.536,311.990,LP
222,2255828.254,599295.706,311.406,SIGN PARK RULES
223,2255827.920,599299.564,311.326,LP
224,2255827.790,599292.231,311.426,UDG ELEC
225,2255827.687,599278.301,311.799,UDG ELEC
226,2255796.869,599254.310,312.094,tre .140 TREE
227,2255789.881,599263.102,311.934,tre .140 TREE
228,2255770.802,599250.649,312.229,tre .400 CEDAR
229,2255766.193,599238.234,312.698,MH
230,2255737.117,599241.022,312.566,BUSH
231,2255724.141,599252.029,312.177,tre .050 TREE
232,2255700.388,599253.391,312.128,tre .050 TREE
233,2255694.147,599260.610,311.813,tre CEDAR CLUMP
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235,2255672.833,599239.978,312.676,COMM MH
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258,2255827.891,599234.151,312.648,STORM SEWER MH
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260,2255841.994,599236.148,312.490,STOP SIGN
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262,2255831.445,599236.347,312.538,SWBT
263,2255825.014,599234.696,312.694,SWBT
264,2255825.858,599222.101,312.676,FIRE H 515
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267,2255810.080,599236.622,312.664,CEDAR CLUMP
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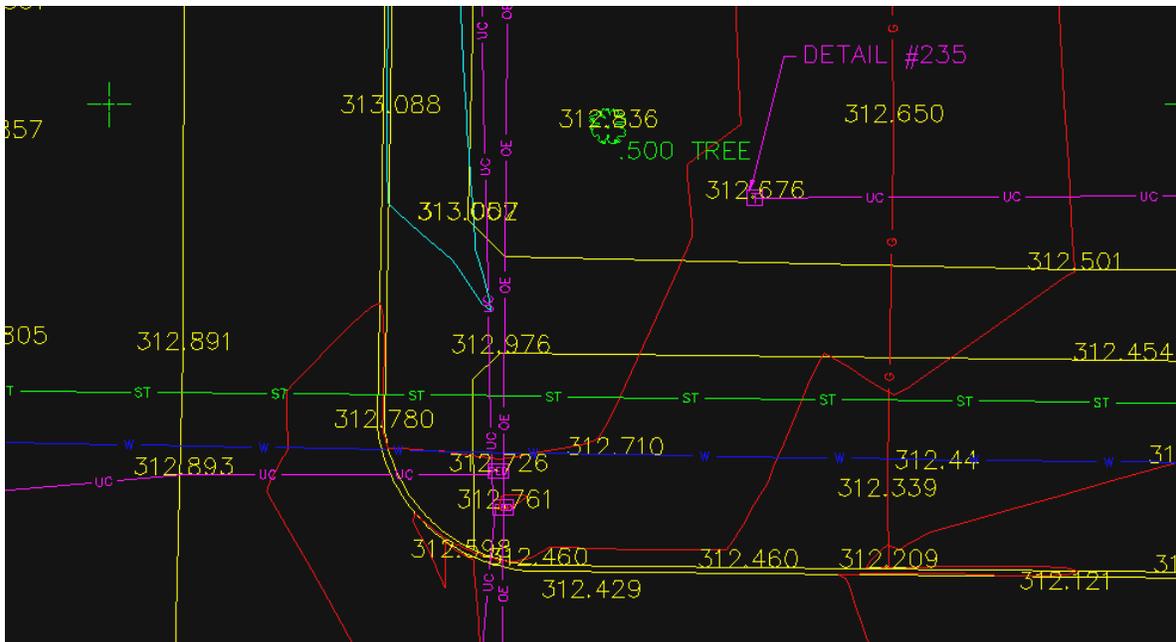
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287,2255710.647,599237.877,312.699,tre .500
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295,2255839.623,599357.835,310.190,G
296,2255799.188,599296.333,311.355,COR
297,2255798.211,599297.874,311.357,NE COR
298,2255798.580,599297.362,311.263,CTRLV
299,2255777.360,599298.171,311.353, PARK SIN
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403,2255828.862,599333.791,310.815,BSW
404,2255828.722,599346.654,310.609,BSW
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H-5. Typical Planimetric Detail in Parking Area



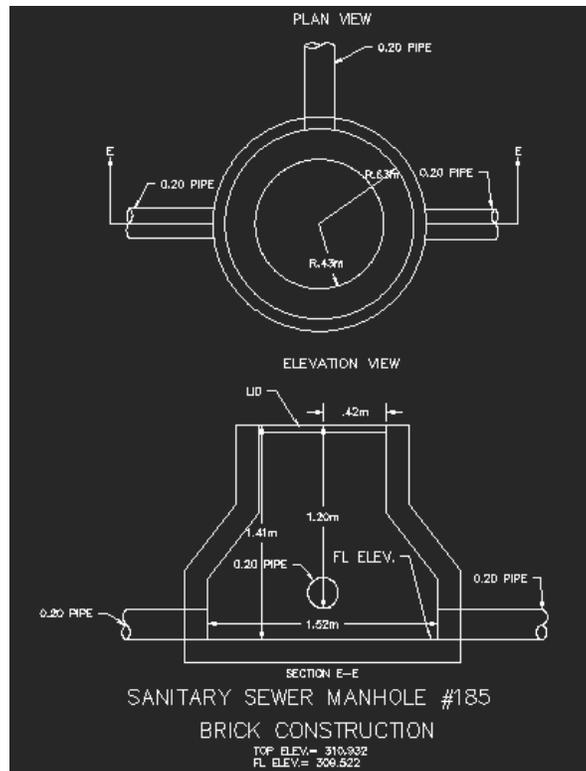
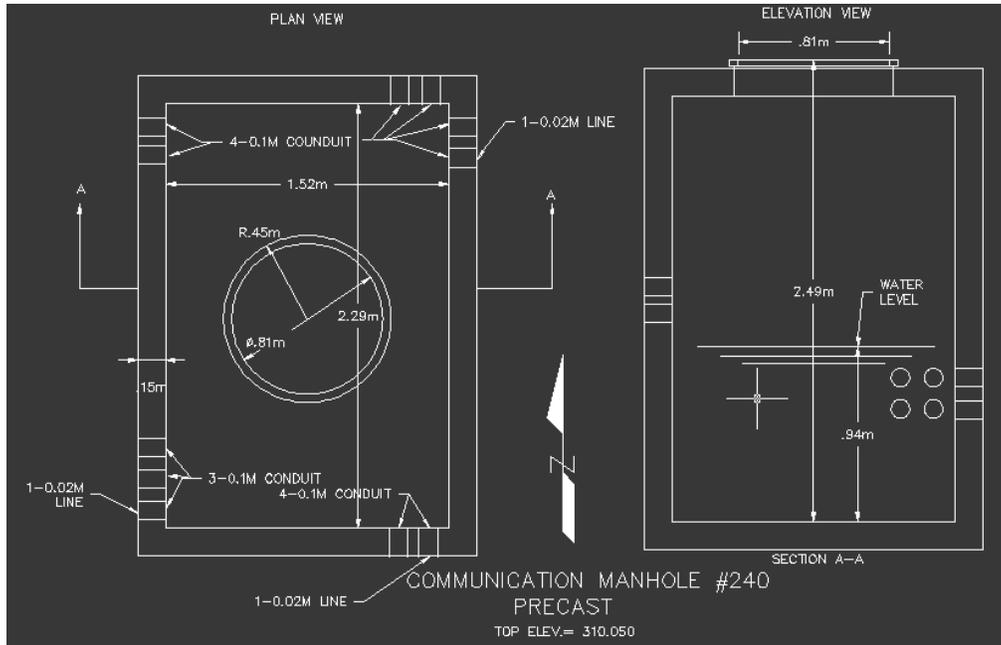
H-6. Typical Utility Details (Plan)

This section of the 10 acre site drawing depicts the varied utilities that were detailed in this area. In this area are shown underground cable, water, storm, and overhead electric utilities. Utility details were shown on two separate drawing sheets accompanying the three plan sheets. Detail # 235 on this plan is shown on the following plate.



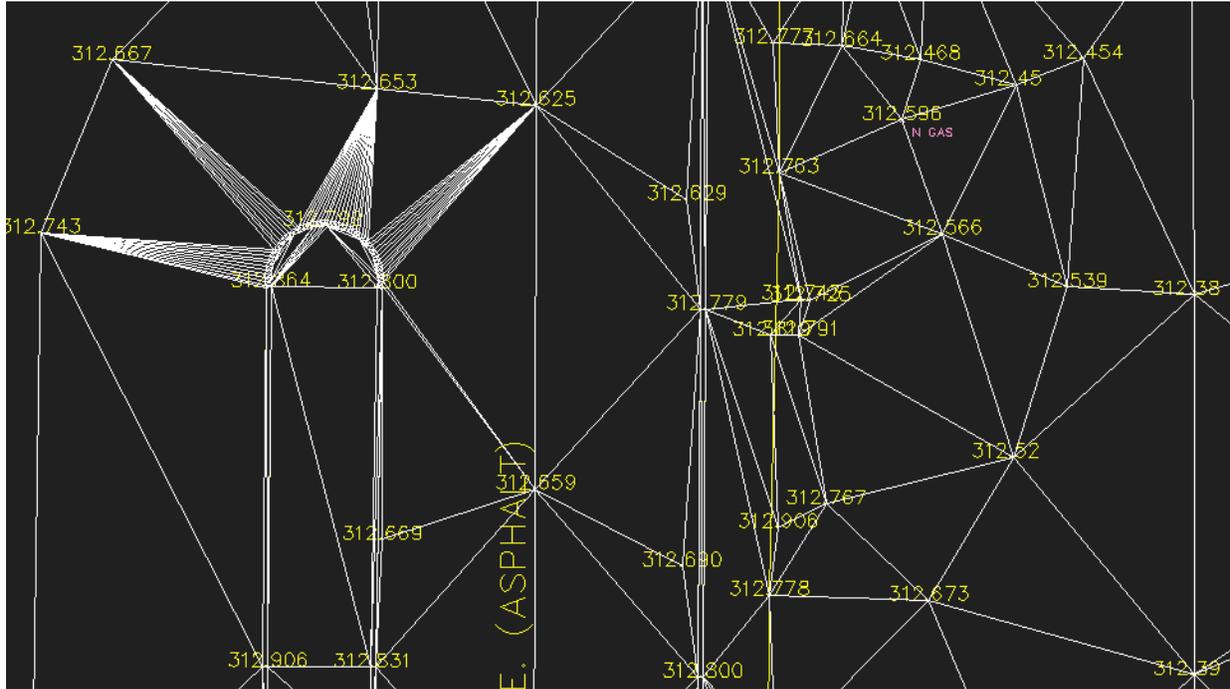
H-7. Utility Details (Plan and Elevation)

Typical utility details on the proposed site are shown below. The top plate is a precast communication box and the lower plate a sanitary sewer manhole.



H-8. Triangulated Network

The following plate illustrated a triangulated network connecting elevation shots. Contours were created in AutoCAD from this network. The multiple triangles on the parking median curb are due to continuous elevation data points being generated around the circular curve.



H-9. Control Description

The following control data sheet submitted in an AutoCAD dwg file contains a sketch of a control point set at the proposed site.

SURVEY CONTROL DATA						
Description of C. of E. Brass Cap			Adjusted Horizontal Control Data			
Station FC-3	State Oklahoma	Order: 2nd	Established by GPS			
County Tulsa	Chief of Party R. Entz		Combined Scale Factor:			
Year 2002	Described by R. Entz		NAD 27 Grid Data	Coordinates (US Survey Feet)	Plane Azimuth Angle	Azimuth Mark
Locality Military Base	Section	Township	State: OK	N		
	feet from	line &	Zone: North	E		
	feet from	line	Code: 3501			
Distances & Directions To Prominent & Reference Marks			NAD 83 Grid Data	Coordinates (Meters)	Plane Azimuth Angle	Azimuth Mark
Object	Distance (Feet)	Azimuth or Bearing	State: OK	N 145830.258		
			Zone: North	E 780450.293		
			Code: 3501			
			Metric Conversion Factor: 3.2808333333 ft/m			
Location Map			Geodetic Data	Position	Elevation NAVD 88	Elevation NGVD 29
			Latitude	N		
			Longitude	W		312.665m
			Field Sketch Of Monument (NTS) Station FC-3			
Prepared By: Entz Engineering & Assoc. and Huffman Surveying Company 600 Emporia St., Ste. "C" Muskogee, Oklahoma			Book:	4/16/2002		
			Page:			

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