



Phase 3: Broadband Infrastructure  
Site Cost Estimates  
for Initial Recommendations  
Custer County, Colorado

Prepared For  
Custer County Economic Development  
Board

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## Executive Summary

The Custer County Economic Development Corporation (CCEDC) desires to improve broadband availability and wireless service to users throughout Custer County. Because the County is rural and sparsely populated, commercial entities do not invest capital to improve service due to low return on investment concerns. CCEDC wishes to proactively encourage expansion by providing the tower assets needed to serve all its constituents. To that end, Centerline Solutions is providing this report with applicable costing information to develop and activate those sites determined via this effort.

These locations are as follows:

- Beddows or Buck Mountain
- West Rosita
- East of Domingo or East of Domingo 2
- Junkins (Loop) High Point
- Centennial
- San Isabel

Provided in this report is information regarding each site, information regarding physical visits, assumptions made, associated cost estimates and recommendations on how to proceed.

## Project Overview

The Custer County Economic Development Corporation (CCEDC) desires to improve broadband availability and wireless service throughout Custer County. Because the County is rural and sparsely populated, commercial entities do not invest capital to improve service due to low return on investment concerns. CCEDC wishes to proactively encourage expansion by providing the tower assets needed to serve all its constituents. To that end, Centerline Solutions is providing this report with applicable costing information to develop and activate those sites determined via this effort.

The cost modeling generated for each tower site is budgetary, being estimated by experts at Centerline Solutions with the information available to them. Where applicable, information gleaned from physical visits to locations and assumptions are included with this report.

## Site Cost Estimates

The Centerline team utilized data from field visits, interviews with Custer County residents, local stakeholders, and expert knowledge to generate the estimates for each coverage location. The costing information for each candidate presented as such:

- Field notes (when applicable)
- Stated Assumptions / Presumptions
- Costing Estimate Table
- Recommendations Following Site Details

Some site information is presented as part of the overall effort of discovery for this effort. This supplemental information includes location data and candidates for coverage can be found in APPENDIX A – Additional Site Information. A large number of sites were evaluated and the afore mentioned locations chosen as best to provide the prescribed coverage for Custer County. The cost estimates do not include some traditional site development costs specifically related to shelter design, installation and electrical service.

The site cost estimates also include a line for Site Acquisition/Development which covers the professional fees to correctly develop the site. This line item provides cost estimates that include

Lease preparation  
Lease negotiation  
NEPA screening  
Zoning drawings  
Zoning  
Permitting  
Architectural and Engineering Drawings  
Professional Engineering Certifications

## Beddows

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Self-Support Tower
- **Site Shelter:** None
- **Site Access:** Medium difficulty for access.
- **Access distance:** Medium distance to access site, less than 2000 feet.
- **Immediate terrain:** Gentle terrain, some heavy rock but not enough to encumber access.
- **Distance to available power:** Confirmed that power is available at the nearby road.
- **Power install considerations:** Assumed power company able to deliver a transformer to the site. Ground ring to include one chemical rod only. Assumed that no tower lighting will be required.
- **Additional considerations:** Pricing includes cedar fence around tower. Assumed that site is engineered and built to support two cellular carriers and local WISPs. Site needs to be a self-support structure for the carriers.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 99,165	
Civil	Site Grading	\$ 10,776	
Civil	Tower FDN	\$ 57,500	Pad
Civil	Compound Improvements	\$ 21,000	Gravel, cedar fence, grounding
Elect	Service	\$ 95,000	multi-meter bank
Tower	Cost	\$ 45,250	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 19,500	
	<b>Total</b>	<b>\$ 389,136</b>	

*Table 1: Beddows Cost Estimates*

**Buck Mountain**

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Self-Support Tower
- **Site Shelter:** None
- **Site Access:** Difficult, no paved roads or vehicle-friendly pathways up to the location.
- **Access distance:** Best determined path between 2300 feet and 2500 feet with an elevation increase of over 500 feet.
- **Immediate terrain:** Intermediate forest and heavy exterior and ingrained stone (“rocky”).
- **Distance to available power:** Assumed to be 2300 feet for budgeting.
- **Power install considerations:** 2300 feet of new road required. New overhead power from street with one power pole every 100 feet required.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 210,000	
Civil	Site Grading	\$ 35,000	
Civil	Tower FDN	\$ 59,000	Pad
Civil	Compound Improvements	\$ 21,000	
Elect	Service	\$ 250,000	
Elect	Site Install	\$ -	
Tower	Cost	\$ 45,250	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 19,500	
	<b>Estimate Total</b>	<b>\$ 680,695</b>	

*Table 2: Buck Mountain Cost Estimates*

**West Rosita**

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Lite Site
- **Site Shelter:** None
- **Site Access:** Site is easily accessed via a nearby paved road.
- **Access distance:** Very close, existing roadway available all the way up to the nearby residence.
- **Immediate terrain:** Most elevated peak of location has no notable terrain considerations, very light forest nearby.
- **Distance to available power:** Nearby residence has available power (100 amp), less than 200 feet in distance.
- **Power install considerations:** Commercial power readily available at nearby residence.
- **Additional considerations:** Lite Site with fence around foundation located on vacant lot. One chemical rod ground required, blasting is not included in estimate and assumed not required.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 67,500	
Civil	Site Grading	\$ 11,500	
Civil	Tower FDN	\$ 12,500	Pad
Civil	Compound Improvements	\$ -	
Elect	Service	\$ 35,000	from transformer near house
Tower	Cost	\$ 115,000	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 10,500	
Total Cost Estimate		\$ 292,945	

*Table 3: West Rosita Cost Estimates*

## East of Domingo

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Lite Site
- **Site Shelter:** None
- **Site Access:** Minimal road improvements necessary, easy access.
- **Access distance:** Very close, existing roadway available all the way up to nearby residence.
- **Immediate terrain:** Very light forest.
- **Distance to available power:** Assumed that nearby residence has available power (100 amp), less than 300 feet at the most conservative measurement.
- **Power install considerations:** Assumed that commercial power readily available at nearby residence.
- **Additional considerations:** Lite site with fence around foundation needed. One chemical rod ground required.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 8,500	
Civil	Site Grading	\$ 11,526	
Civil	Tower FDN	\$ 12,309	Pad
Civil	Compound Improvements	\$ -	
Elect	Service	\$ 15,000	100 amp single meter
Tower	Cost	\$ 115,000	Lite Site
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 10,500	
	<b>Total Cost Estimate</b>	<b>\$ 213,780</b>	

*Table 4: East of Domingo Cost Estimates*



## East of Domingo 2

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Lite Site
- **Site Shelter:** None
- **Site Access:** A nearby home with easy access exists; assumption is easy access to site available.
- **Access distance:** A nearby home with easy access exists; assumption is easy access to site available.
- **Immediate terrain:** Very light forest.
- **Distance to available power:** Assumed to be less than 300 feet to nearby home.
- **Power install considerations:** Assumed that nearby home has available 100 amps of power to facilitate commercial at the location.
- **Additional considerations:** The field crew was unable to visit this site in person; some assumptions reflect experience and assumptions. Lite site with fence around foundation needed. One chemical rod ground required.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 18,500	
Civil	Site Grading	\$ 11,500	
Civil	Tower FDN	\$ 12,500	Pad
Civil	Compound Improvements	\$ -	
Elect	Service	\$ 20,000	
Tower	Cost	\$ 115,000	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 10,500	
Total Estimated Cost		\$ 228,945	

Table 5: East of Domingo 2 Cost Estimates

## Junkins (Loop) High Point

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Lite Site
- **Site Shelter:** None
- **Site Access:** Site is very close to a nearby home with existing road access.
- **Access distance:** Very close, existing roadway available all the way up to the nearby residence.
- **Immediate terrain:** Existing home just east of the location, but not high enough to encumber coverage or placement.
- **Distance to available power:** Assumed that nearby residence has available power (100 amp) considering its size.
- **Power install considerations:** Assumed that commercial power readily available at nearby residence.
- **Additional considerations:** Was not able to communicate with the nearby homeowner, which is very near the site.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 45,000	
Civil	Site Grading	\$ 47,500	
Civil	Tower FDN	\$ 12,500	Pad
Civil	Compound Improvements	\$ -	
Elect	Service	\$ 30,000	single meter 100 amp
Tower	Cost	\$ 115,000	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 10,500	
Total Estimated Cost		\$ 301,445	

*Table 6: Junkins High Point Cost Estimates*

## Centennial

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 100 Foot AGL Lite Site
- **Site Shelter:** None
- **Site Access:** Existing road and pathways to site; assumption is that road will require no additional improvements.
- **Access distance:** N/A, existing road and pathways all the way to site.
- **Immediate terrain:** Area appears to have very little rock and is flat.
- **Distance to available power:** N/A, assumption is that contractor will provide and install a new power source.
- **Power install considerations:** Assumption is that site will require a hybrid solution between propane and solar; supply will be 48V DC.
- **Additional considerations:** The field crew was unable to visit this site in person; some assumptions reflect experience and assumptions. Lite site with fence around foundation needed. One chemical rod ground required.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Costs	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Site Grading	\$ 500	
Civil	Tower FDN	\$ 10,500	Pad
Civil	Compound Improvements	\$ 2,500	
Elect	Service	\$ 205,000	hybrid solar/lpg dc only
Tower	Cost	\$ 115,000	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 10,500	
Total Cost Estimate		\$ 384,945	

Table 7: Centennial Cost Estimates

## San Isabel

The estimates for this site were created under the followings notes or assumptions:

- **Site Type:** 120 Foot AGL Self-Support Tower
- **Site Shelter:** None
- **Site Access:** Assumption is that road improvements will be needed to develop access to site.
- **Access distance:** N/A
- **Immediate terrain:** Area appears to have very little rock with minimal tree cover.
- **Distance to available power:** Assumption is power is available with 350 feet.
- **Power install considerations:** Assumed that local power company will deliver a transformer to a nearby residence located southeast of the top of the hill on Wetmore Road.
- **Additional considerations:** The field crew was unable to visit this site in person; some assumptions reflect experience and assumptions. Lite site with fence around foundation included. One chemical rod ground required. Assumed that site is engineered and built to support two cellular carriers and local WISPs. Site needs to be a self-support structure for the carriers.

Against the stated notes and assumptions, refer to the following table for estimates:

Equipment / Construction Estimate		Cost	Comments
Design	Site Acquisition / Development	\$ 33,925	
Civil	Road improvement	\$ 75,550	
Civil	Site Grading	\$ 10,776	
Civil	Tower FDN	\$ 57,500	Pad
Civil	Compound Improvements	\$ 21,000	
Elect	Service	\$ 70,000	
Tower	Cost	\$ 45,250	
Tower	Delivery	\$ 7,020	
Tower	Install	\$ 19,500	
	Total Estimated Cost	\$ 340,521	

Table 8: San Isabel Cost Estimates

## Recommendations

Considering the cost modeling information provided, the following is recommended to provide the best effective solution to satisfy the needs for Custer County. The following sites are recommended in order based on covered addresses, incremental covered addresses and constructability:

- Beddows or Buck Mountain
- West Rosita
- East of Domingo or East of Domingo 2
- Junkins (Loop) High Point
- Centennial
- San Isabel

### Beddows versus Buck Mountain

It is recommended that the Beddows location be developed over Buck Mountain. The challenges present for Buck Mountain greatly outweigh it for viability, such as required cost to develop, engineering difficulty, and HOA constraints.

### West Rosita

The original site designated for West Rosita is a viable site, but during the field visits we determined there was a property that would provide almost equivalent coverage and would be a much easier build. Finally, we had a local homeowner who indicated interest in allowing a tower on his property.

### East of Domingo versus East of Domingo 2

It is recommended that the East of Domingo location be developed over East of Domingo 2. Geography, a higher elevation, ease of access, site development cost, and logistics make East of Domingo the superior location for a structure.

### Junkins (Loop) High Point

The original selected Junkins (Loop) High Point site is still the preferred location. A tower can be located Southeast of the residence at a slightly lower elevation that will serve the needed areas. Possible alternate locations were identified during the field visit as a backup to this location.

### Centennial

Although we were not able to visit the site during field visits we did get very close. Construction of this site will not be difficult although there is no available commercial power. We have

included in our cost estimate alternate energy sources sized to support two small telecommunication sites.

Because Centennial is an existing site for one of the incumbent carriers it did not merit a higher ranking, but we feel that replacing or adding a TIA-222G compliant tower in this location may entice the incumbent to migrate to a more robust structure.

### **San Isabel**

Although we were not able to make it to the site during field visits we were able to make a good assessment on San Isabel 1 using satellite data. This site was located fairly close to existing residents on a local high point. This site was set as a lower priority in the previous report due to difficult connectivity to the outside world

San Isabel 2 which is located on Boy Scout Camp property just inside the County line presented more of a challenge. Access and power were harder to assess due to the amount of forest in the area. This site could be revisited in the future as it would provide coverage to the San Isabel town and lake areas.

## APPENDIX A – Additional Site Information

### Candidate Site Locations and Elevations

Name	Longitude	Latitude	Altitude (ft)
Move Tom Tower	-105.3334432	38.08120389	[9,154.48]
Anderson Tower	-105.30683	38.092316	[9,361.12]
Antelope Tower	-105.305307	38.032577	[9,003.6]
Arlie Tower	-105.517614	38.11673188	[7,960.56]
Beddows	-105.5386472	38.22603056	[8,495.2]
Buck Mountain Potential	-105.5272861	38.24013333	[8,619.84]
Bullard Mtn	-105.2598722	38.21581944	[8,869.12]
Centennial Tower	-105.2551167	37.94514444	[9,449.68]
Clay Tower/Bull	-105.4377722	38.18118611	[8,675.6]
Democrat Mountain	-105.534851	38.26506	[8,541.12]
East of Domingo	-105.3775083	38.1957	[8,478.8]
East of Domingo 2	-105.3645306	38.19044722	[8,718.24]
Gene Tower	-105.357715	38.056867	[8,705.12]
Hal Tower	-105.283316	38.189688	[9,167.6]
Hermit Basin	-105.5881	38.121312	9,000
Hilltop Hermit Basin	-105.5840618	38.11779926	[8,882.24]
Horn Creek	-105.534914	38.05334937	[9,033.12]
JJ Courtyard	-105.4654	38.13568	[7,868.72]
Junkins High Point	-105.2933357	38.11128715	[9,885.92]
Ken Battershill	-105.5954	38.17118	[8,600.16]
Mid 255	-105.341258	38.203042	[8,901.92]
Myron Mtn	-105.2533444	38.16937778	[9,275.84]
North 165	-105.1233306	38.10490278	[9,758]
North 255 Unidentified	-105.3186444	38.24336111	[8,462.4]
Rosita Tower	-105.323783	38.104091	9,555
San Isabele	-105.0614861	38.01251944	[9,213.52]
San Isabele 2	-105.0509462	37.99648555	[9,138.08]
South Colony Tower	-105.462785	37.994201	[8,547.68]
South Ranch	-105.291525	38.00515833	[9,124.96]
Sperry Peak	-105.249408	38.093231	[10,932.24]
Stoneman Tower	-105.58051	38.138348	[8,751.04]
Tom Tower	-105.333186	38.07980764	[9,147.92]
Transmitter Hill	-105.369675	38.12760833	[9,367.68]
Verdemont Tower	-105.5744444	38.19722222	[8,032.72]
Water Tanks	-105.4440833	38.13876667	[8,062.24]
West Cliff Airport	-105.3786969	38.02322282	[8,226.24]
West Rosita	-105.356041	38.083437	[8,905.2]
Wetmore	-105.084323	38.228865	[6,504.24]

**Candidate Site Analysis**

Name	Addresses Covered of 6,553 total	Addresses Percentage (% of 6,553)	Existing covered addresses	Add Addresses
West Rosita Tower 100	1,039	15.86		1039
Water Tank 100	983	15		983
Buck Mountain 100	915	13.96		915
Beddows 100	851	12.99		851
Sperry Peak 100	654	9.98		654
Junkins High Point	651	9.93		651
East of Domingo 100	647	9.87		647
East of Domingo 2 100	631	9.63		631
Gene Tower 100	704	10.74	223	481
Verdemont Tower 100	443	6.76		443
South Ranch 100	348	5.31		348
Mld 255 Tower at 100 ft	316	4.82		316
Toms Tower 100	788	12.03	513	275
Bullard Mountain 100	227	3.46		227
Centennial Tower 100	197	3.01		197
Transmitter Hill 100	1,150	17.55	955	195
Move Toms Tower 100	695	10.61	513	182
Myron Mountain 100	161	2.46		161
Rosita Tower 100	370	5.65	233	137
North 255 100	129	1.97		129
Antelope Tower 100	417	6.36	293	124
San Isabele 100	118	1.8		118
Anderson Tower 100	478	7.29	368	110
Arlie 100	1,053	16.07	987	66
Horn Creek 100	564	8.61	503	61
South Colony Tower 100	394	6.01	333	61
Clay Tower 100	1,574	24.02	1,514	60
Hermit Basin 100	540	8.24	484	56
Hal Tower at 100 ft	240	3.66	195	45
Wetmore 100	124	1.89	91	33
Stoneman Tower 100	735	11.22	708	27
North 165 100	13	0.2		13



**Existing Site Analysis**

Name	Addresses Covered of 6,553 total	Addresses Percentage (% of 6,553)
Clay Tower 20	1,514	23.1
JJ Courtyard at 30 ft Hilltop	1,118	17.06
Arlie30	987	15.06
Transmitter Hill D at 20 ft	955	14.57
Stoneman Tower 20	708	10.8
Democrat Mt 20	650	9.92
Toms Tower 20	513	7.83
Horn Creek 30 Hilltop	503	7.68
Hilltop Hermit 30 Hilltop	484	7.39
Anderson Tower 20	368	5.62
South Colony Tower 20	333	5.08
Antelope Tower 20	293	4.47
Rosita Tower at 20 ft	233	3.56
Gene Tower20	223	3.4
Hal Tower at 20 ft	195	2.98
Centennial at 20	160	2.44
Wetmore 20	91	1.39