SDRC Box Elder Rev 2

MORRISON HERSHFIELD CORPORATION
66 Perimeter Center East, Suite 600, Atlanta, Georgia 30346 USA
Tel. 770 379 8500 Fax. 770 379 8501

Apr 7, 04

REPORT

203905 / Box Elder
150 ft Monopole Tower

Pennington County, SD

Status:	**NO UPGRADE REQUIRED.**
Summary of Failure:	**N/A**
Upgrade Summary:	**N/A**
Loading:	**Microwave (Refer to Table 2 for details)** **Implementation Report: SDRC_BoxElder MW part, dated 2/25/04**

REGISTERED PROFESSIONAL ENGINEER
REG. NO. 7386
DENIS HUM
SOUTH DAKOTA

4.7.04

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Rapid City Growth
Management Department

Presented to:

Western Wireless
PB Architects
303 Battery Street
Seattle, WA 98121

Report No. 6043035: WW0-056R2 April 7, 2004
MAM-Report-WW0-056R2.doc

MORRISON HERSHFIELD CORPORATION
66 Perimeter Center East, Suite 600, Atlanta, Georgia 30346 USA
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April 7, 2004

Mr. Peter Bocek
PB Architects
303 Battery Street
Seattle, WA 98121

Subject: **Structural Analysis of 150 ft Monopole Tower**
Site: 203905 / "Box Elder"/ Pennington County, SD
***Western Wireless* Proposed Antenna Loading**
MH Project No. 6043035: WW0-056R2

Dear Mr. Bocek:

Morrison Hershfield has carried out an analysis of the 150 ft monopole tower in Box Elder, SD for the addition of Western Wireless's proposed antenna installation given in Table 2. The structural analysis was done in accordance with the requirements of TIA/EIA-222-F *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures* using a fastest-mile wind speed of 80 mph and 1/2" ice for Pennington County, meeting the requirements of the 2000 International Building Code for a 3-second gust wind speed of 90 mph and 1/2" ice. The tower has been assumed to be in good condition and capable of supporting its full design capacity.

Our analysis demonstrates that the existing tower **is in conformance** with the requirements of the above noted standards under the effects of loading due to the proposed antenna installation and existing antennas.

Foundation loads from our analysis are less than the original design reactions from Valmont (Valmont Foundation Drawing No. 3736-F, dated 6/26/01, provided by Western Wireless). The foundations may therefore, by comparison, be considered adequate for the proposed loads.

All results and conclusions derived from this analysis report are as accurate as the information provided to Morrison Hershfield. It is also assumed that the structure has been properly maintained, is in good condition and is capable of carrying the full design loading. Unless noted otherwise, this report is limited to a structural analysis of the tower based on established engineering principles for both structural behavior and member capacities.

We trust that this report is satisfactory. If you have any questions regarding the investigation, please contact our office.

Yours very truly,
Morrison Hershfield Corporation

Denis Hum, P.E. (SD License No. 7386)
Senior Engineer

Table 1: Tower Details

Site Name	203905 / Box Elder
Location	SR 55, Box Elder, SD / Pennington County (Lat 44-05-06, Long 103-04-24)
Tower Description	150 ft monopole tower, manufactured by Valmont.
Current Standard and Loading	TIA/EIA-222-F, 80 mph wind speed and 1/2" ice, meeting the requirements for the 2000 IBC for a 90 mph 3-sec gust and 1/2" ice.
Previous MH Analyses	WW0-056R1 (9/22/03), WW0-056 (8/27/03)

Table 2: Antenna Loads

Elev. (ft)	Carrier	Antenna Description	TX-Lines
		*** PROPOSED ***	
125.0	Western Wireless	(1) RFS SP6-107AC	(1) EWP90-107
105.0	Western Wireless	(1) RFS PA6-59AC	(1) EWP90-107
60.0	Western Wireless	(1) RFS PA4-59AC	(1) EWP90-107
		*** EXISTING ***	
150.0	Western Wireless	(2) DAPA 09010 (1) Upright, (1) Inverted	(2) 1-5/8"
150.0	Western Wireless	(6) Antel RWA80014	(6) 1-1/4"
150.0	Western Wireless	(3) Antel BCD 80010 (2) Upright, (1) Inverted	(3) 1-1/4"
150.0	Western Wireless	(1) 12 ft Platform	

Any discrepancies in loading from this listing should be brought to Morrison Hershfield's attention; results of this analysis cannot be used if the loading is different.

Table 3: Critical Twist and Sway at 50 mph Service Wind (10dB degradation)

Elev (ft)	Dish	Maximum Frequency (GHz)	Maximum Sway (deg)	Maximum Twist (deg)	Allowable Deformation (deg)
125	SP6-107AC	10.7	0.5502	0.0042	0.83
105	PA6-59AC	5.9	0.4885	0.0030	1.50
60	PA4-59AC	5.9	0.2786	0.0011	2.25

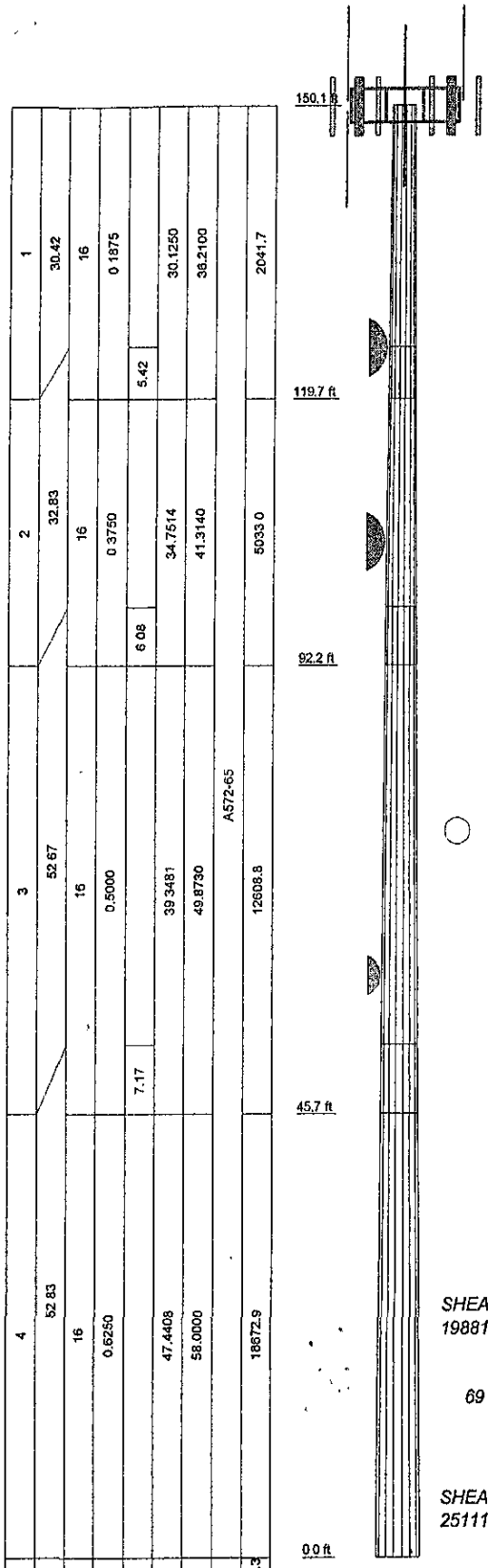
Allowable deformation values given for critical sway and twist are based on formulae from the draft version of ANSI/TIA/EIA-222-G.4, for the serviceability limit state condition of a 60 mph 3-second gust wind speed. It is assumed that this serviceability condition meets the serviceability requirements of TIA/EIA-222-F for a 50 mph fastest-mile wind speed.

Table 4: Tower Component Stresses vs. Capacity

Section No.	Elevation	Combined Stress Ratio	Allowable Stress Ratio	Percent Capacity Used
1	120 – 150 ft	0.252	1.333	18.9
2	92 – 120 ft	0.268	1.333	20.1
3	47 – 92 ft	0.388	1.333	29.1
4	0 – 47 ft	0.445	1.333	33.4

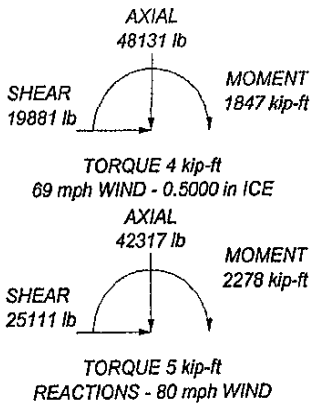
Table 5: Tower Foundation Results

Load Type	Original Design	Current Analysis	% Ratio to Original
Compression (kip)	59.9	48.1	80.3
Moment (kip-ft)	3932.6	2278	57.9
Shear (kip)	36.8	25.1	68.2



Section	1	2	3	4
Length (ft)	30.42	32.83	52.67	52.83
Number of Sides	16	16	16	16
Thickness (in)	0.1875	0.3750	0.5000	0.6250
Lap Splice (ft)	5.42	6.08	7.17	
Top Dia (in)	30.1250	34.7514	39.3481	47.4408
Bot Dia (in)	38.2100	41.3140	49.8730	58.0000
Grade	A572-65			
Weight (lb)	2041.7	5033.0	12608.8	18672.9

Total Weight (lb): 38356.3



APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
(2) RWA80014 (Existing)	150	09010 (Existing)	150
(2) RWA80014 (Existing)	150	BCD80010 (Existing)	150
(2) RWA80014 (Existing)	150	Standard Platform (Existing)	150
BCD80010 (Existing)	150	SPF6-57AN (Proposed)	125
BCD80010 (Existing)	150	PA6-57AC (Proposed)	105
09010 (Existing)	150	PA4-57AC (Proposed)	60

MATERIAL STRENGTH

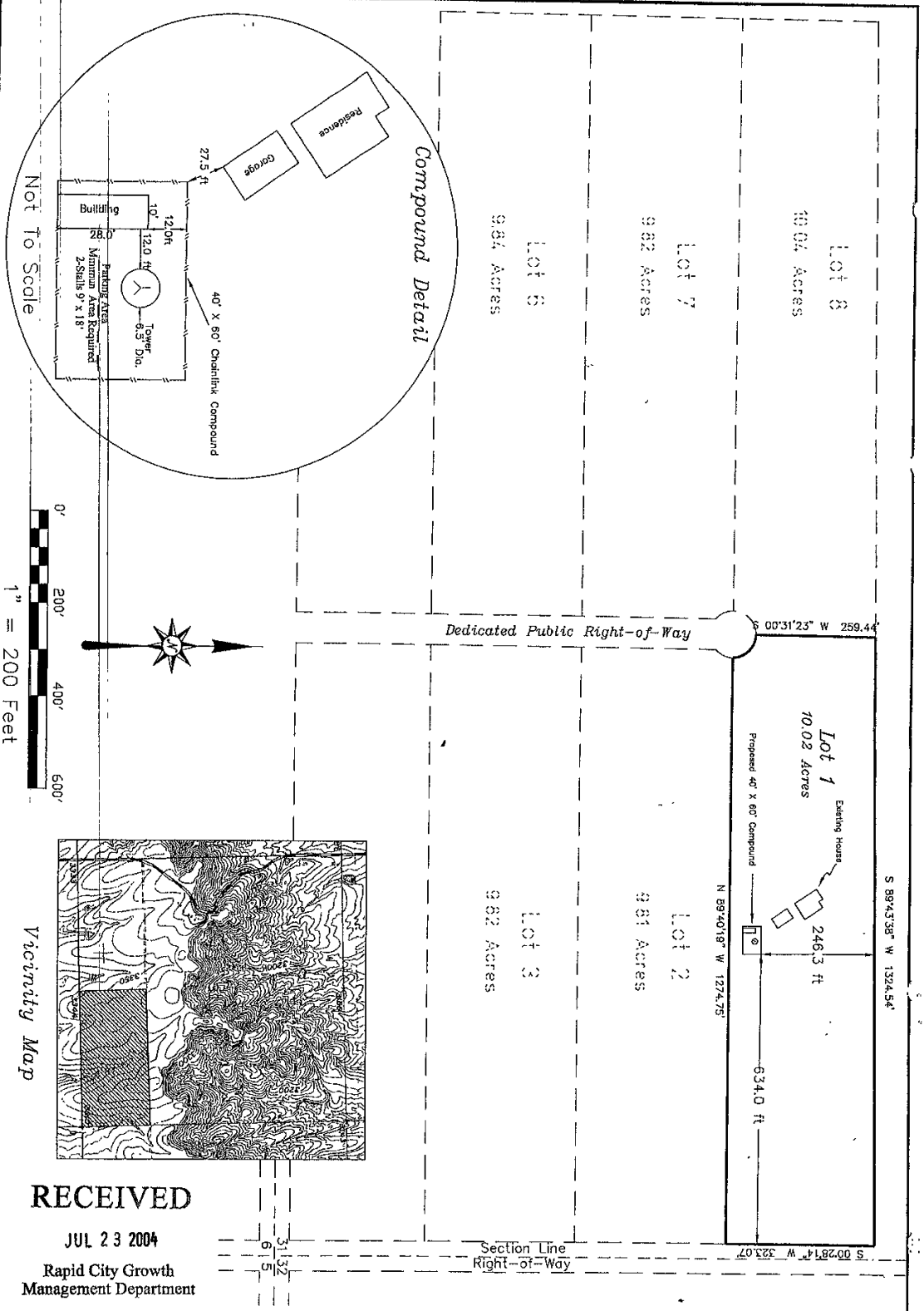
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. TOWER RATING: 33.4%

Morrison Hershfield
66 Perimeter Center East
Atlanta, GA 30346
Phone: (770) 379-8500
FAX: (770) 379-8598

Job: 6043035 / WW0-056R2		
Project: SDRC_Box Elder-Cell# RAP_038		
Client: Western Wireless	Drawn by: MAM	App'd
Code: TIA/EIA-222-F	Date: 04/06/04	Scale: NTS
Path: U:\Tower Projects\Western Wireless\WW0-056m\WW0-056R2\Analysis\WW0-056R2.eri		Dwg No E-1



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Management Department

Site Plan For Box Elder Tower

Lot 1, of Hidden Springs Ranchettes No. 2,
Located in the S1/2SE1/4, Section 31, T.2N.,R.9E.,B.H.M.,
Pennington County, South Dakota.

Surveyed By: RJB/SEV	Date: 6-7-01	Project No. 01-076
Drawn By: RJB	Checked BY: RJB/SEV	Revisions:

Precision Surveying & Mapping, Inc.
1021 Junction Ave Sturgis, SD 57785
Tel (605) 347-4014 Fax (605) 423-4110
E-mail psm@mato.com