NOISE ASSESSMENT

Boulder Creek
Communications Facility
APN 405-101-04

Lead Agency:

County of San Diego
Department of Planning and Land Use
Contact: Emmet Aquino
5201 Ruffin Road, Suite B
San Diego, CA 92123
858-694-8845

Prepared by:

Jeremy Louden
Ldn Consulting, Inc.
In corporation with:
Aspectus, Inc

Project Proponent:

Mobilitie, LLC
15505 Sand Canyon
Irvine, CA 92618

~~August 16~~November 1, 2011

TABLE OF CONTENTS

TABLE OF CONTENTS II
LIST OF FIGURES II
LIST OF TABLES II
ATTACHMENTS II
GLOSSARY OF TERMS III
EXECUTIVE SUMMARY IV
1.0 INTRODUCTION 1
1.1 PROJECT DESCRIPTION 1
1.2 ENVIRONMENTAL SETTINGS & EXISTING CONDITIONS 1
1.3 METHODOLOGY AND EQUIPMENT 6
2.0 OPERATIONAL ACTIVITIES 8
2.1 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE 8
2.2 POTENTIAL OPERATIONAL NOISE IMPACTS 9
2.3 CONCLUSIONS 18
3.0 CERTIFICATIONS 19

LIST OF FIGURES

FIGURE 1-A: PROJECT VICINITY MAP 2
FIGURE 1-B: PROJECT SITE LAYOUT 3
FIGURE 1-C: PROJECT EQUIPMENT CONFIGURATION 5
FIGURE 2-A: PROPOSED AND FUTURE EQUIPMENT LOCATIONS 10
FIGURE 2-B: NOISE MITIGATION AND BARRIER LOCATIONS 15
FIGURE 2-C: EXHAUST AND VENTILATION FOR NOISE REDUCTION (SOUTHERN FAÇADE) 17

LIST OF TABLES

TABLE 2-1: SOUND LEVEL LIMITS IN DECIBELS (DBA) 8
TABLE 2-2: UNMITIGATED PROPERTY LINE NOISE LEVELS 13
TABLE 2-3: MITIGATED PROPERTY LINE NOISE LEVELS 14

ATTACHMENTS

MANUFACTURES SPECIFICATIONS AND NOISE DATA (GENERATOR) 20
FRESNEL BARRIER REDUCTION CALCULATIONS (HVAC AND GENERATOR) 22

GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically Ldn's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the development of the proposed Project. The Project known as the Boulder Creek Communications Facility consists of a lease area 100 feet by 100 feet on a single parcel totaling approximately 40 gross acres. The project is requesting a Major Use Permit (MUP) for the installation of a two cellular towers and ancillary equipment. The Project is located at 10950 Boulder Creek Road, north of Interstate 8, in the unincorporated community of Descanso in eastern portion of the County of San Diego, CA.

Based on the empirical data, manufactures specifications, the distances to the property lines and the shielding from the equipment shelters, 6-7 foot high barriers at the HVAC units and the combination of the enclosure of the standby generator and the southern facade of the generator enclosure being at least 8 foot high the cumulative noise levels from the proposed communications facility were found to be below the most restrictive nighttime property line standard of 45 dBA. No impacts are anticipated and no additional mitigation is required.

No impacts are anticipated and no additional mitigation is required. Noise characteristics of the future equipment may vary and verification of compliance with County of San Diego noise regulations can be conducted, if needed, after the equipment is installed. If any additional sound attenuation is found to be necessary for the future carriers, it can be specified at that time. It is not expected that any additional sound attenuation will be necessary for this project.

1.0 INTRODUCTION

1.1 Project Description

This noise study was completed to determine the noise impacts associated with the development of the proposed Boulder Creek Communications Facility. The Project is located at 32° 53′ 01″ N and 116° 38′ 46″ W, along Boulder Creek Road north of Interstate 8 near Descanso, CA. The site is in the unincorporated community of Descanso located within the eastern portion of the County of San Diego. The general location of the Project is shown on the Vicinity Map, Figure 1-A.

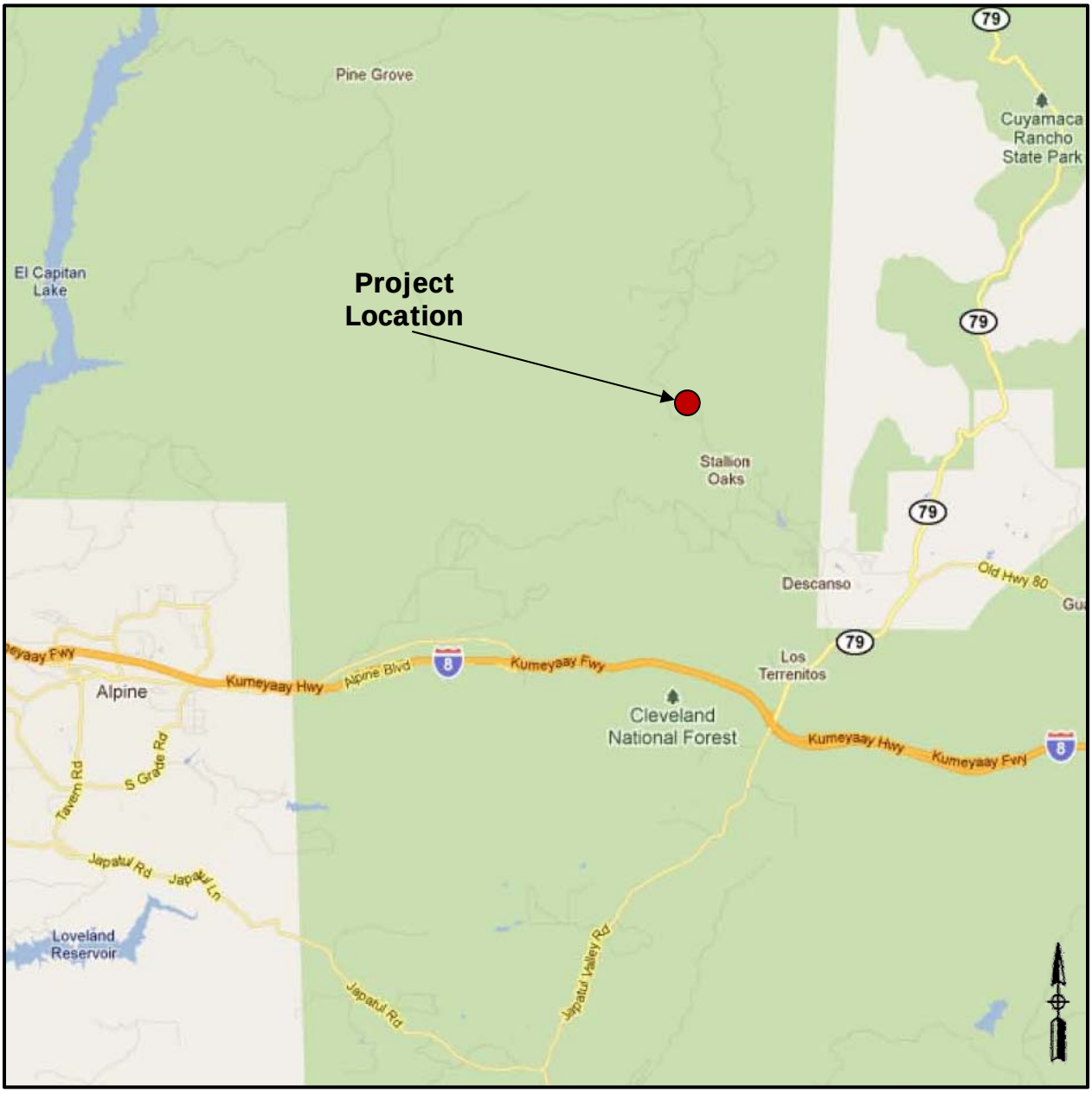
The proposed Project would result in the construction, operation and maintenance of a single cellular communications facility at this time with the potential expansion of a second carrier. The project proposes to develop the site to allow for one additional cellular facility in the future but only a single generator is proposed. Each single carrier will include a cellular tower, equipment shelter to house the all the electrical and transfer equipment accompanied with two Marvair ComPac II HVAC units for temperature control. A single standby 30 KW generator is also proposed as backup power for both potential carriers. The proposed project consists of the construction of an unmanned telecommunications facility consisting of a 10 foot high by 12 foot wide by 16 foot long prefabricated equipment shelter which will enclose equipment cabinets for wireless telecommunications equipment. Also planned are directional panel antennas which will be mounted on a 45 foot high faux water tank. The general project configuration can be seen in Figure 1-B. The proposed equipment layout is provided in Figure 1-C.

1.2 Environmental Settings & Existing Conditions

Settings & Locations

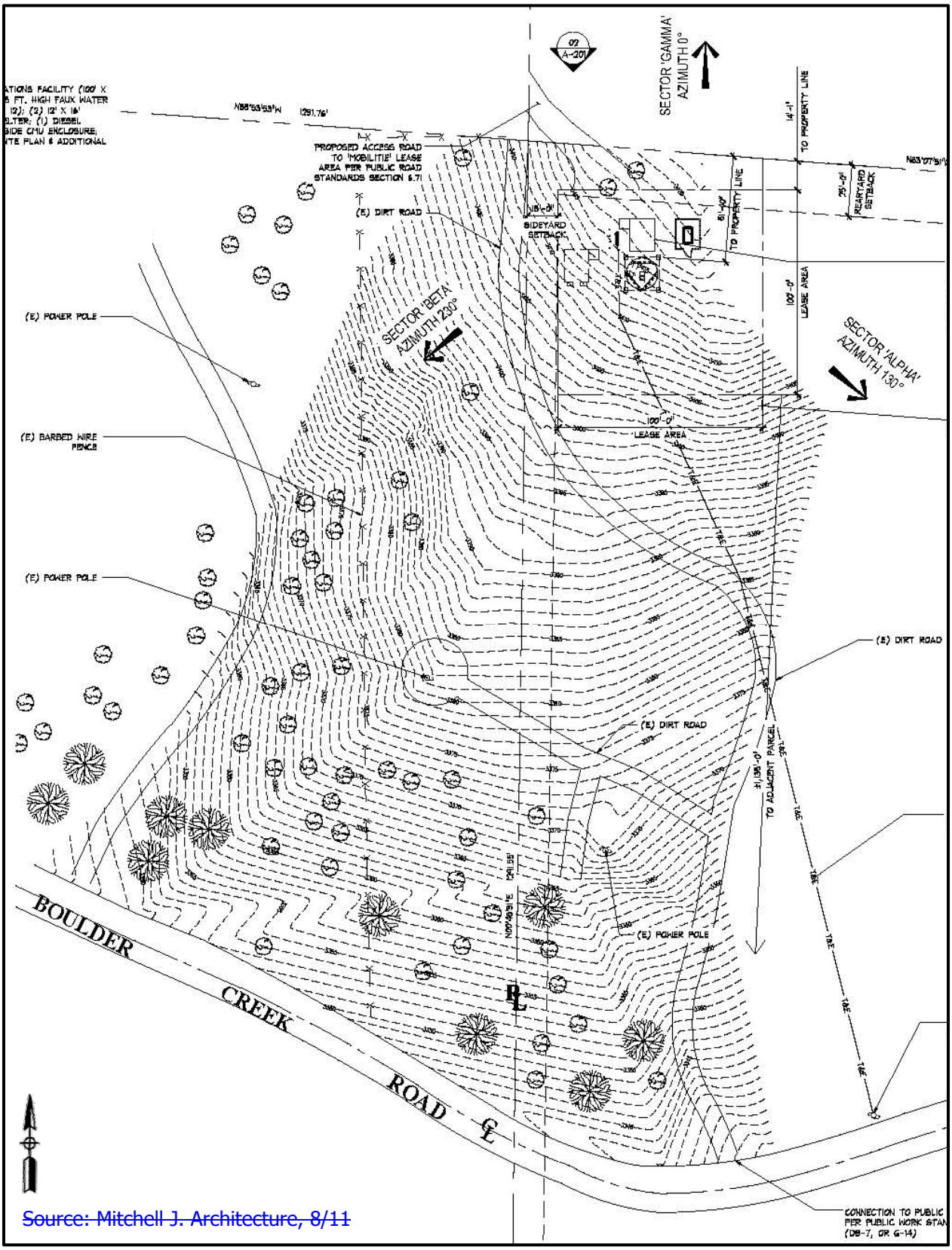
The Project would consist of a cellular communications facility on a single parcel of land. The County Assessor Parcel Number (APN) affected by the proposed Project for the facilities include 405-101-46 (40 acre parcel). The proposed lease area is in the northern western portion of the subject property, over 1,000 feet from the southern and eastern property lines and roughly 40 feet from the nearest property line to the north and west. The communication facility lease area is 100 feet by 100 feet. The zoning for the Project parcel and all surrounding land uses is General Rural (S-92).

Figure 1-A: Project Vicinity Map

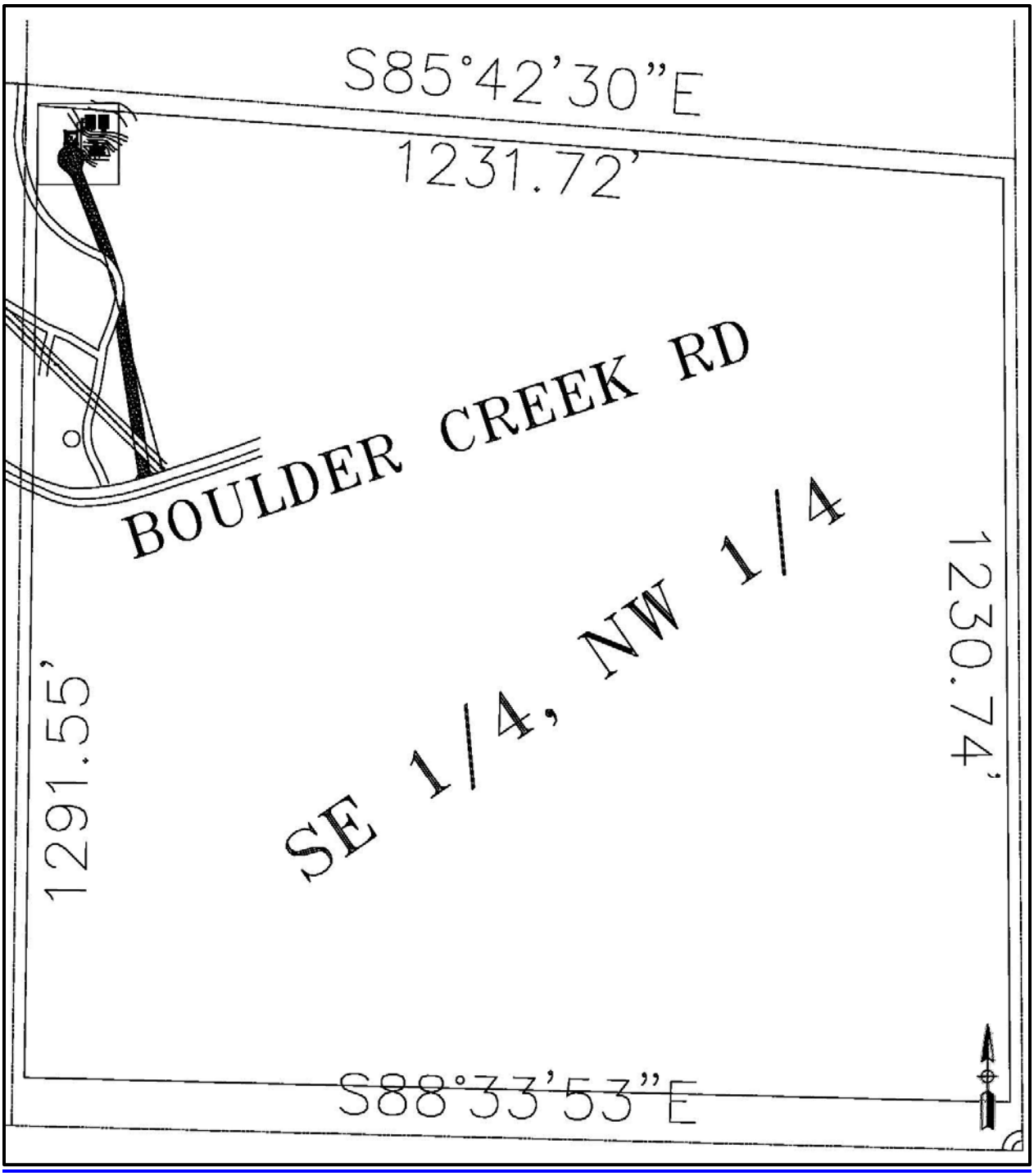


Source: Google Maps, 8/11

Figure 1-B: Project Site ~~Configuration~~Layout

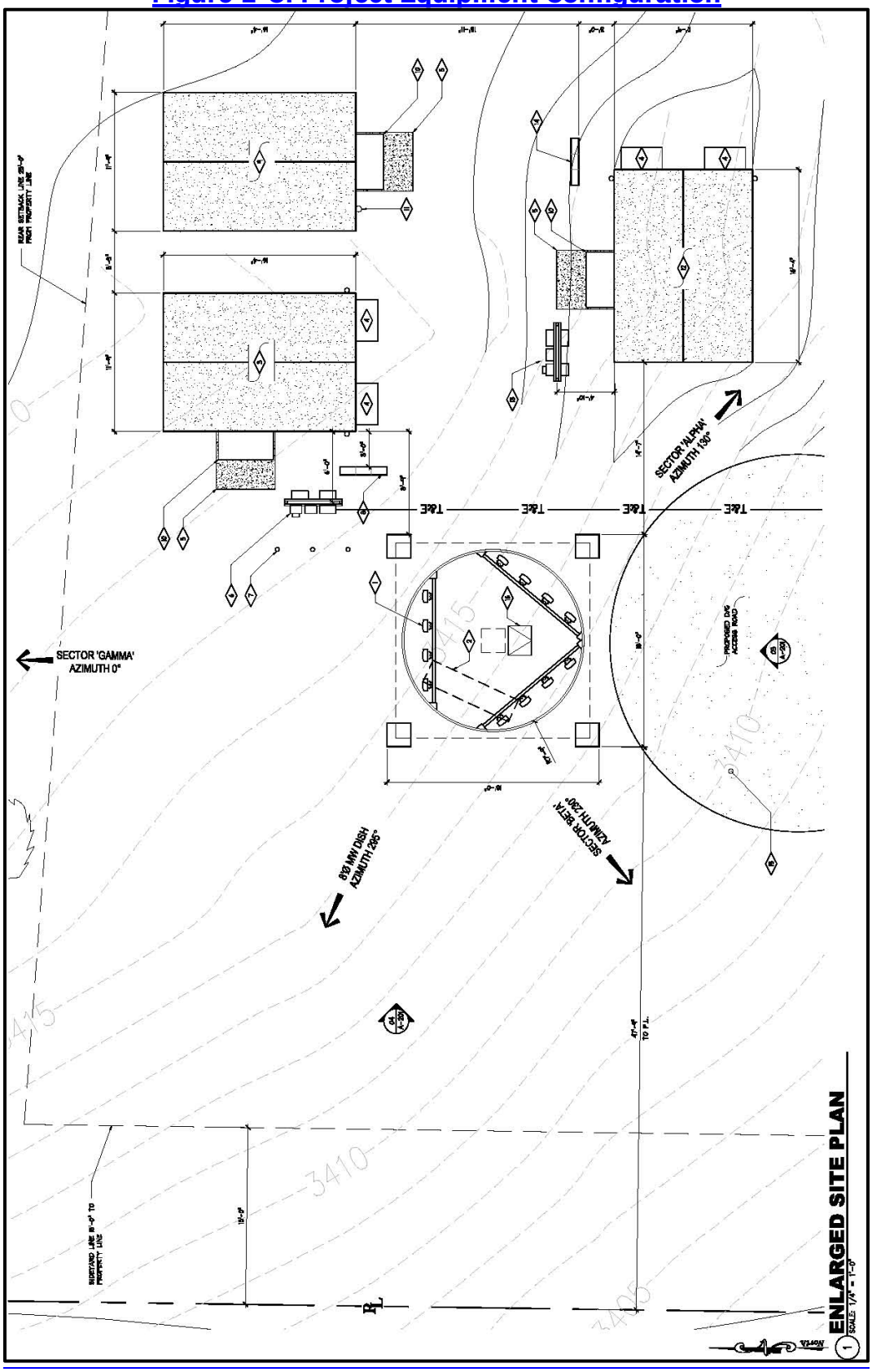


~~Source: Mitchell J. Architecture, 8/11~~



Source: Mitchell J. Architecture, 2011

Figure 1-C: Project Equipment Configuration



1.3 Methodology and Equipment

a) Noise Measuring Methodology and Procedures

To assess potential noise impacts, measurements of a single existing Marvair Com Pac HVAC unit were made at an operational Verizon facility installation in the City of San Diego, CA. The noise measurements were recorded on November 4, 2010 by Ldn Consulting, Inc. at approximately 10:30 a.m. The measured noise level was found to 74.8 dBA Leq at 5 feet. The manufacturer's data show the noise emission level for this unit as 73 dBA at 5 feet. The measurement is slightly higher than the manufacturer's data which maybe from nearby traffic noise.

Therefore, the measured noise level will be used for a worst-case analysis in this report. The sound levels for the proposed on-site standby generator were taken from the manufacture's specifications.

Noise measurements were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200.

b) Noise Calculations and Factors

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is base on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are

made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

2.0 OPERATIONAL ACTIVITIES

2.1 Guidelines for the Determination of Significance

Section 36.404 of the County of San Diego noise ordinance provides performance standards and noise control guidelines for determining and mitigating non-transportation, or stationary, noise source impacts to adjacent properties. The purpose of the noise ordinance is to protect, create and maintain an environment free from noise that may jeopardize the health or welfare, or degrade the quality of life.

The County Noise Ordinance states that it shall be unlawful for any person to cause or allow the creation of any noise to the extent that the one-hour average sound level, at any point on or beyond the boundaries of the property exceeds the applicable limits provided in Table 2-1.

Table 2-1: Sound Level Limits in Decibels (dBA)

ZONE		APPLICABLE LIMIT ONE-HOUR AVERAGE SOUND LEVEL (DECIBELS)
R-S, R-D, R-R, R-MH, A-70, A-72, S-80, S-81, S-87, S-88, S-90, S-92, R-V, and R-U Use Regulations with a density of less than 11 dwelling units per acre.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45
R-RO, R-C, R-M, C-30, S-86, R-V, R-U and V5. Use Regulations with a density of 11 or more dwelling units per acre.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50
S-94, V4, and all other commercial zones.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55
V1, V2 V1, V2 V1 V2	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m. 10 p.m. to 7 a.m.	60 55 55 50
V3	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	70 65
M-50, M-52, M-54	Anytime	70
S-82, M-58, and all other industrial zones.	Anytime	75

Source: County of San Diego Noise Ordinance Section 36.404

As stated above in Section 1, the Project and surrounding properties are zoned General Rural (S-92). Section 36.404 of the Noise Ordinance sets a most restrictive operational exterior noise limit for the R-R and residential noise sensitive land uses of 50 dBA Leq for daytime hours of 7 a.m. to 10 p.m. and 45 dBA Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. as shown in Table 2-1 above. Most of the Project components will only operate during the daytime hours but a few may operate during nighttime or early morning hours and therefore the most restrictive and conservative approach is to apply the 45 dBA Leq nighttime standard at the property lines.

2.2 Potential Operational Noise Impacts

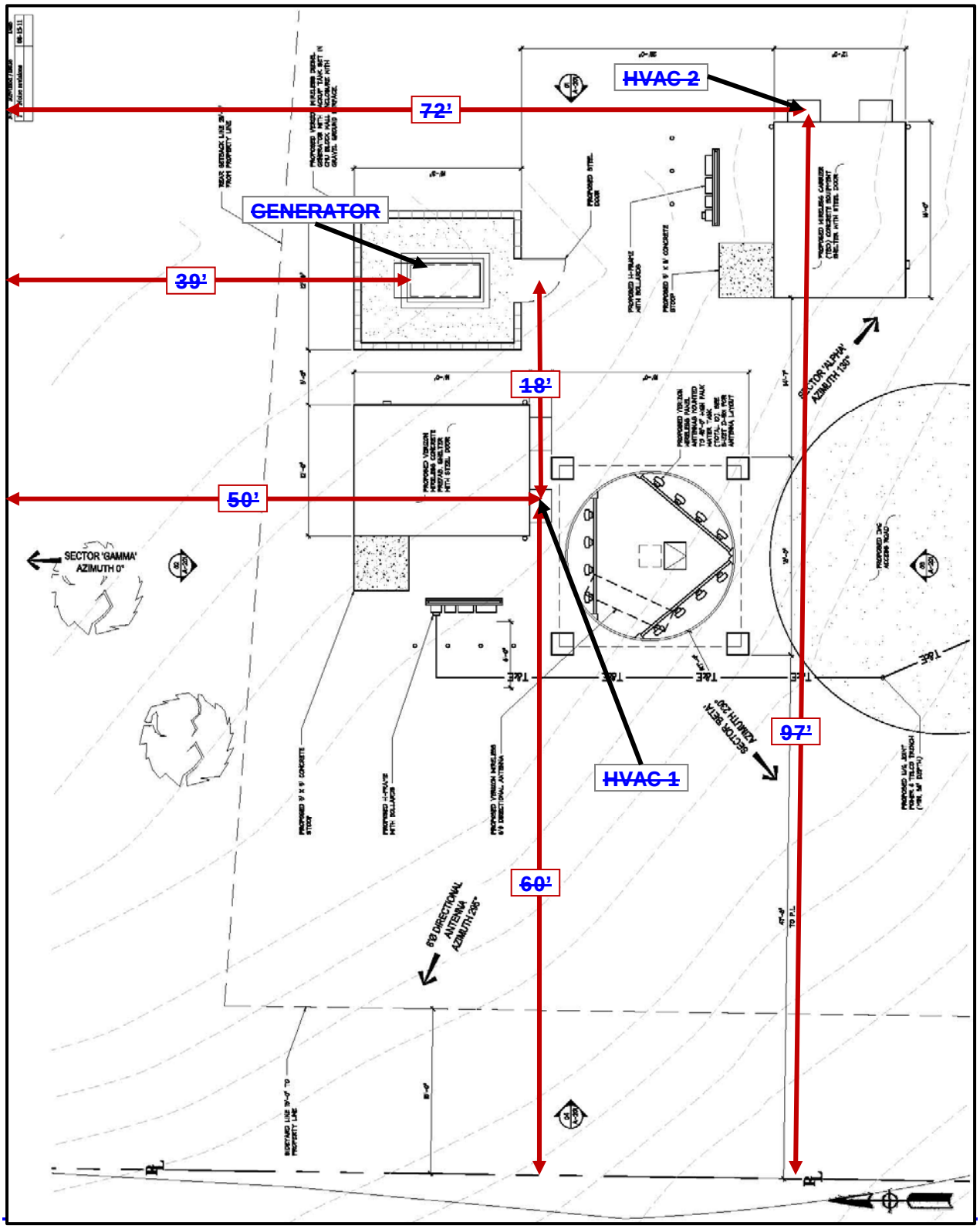
This section examines the potential stationary noise source impacts associated with the operation of the proposed Boulder Creek Communications Facility. Specifically, noise levels from the proposed HVAC units and the standby generator.

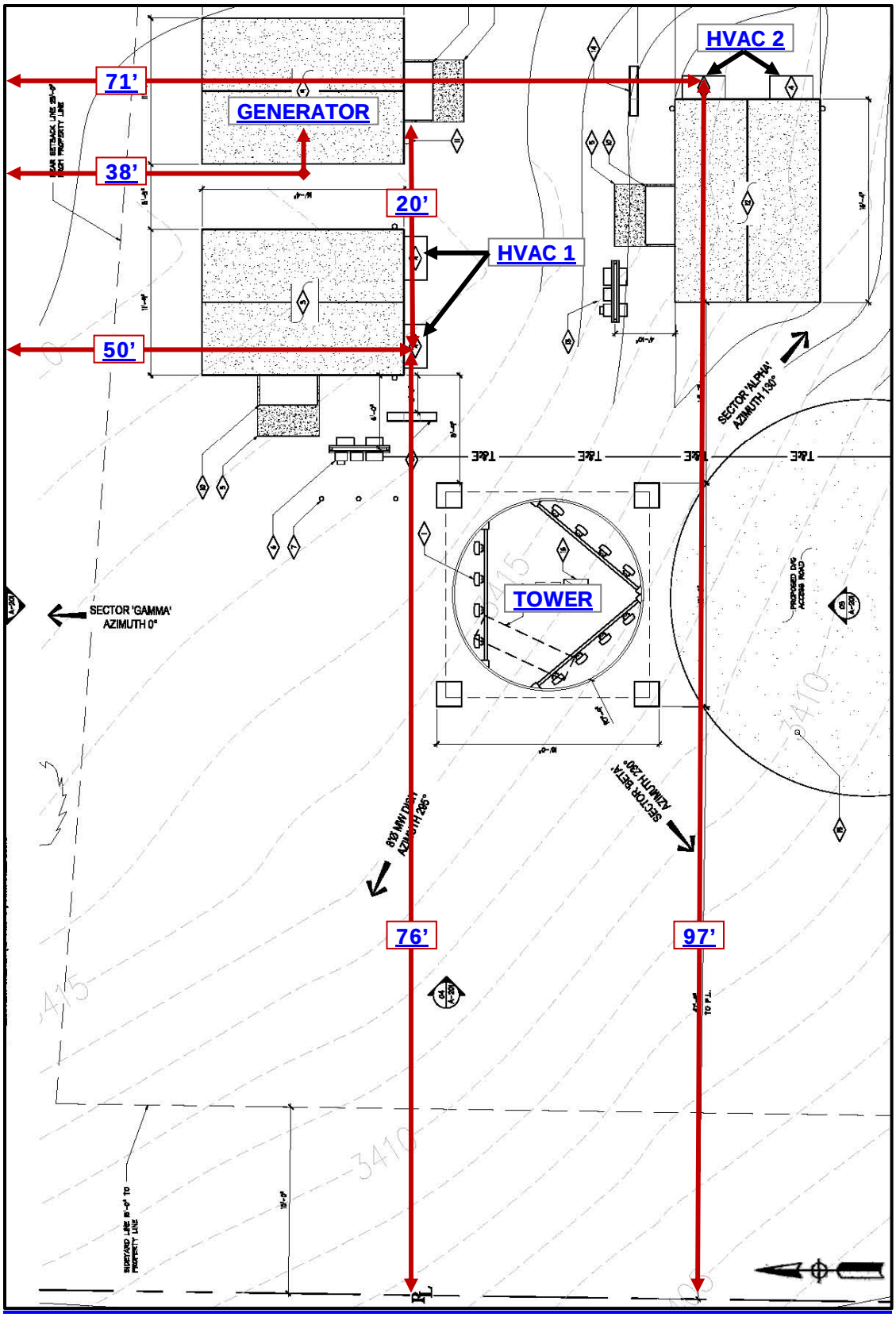
The proposed Project includes a cellular tower, equipment shelter to house the all the electrical and transfer equipment accompanied with two Marvair ComPac II HVAC units for temperature control for each of the two carriers and a single standby 30 KW generator. The project proposes to develop the site to allow for one additional cellular facility in the future but only a single carrier is proposed at this time. For the purposes of this analysis, the future equipment was assumed to be the same as the proposed. The proposed Project consists of the construction of an unmanned telecommunications facility consisting of a 10 foot high by 12 foot wide by 16 foot long prefabricated equipment shelter which will enclose equipment cabinets for wireless telecommunications equipment. Also planned are directional panel antennas which will be mounted on a proposed and future 45 foot high faux water tank.

Based upon the Project site layout and the adjacent property zoning potential impacts may occur. The worst-case potential impact is located along the northern and western property lines where the equipment shelters with the HVAC units and the standby generators are located roughly 40-60 feet from the property lines. The southern and eastern property lines are located over 1,000 feet from the noise sources.

The Project layout, proposed equipment locations, the future potential facility and distances to the nearest property lines (northern and western) form the noise producing equipment can be seen in Figure 2-A below. The operational noise levels from all the potential on-site equipment sources are analyzed below for both carrier units and the generator to determine if impacts would occur and if any mitigation measures will be required. The cumulative noise level analysis with associated distances, noise calculations is also provided along with a table showing the individual noise sources and their associated property line noise levels.

Figure 2-A: Proposed and Future Equipment Locations





Generator Noise Levels

It was determined that a standby generator of 30 kilowatts (KW) is needed for each of the four carriers to power the proposed equipment and controls if the main power supply is lost. To assess the generator noise levels, typical outdoor sound levels were provided by the manufacturer (Generac Power Systems). The noise ratings provided by Generac indicated that a 30 KW generator will produce unmitigated noise levels ranged between 62.0 to 67.3 dBA Leq when measured at a distance of 23 feet in all directions. The manufactures specifications are provided as ***Attachment A*** to this report. For the purposes of this report all four standby generators were modeled using a worst-case noise level of 67.3 dBA Leq at 23 feet and a source height of 5 feet.

HVAC Noise Levels

While two HVAC units are typically installed on the exterior of an equipment shelter, only one is expected to be operational at a time and never running simultaneously. The proposed communications facility is planned to be operational 24 hours a day, 7 days a week.

To assess potential noise impacts, measurements of a single existing Marvair ComPac II HVAC unit were made at an operational Verizon facility installation in the City of San Diego, CA. The HVAC unit was mounted on the side of the building, similar to the proposed units, and had a source height of 4½ to 5 feet above the ground. The noise measurements were recorded on November 4, 2010 by Ldn Consulting at approximately 10:30 a.m. The measured noise level was found to be 74.8 dBA Leq at 5 feet. The manufacturer's data show the noise emission level for this unit as 73 dBA at 5 feet. The measurement may have a small traffic noise contribution, and are slightly higher than the manufacturer's data. Therefore, the measured noise level of 74.8 dBA Leq with a source height of 5 feet will be used for a worst-case analysis in this report for all proposed HVAC units. Up to four HVAC units (one at each carrier building) could be operating at the same time. For the purposes of this analysis, the future HVAC units were assumed to be the same as the proposed HVAC units.

Cumulative Noise Levels

The worst-case property line noise levels will occur when two HVAC units (one on each building) and the standby generator are operating at the same time. This would only occur during a power failure when the generators are needed to operate the HVAC units and would be considered the worst-case situation. The combined noise levels at the nearest property lines to the north and west were projected to be between 58-64 dBA Leq with no barriers or shielding of the standby generator or shelter HVAC units and impacts would occur. The results of the propagated noise levels are shown in Table 2-2 below.

Table 2-2: Unmitigated Property Line Noise Levels

Property Line	Source	Measurement Distance (Feet)	Measured Noise Level (dBA)	Distance to Property Line (Feet)	Noise Reduction due to distance (dBA)	Resultant Noise Level @ Property Line (dBA)
North	HVAC 1	5	74.8	50	-20.0	54.8
	HVAC 2	5	74.8	~~72~~71	-23.~~2~~0	51.~~6~~8
	Generator	23	67.3	~~39~~38	-4.~~6~~4	62.~~7~~9
	Cumulative Noise Level @ Property Line (dBA)					**63.~~6~~8**
South	HVAC 1	5	74.8	1,241	-47.9	26.9
	HVAC 2	5	74.8	1,223	-47.8	27.0
	Generator	23	67.3	1,251	-34.7	32.6
	Cumulative Noise Level @ Property Line (dBA)					**34.5**
East	HVAC 1	5	74.8	1,210	-47.7	27.1
	HVAC 2	5	74.8	1,138	-47.1	27.7
	Generator	23	67.3	1,153	-34.0	14.3
	Cumulative Noise Level @ Property Line (dBA)					**30.5**
West	HVAC 1	5	74.8	~~60~~76	-~~21~~23.6	~~53~~51.2
	HVAC 2	5	74.8	97	-25.8	49.0
	Generator	23	67.3	~~78~~96	-~~10.6~~12.4	~~56.7~~54.9
	Cumulative Noise Level @ Property Line (dBA)					**~~58.8~~57.2**

Therefore, additional noise modeling was conducted to determine the height and type of the noise barriers needed to reduce the generator and HVAC noise levels under the County's thresholds. Due to the orientation of the buildings the mounted HVAC units are directly shielded from the northern property line by the buildings themselves. This was accounted for where applicable in the modeling. To determine the noise level reductions from the proposed 10 foot high buildings and the necessary barriers heights the Fresnel Barrier Reduction Calculations were utilized for each piece of equipment. The Fresnel barrier reduction calculations for each property line are provided in ***Attachment B*** of this report.

It was determined that due to the close proximity of the generator to the northern property line it would be difficult to achieve the necessary 19 dBA reduction unless the generator was enclosed and free of any openings on the northern, eastern and western facing sides of the enclosure. Based on measurements taken at a similar back-up generator system in Valley Center, CA in 2007, it was determined that a cinder block building equipped with a roof having an opening on only one side, for ventilation, will reduce the noise levels at least 19-20 dBA on the adjacent sides of the building opening and 38-40 dBA on the side of the building opposite the opening. Based on the orientation of the building and the location to the nearest property lines it was also determined that the ventilation must be located on the southern side of the

building and the sides of the building facing north, east and west are required to be completely free of any openings or ventilation in order to reduce levels at the proposed northern property line. In order to determine the relative noise reduction associated with the incorporation of the cinder block building equipment with a roof, as described above, and the distance to the property lines a point-source noise modeling program was utilized. The generator noise levels were modeled to each property line and take into account the reduction of the required cinder block structure to determine if any additional mitigation or noise reductions will be needed.

The results from of the modeling for the northern and western property lines (eastern and southern property lines are over 1,000 feet away and no impacts are anticipated) was conducted with the incorporation of the generator enclosure and it was determined that mitigation would also be needed for the HVAC units located on the two carrier shelters to block the noise transmission to the northern and western property lines. Utilizing the Fresnel Barrier Reduction Calculations it was determined that a ~~7~~6 foot high barrier placed at the first HVAC to shield noise to the west and a 6 foot high barrier place at the second HVAC unit to shield noise to the north. The 6~~-7~~ foot barriers~~–~~ along with the combination of the standby generator enclosure described above would reduce the noise levels at the property lines to below the County's most restrictive 45 dBA Leq nighttime standard. The cumulative noise levels at the property lines with the mitigation measures are provided in Table 2-3 below.

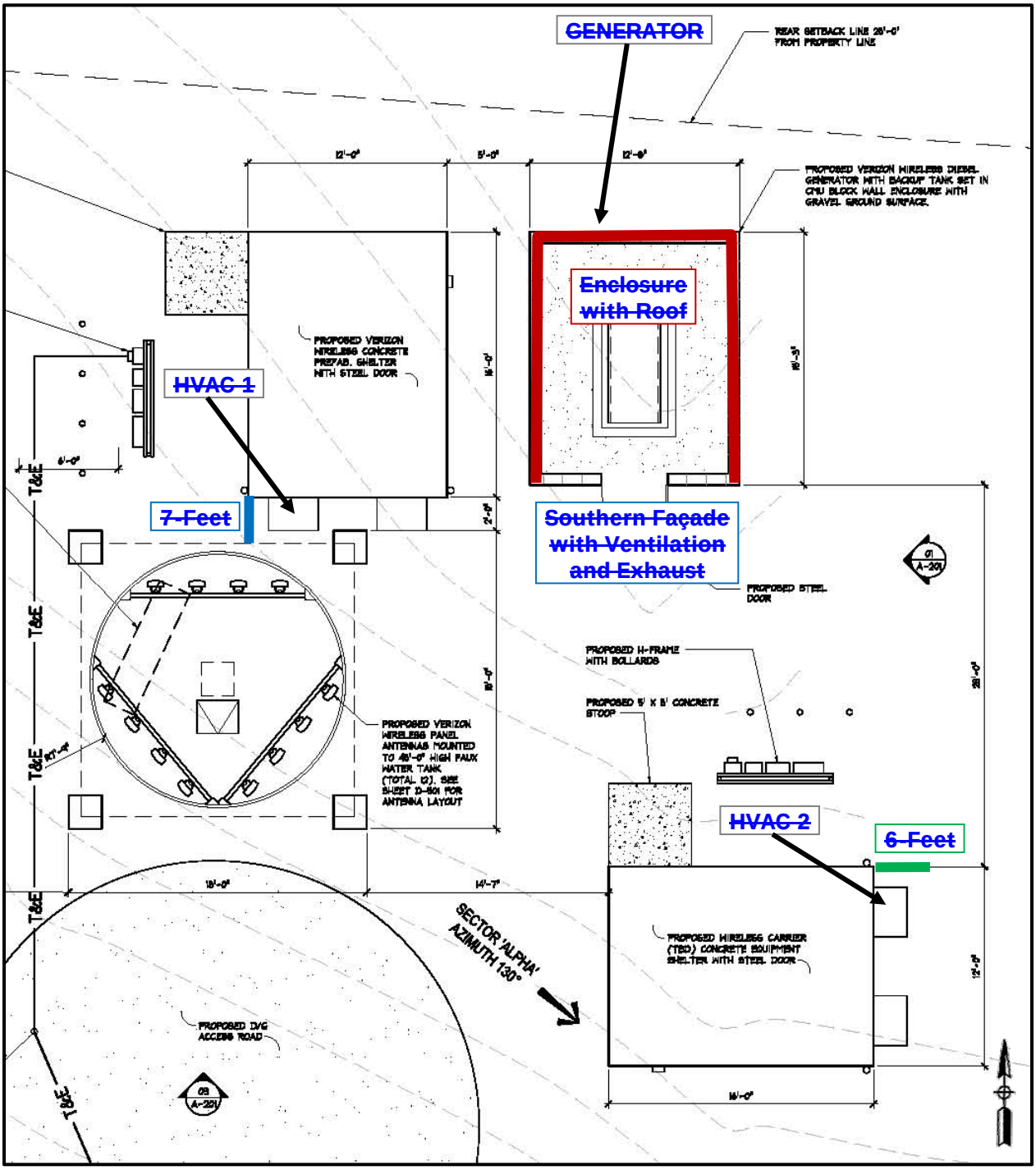
Table 2-3: Mitigated Property Line Noise Levels

Property Line	Source	Unshielded Property Line Noise Levels (dBA)	Noise Reduction from Buildings or Barriers (dBA)	Resultant Noise Level @ Property Line (dBA)
North	HVAC 1	54.8	-~~10.4~~18.0	~~42~~36.8
	HVAC 2	51.~~6~~8	-~~17.8~~7.5	~~31.2~~44.3
	Generator	62.~~7~~9	-~~19~~38.0	~~37.7~~24.9
	Cumulative Noise Level @ Property Line (dBA)			**~~44.2~~45.0**
West	HVAC 1	~~44.0~~51.2	-~~18.0~~7.5	~~36.8~~43.7
	HVAC 2	~~45.1~~49.0	-~~7.5~~17.8	~~44.1~~31.2
	Generator	~~52.3~~54.9	-~~38~~19.0	~~24.7~~35.9
	Cumulative Noise Level @ Property Line (dBA)			**44.~~9~~5**

The Fresnel barrier reduction calculations for the HVAC units and the southern facing façade of the standby generator are also provided in ***Attachment B*** of this report. The noise levels were found to comply at all property lines based on distance separation, the shielding of the HVAC units and the enclosure of the standby generator as described above. The required mitigation

measures are provided graphically in Figure 2-B below. The exhaust and ventilation on the southern building façade are shown graphically in Figure 2-C.

Figure 2-B: Noise Mitigation and Barrier Locations



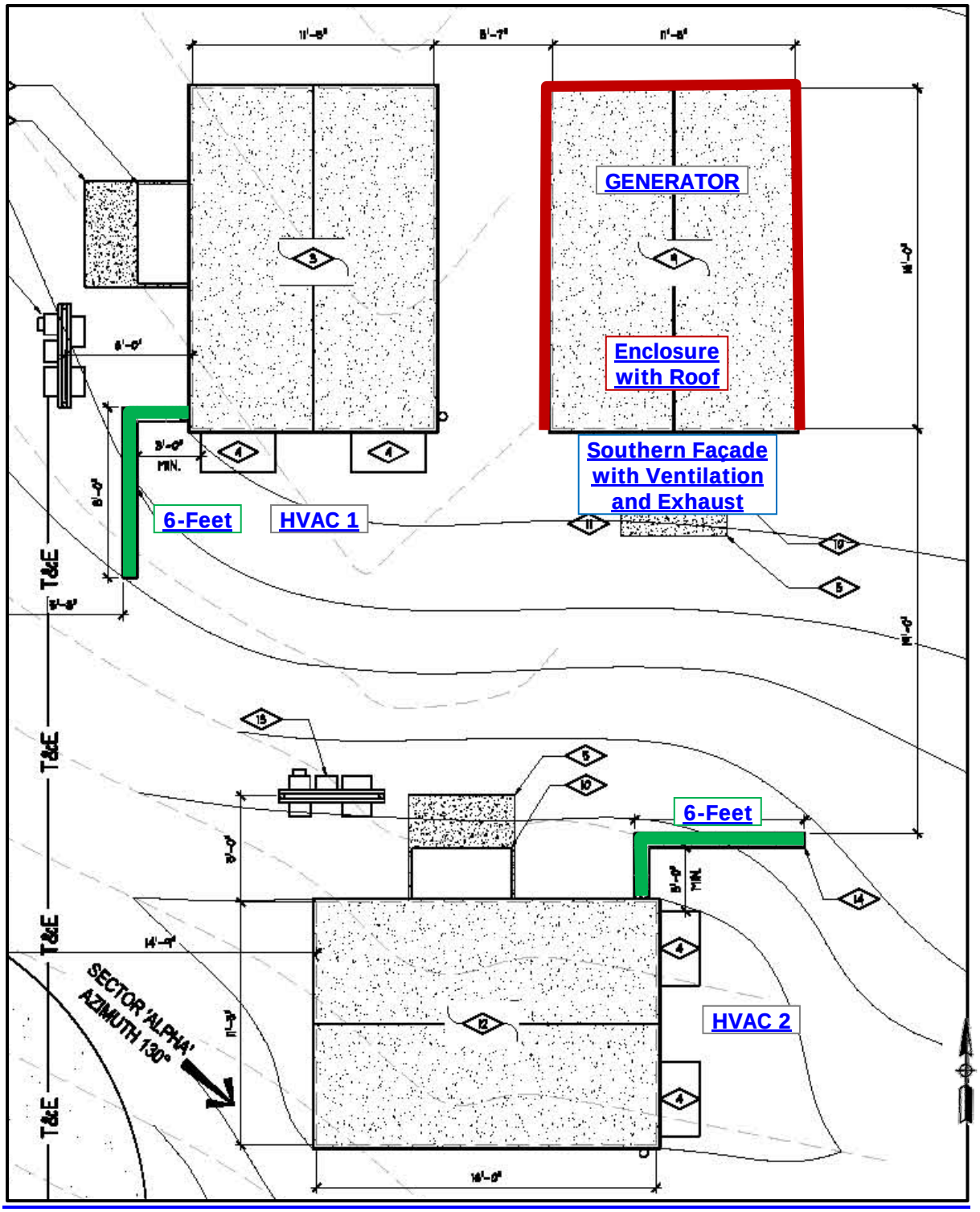
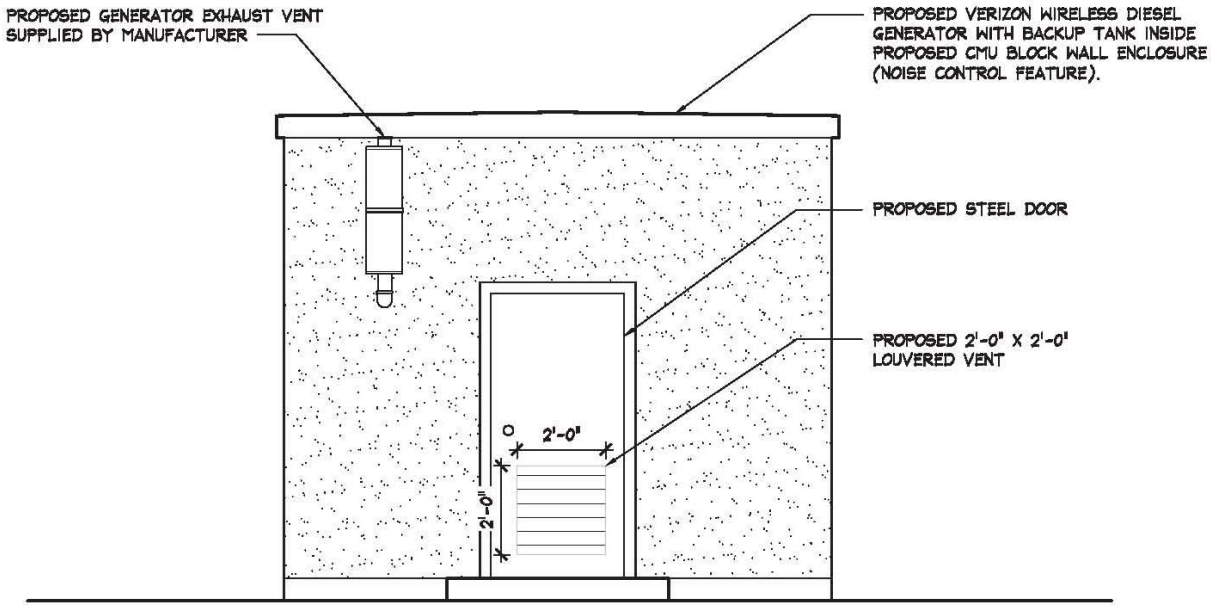

GENERATOR
Enclosure with Roof
Southern Façade with Ventilation and Exhaust
6-Feet
HVAC 1
6-Feet
HVAC 2
SECTOR 'ALPHA' AZIMUTH 130°
T&E
T&E
T&E
T&E

Figure 2-C: Exhaust and Ventilation for Noise Reduction (Southern Façade)

Please refer to the Project Site Plans for more details.



A roof is also required and needs to be constructed with ¾-inch thick plywood sheathing and a weatherproofing component (i.e. asphalt shingle or tile). Except for the open end of the building on its south side, all cracks, gaps, or openings in the interior of the building shall be caulked or chinked to provide a noise seal. The building's interior façade shall be at least two (2) feet away from the generator.

Source: Mitchell J. Architecture, ~~8/11~~2011

2.3 Conclusions

Based on the empirical data, manufactures specifications, the distances to the property lines and the shielding from the equipment shelters, 6~~-7~~ foot high barriers at the HVAC units and the combination of the enclosure of the standby generator and the southern facade of the generator enclosure being at least 8 foot high the cumulative noise levels from the proposed communications facility were found to be below the most restrictive nighttime property line standard of 45 dBA. No impacts are anticipated and no additional mitigation is required.

Noise characteristics of the future equipment may vary and verification of compliance with County of San Diego noise regulations can be conducted, if needed, after the equipment is installed. If any additional sound attenuation is found to be necessary for the future carrier, it can be specified at that time. It is not expected that any additional sound attenuation will be necessary for this project.

3.0 CERTIFICATIONS

The contents of this report represent an accurate depiction of the existing and future acoustical environment and impacts within the proposed Boulder Creek Communications Facility development in the community of Descanso, CA. The report was prepared by Jeremy Louden; a County approved CEQA Consultant for Acoustics.

DRAFT

Jeremy Louden, Principal
~~Principal~~
Ldn Consulting, Inc.
760-473-1253
~~jlouden@ldnconsulting.net~~
jlouden@ldnconsulting.net

Date ~~August 16~~November 1, 2011

In corporation with:
Aspectus, Inc
33672 Holtz Hill Road
Dana Point, CA 92629

ATTACHMENT A

MANUFACTURES SPECIFICATIONS AND NOISE DATA
(Generator)

GENERAC®
POWER SYSTEMS, INC.

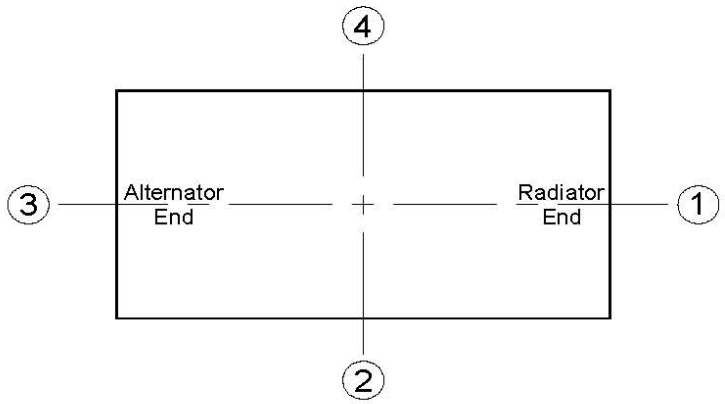
Sound Data

SD030 2.4L John Deere
L2A Sound Attenuated Enclosure

Sound Pressure Levels in dB(A)

GENERATOR SET WITH EXHAUST SYSTEM

Position	Overall Level	Frequency Spectrum Levels								
		Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
1	65.6	25.0	62.8	56.7	54.8	56.3	52.0	50.0	50.4	43.7
2	64.7	28.1	61.2	60.2	52.1	53.9	48.4	47.4	40.9	36.5
3	67.3	24.2	65.6	61.2	50.9	51.8	48.8	45.2	41.4	34.9
4	62.0	23.1	53.7	62.0	50.9	51.8	49.7	46.1	40.5	38.1
Average	64.9	25.1	60.8	60.0	52.2	53.4	49.7	47.2	43.3	38.3



Notes:

1. Generator operating at full rated load.
2. Generator configuration includes standard exhaust system mounted within Series 2000 enclosure.
3. All measurement positions are 7 m (23 ft) from center of generator set and at 1 m (3.3 ft) height.
4. Test conducted on an asphalt surface in free field conditions.
5. Reference sound pressure is 2×10^{-5} Pa.

ATTACHMENT B

Fresnel Barrier Reduction Calculations
(HVAC and Generator)

Northern Property Line

HVAC Unit 1

Source to Receiver Horizontal Distance (ft) = 50.00
Source to Barrier Horizontal Distance (ft) = 2.00
Barrier to Receiver Horizontal Distance (ft) = 48.00
Source Height (ft) = 5.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 10.00
Distance Source to Receptor (ft) d = 50.00
Distance Source to Barrier top (ft) d1 = 5.39
Distance Barrier top to Receiver (ft) d2 = 48.26

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 51.746
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 25.873
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 12.937
Frequency (Hz) = 1000 Attenuation (db) = 20.0 Fresnel N = 6.468
Frequency (Hz) = 500 Attenuation (db) = 18.0 Fresnel N = 3.234
Frequency (Hz) = 250 Attenuation (db) = 15.1 Fresnel N = 1.617
Frequency (Hz) = 125 Attenuation (db) = 12.7 Fresnel N = 0.809
Frequency (Hz) = 63 Attenuation (db) = 10.6 Fresnel N = 0.404

HVAC Unit 2

Source to Receiver Horizontal Distance (ft) = 72.00
Source to Barrier Horizontal Distance (ft) = 5.00
Barrier to Receiver Horizontal Distance (ft) = 67.00
Source Height (ft) = 5.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 6.00
Distance Source to Receptor (ft) d = 72.00
Distance Source to Barrier top (ft) d1 = 5.10
Distance Barrier top to Receiver (ft) d2 = 67.01

Frequency (Hz) = 8000 Attenuation (db) = 14.8 Fresnel N = 1.512
Frequency (Hz) = 4000 Attenuation (db) = 12.5 Fresnel N = 0.756
Frequency (Hz) = 2000 Attenuation (db) = 10.5 Fresnel N = 0.378
Frequency (Hz) = 1000 Attenuation (db) = 8.8 Fresnel N = 0.189
Frequency (Hz) = 500 Attenuation (db) = 7.5 Fresnel N = 0.094
Frequency (Hz) = 250 Attenuation (db) = 6.4 Fresnel N = 0.047
Frequency (Hz) = 125 Attenuation (db) = 5.5 Fresnel N = 0.024
Frequency (Hz) = 63 Attenuation (db) = 5.0 Fresnel N = 0.012

Generator

-38 dB based on empirical data taken at a similar back-up generator system in Valley Center, CA in 2007.

Western Property Line

HVAC Unit 1

Source to Receiver Horizontal Distance (ft) = ~~60~~76.00
Source to Barrier Horizontal Distance (ft) = 5.00
Barrier to Receiver Horizontal Distance (ft) = ~~55~~71.00
Source Height (ft) = 5.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 6.00
Distance Source to Receptor (ft) d = ~~60~~76.00
Distance Source to Barrier top (ft) d1 = 5.10
Distance Barrier top to Receiver (ft) d2 = ~~55~~71.01

Frequency (Hz) = 8000 Attenuation (db) = 14.~~9~~8 Fresnel N = 1.~~535~~506
Frequency (Hz) = 4000 Attenuation (db) = 12.~~5~~4 Fresnel N = 0.~~767~~753
Frequency (Hz) = 2000 Attenuation (db) = 10.5 Fresnel N = 0.~~384~~376
Frequency (Hz) = 1000 Attenuation (db) = 8.8 Fresnel N = 0.~~192~~188
Frequency (Hz) = 500 Attenuation (db) = 7.5 Fresnel N = 0.~~096~~094
Frequency (Hz) = 250 Attenuation (db) = 6.~~5~~4 Fresnel N = 0.~~048~~047
Frequency (Hz) = 125 Attenuation (db) = 5.5 Fresnel N = 0.024
Frequency (Hz) = 63 Attenuation (db) = 5.0 Fresnel N = 0.012

HVAC Unit 2

Source to Receiver Horizontal Distance (ft) = 97.00
Source to Barrier Horizontal Distance (ft) = 2.00
Barrier to Receiver Horizontal Distance (ft) = 95.00
Source Height (ft) = 5.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 10.00
Distance Source to Receptor (ft) d = 97.00
Distance Source to Barrier top (ft) d1 = 5.39
Distance Barrier top to Receiver (ft) d2 = 95.13

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 49.926
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 24.963
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 12.481
Frequency (Hz) = 1000 Attenuation (db) = 20.0 Fresnel N = 6.241
Frequency (Hz) = 500 Attenuation (db) = 17.8 Fresnel N = 3.120
Frequency (Hz) = 250 Attenuation (db) = 14.9 Fresnel N = 1.560
Frequency (Hz) = 125 Attenuation (db) = 12.6 Fresnel N = 0.780
Frequency (Hz) = 63 Attenuation (db) = 10.6 Fresnel N = 0.390

Generator

-19 dB based on empirical data taken at a similar back-up generator system in Valley Center, CA in 2007.