HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942
619.462.1515 **tel**
619.462.0552 **fax**
www.**helixepi**.com

December 23, 2019

Mr. Eduardo Sida, MPH
Management Analyst
City of Perris Community Service Department
135 N. D Street
Perris, CA 92570

Subject: Enchanted Hills Park Project – Noise Analysis

Dear Mr. Sida:

HELIX Environmental Planning, Inc. (HELIX) has performed an analysis of noise and vibration impacts related to the construction, operation, and traffic associated with the proposed Enchanted Hills Park Project (project). This letter summarizes the methodology and results of the noise and vibration analysis.

ENVIRONMENTAL SETTING AND PROJECT DESCRIPTION

The project site is located in the western portion of the city of Perris, approximately 300 feet south of Motte Rimrock Reserve. The site is bordered by West Metz Road to the north, Weston Road to the south, and single-family residences to the west and east. Open space is located further to the north and east. The lot is approximately 22 acres in size and is owned by the City. Currently, the site is primarily undeveloped, with the exception of several trails, a bicycle motocross (BMX) course, and other manmade features.

The proposed project involves the construction of a park with a combination of passive and active recreational features. The park would include a multi-use sports field, child play area, toddler play area, restrooms, picnic shelters, hardscape, parking lots, bridges, trails, basketball courts, BMX course improvements, art rocks, splash play, a skating area, an adventure play, and a zip line (refer to Attachment A – Site Plan). The project would retain and incorporate some of the existing site features, including a painted boulder called Owl Rock and the existing BMX course.

FUNDAMENTALS OF NOISE AND VIBRATION

Noise

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration.

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver contribute to the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. A logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA units. The threshold of hearing for the human ear is approximately 0 dBA, which corresponds to 20 micro Pascals (mPa).

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions.

Vibration

Vibration is defined as any oscillatory motion induced in a structure or mechanical device as a direct result of some type of input excitation. Sources of ground-borne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or manufactured (explosions, trains, machinery, traffic, construction equipment, etc.). Vibration sources may be transient, steady-state (continuous), or pseudo steady-state. Examples of transient construction vibrations are those that occur from blasting with explosives, impact pile driving, demolition, and wrecking balls.

Ambient and source vibration information are expressed in terms of the peak particle velocity (PPV) in inches per second (in/sec). The root mean square (RMS) of a signal is the average of the squared amplitude of the signal in decibels (relative to 1 micro-in/sec). Because the net average of a vibration signal is zero, the RMS amplitude is used to describe the “smoothed” vibration amplitude. The RMS amplitude is always less than the PPV and is always positive. The RMS average is typically calculated over a one-second period.

The background vibration velocity level in residential areas is usually 50 vibration decibels (VdB) or lower; this is well below the level perceptible by humans, which is approximately 65 VdB. Most perceptible indoor vibration is caused by sources within buildings, such as the operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible ground borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

NOISE MODELING SOFTWARE

Modeling of the operational exterior noise environment for this report was accomplished using Computer Aided Noise Abatement (CadnaA) version 2019. CadnaA is a model-based computer program developed by *DataKustik* for predicting noise impacts in a wide variety of conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project-related information, such as noise source data, barriers, structures, and topography to create a detailed CadnaA model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. For the analysis presented herein, operational noise modeling conservatively did not include topographical or other noise attenuation features.

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

EXISTING SENSITIVE LAND USES

Noise sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise and generally include residences, hospitals, schools, hotels, resorts, libraries, sensitive wildlife habitat, or similar facilities where quiet is an important attribute of the environment. NSLUs in the project vicinity include the residential land uses located across West Metz Road to the north, across Weston Road to the south, and adjacent to the project boundaries on the east and west.

EXISTING NOISE SETTING

The proposed project site is in an area surrounded by residential and open space land uses, and existing noise levels are relatively low. Noise sources in the immediate vicinity of the project site include residential traffic from West Metz Road, Altura Drive, Weston Road, and Carter Drive, in addition to occasional overhead aircraft associated with Perris Valley Airport-L65, which is located 2.5 miles to the southeast, and March Air Reserve Base, which is located 5 miles to the north.

NOISE REGULATIONS

Construction Noise

The City's Municipal Code Chapter 7.34.060 (Construction noise) prohibits construction between the hours of 7:00 p.m. and 7:00 a.m. and on Sundays and legal holidays, with the exception of Columbus Day and Presidents' Day. Additionally, construction noise levels are limited to 80 dBA in residential zones in the City.

Operational Noise

The City's Municipal Code Chapter 7.34.050 (General prohibition) limits exterior noise levels at residential properties to a maximum noise level (L_{MAX}) of 80 dBA L_{MAX} from 7:01 a.m. to 10:00 p.m. and 60 dBA L_{MAX} from 10:01 p.m. to 7:00 a.m. A maximum noise level limit is not the most appropriate metric to use in the analysis for the project because operation of the park would generate noise levels that would continuously fluctuate over time. The noise level metric appropriate to use in this analysis is a time-averaged noise level (L_{EQ}). Therefore, this analysis incorporates residential land use noise

standards from the County of Riverside General Plan Noise Element, which utilize an L_{EQ} metric. These standards are shown in Table 1, *Stationary Source Residential Land Use Standards*.

Table 1
STATIONARY SOURCE RESIDENTIAL LAND USE STANDARDS

Time Period	Standard (dBA L_{EQ} [10 minute])	
	Interior	Exterior
10:00 p.m. to 7:00 a.m.	40	45
7:00 a.m. to 10:00 p.m.	55	65

Source: County of Riverside General Plan Noise Element, 2015

ANALYSIS AND IMPACTS

Construction Noise Levels

Construction of the proposed project is anticipated to involve rock clearing/breaking, grading, facilities construction, and paving. The magnitude of the impact would depend on the type of construction activity, equipment, duration of each construction phase, distance between the noise source and receiver, and intervening structures. Construction would generate elevated noise levels that may by audible at nearby residential uses in the vicinity of the project site.

Construction equipment would not all operate at the same time or location. Furthermore, construction equipment would not be in constant use during the 12-hour operating day. Table 2, *Construction Equipment Noise Levels*, provides the 50-foot distance noise levels for commonly used construction equipment.

Table 2
CONSTRUCTION EQUIPMENT NOISE LEVELS

Unit	Percent Operating Time	dBA L_{MAX} at 50 feet	dBA L_{EQ} at 50 feet
Backhoe	40	77.6	73.6
Breaker	20	90.3	80.3
Compactor	20	83.2	76.2
Compressor	40	77.7	73.7
Concrete Mixer Truck	40	78.8	74.8
Concrete Pump Truck	20	81.4	74.4
Dump Truck	50	76.5	72.5
Drum Mixer	40	80.0	77.0
Medium Excavator	40	78.0	74.0
Large Excavator	40	80.7	76.7
Front-End Loader	40	79.1	75.1
Grader	40	85.0	81.0
Paver	50	77.2	74.2
Roller	20	80.0	73.0

Source: USDOT 2008

It is anticipated that rock breaking and subsequent rock removal would be required for the proposed project to remove boulders from areas prior to grading. Rock breaking, if necessary, would likely be achieved via an excavator-mounted breaker. The use of this equipment would occur at variable locations across the site, based on the locations of individual rocks that need to be broken prior to removal. Because the exact locations of this activity are unknown, a setback distance is provided for planning purposes. Assuming a 10 percent hourly operating time, a breaker used within 50 feet of a residence would generate noise levels above 80 dBA.

Grading would be required throughout various portions of the site, including the locations of the proposed parking lots and multi-use field. A grader would be used and, due to its mobile nature, would operate at an average distance of approximately 200 feet from the nearest residences over the course of a workday. Assuming a 40 percent hourly operating time, a grader would generate a noise level of 69.0 dBA L_{EQ} at 200 feet.

Construction of the proposed facilities, including the play areas, restrooms, picnic shelters, and splash play, would occur at various locations throughout the site. A loader/backhoe would likely be used in construction for each of the listed facilities. The facility anticipated to require the use of a loader/backhoe that is closest to off-site residences is the picnic shelter in the northern portion of the site, which is located 190 from the residences to the north. Assuming a 40 percent hourly operating time, the use of a loader/backhoe would generate a noise level of 62.0 dBA L_{EQ} at 190 feet.

Paving would be required at the locations of the proposed parking lots. A roller and then a paver would likely be used and, due to their mobile nature, would operate at an average distance of approximately 200 feet from the nearest residences over the course of a workday. Assuming a 20 percent hourly operating time for a roller and a 50 percent hourly operating time for a paver, a roller would generate a noise level of 61.0 dBA L_{EQ} and a paver would generate a noise level of 62.2 dBA L_{EQ} at a distance of 200 feet.

The City's Municipal Code Chapter 7.34.060 prohibits construction between the hours of 7:00 p.m. and 7:00 a.m. and on Sundays and legal holidays, with the exception of Columbus Day and Presidents' Day. Additionally, construction noise levels are limited to 80 dBA in residential zones in the city. Project-related construction activities would only occur within the hours specified in the City's Municipal Code, and grading, construction, and paving activities would not exceed the 80-dBA limit in residential zones in the city. However, since rock breaking may occur within 50 feet of residences, the proposed project could result in a violation of the City's construction noise standard. Construction noise impacts would be potentially significant, and mitigation measure NOI-1, detailed below, would be required.

Construction Vibration

The primary source of vibration during project construction would be a vibratory roller (primarily used in areas that would be paved). Due to its mobile nature, the use of a vibratory roller during construction would occur at an average distance of 200 feet from the nearest off-site residential land uses. A vibratory roller creates approximately 0.21 in/sec PPV at a distance of 25 feet. At a distance of 200 feet, a vibratory roller would create a PPV of 0.02 in/sec[1]. This would be below the distinctly perceptible

[1] Equipment PPV = Reference PPV * $(25/D)^n$(in/sec), where Reference PPV is PPV at 25 feet, D is distance from equipment to the receptor in feet, and n= 1.1 (the value related to the attenuation rate through the ground); formula from Caltrans 2013.

vibration annoyance potential criteria of 0.04 in/sec PPV as provided in the California Department of Transportation's (Caltrans') Transportation and Construction Vibration Guidance Manual (Caltrans 2013) for continuous/frequent intermittent sources. Though vibration levels may be perceptible to people at nearby land uses, the levels would be low and would occur for short periods of time. As such, vibration impacts to humans would be less than significant.

Operational Noise Levels

The proposed project would include a variety of uses throughout the site that would produce noise. Generally, these uses would be associated with daytime recreation activities and would not generate high levels of noise. In addition, a substantial amount of noise generated on site would not be audible due to the large area of the site and distance from the noise sources to off-site receivers.

Of the project's various proposed park uses, the primary noise-generating uses would include the multi-use sports field, child play area, splash play, and basketball courts. Noise associated with these four uses are discussed in the following sections.

Multi-use Sports Field

The proposed multi-use sports field would be located in the northern half of the park. The field is anticipated to host both organized and unorganized sporting events. For organized sporting events, public address systems would not be used unless a permit is obtained from the City, and noise associated with public address systems is not analyzed herein. At its closest point, the field would be approximately 110 feet from the nearest residential property line to the west. For analysis purposes, however, the various noise sources, including players, coaches, referees, and cheering spectators, are assumed to be located at an average distance of 300 feet from the nearest property line because these noise sources would be located across the entire field area and not just at the portion closest to the residences.

For a previous project (HELIX 2019), HELIX conducted a site visit at a sports field to assess crowd noise levels from a sporting event similar to an event that may be held at the proposed multi-use field. No public address systems were in use at the fields during the site visit. Noise from spectators, coaches, and referees blowing whistles generated most of the noise. During a 15-minute measurement period when multiple matches were in play, a noise level of 61.2 dBA L_{EQ} (15-minute) was measured at a distance of 200 feet from the center of the crowd, which was estimated to consist of approximately 300 people.

Because the noise sources associated with the proposed multi-use sports field are anticipated to be located at an average distance of approximately 300 feet from the nearest property line, noise levels at the receivers can be assumed to be less than 61.2 dBA L_{EQ}, and would therefore be below the 65-dBA L_{EQ} daytime exterior noise level threshold used for this analysis. In addition, it is unlikely that the proposed multi-use sports field, as part of a neighborhood park, would host organized sporting events with as many as 300 people.

Child Play Area and Splash Play

The project proposes a child play area and a splash play in the southern half of the site, at distances of approximately 170 feet and 320 feet, respectively, from the nearest residential property lines. Both the child play area and splash play would accommodate playing children who would generate noise. While exact noise planning is not feasible for these two play areas due to a lack of specific numbers and utilization (e.g., what kind of games will be played, how many children will be participating), it is reasonably assumed for this analysis, based on the size of the child play area and splash play, as well as HELIX's experience with similar type projects (HELIX 2016), that 30 children would be present at both the child play area and splash play at a given time, resulting in 30 individually distributed noise sources at each location. Based on these assumptions, the child play area is estimated to generate a noise level of 49.3 dBA L_{EQ} at the site's southern property line (a distance of 170 feet) and the splash play is estimated to generate a noise level of 43.7 dBA L_{EQ} at the site's eastern property line (a distance of 320 feet). Noise levels from these two project components would be below the 65-dBA L_{EQ} daytime exterior noise level threshold used for this analysis.

Basketball Court

The project proposes two basketball courts, one in the center of the site and one near the northern end of the site. Noise from the court at the northern end of the site is analyzed herein, as this court is closer to a residential property line, at an approximate distance of 100 feet from the northern property line.

The sound of a basketball hitting the backboard of a basketball hoop would typically have a maximum noise level of less than 85 dBA at about 5 feet and a duration of less than 0.2 second. A single event of a ball hitting the backboard, averaged over the duration of an hour, would be approximately 42.4 dBA L_{EQ} at 5 feet, 22.4 dBA L_{EQ} at 50 feet, and 16.4 dBA L_{EQ} at 100 feet (HELIX 2017).

The number of backboard hits in a recreational basketball game would vary. A reasonable assumption is based on a professional basketball game, which averages approximately 180 shots attempted per the standard 48-minute game (Teamrankings.com 2019), which equates to approximately 225 shots per hour. Because recreational basketball games are generally less organized and faster-paced than professional basketball games, this analysis assumes 300 backboard hits per hour. With 300 backboard hits per hour, the proposed basketball court would generate a noise level of 41.8 dBA L_{EQ} at the project site's northern property line, which would be below the 65-dBA L_{EQ} daytime exterior noise level threshold used for this analysis.

Traffic Noise Levels

The project is estimated to generate 90 daily trips, with 19 trips during the peak hour, on weekdays and 450 daily trips, with 46 trips during the peak hour, on Saturdays (Urban Crossroads 2019). Due to the low levels of vehicular traffic, noise levels are not anticipated to substantially increase noise levels at residences along local roadways in the vicinity of the project site. In addition, because the project includes two entrances, one on each end of the park site, not all vehicular traffic would travel along the same roadways.

MITIGATION

The following mitigation measure would reduce construction noise impacts associated with rock breaking to a less-than-significant level:

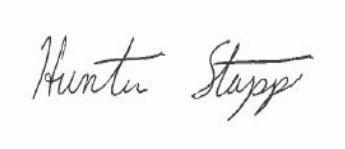
NOI-1 **Rock Breaking Restrictions.** Noise generated during construction activities, including rock breaking, shall not exceed 80 dBA L_{EQ} (one hour) at off-site residential properties. Since rock breaking within 50 feet of residential properties would exceed 80 dBA, no rock breaking within 50 feet of residential properties shall occur.

CONCLUSIONS

With implementation of mitigation measure NOI-1, impacts related to the proposed project's construction and operational noise would be less than significant.

We appreciate the opportunity to work with you on this project. Please let me know if you have any questions or require any further information.

Regards,



Hunter Stapp
Noise Analyst

Charles Terry
Principal Specialist
Noise, Acoustics & Vibration

Attachments:

Attachment A – Site Plan

REFERENCES

California Department of Transportation (Caltrans). 2013. Transportation and Construction Vibration Guidance Manual. September.

HELIX Environmental Planning, Inc. (HELIX). 2019. Acoustical Analysis Report for the 3Roots San Diego Project. June.

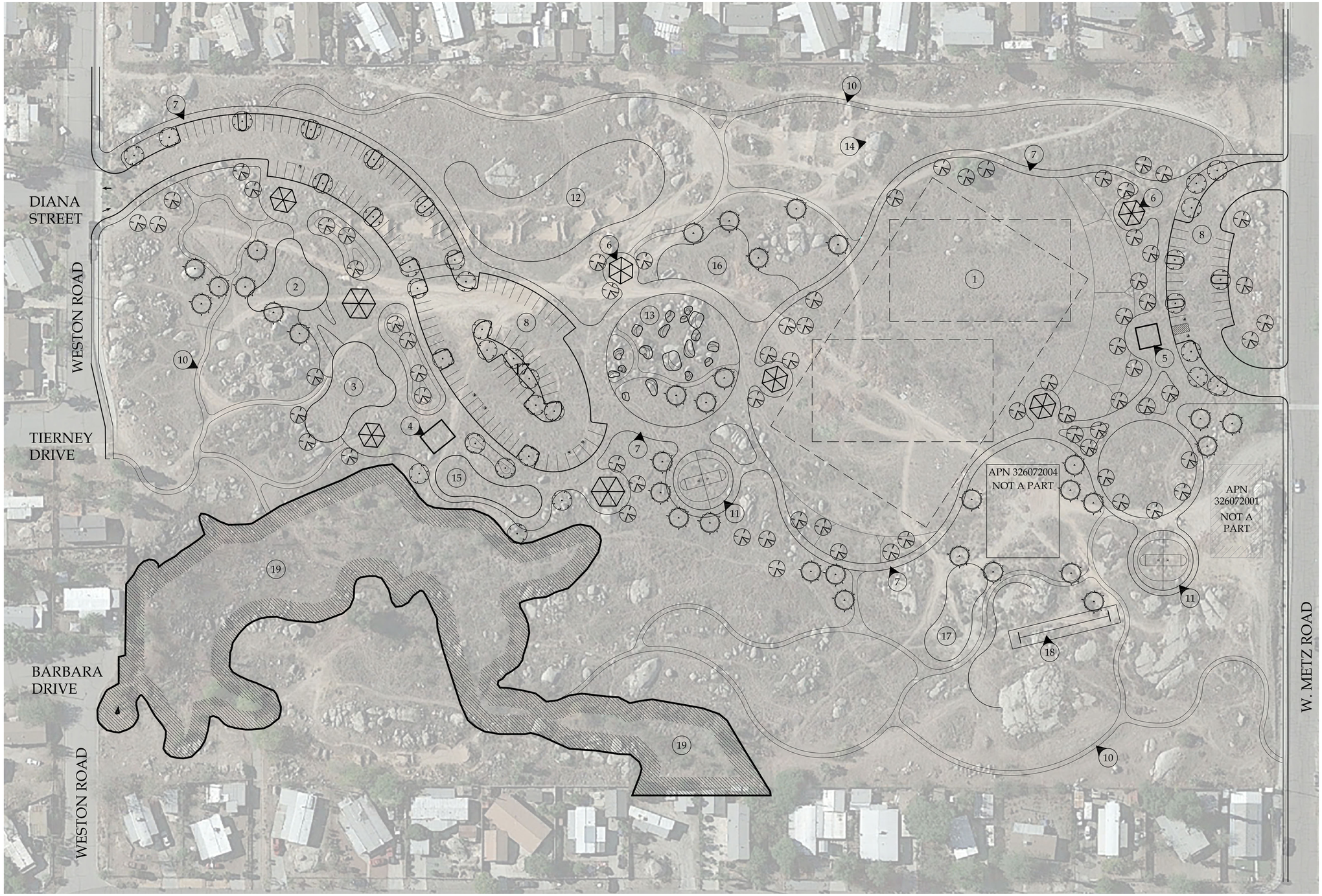
2017. Noise Technical Report for the La Colonia Skate Park Project. December.

2016. Acoustical Site Assessment Report for the Bub Williamson Park Project. July.

Teamrankings.com. 2019. NBA Team Field Goals Attempted per Game. Available from: https://www.teamrankings.com/nba/stat/field-goals-attempted-per-game.

Urban Crossroads. 2019. Enchanted Hills Park Focused Traffic Assessment. December 13.

U.S. Department of Transportation (USDOT). 2008. Roadway Construction Noise Model (RCNM).



LEGEND:

1. MULTI-USE FIELD
2. CHILD PLAY AREA
3. TOT PLAY AREA
4. LARGE RESTROOM BUILDING
5. SMALL RESTROOM BUILDING
6. PICNIC SHELTERS
7. HARDSCAPE
8. PARKING LOTS
9. BRIDGES
10. TRAILS
11. HALF-COURT BASKETBALL
12. BMX COURSE IMPROVEMENTS
13. ART ROCKS
14. PROTECT EXISTING OWL ROCK
15. SPLASH PLAY
16. SKATE SPOT
17. ADVENTURE PLAY
18. ZIP LINE
19. RIPARIAN/RIVERINE AREAS

ENCHANTED HILLS PARK

CITY OF PERRIS

NORTH

0' 50' 100' 200'

DATE: DECEMBER 3, 2019

COMMUNITY WORKS DESIGN GROUP