CO Architects

Scripps Mercy Hospital Campus

Noise Study Report

PTS Project No. 658545

Revision 6 | June 9, 2022

Job number 263118-05

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Document verification

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Job title	Scripps Mercy Hospital Campus			**Job number** 263118-05
Document title	Noise Study Report			**File reference**
Document ref	PTS Project No. 658545			

Revision	**Date**	**Filename**	20201009 Scripps Campus Noise Study Report.docx		
Draft 1	Oct 9, 2020	**Description**	First draft		
			Prepared by	Checked by	Approved by
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		Signature			
Draft 2	June 24, 2021	**Filename**	2021-06-15 Scripps Campus Noise Study Report_r2.docx		
		Description	Updates to Construction Noise and Vibration sections		
			Prepared by	Checked by	Approved by
		Name	Avi Bortnick	Chris Pollock	
		Signature			
Final	June 09, 2022	**Filename**			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document verification with document	✓

Contents

1 Introduction

1.1 Executive Summary

The existing Scripps Mercy Hospital is a safety net and acute care facility operating a level-one trauma center serving approximately 2500 patients annually. The proposed Scripps Mercy Hospital Campus project would include several replacements for existing buildings as well as newly constructed facilities at the existing Scripps Mercy campus, in order to meet State seismic building codes and abide by California's Office of Statewide Health Planning and Development (OSHPD) requirements that must be met under current law by January 1, 2030. The existing campus and planned end-state design are shown in Figure 1 below. This report presents the analysis of the acoustic impact associated with the proposed Scripps Mercy Hospital Campus project and compliance with relevant noise standards. Impact is determined based on the City of San Diego General Plan Noise Element, local municipal code, and California Environmental Quality Act (CEQA) requirements, and the City's CEQA Significance Determination Thresholds.

A summary of acoustic impacts is as follows:

- Building systems (e.g. Heating and Ventilation systems, generators) would be designed to incorporate sufficient sound attenuation measures to keep radiated levels below city required limits, therefore there is no significant impact and no mitigation would be required.
- Project-related traffic changes would have a significant unmitigated impact at residential locations along Fourth Avenue between Lewis St. and Arbor Dr.
- Changes to helicopter flight paths and heliport operations would not result in significantly adverse impact to noise sensitive land uses (NSLU) near the hospital. No mitigation would be required.
- Vibration due to construction activity would not result in significant impacts to nearby receiver locations.
- Construction noise could exceed City of San Diego Municipal Code limits at nearby noise sensitive land use (NSLU) receiver locations, which would be considered a significant noise impact associated with construction. Implementation of mitigation measures would be required to meet City standards and reduce impacts to below a level of significance. These measures would apply to receiver locations both outside the property line, as well as within the existing campus (e.g. the Scripps Chapel).

The current noise environment is dominated by traffic noise. Current Community Noise Equivalent Levels (CNELs) range from 61 to 69 CNEL at hospital façade locations, and 71 to 74 CNEL at medical office and hospital support building façade locations. Projected future CNELs at building facades are not expected to exceed “conditionally compatible” levels indicated in the San Diego General Plan. Standard façade window systems may not achieve the acoustic performance required to attenuate traffic noise such that indoor noise levels do not exceed limits set forth in the General Plan (45 CNEL for the hospital and 50 CNEL for medical office and support buildings). Façade systems with higher sound transmission coefficients (STCs) would be incorporated into the design of the buildings exposed to over 70 CNEL in order to meet the general plan requirement. There is no significant impact and no mitigation is required.

The traffic noise increase due to the project is expected to be less than significant (< 3 dBA increase) at all modeled locations, except along Fourth Avenue near Lewis Street, which is expected to increase from the current 73.7 CNEL to 77 CNEL. This is a significant impact. Tables NE-5 and NE-6 of the San Diego General Plan Noise Element outline a number of typical noise attenuation methods (see Table 3 and Table 4). There is, however, no feasible City procedure to ensure that increased traffic noise affecting existing NSLUs outside the project boundary is sufficiently attenuated to meet City standards. Therefore, operational noise impacts due to increased traffic volumes on Fourth Avenue remain significant and unmitigated.

Planned changes to helicopter flight paths for the new campus would keep helicopters farther away from nearby NSLUs. The change would not increase CNELs attributable to helicopter noise at NSLUs impacted most by helicopters traveling to the project site (along Washington and across Mercy Canyon). This therefore does not present a significant noise impact to nearby NSLUs. The new heliport can accommodate larger helicopters but use by these larger craft would be expected to be extremely rare (a worst-case estimate of once every 20 days was used for noise analysis). The new flight paths and visits by larger helicopters would not significantly change current CNELs, however, the individual noise event resulting from larger helicopter visits may result in Sound Exposure Level (SEL) increases of approximately 2 dBA compared to current helicopter visits; given the minimal increase in CNEL, this would not present a significant impact.

Building systems equipment selections have not been finalized in the design. Sound attenuation methods such as acoustic louvers, ducted silencers, and barrier walls are currently included in the design to ensure radiated noise does not exceed noise ordinance limits at the property lines. The project would therefore be conditioned (as described in the project’s Acoustic Basis of Design documentation) such that noise impact is below a level of significance; no mitigation is required beyond what would be accounted for in the design.

The noise control measures, as described in this report, would be made a condition of project approval to meet the city ordinance construction threshold of 75 dBA L_{eq} at the closest NSLUs during all construction phases of the project. A qualified acoustic consultant would be engaged, as required, to ensure the noise control measures are implemented specific to the construction plan; as a result, no significant construction noise impacts would be expected.

1.2 Noise Scales and Descriptors

This noise study references acoustics metrics and descriptors that align with those used in applicable regulatory standards (summarized in Section 1.5). A summary of the noise-specific terms used in this report is included below.

From the San Diego General Plan Noise element:

Noise is usually measured in ***decibels (dB)****, because of the great dynamic range of the human ear. Decibels (dB) are based on a logarithmic scale that compresses the wide range in sound pressure levels to a more usable range of numbers. People judge a sound that is 10 dB higher than another sound as being twice as loud; and 20 dB higher four times as loud; and so forth.*

A-weighted decibels (dBA) *measured on a sound level meter use the A-weighted filter, which de-emphasizes the very low, and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear. The A-weighted filter adjusts the scale or "fine-tunes" it for hearing by humans. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud).*

Community Noise Equivalent Level (CNEL) *is the predominant noise rating scale used in California for land use compatibility. The CNEL rating represents the average of equivalent noise levels at a location for a 24-hour period, based on an A-weighted decibel with upward adjustments added to account for increased noise sensitivity in the evening and night periods in order to account for the lower tolerance of individuals to noise during those periods. All noise levels used in the Noise Element are dBA CNEL, unless otherwise indicated. Urban areas typically have a higher ambient noise level, which is the composite of noise from all normal background noise sources at a given location. Single event noises such as an aircraft flyover can affect the background noise level. Single-Event Noise Exposure Level (SENEL) or Sound Exposure Level (SEL) is a rating scale used to measure single event noises. The SENEL measures the duration between the initial and final times for which the sound level of the single event exceeded the background noise level. It takes into account the maximum noise level (LMax) and the duration of the event.*

Noise Sensitive Land Uses (NSLU) and Sensitive Receptors include, but are not limited to residential uses, hospitals, nursing facilities, intermediate care facilities, child educational facilities, libraries, museums, places of worship, childcare facilities, and certain types of passive recreational parks and open space. CEQA and the San Diego General Plan establish noise significance thresholds specific to proposed project uses and/or zoning. In this report, NSLU and Sensitive Receptor refer to representative noise receiver locations to establish compliance with relevant regulations and standards.

1.3 Project Location

The Scripps Mercy Hospital Campus project involves demolition of existing buildings and construction of new medical offices and hospital buildings at the Scripps Mercy Hospital Campus in the Uptown community of the City of San Diego. The project site is located on approximately 21.07 acres generally at 4077 Fifth Avenue and is currently developed with the Scripps Mercy Hospital campus buildings, surface and structured parking, internal streets and driveways, and landscaping. The project site is situated north of Washington Street, east of Fourth Avenue, east and west of Sixth Avenue, and south of existing development that is located along Arbor Drive. Regional access to the site is provided by State Route 163 (SR 163), immediately east of the project site. Local access to the site is via Washington Street, Fifth Avenue, Lewis Street, and Fourth Avenue.

There are sensitive receptors both within the campus (the hospital spaces, the Chapel, etc.) and at locations neighboring the project site. Section 4.4 of this report includes predicted estimated sound levels due to demolition and construction activities noise at nearby properties as compared to the City's Municipal Code *Sec. 59.5.0404* noise limits. It should be noted that the project site and all adjacent and surrounding areas are commercially zoned (CC). However, there are multi-family residential developments adjacent to the project site and within the commercial zoned area that are regarded as sensitive receptors.

1.4 Project Description

The project involves a Conditional Use Permit (CUP) to amend existing CUP No. 304755, Site Development Permit (SDP) to amend existing SDP No. 531932 and due to exceeding the Community Plan building height limit of 65 feet in the Community Plan Implementation Overlay Zone (CPIOZ), a Planned Development Permit (PDP), Public Service Vacations, and a Tentative Map for demolition and construction on the Scripps Mercy Hospital Campus site. Demolition would include the Facility Building, Generator Building and Cooling Tower, Behavioral Health Clinic, Hospital Building, 550 Washington Building, 550 Washington Parking Structure, Mercy Manor, Parking Lot 4.1, and Emergency Department. The completed Cancer Center and associated parking structure, would remain, as well as the College Building, Mercy Gardens, the Chapel, Central Energy Plant, and Parking Lot 12. A new parking structure (6th Avenue Parking Structure and Bridge) has been approved and is being constructed at the surface parking located on the east side of Sixth Avenue separately and in advance of major construction efforts of the project. While this parking structure is part of the existing CUP for the hospital campus; its construction has been previously approved under SCR No. 531932. Construction for the project would include Hospital I (16 stories, 625,960 square feet), Hospital II (16 stories, 380,000 square feet), Hospital

Support Building (three stories with three levels of parking below ground, 65,000 square feet), Medical Office Building I (six stories with one basement level, 170,000 square feet), Medical Office Building II (nine stories with five levels of below ground parking, 300,000 square feet), and Central Energy Plant Expansion and two Utility Yards.

The project would also involve Public Service Vacations. Storm water easements would be vacated where storm water facilities have been/would be moved and/or new storm water facilities constructed. A portion of Sixth Avenue would be vacated along the westerly side of the street, and four street easements would be vacated on the east side of Sixth Avenue. Additionally, existing San Diego Gas and Electric (SDG&E) facilities (including electricity and natural gas lines) would be relocated and easement quit claimed.

The site is zoned CC-3-8, CC-3-9, OR-1-1, RM-3-9, OC-1-1, Transit Overlay Zone, and Community Plan Implementation Overlay Zone. The project site is located in the Medical Complex Neighborhood of the Uptown Community Plan and is designated Institutional, Community Commercial: 0-109 Dwelling Units / Acre, and Open Space. The site is designated Institutional & Public and Semi-Public Facilities, Multiple Use, and Parks, Recreation, and Open Space in the San Diego General Plan.

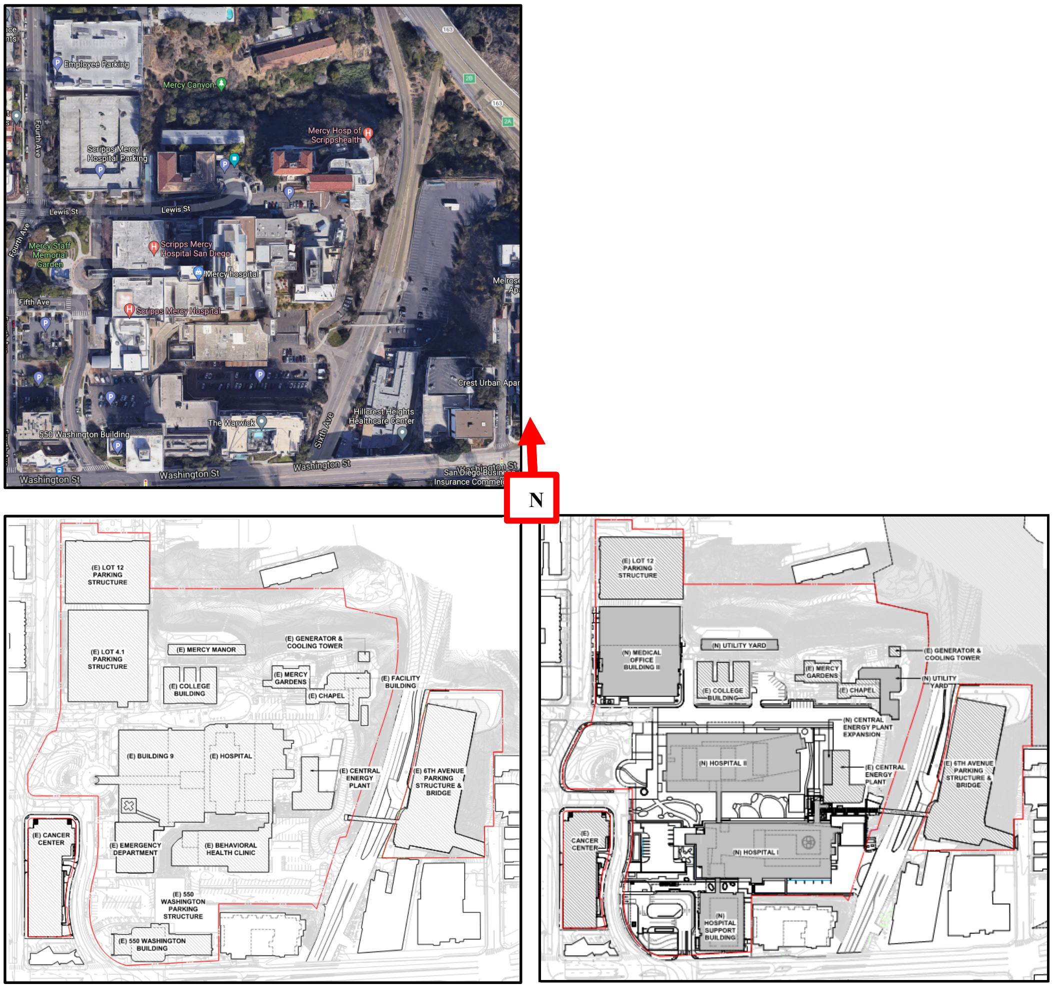


Figure 1 – (a) (top) Satellite map of existing site, (b) (bottom left) site plan of existing campus, (c) (bottom right) site plan of planned end state

1.5 Applicable Standards

The following regulatory limits apply to the project:

1.5.1 City of San Diego Municipal Code, Chapter 5, Article 9.5, Division 4, §59.5.0404, Construction Noise

The San Diego Municipal Code Sec. 59.5.0404 specifies allowable hours of construction and limits on noise from construction activities. The code section contains the following main points:

- No construction activities between 7 pm and 7 am
- No construction activities on Sunday
- No construction activities on major holidays, except for Columbus Day and Washington's birthday
- Construction noise cannot cause an average sound level in excess of 75 decibels[1] at a property boundary between 7 am and 7 pm.
- Exemptions may be granted via a permit issued by the Noise Abatement and Control Administrator, if for instance, noise would be less objectionable at night

The full code section is reproduced below:

(a) *It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington's Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions,*

[1] More specifically, 75 dB(A) L_{eq}

working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.

(b) Except as provided in subsection (c) hereof, it shall be unlawful for any person, including the City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

(c) The provisions of subsection (b) of this section shall not apply to construction equipment used in connection with emergency work, provided the Administrator is notified within 48 hours after commencement of work.

1.5.2 City of San Diego Municipal Code, Chapter 5, Article 9.5, Division 4, §59.5.0401, Sound Level Limits

The San Diego Municipal Code outlines general limits that would apply to building system noise radiated from the property to neighboring properties. Excerpts from the code are below:

(a) It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit given in the following table [Table 1], at any location in the City on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person.

(b) The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts. Permissible construction noise level limits shall be governed by Section 59.5.0404 of this article.

Land Use	Time of Day	One-Hour Average Sound Level (decibels)
1. Single Family Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45 40
2. Multi-Family Residential (Up to a maximum density of 1/2000)	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50 45
3. All other Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55 50
4. Commercial	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	65 60 60
5. Industrial or Agricultural	any time	75

Table 1 – San Diego Municipal Code §59.5.0401 table of applicable limits

1.5.3 City of San Diego General Plan Noise Element

The City General Plan Noise Element (2015) establishes noise compatibility guidelines for uses affected by traffic noise, as shown in Table 2.

Land Use Category	**Exterior Noise Exposure (dBA CNEL)**				
	< 60	**60 – 65**	**65 – 70**	**70 – 75**	**75 <**
Open Spaces and Parks and Recreational					
Parks, Active and Passive Recreation					
Outdoor Spectator Sports, Golf Courses; Water Recreational Facilities; Indoor Recreation Facilities					
Agricultural					
Crop Raising & Farming; Community Gardens, Aquaculture, Dairies; Horticulture Nurseries & Greenhouses; Animal Raising, Maintain & Keeping; Commercial Stables					
Residential					
Single Dwelling Units; Mobile Homes		**45**			
Multiple Dwelling Units **For uses affected by aircraft noise, refer to Policies NE-D.2. & NE-D.3.*		**45**	**45***		
Institutional					
Hospitals; Nursing Facilities; Intermediate Care Facilities; Kindergarten through Grade 12 Educational Facilities; Libraries; Museums; Child Care Facilities		**45**			
Other Educational Facilities including Vocational/Trade Schools and Colleges and Universities		**45**	**45**		
Cemeteries					
Retail Sales					
Building Supplies/Equipment; Food, Beverages & Groceries; Pets & Pet Supplies; Pharmaceutical, & Convenience Sales; Wearing Apparel & Accessories			**50**	**50**	
Commercial Services					
Building Services; Business Support; Eating & Drinking; Financial Institutions; Maintenance & Repair; Personal Services; Assembly & Entertainment (includes public and religious assembly); Radio & Television Studios; Golf Course Support			**50**	**50**	
Visitor Accommodations		**45**	**45**	**45**	
Offices					
Business & Professional; Government; Medical, Dental & Health Practitioner; Regional & Corporate Headquarters			**50**	**50**	
Vehicle and Vehicular Equipment Sales and Services Use					
Commercial or Personal Vehicle Repair & Maintenance; Commercial or Personal Vehicle Sales & Rentals; Vehicle Equipment & Supplies Sales & Rentals; Vehicle Parking					
Wholesale, Distribution, Storage Use Category					
Equipment & Materials Storage Yards; Moving & Storage Facilities; Warehouse; Wholesale Distribution					
Industrial					

Land Use Category	Exterior Noise Exposure (dBA CNEL)				
	< 60	60 – 65	65 – 70	70 – 75	75 <
Heavy Manufacturing; Light Manufacturing; Marine Industry; Trucking & Transportation Terminals; Mining & Extractive Industries					
Research & Development				50	

	Compatible	Indoor Uses	Standard construction methods should attenuate exterior noise to an acceptable indoor noise level. Refer to Section I.
		Outdoor Uses	Activities associated with the land use may be carried out.
45, 50	Conditionally Compatible	Indoor Uses	Building structure must attenuate exterior noise to the indoor noise level indicated by the number (45 or 50) for occupied areas. Refer to Section I.
		Outdoor Uses	Feasible noise mitigation techniques should be analyzed and incorporated to make the outdoor activities acceptable. Refer to Section I.
	Incompatible	Indoor Uses	New construction should not be undertaken.
		Outdoor Uses	Severe noise interference makes outdoor activities unacceptable.

Table 2 – San Diego General Plan Land Use Noise Compatibility Guidelines

Tables NE-5 and NE-6 from the Noise Element provide potential noise mitigation methods for reducing noise.

Noise Level Reduction	Typical Mitigation Methods
15-20 dBA	*Mitigation 1, 2, and 3* 1. Air conditioning or mechanical ventilation. 2. Double-paned glass. 3. Solid core doors with weather stripping and seals.
20-25 dBA	*Mitigation 1, 2, and 3 plus* 4. Stucco or brick veneer exterior walls or wood siding w/one-half inch thick fiberboard underlayer. 5. Glass portions of windows/doors not to exceed 20 percent. 6. Exterior vents facing noise source shall be baffled.
25-30 dBA	*Mitigation 1 through 6 plus* 7. Interior sheetrock of exterior wall attached to studs by resilient channels or double walls. 8. Window assemblies, doors, wall construction materials, and insulation shall have a lab-tested STC rating of 30 or greater.

Table 3 – San Diego General Plan Noise Element *Table NE-5 Typical Noise Attenuation Methods to Insulate the Noise Receiver*

Reducing the Source Noise*
Traffic Noise
Traffic Calming/Traffic Management Techniques
Low-Noise Road Pavement Surfaces
Commercial and Industrial Noise
Sound insulation of buildings, for walls, windows, doors, opening, ventilations etc.
Screens and Enclosures
Silencers, attenuators, or mufflers in connection with rotating machinery and ducts/pipes leading to and from building
Limiting of noise-producing operations
*Interrupted the Noise Path**
Landscaped Berms
Natural Land Forms
Noise-Compatible Structures/Buildings
Landscaping/Vegetation
Walls
*Separating the Noise Source**
Provide distance buffer between the noise source and the noise-sensitive use
Locate noise-compatible uses such as vehicle parking, open spaces, or commercial uses between the noise source and the noise-sensitive areas
Insulate the Noise Receiver
Refer to Table NE-5

*These methods are not applicable for aircraft noise

Table 4 – San Diego General Plan Noise Element *Table NE-6 Potential Noise Attenuation Methods*

1.5.4 California Environmental Quality Act

San Diego's environmental review process is established by the California Environmental Quality Act (CEQA). Provisions relating to "Temporary Construction Noise" are in alignment with and reference Section 59.5.0404 of the Municipal Code.

Traffic noise significance thresholds from the 2016 CEQA Significance Determination Thresholds are outlined in Table 5 below.

Structure or Proposed Use that would be impacted by Traffic Noise	Interior Space	Exterior Useable Space [22]	General Indication of Potential Significance
Single-family detached	45 dB	65 Db	Structure or outdoor useable area[23] is < 50 feet from the center of the closest (outside) lane on a street with existing or future ADTs > 7500 [24]
Multi-family, schools, libraries, hospitals, day care, hotels, motels, parks, convalescent homes.	- Development Services Department (DSD) ensures 45 dB pursuant to Title 24	65 dB	
Offices, Churches, Business, Professional Uses	n/a	70 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 20,000
Commercial, Retail, Industrial, Outdoor Spectator Sports Uses	n/a	75 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 40,000

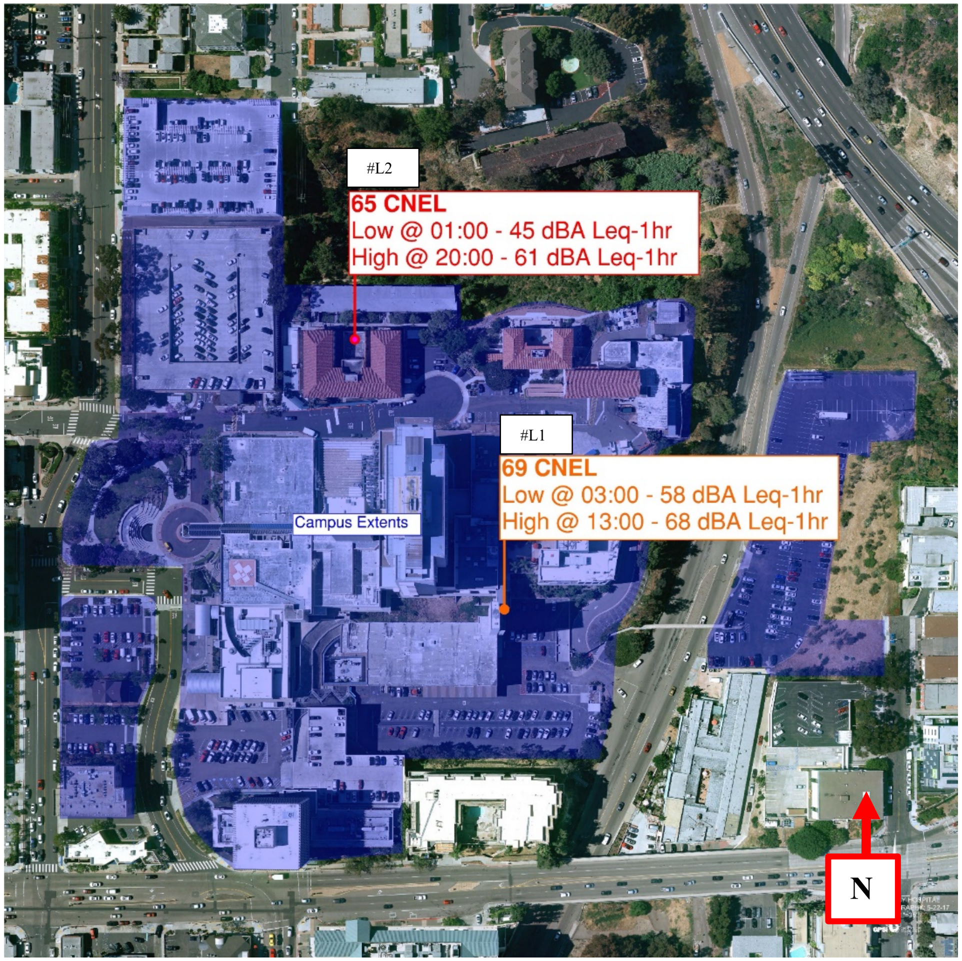
Table 5 - 2016 CEQA Significance Determination Thresholds

2 Environmental Setting

2.1 Existing Noise Environment

2.1.1 Measured Levels

Arup conducted two noise surveys at Scripps Mercy campus to document existing ambient noise levels. 24-hour measurements were taken at the north and south sides of the Scripps Mercy campus. For these measurements the noise monitors were placed at the Building 7 Balcony on October 8-9, 2018, and the College Building lower roof on February 6-7, 2019. The measurement locations and summary results are provided in Figure 2 below. In addition to the long-term measurements, 15-minute spot measurements were taken at locations around the perimeter of the campus as shown in Figure 3. Traffic was the dominant noise source at all measurement locations.



Location No.	Location description	Measured Noise Level, dBA		
		CNEL	High $L_{eq\text{-}1hr}$	Low $L_{eq\text{-}1hr}$
L1	Building 7 Balcony facing Sixth Ave	69.0	68	58
L2	College Building Lower Roof	64.7	61	45

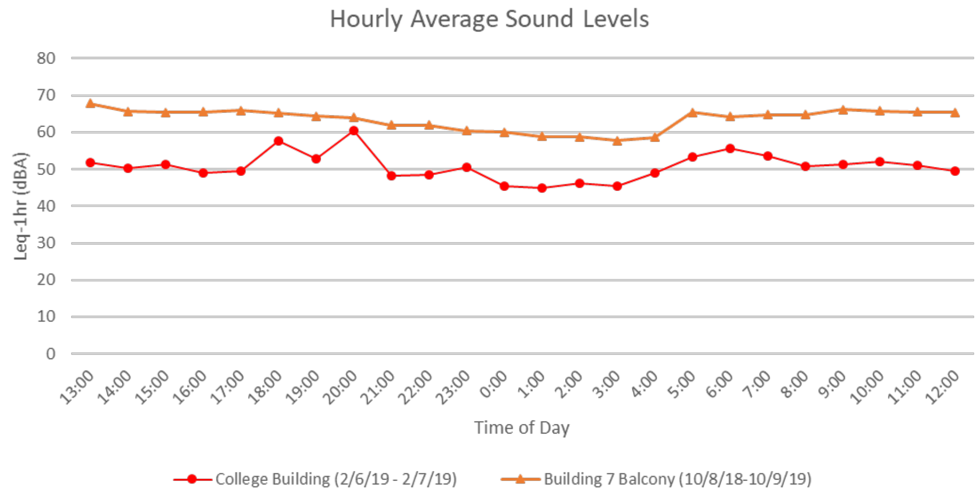
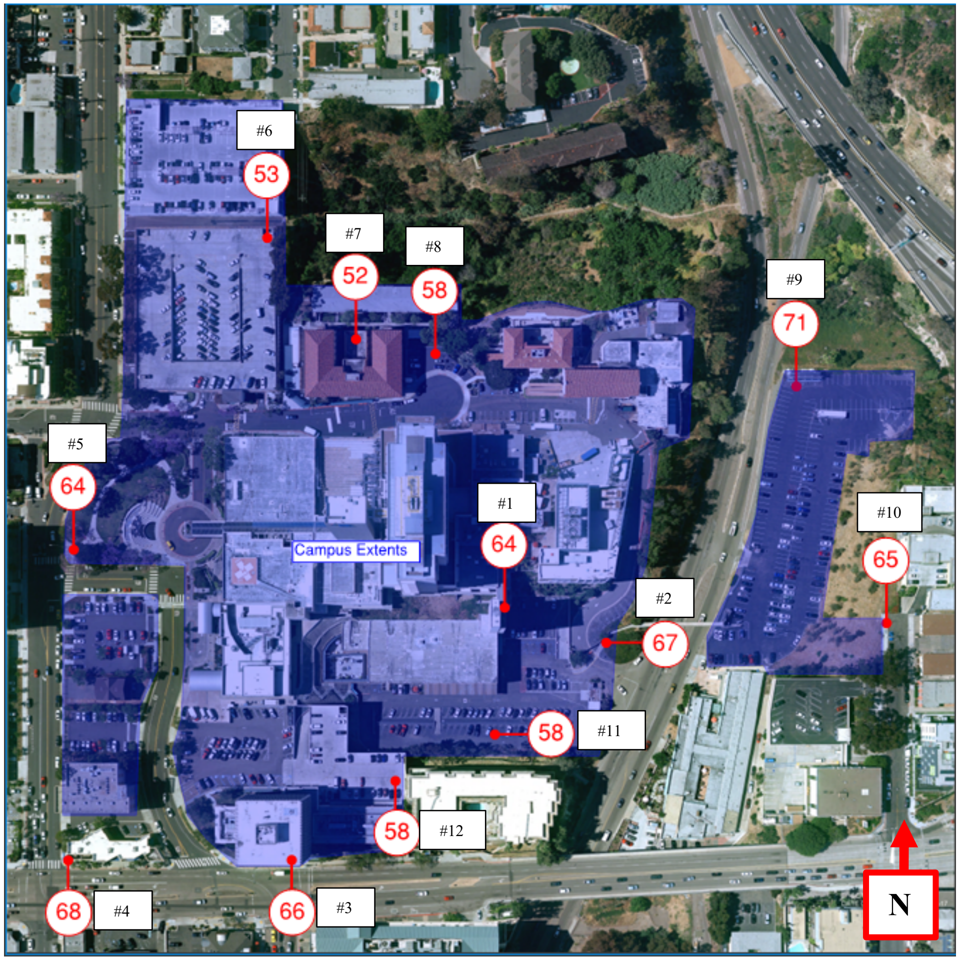


Figure 2 – (a) (left) 24-hour ambient noise measurement locations, CNEL results, high/low $L_{eq\ 1\text{-}hour}$ and 7am to 7pm and $L_{eq\ 12\text{-}hour}$ (b) (right) $L_{eq\ 1\text{-}hour}$ graphed against time of day for each long term measurement location. The shaded blue areas in the satellite image indicate the extent of the existing Scripps Mercy Hospital campus.



Location No.	Location description	Measured Noise Level, dBA $L_{eq,\ 15min}$
1	Building 7 Balcony facing Sixth Ave	64
2	Walking Pathway ~70’ from Sixth Ave	67
3	550 MOB Roof facing Washington St	66
4	NE Corner of Washington and Fourth	68
5	NE Corner of Fourth and Fifth	64
6	Roof of Visitor Parking Structure	53
7	Roof of College Building	52
8	Parking lot east of College Building	58
9	Parking lot east of Sixth Ave	71
10	End of 8th ave	65
11	Parking lot south of BHU	58
12	MOB parking lot	58

Figure 3 –Short term $L_{eq,\ 15\text{-min}}$ measurements. The shaded blue areas in the satellite image indicate the extent of the existing Scripps Mercy Hospital campus.

2.1.2 Current Traffic Noise

Acoustic modeling software *SoundPlan 8.2* was used to calculate traffic noise using TNM 2.5 methodology at fifteen different receiver locations in and around the Scripps Mercy Campus. Models were generated for the following scenarios: Existing, Project, and Forecast (2035) + Project.

The fifteen representative receiver locations are shown in Figure 4. The receiver locations were modeled at an elevation of 5ft above the ground level.

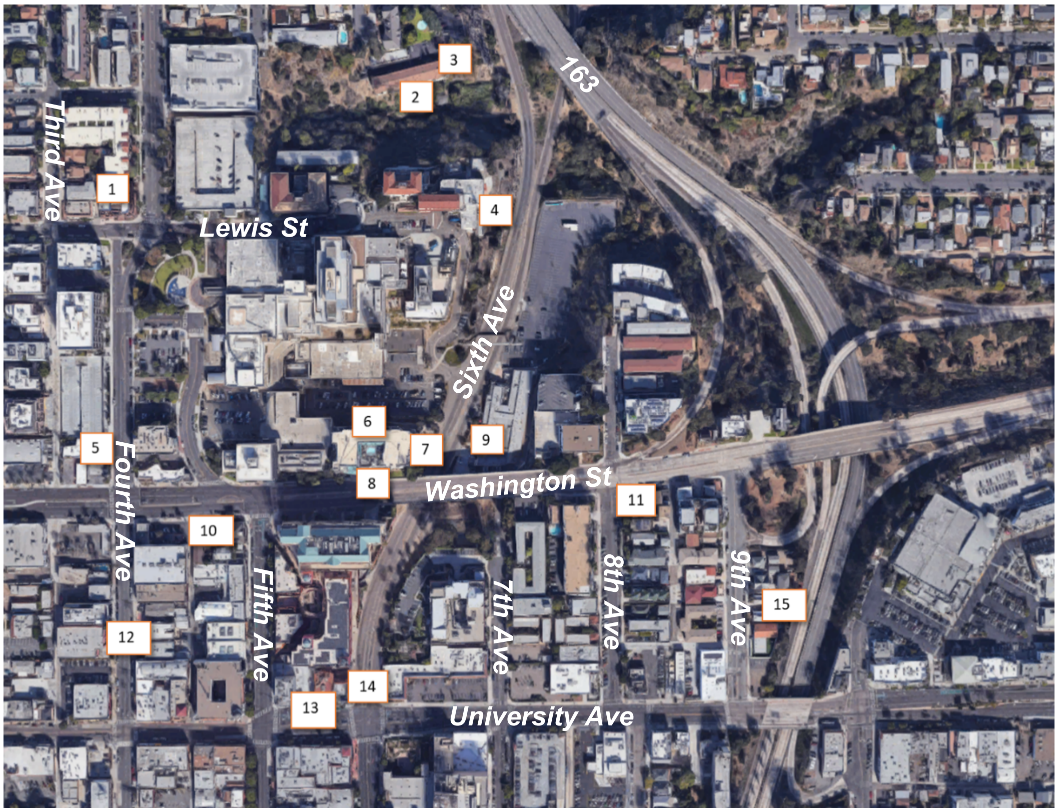


Figure 4 – Traffic and helicopter noise modeling receiver locations

CNEL results from the existing conditions traffic model at the representative receiver locations are presented in Table 6. The table includes AM and PM Peak calculated $L_{eq\text{-}1hr}$ levels as well. Noise contour maps are included in APPENDIX A.

	Existing		
Receiver Location	AM Peak	PM Peak	CNEL
	L_{eq},1hr	L_{eq},1hr	
1	71.5	69.1	73.7
2	60	60.2	62.1
3	62.2	62.4	64.4
4	65.6	65.9	68.1
5	68.5	69.5	72.0
6	57.4	58.1	60.5
7	66.3	67	69.5
8	68.3	69.1	71.0
9	68.8	69.3	72.0
10	77.4	78.1	80.4
11	67.7	69.3	72.1
12	67.3	68.1	71.0
13	72.9	73.7	76.4
14	72.8	73.8	76.5
15	77	77.3	79.5

Table 6 – Existing vehicular traffic AM Peak, PM Peak, and CNEL results from SoundPlan model.

The modeled existing noise environment was compared to results from the measurement noise survey. For the measured locations, the model is within a 3 dB margin and therefore considered a baseline scenario.

2.1.3 Helicopter Noise

The existing Scripps Mercy rooftop heliport was designed to accommodate helicopters up to and including Airbus H145 models (formerly Eurocopter EC145), with an overall length of 42 ft and a maximum gross takeoff weight of 9,000 lbs.

Noise data for the Sikorsky S-76 was used as a benchmark for the largest helicopter / loudest source levels at the Scripps Mercy Heliport. Extensive noise data for the Sikorsky S-76 is available for hover and idle flight scenarios. The Sikorsky S-76 is 52 ft and has a 11,700 lbs. takeoff weight. This helicopter data was used as a conservative representation, since it slightly exceeds the current and usual helicopter variants used for medical emergencies in size and weight.

The helicopter sound data for the hover and idle flight stages is summarized below in Table 7. APPENDIX B includes a detailed description of the helicopter sound data.

	Sikorsky S-76 Sound Power Levels (dB ref 10^{-12} Watts)									
	A-weighted average	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
Hover	125.6	127.6	128.2	136.3	129.0	116.6	118.0	115.4	110.7	103.6
Flight	114.2	121.2	116.9	127.2	117.2	101.3	102.4	101.1	100.2	96.3

Table 7 – Sikorsky S-76 Sound Power Levels per U.S. Department of Transportation, Federal Aviation Administration (2017) Aviation Environmental Design Tool (AEDT)

For the assessment, the worst-case scenario of a hot offload, where a 5-minute approach is followed by a 10-minute offload on the flight deck with the helicopter running and a 5-minute departure was used.

This assessment is provided for the current flight paths (south-west and north-east). The results are given for the two worst case representative receiver locations, which is the apartment complex on the southside of the campus and the residences north of the valley. These receivers are represented by locations on the top floors of receiver locations 2, 3, 6, 7 and 8. Results are presented in Table 8.

Receiver	Existing Flightpath (NE) $L_{Aeq,1hr}$	Existing Flightpath (SW) $L_{Aeq,1hr}$	Existing (Traffic only) CNEL
2	65.1	61.9	62.1
3	59.3	53.3	64.4
6	47.3	63.9	60.5
7	47.3	49.0	69.5
8	44.3	54.1	71.0

Table 8 – Modeled existing helicopter noise vs existing traffic noise.

Corrections for possible tonal nuisance are not included in this assessment, as these can vary per helicopter type.

Selection of these units to account for noise levels, as well as sound attenuation measures would be part of the ongoing design to comply with local and state noise level requirements.

3 Methodology and Equipment

3.1 Field Measurements

The following equipment was used to measure existing noise levels at the project site:

- Brüel & Kjær Type 2250 Sound Level Meter / Analyzer
- Brüel & Kjær Type 4231 Calibrator
- Rion NL-52 Sound Level Meter
- Rion NC-74 Sound Calibrator
- Tripods for both Sound Level Meters
- BP-21A Battery Pack

Both meters were field calibrated shortly prior to commencing measurements on each visit. The Brüel & Kjær (B&K) meter was deployed on a tripod at an elevation of approximately 5’ to capture 15-minute L_{eq} measurements at locations indicated in Figure 2. The Rion was deployed on a tripod at an elevation of approximately 5’ to capture 48-hour long term measurements at the locations and associated dates indicated in Figure 3. The Rion was plugged into the BP-21A battery pack to allow uninterrupted measuring for the full 48-hour period.

Both meters and calibrators conform to American National Standards Institute (ANSI) specifications for sound level meters (ANSI SI.4-1983 R2001) and have been traceably maintained and calibrated with the National Bureau of Standards.

3.2 Traffic Noise Modeling

Acoustic modeling software *SoundPlan 8.2* was used to calculate traffic noise per TNM 2.5. Fifteen different representative receiver locations were chosen around the Scripps Mercy Health Center to represent the range of different traffic and building conditions. AM and PM peak L_{eq} levels are calculated for the forecast 2035 traffic including project contributions. CNELs are calculated for strictly project-related traffic, as well as project traffic combined with forecast changes in traffic for 2035.

The local mobility analysis by the traffic consultant (Linscott, Law & Greenspan) provides the existing traffic volumes and expected volumes for Phase 1 (Year 2030, Opening Year) and Phase II (Year 2035, Project Buildout), with and without the proposed project included in the traffic noise analysis. The local mobility analysis provided ADT volumes for the main street segments and AM/PM Peak Hour Volumes for all relevant intersections as shown in Table 9.

	ADT		
Roadway Segment	**Existing**	**Project**	**Phase II (2035) + Project**
SR 163			
North of 6th Ave	162,000	1,830	208,630
6th Ave – Robinson Ave	130,000	1,070	205,870
South of Robinson Ave	109,000	970	139,470
4th Avenue			
Montecito Wy – Lewis St	7,282	15,600	28,450
Lewis St – 5th Ave	17,890	14,680	27,180
5th Ave – Washington St	14,385	11,110	24,290
Washington St – University Ave	9,018	810	10,844
5th Avenue			
Washington St – University Ave	12,203	810	12,394
Washington St			
4th Ave – 5th Ave	35,970	1,500	39,196
5th Ave – 8th Ave	34,928	1,680	42,712
8th Ave – Richmond St	41,904	1,020	44,440
University Ave			
4th Ave – 5th Ave	17,072	560	22,055
5th Ave – 6th Ave	23,070	1,120	25,630

Table 9 – Average Daily Traffic (ADT) provided by traffic consultant.

These ADTs and a distribution analysis were used in SoundPlan modeling software to generate CNEL contours and relevant noise data for the fifteen receiver locations. APPENDIX B includes modeling assumptions and run parameters.

3.3 Helicopter Noise Modeling

A “hot offload” was used for our analysis, where a 5-minute approach is followed by a 10-minute offload on the flight deck with the helicopter running, and then a 5-minute departure.

Helicopter noise is represented by the 1-hour equivalent noise level ($L_{Aeq,1hr}$) and the effect it has on the overall CNEL.

The “hot offload” was modelled by treating the entire flight path as a point source at the most critical locations of that flightpath. This point source was represented in a SoundPlan model of the campus and surrounding area. For the approach and departure, the ‘idle flight’ noise data is utilized. For the offload on the helipad, the ‘hover’ noise data is utilized. In summary, the following combination of sources, corrected for their duration, represented the different flightpaths:

- Existing Flightpath South-West

  Flightpath South-West (5 minutes) + Offload on helipad (10 minutes) + Flightpath South-West (5 minutes)

- Proposed Future Flightpath -East

Flightpath East (5 minutes) + Offload on helipad (10 minutes) + Flightpath East (5 minutes)

- Proposed Future Flightpath South-West

  Flightpath South-West (5 minutes) + Offload on helipad (10 minutes) + Flightpath South-West (5 minutes)

- Proposed Future Flightpath South-West

  Flightpath South-West (5 minutes) + Offload on helipad (10 minutes) + Flightpath South-West (5 minutes)

Flightpath information was provided by the helipad planning consultant, *Heliplanners* and is represented in Figure 5 below. The full flight path information is included in APPENDIX C

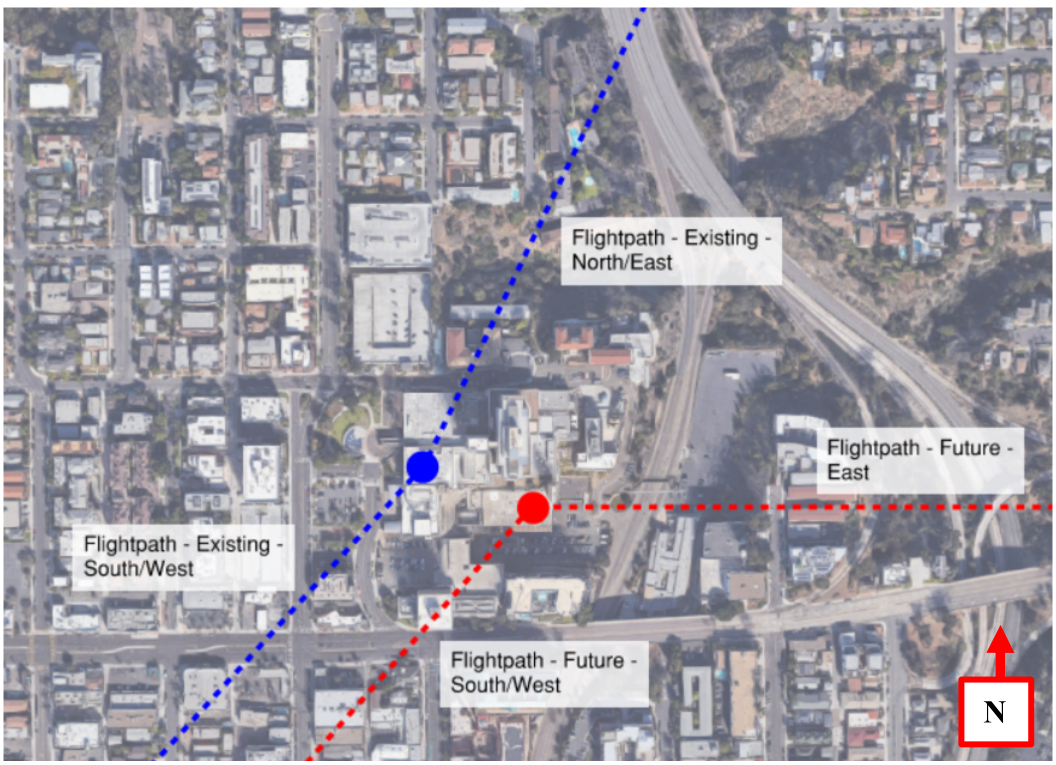


Figure 5 – Most critical positions for current and planned flightpaths for helicopters landing at the Scripps Mercy campus.

3.4 Building Systems Noise

Final equipment selections, locations, and source sound power levels for the planned project were not available. Based on preliminary designs for the project, a worst case building systems noise case was identified between the planned Hospital Level 2 (L2) mechanical floor and "The Warwick" apartment complex located approximately 100’ away. The preliminary design included sound power limits for the air handler unit (AHU) air intake as described in Table 10 below. Attenuation levels for typical acoustic louvers are provided in Table 11 below.

	Limiting Octave Band Sound Power Levels (dB re10^{-12}W)							
	63 Hz	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
AHU	95	95	95	95	95	95	91	87

Table 10 – Preliminary Hospital Level 2 air handler intake limiting levels

	Octave Band Insertion Loss (dB)							
	63 Hz	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
Acoustic Louver	10	13	15	19	22	23	24	24

Table 11 – Octave band insertion loss (sound attenuation) levels for typical acoustic louver product (6” *Kinetics KCAL-2*)

An estimated worst case resulting sound pressure level at the neighboring apartment can be calculated by subtracting the acoustic louver insertion loss values from the limiting sound power levels, performing a point source sound propagation calculation for the assumed distance, and calculating an A-weighted average of the resulting octave band levels.

$$L_p = L_w - 20\,log_{10}(r) - 11 + DI - I_l$$

where:

L_p = maximum octave band sound pressure level at receptor

L_w = limiting octave band sound power level for a single air handler

r = distance between the acoustic louver face and apartment receptor

DI = directivity correction

I_l = octave band insertion Loss of Louver

Adding 6dB to this resulting level would account for the four total air handlers.

3.5 Construction Noise

To evaluate the noise impact from construction, the identified equipment scheduled for use during each construction and demolition phase was considered, sound emission levels from available data sources for each equipment type was gathered.

Table 12 lists expected site equipment for all construction phases and their corresponding estimated maximum sound levels at a distance of 50 feet. The anticipated equipment types have been provided by Layton Construction (the project Contractor), and the sound emission levels are based on the Federal Highway Administration (FHWA) Construction Noise Handbook. Equipment sound levels not contained in the FHWA list were found in other sources, as noted. Extremely quiet equipment has been omitted from the calculations (i.e. equipment for which levels are expected to be inaudible at 50' compared to typical ambient levels).

Anticipated construction equipment types, quantities, and uses were provided by the Contractor, however, construction projects are dynamic in nature and exact workflows, timing and location for the operations of equipment cannot be programmed at this stage, so estimates and assumptions are used. Reasonable assumptions have been made to approximate equipment locations and durations of use based on the equipment type and typical duty cycles. Supplementary construction noise calculations are included in APPENDIX D.

Equipment	Source Noise Level (dBA) at 50 feet (L_{max}))
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Mobile Crane	83
Loader	85
Truck	88
Grader	85
Piles (Drilled)*	81
Excavator	81
Generator	81
Welding Machine**	60
Impact Wrench	85
Jack Hammer	88
Pneumatic Tool	85
Saw	76
Forklift***	68

Table 12 - Site construction equipment and respective noise levels

*Similar to an excavator
**Based on OSHA dosimeter data
***Based on The Measurement of Sound Levels in Construction

3.6 Construction Vibration

3.6.1 Vibration Impact Criteria

Peak particle velocity (PPV) is a measure of vibration magnitude commonly used to characterize ground-borne vibration from construction equipment.

Ground-borne vibration can transmit through building structure and can potentially be felt by occupants (distinct from audible noise). In more extreme cases, ground-borne vibration can cause damage to buildings.

There are no requirements in the City of San Diego Municipal Code specific to construction vibration impact.

Assessment for potential of building damage and human annoyance is based on guidelines in the Caltrans Transportation and Construction Vibration Guidance Manual[3] (chapter 7.3), summarized in Table 13 and Table 14 below. For the purposes of this assessment, "Distinctly perceptible" vibrations (0.25 inches/sec for transient sources or 0.10 inches/sec for continuous/frequent intermittent sources) are used as the the threshold of acceptability for construction projects near sensitive receiver locations.

Structure and Condition	**Maximum PPV (inches/sec)**	
	Transient Sources	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Table 13 – Vibration Damage Potential Threshold Criteria. Source: Transportation and Construction Vibration Guidance Manual (Caltrans, April 2020)

Human Response	**Maximum PPV (inches/sec)**	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Table 14 – Vibration Annoyance Potential Criteria. Source: Transportation and Construction Vibration Guidance Manual (Caltrans, April 2020)

Note that some individuals may be annoyed at barely perceptible levels of vibration, depending on the activities in which they are participating.

In the tables above, 'Transient Sources' are meant to apply to single, isolated events such as blasting and ball drops. 'Continuous/Frequent Intermittent Sources' refer to most other construction activities, and characteristic of the activity / equipment types planned for the Scripps Mercy Hospital Project.

3.6.2 Vibration Prediction Methodology

Ground-borne vibration due to construction activity is predicted as follows:

1. Construction equipment is tabulated in Table 15, along with typical ground-borne vibration for each equipment type at a 25-foot reference distance (§3.6.3).
2. For each construction phase, the highest ground-borne construction vibration amplitude of all equipment used in that phase is identified for use in predicting a typical worst-case ground-borne construction vibration at each receiver location (§3.6.3).
3. For each receiver and each construction phase, the highest vibration velocity (PPV) is tabulated and compared with the vibration impact criteria in Tables 13 and 14 (see §4.5).

3.6.3 Source Vibration

Typical ground-borne vibration velocity levels (PPV) for each type of construction equipment are based on data in the Federal Transit Administration *Transit Noise and Vibration Impact Assessment Manual*[4] (FTA). The list of construction equipment used for each construction phase was provided by Layton Construction.

	Equipment in use by Construction Phase												**Reference Vibration Velocity**		
Equipment	4.1 Parking Demo	MOB II Const.	BHU Demo.	550 Demo.	MRH & HSB Const.	Ed Demo Ambul.	Existing Hosp Demo		Mercy Manor	CEP Expansion	Fac. And Gen Demo	Hosp II Const.	PPV @ 25ft (inches /sec)	reference	reference definition
Air Compressor	•	•	•	•	•		•		•	•	•	•	-		
Backhoe	•	•	•	•	•	•	•		•	•	•	•	0.089	FTA	Small bulldozer
Compactor		•			•	•				•		•	0.21	FTA	Vibratory Roller
Concrete Mixer		•			•	•				•		•	0.076	FTA	Loaded trucks
Concrete Pump		•			•	•				•		•	0.076	FTA	Loaded trucks
Concrete Vibrator		•			•	•				•		•	-		
Mobile Crane		•	•	•	•	•	•		•	•	•	•	0.008	Wiss 1981	Crane idling
Loader	•		•	•	•	•	•		•	•	•	•	0.089	FTA	Large bulldozer
Truck	•	•	•	•	•	•	•		•	•	•	•	0.076	FTA	Loaded trucks
Grader					•	•				•		•	0.089	FTA	Large bulldozer
Piles (Drilled)		•	•		•	•			•	•	•	•	0.089	FTA	Caisson drilling
Excavator	•	•	•	•	•	•	•		•	•	•	•	0.089	FTA	Large bulldozer
Generator					•					•			-		
Welding Machine		•	•		•	•			•	•	•	•	-		
Impact Wrench		•			•					•		•	-		
Jack Hammer	•		•	•			•		•		•		0.035	FTA	
Pneumatic Tool		•	•		•				•	•	•	•	-		
Saw	•	•	•	•	•		•		•	•	•	•	-		
Forklift		•			•	•				•		•	0.076	FTA	Loaded trucks
Max vibration of single piece of equipment used in phase (PPV@25ft in inches/sec)	.089	0.21	.089	.089	0.21	0.21	.089	0.21	.089	0.21	.089	0.21			

Table 15 – Planned equipment (from Layton Construction) by construction phase, with typical ground-borne peak particle velocities (PPV) @ 25ft distance.

Per Layton Construction, piles will be limited to drilled piles; no impact or vibratory piling is planned. Drilled piles result in dramatically less vibration than impact or vibratory piling. No blasting activity is planned. Impact piling and blasting typically produce the most significant vibration of all construction activities.

3.6.4 Vibration Predictions at Receiver Sites

Ground-borne vibration at receiver sites for each piece of equipment is predicted using the following propagation model[3,4]

$$PPV_{Equipment} = PPV_{Ref}(25/D)^n$$

where:

$PPV_{Equipment}$ = predicted peak particle velocity in inches per second adjusted for distance to receiver

D = distance from equipment to receiver in feet

$PPV_{Equipment}$ = typical ground-borne peak particle velocity due to the equipment at reference distance 25 feet from the equipment

n = propagation constant set to 1.1 per Caltrans guidance (this represents a more conservative attenuation with distance than the FTA general recommendation of $n = 1.5$).

The vibration transmitted to building floors of a receiver property will be different than the ground-borne vibration in soil at the site. Building foundation coupling loss, propagation loss through structures (typically resulting in less ground-borne vibration at upper floors of multistory buildings), and structural amplification are not factored into the predictions, but can affect the occupant perception of vibration.

A summary of the anticipated construction related vibration levels is provided in section 4.5.1 below.

3.7 Other Formulas and Calculations

3.7.1 Façade Break-In Calculations

In determining the potential indoor impact of building systems noise, the following façade break-in calculation was used.

The outdoor sound pressure level is the incident level at the facade (i.e. with NO facade correction).

The direct component is calculated by:

$$L_{p,dir,In} = L_{p,ext} + TL + 10\log_{10}(S) + \Delta L_{dist} + 10\log_{10}(\cos\beta) + 10\log_{10}(\cos\phi)$$

where:

$L_{p,ext}$	=	external sound pressure level incident on the façade
TL	=	transmission loss of the partition (negative sign convention)
S	=	surface area of the façade
ΔL_{dist}	=	distance correction for direct sound radiation from the facade, calculated using distance correction
β	=	angle of view of the incident source (by default 0 degrees for a point source)
ϕ	=	angle of elevation of the incident sound wave (by default 0 degrees for normal incidence)

The effect of the $10\log_{10}(\cos\beta) + 10\log_{10}(\cos\phi)$ terms is to decrease the noise break-in to account for grazing incidence of sound onto the façade.

Default/typical values of 180 degrees for angle of view (β) and 37 degrees for angle of elevation (ϕ), corresponding to an upper-floor receiver at a typical 21' setback from the road edge were used.

For these values, $10\log_{10}(\cos\beta) = -2$ and $10\log_{10}(\cos\phi) = -1$ resulting in an overall reduction of -3 dB relative to normal-incidence from a point source.

4 Future Noise and Potential Impact

4.1 Traffic Noise

4.1.1 Future and Project-Generated Traffic Noise

In addition to modeling the existing traffic noise, SoundPlan 8.2 was used to calculate traffic noise resulting from the project, as well as traffic forecasts for the year 2035. The results are presented below in Table 16. AM and PM peak L_{eq} levels are provided for the forecast 2035 traffic including project contributions. CNELs are calculated for strictly project-related traffic, as well as project traffic combined with forecast changes in traffic for 2035.

	Project	**Forecast 2035 + Project**		
Receiver	**CNEL**	**AM Peak**	**PM Peak**	**CNEL**
		L_{eq},1hr	L_{eq},1hr	
1	74.1	72.6	74.5	77.0
2	46.0	61.1	60.8	63.4
3	49.0	63.3	63.0	65.7
4	54.7	66.7	66.5	69.2
5	67.4	70.3	72.2	73.3
6	47.1	58.4	59.0	61.2
7	54.6	67.2	67.8	70.0
8	57.1	68.9	70.2	71.7
9	58.4	69.7	69.8	72.4
10	67.6	78.1	79.5	81.1
11	59.0	69.5	71.8	73.6
12	62.6	68.3	70.5	72.0
13	62.8	74.1	75.0	77.3
14	61.7	73.8	74.5	77.0
15	58.7	79.1	78.6	81.4

Table 16 – Traffic noise model predicted CNEL results due to project-related traffic and the summed noise results for traffic noise due to the project and forecast 2035 traffic.

4.1.2 Traffic Noise Impact

As shown in Table 17, forecast noise levels would exceed the existing condition. For these receivers, the resulting increase in CNEL level is related to the increase in general traffic volumes. For most receivers, the increase is small and would not be noticeable. The project-related increase in traffic results in a significant impact at receiver location 1 at the portion of Fourth Ave north of the campus. The ADT for Fourth Avenue north of the Campus increases from 7,282 to 28,450, including the 15,600 additional daily traffic for the project.

	Existing	**Project**	**Forecast 2035 + Project**	**CNEL Increase**	**Significant impact?**
Receiver	**CNEL**	**CNEL**	**CNEL**	**dB**	
1	73.7	74.1	77.0	3.3	YES
2	62.1	46.0	63.4	1.3	NO
3	64.4	49.0	65.7	1.3	NO
4	68.1	54.7	69.2	1.1	NO
5	72.0	67.4	73.3	1.3	NO
6	60.5	47.1	61.2	0.7	NO
7	69.5	54.6	70.0	0.5	NO
8	71.0	57.1	71.7	0.7	NO
9	72.0	58.4	72.4	0.4	NO
10	80.4	67.6	81.1	0.7	NO
11	72.1	59.0	73.6	1.5	NO
12	71.0	62.6	72.0	1.0	NO
13	76.4	62.8	77.3	0.9	NO
14	76.5	61.7	77.0	0.5	NO
15	79.5	58.7	81.4	1.9	NO

Table 17 – Existing traffic noise vs calculated project-related traffic noise vs total forecast 2035 noise (including project contributions).

Expected future CNELs at building facades are not expected to exceed “conditionally compatible” levels indicated in the San Diego General Plan. Sound insulating façade constructions would need to be incorporated into the building envelope designs to attenuate exterior noise to indoor noise levels below limits set forth in the general plan (45 CNEL for the Hospital and 50 CNEL for medical office and support buildings).

The traffic noise increase due to the project is expected to be insignificant (< 3 dBA increase) at all modeled locations except along Fourth Avenue, which is expected to increase from the current 73.7 CNEL to 77.0 CNEL. Table 3 and Table 4 summarize the San Diego General Plan recommended sound attenuation methods. These approaches, however, would need to be applied outside the extents of the project boundaries, and are therefore not feasible within the scope of this project. There is no standard procedure to ensure that increased traffic noise outside the project bounds affecting existing NSLUs outside the project bounds is sufficiently attenuated to meet City standards. There are therefore no feasible mitigation measures to reduce traffic noise impact to a less than significant level.

4.2 Helicopter Noise

4.2.1 Future Helicopter Noise

The future heliport would be designed to accommodate helicopters up to and including Sikorsky UH-60 Black Hawk type helicopters and variants, with an overall length of 65 feet and max gross takeoff weight of 22,000 lbs. The helicopter planning consultant (Heliplanners) has indicated that a majority of the helicopters using the Scripps Mercy Hospital heliport would, however, continue to be the same ~42 foot long / 9,000 lb models (e.g. Airbus H145). Large UH-60 and similar helicopters would be used for no more than 5% of helicopter visits to the Scripps Mercy Hospital heliport; they would only be used when emergency responders or firefighters are injured in the line of duty, during mass casualty events, or for training flights. The approach, landing, and departure of these larger helicopters would result in an approximate 2 dBA increase in Sound Exposure Levels (SELs) for the total event.

Flights per day to the future heliport would not be expected to increase compared to the current operations; the emergency department bed capacity would not be increasing and therefore helicopter flights to the hospital would not be expected to significantly increase.

The following analysis is provided for the current flight paths (south-west and north-east) and two future flight paths (south-west and east). The results are given for the two nearest sensitive receivers, being “The Warwick” apartments on the southside of the campus and the residences north of Mercy Canyon. These receivers are represented by modeled locations at the top floor of receiver locations 2, 3, 6, 7 and 8 (shown in Figure 4).

Receiver	Existing Flightpath (NE) $L_{Aeq,1hr}$	Existing Flightpath (SW) $L_{Aeq,1hr}$	Existing (Traffic only) CNEL	Existing (Traffic + Flightpath) CNEL	Future Flightpath (East) $L_{Aeq,1h}$	Future Flightpath (South-west) 1hr $L_{Aeq,1h}$	Forecast 2035 + Project CNEL
2	65.1	61.9	62.1	62.4	59.2	50.9	63.4
3	59.3	53.3	64.4	64.5	55.1	44.7	65.7
6	47.3	63.9	60.5	60.9	65.0	69.0	61.2
7	47.3	49.0	69.5	69.5	64.5	57.9	70.0
8	44.3	54.1	71.0	71.0	54.2	58.8	71.7

Table 18 – Predicted CNEL and LAeq-1hr results for Helicopter flight paths vs current and future traffic noise at representative receiver locations.

Corrections for possible tonal nuisance are not included in this assessment since these can vary per helicopter type.

4.2.2 Helicopter Noise Impact

Planned changes to helicopter flight paths for the new campus are expected to result in less than a 2 dB increase in CNELs at NSLUs impacted most by helicopters traveling to the campus (see Table 18). Per the City of San Diego Significance Determination Thresholds (2016), this does not present a significant noise impact to nearby NSLUs.

Larger, louder helicopter visits will be infrequent (~once every 20 days) and would not significantly impact CNELs, however, the individual noise event resulting from larger helicopter visits would result in Sound Exposure Level (SEL) increases of approximately 2 dBA compared to current helicopter visits; while this would be considered a noticeable difference, this does not constitute a significant impact.

4.3 Building Systems Noise

The new campus buildings would include a range of building systems units including air handlers, exhaust fans, cooling towers, condensers, emergency generators, etc. Many of these units would be located at building rooftops as well as at the Hospital L2 mechanical floor. Final equipment selections and noise data are not available at this time, though the design documents “limiting levels” for Hospital air handlers is provided in Table 10.

Building systems would be designed to incorporate acoustic louvers, ducted silencers, and barrier walls to ensure radiated noise does not exceed noise ordinance limits at the property lines or result in significant noise impacts at existing buildings on the Scripps campus. These sound attenuation measures would be specified based on building systems manufacturer-provided sound power levels, architectural elements, and relative distances between equipment and NSLUs.

The nearest anticipated NSLU at the property line is “The Warwick” apartment complex at the south side of the campus. The Hospital L2 mechanical floor intake louvers would be approximately 100’ away from the nearest apartment. If acoustic louvers are implemented, the noise level at the nearest apartment complex resulting from the four preliminary planned L2 air handlers would not exceed 48dBA; this does not exceed the San Diego Municipal Code commercial zone limit of 60dBA. If producing a level of 48dBA constantly over a 24-hour period, the maximum resulting community noise equivalent level would be 55 CNEL, which is below the City’s significance threshold of 65 CNEL. This would not result in a significant impact.

This nearest location would be expected to be the worst case condition for building system noise impacting NSLUs. Appropriate acoustic calculations would be performed based on the final design to confirm noise levels from project buildings would not exceed city noise ordinance, significance thresholds, or limits at project buildings. No significant impacts would result.

4.4 Construction Noise Impact by Phase

Table 19 summarizes predicted average sound levels at nearby receiver locations that would result from construction noise. Four representative receiver locations were selected based on proximity (highest potential noise impact) to the construction and demolition work. A fifth residential location was assessed for the following phases: Parking Lot 4.1 Demolition, MOB II Construction, Behavioral Health Building Demolition, 550 Washington Building Demolition, Hospital I and Hospital Support Building Construction, Emergency Department Demolition, Existing Hospital Demolition, , Mercy Manor Demolition, Central Energy Plant Expansion, Facility and Generator Building Demolition, and Hospital II Construction.

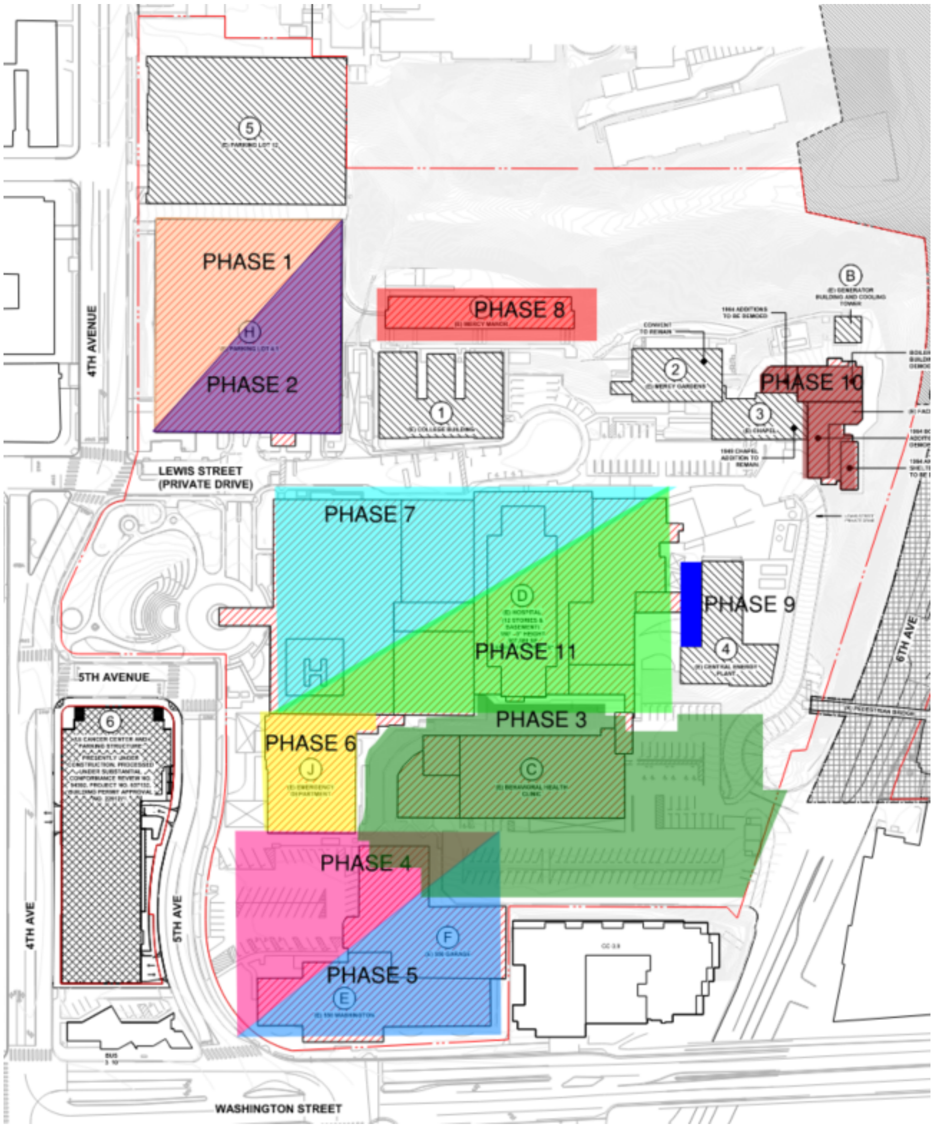
As shown in Table 15, noise levels would exceed City of San Diego Municipal Code during several phases resulting in a significant noise impact associated with construction. Most exceedances occur during demolition phases. In order to meet City standards and reduce impacts to below a level of significance, mitigation measures (presented in Section 4.4.14) would be required. Specific implementation of these noise control measures, with planning and oversight by a qualified acoustic consultant, would reduce construction noise impacts to below a level of significance.

The sections below analyze the expected demolition and construction noise for each phase of the project. The noise impacts are assessed in two ways:

- Calculating the *maximum* anticipated sound level for each piece of equipment at four receiver locations closest to the project site based on the distance between work activity source location and receiver locations.
- Calculating the *average sound level over the duration of the various construction phases* during the hours of allowable construction (7 am to 7 pm, excluding Sundays and major holidays) to determine compliance with San Diego Municipal Code and CEQA. This calculation factors in both equipment quantities and percent of use time over the construction phase.
- The zones of the various demolition and construction phases analyzed in the following sections are indicated in the color-coded overlay on the site plan shown in Figure 6.
- Noise control measures to be applied to demolition and construction activities are summarized in section 4.4.14 below.

Phase	Receiver Location	L_{eq} for Phase (dBA)
Parking Lot 4.1 Demolition	1	73
	2	69
	3	67
	4	69
	5	**81**[1]
MOB II Construction	1	65
	2	61
	3	59
	4	61
	5	73
BHU Building Demolition	1	71
	2	**83**[1]
	3	72
	4	71
550 Washington Demolition	1	66
	2	**80**[1]
	3	75
	4	73
Hospital I HSB Construction	1	69
	2	**81**[1]
	3	70
	4	69
Emergency Department Demolition	1	72
	2	**80**[1]
	3	**76**[1]
	4	**77**[1]
Existing Hospital Demolition	1	71
	2	75
	3	70
	4	72
Mercy Manor Demolition	**1**	**80**[1]
	2	69
	3	66
	4	67
	5	74
Central Energy Plant Expansion	1	68
	2	70
	3	62
	4	62
Facility and Generator Building Demolition	**1**	**77**
	2	72
	3	67
	4	67
Hospital II Construction	1	66
	2	67
	3	64
	4	66
[1] Predicted average noise level would require implementation of measures presented in Section 4.4.14 to meet city standards.		

Table 19 – Predicted average noise levels (12-hour L_{eq}) at receiver locations due to construction noise without implementing noise control measures. Leq is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.



Phase		Construction Phasing	Date
1		Parking Lot 4.1 Demolition	Nov 2022 - Mar 2023
2		MOB II Construction	Apr 2023 – Dec 2024
3		Behavioral Health Building Demolition	Oct 2023 – Mar 2024
4		550 Washington Building Demolition	Jan 2025 – Jul 2025
5		Hospital I and Hospital Support Building Construction	Apr 2024 – Mar 2028
6		Emergency Department Demolition	Mar 2029 - Oct 2029
7		Existing Hospital Demolition	Mar 2029 – April 2030
8		Mercy Manor Demolition	2030
9		Central Energy Plant Expansion	2031-2032
10		Facility and Generator Building Demolition	2033
11		Hospital II Construction	2034-2038

Figure 6 - Site plan with phases (top), and planned dates for each phase (bottom).

4.4.1 Parking Lot 4.1 Demolition

The Parking Lot 4.1 Demolition is scheduled to occur from November 2022 to March 2023.

The anticipated maximum sound level for each equipment type scheduled for use during the Parking Lot 4.1 Demolition phase at five representative receiver locations are shown in Table 20.

Equipment	Location 1 Level (dBA) @ 496’	Location 2 Level (dBA) @ 796’	Location 3 Level (dBA) @ 1012’	Location 4 Level (dBA) @ 792’	Location 5 Level (dBA) @ 200’
Air Compressor	61	57	55	57	69
Backhoe	60	56	54	56	68
Loader	65	61	59	61	73
Truck	68	64	62	64	76
Excavator	61	57	55	57	69
Jack Hammer	68	64	62	64	76
Saw	56	52	50	52	64

Table 20 - Parking Lot 4.1 Demolition – maximum predicted equipment sound levels at five receiver locations

The anticipated average total sound level during the duration of the Parking Lot 4.1 Demolition phase during allowed construction hours[2], from November 2022 to March 2023, due to use of all equipment is indicated in Table 21 and Figure 7.

Total sound level	Location 1 Level (dBA) @ 496’	Location 2 Level (dBA) @ 796’	Location 3 Level (dBA) @ 1012’	Location 4 Level (dBA) @ 792’	Location 5 Level (dBA) @ 200’
L_{eq}[3] for phase	73	69	67	69	81

Table 21 - Parking Lot 4.1 Demolition phase - total average sound levels during allowed construction hours, at five receiver locations for the demolition period

[2] Between the hours of 7 am and 7 pm (excluding Sundays and major holidays)
[3] An index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Figure 7 - Parking Lot 4.1 Demolition phase - total sound levels during allowed construction hours, at five receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at Location 5 would not exceed City requirements.

4.4.2 MOB II Construction

The MOB II Construction phase is scheduled to occur from April 2023 to Dec 2024.

The anticipated maximum sound level for each equipment type scheduled for use during the MOB II Construction phase at the four nearest receiver locations are shown in Table 22.

Equipment	Location 1 Level (dBA) @ 496’	Location 2 Level (dBA) @ 796’	Location 3 Level (dBA) @ 1012’	Location 4 Level (dBA) @ 792’	Location 5 Level (dBA) @ 200’
Air Compressor	61	57	55	57	69
Backhoe	60	56	54	56	68
Compactor	62	58	56	58	70
Concrete Mixer	65	61	59	61	73
Concrete Pump	62	58	56	58	70
Concrete Vibrator	56	52	50	52	64
Mobile Crane	63	59	57	59	71
Truck	68	64	62	64	76

Equipment	Location 1 Level (dBA) @ 496’	Location 2 Level (dBA) @ 796’	Location 3 Level (dBA) @ 1012’	Location 4 Level (dBA) @ 792’	Location 5 Level (dBA) @ 200’
Piles (Drilled)	61	57	55	57	69
Excavator	61	57	55	57	69
Welding Machine	40	36	34	36	48
Impact Wrench	65	61	59	61	73
Pneumatic Tool	65	61	59	61	73
Saw	56	52	50	52	64
Forklift	48	44	42	44	56

Table 22 - MOB Make Ready phase - maximum equipment sound levels at five receiver locations

The anticipated average total sound level during the duration of the MOB II Construction phase during allowed construction hours, from April 2023 to December 2024 due to use of all equipment is indicated in Table 23 and Figure 8.

Total sound level	Location 1 Level (dBA) @ 496’	Location 2 Level (dBA) @ 796’	Location 3 Level (dBA) @ 1012’	Location 4 Level (dBA) @ 792’	Location 5 Level (dBA) @ 200’
Leq for phase	65	61	59	61	73

Table 23 - MOB II Construction phase - anticipated average sound levels during allowed construction hours, at five receiver locations for the construction period.

Figure 8 - MOB II Construction phase - anticipated average sound levels during allowed construction hours, at five receiver locations for the construction period

No significant impacts are expected during this construction phase.

4.4.3 Behavioral Health Building Demolition

The Behavioral Health Building Demolition phase is scheduled to occur from October 2023 to March 2024.

The anticipated maximum sound level for each equipment type scheduled for use during the Behavioral Health Building Demolition phase at the four nearest receiver locations are shown in Table 24.

Equipment	Location 1 Level (dBA) @ 725’	Location 2 Level (dBA) @ 185’	Location 3 Level (dBA) @ 645’	Location 4 Level (dBA) @ 680’
Air Compressor	58	75	59	58
Backhoe	57	74	58	57
Mobile Crane	60	77	61	60
Loader	62	79	63	62
Truck	65	82	66	65
Piles (Drilled)	58	75	59	58
Excavator	58	75	59	58
Welding Machine	36	54	37	37
Jack Hammer	65	82	66	65
Pneumatic Tool	62	79	63	62
Saw	53	70	54	53

Table 24 - Behavioral Health Building Demolition phase - maximum equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Behavioral Health Building Demolition phase during allowed construction hours, from October 2023 to March 2024, due to use of all equipment is indicated in Table 25 and Figure 9.

Total sound level	Location 1 Level (dBA) @ 725’	Location 2 Level (dBA) @ 185’	Location 3 Level (dBA) @ 645’	Location 4 Level (dBA) @ 680’
Leq for phase	71	83	72	71

Table 25 - Behavioral Health Building Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 9 – Behavioral Health Building Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at receiver Location 2 do not exceed City requirements.

4.4.4 550 Washington Demolition

The 550 Washington Demolition phase is scheduled to occur from January 2025 to July 2025.

The anticipated maximum sound level for each equipment type scheduled for use during the 550 Washington Demolition phase at the four nearest receiver locations are shown in Table 26.

Equipment	Location 1 Level (dBA) @ 1000’	Location 2 Level (dBA) @ 198’	Location 3 Level (dBA) @ 360’	Location 4 Level (dBA) @ 460’
Air Compressor	55	70	64	67
Backhoe	54	69	63	66
Mobile Crane	57	72	66	69
Loader	59	74	68	71
Truck	62	77	71	74
Excavator	55	70	64	67
Jack Hammer	62	77	71	74
Saw	50	65	59	62

Table 26 - 550 Washington Demolition phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the 550 Washington Demolition phase during allowed construction hours, from January 2025 to July 2025, due to use of all equipment is indicated in Table 27 and Figure 10

Total sound level	Location 1 Level (dBA) @ 1000’	Location 2 Level (dBA) @ 198’	Location 3 Level (dBA) @ 360’	Location 4 Level (dBA) @ 460’
L_{eq} for phase	66	80	75	73

Table 27 - 550 Washington Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 10 - 550 Washington Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at Location 2 do not exceed City requirements.

4.4.5 Hospital I and Hospital Support Building Construction

The Hospital I and Hospital Support Building Construction phase is scheduled to occur from April 2024 to March 2028.

The anticipated maximum sound level for each equipment type scheduled for use during the Hospital I and Hospital Support Building Construction phase at the four nearest receiver locations are shown in Table 28.

Equipment	Location 1 Level (dBA) @ 725’	Location 2 Level (dBA) @ 185’	Location 3 Level (dBA) @ 645’	Location 4 Level (dBA) @ 680’
Air Compressor	58	70	59	58
Backhoe	57	69	58	57
Compactor	59	71	60	59
Concrete Mixer	62	74	63	62
Concrete Pump	59	71	60	59
Concrete Vibrator	53	65	54	53
Mobile Crane	60	72	61	60
Loader	62	74	63	62
Truck	65	77	66	65
Grader	62	74	63	62
Piles (Drilled)	58	70	59	58
Excavator	58	70	59	58
Generator	58	70	59	58
Welding Machine	36	48	37	37
Impact Wrench	62	74	63	62
Pneumatic Tool	62	74	63	62
Saw	53	65	54	53
Forklift	45	57	46	45

Table 28 - Hospital I and Hospital Support Building Construction - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Hospital I and Hospital Support Building Construction phase during allowed construction hours, from April 2024 to March 2028, due to use of all equipment is indicated in Table 29 and Figure 11.

Total sound level	Location 1 Level (dBA) @ 725'	Location 2 Level (dBA) @ 185'	Location 3 Level (dBA) @ 645'	Location 4 Level (dBA) @ 680'
L_{eq} for phase	69	81	70	69

Table 29 - Hospital I and Hospital Support Building Construction phase - total sound levels during allowed construction hours, at four receiver locations for the construction period

Figure 11 - Hospital I and Hospital Support Building Construction phase - total sound levels during allowed construction hours, at four receiver locations for the construction period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at receiver Location 2 do not exceed City requirements.

4.4.6 Emergency Department Demolition

The Emergency Department Demolition phase is scheduled to occur from March 2029 to October 2029.

The anticipated maximum sound level for each equipment type scheduled for use during the Emergency Department Demolition phase at the four nearest receiver locations are shown in Table 30.

Equipment	Location 1 Level (dBA) @ 800’	Location 2 Level (dBA) @ 330	Location 3 Level (dBA) @ 480’	Location 4 Level (dBA) @ 430’
Backhoe	56	64	60	61
Compactor	58	66	62	63
Concrete Mixer	61	69	65	66
Concrete Pump	58	66	62	63
Concrete Vibrator	52	60	56	57
Mobile Crane	59	67	63	64
Loader	61	69	65	66
Truck	64	72	68	69
Grader	61	69	65	66
Piles (Drilled)	57	65	61	62
Excavator	57	65	61	62
Welding Machine	36	43	40	41
Forklift	44	52	48	49

Table 30 - Emergency Department Demolition phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Emergency Department Demolition phase during allowed construction hours, from March 2029 to October 2029 due to use of all equipment is indicated in Table 31 and Figure 12.

Total sound level	Location 1 Level (dBA) @ 800’	Location 2 Level (dBA) @ 330	Location 3 Level (dBA) @ 480’	Location 4 Level (dBA) @ 430’
Leq for phase	72	80	76	77

Table 31 - Emergency Department Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 12 - Emergency Department Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at receiver Locations 2, 3, and 4 do not exceed City requirements.

4.4.7 Existing Hospital Demolition

The Existing Hospital Demolition phase is scheduled to occur from March 2029 to April 2030.

The anticipated maximum sound level for each equipment type scheduled for use during the Existing Hospital Demolition phase at the four nearest receiver locations are shown in Table 30.

Equipment	Location 1 Level (dBA) @ 645’	Location 2 Level (dBA) @ 400	Location 3 Level (dBA) @ 700’	Location 4 Level (dBA) @ 520’
Air Compressor	59	63	58	61
Backhoe	58	62	57	60
Mobile Crane	61	65	60	63
Loader	63	67	62	65
Truck	66	70	65	68
Excavator	59	63	58	61
Jack Hammer	66	70	65	68
Saw	54	58	53	56

Table 32 - Existing Hospital Demolition phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Existing Hospital Demolition phase during allowed construction hours, from March 2029 to April 2030 due to use of all equipment is indicated in Table 31 and Figure 12.

Total sound level	Location 1 Level (dBA) @ 645’	Location 2 Level (dBA) @ 400	Location 3 Level (dBA) @ 700’	Location 4 Level (dBA) @ 520’
Leq for phase	71	75	70	72

Table 33 - Existing Hospital Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 13 - Existing Hospital Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

No significant impacts are expected during this construction phase.

4.4.8 Mercy Manor Demolition

The Mercy Manor Demolition phase is scheduled to occur during 2030. The anticipated maximum sound level for each equipment type scheduled for use during the Mercy Manor Demolition phase at the four nearest receiver locations are shown in Table 34.

Equipment	Location 1 Level (dBA) @ 210’	Location 2 Level (dBA) @ 760’	Location 3 Level (dBA) @ 1000’	Location 4 Level (dBA) @ 960	Location 5 Level (dBA) @ 480
Air Compressor	69	57	55	55	61
Backhoe	68	56	54	54	60
Mobile Crane	71	59	57	57	63
Loader	73	61	59	59	65
Truck	76	64	62	62	68
Piles (Drilled)	69	57	55	55	61
Excavator	69	57	55	55	61
Welding Machine	47	36	34	34	40
Jack Hammer	76	64	62	62	68
Pneumatic Tool	73	61	59	59	65
Saw	66	70	65	68	56

Table 34 - Mercy Manor Demolition phase - equipment sound levels at five receiver locations

The anticipated average total sound level during the duration of the Mercy Manor Demolition phase during allowed construction hours due to use of all equipment is indicated in Table 35 and Figure 14.

Total sound level	Location 1 Level (dBA) @ 210’	Location 2 Level (dBA) @ 760’	Location 3 Level (dBA) @ 1000’	Location 4 Level (dBA) @ 960’	Location 5 Level (dBA) @ 480’
Leq for phase	80	69	66	67	74

Table 35 - Mercy Manor Demolition phase - total sound levels during allowed construction hours, at five receiver locations for the demolition period

Figure 14 – Mercy Manor Demolition phase - total sound levels during allowed construction hours, at five receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at Location 1 do not exceed City requirements.

4.4.9 Central Energy Plant Expansion

The Central Energy Plant (CEP) Expansion phase is scheduled to occur from 2031 to 2032.

The anticipated maximum sound level for each equipment type scheduled for use during the CEP Expansion phase at the four nearest receiver locations are shown in Table 36.

Equipment	Location 1 Level (dBA) @ 500’	Location 2 Level (dBA) @ 400’	Location 3 Level (dBA) @ 940’	Location 4 Level (dBA) @ 950’
Air Compressor	61	63	56	55
Backhoe	60	62	55	54
Compactor	62	64	57	56
Concrete Mixer	65	67	60	59
Concrete Pump	62	64	57	56
Concrete Vibrator	56	58	51	50
Mobile Crane	63	65	58	57
Loader	65	67	60	59
Truck	68	70	63	62

Equipment	Location 1 Level (dBA) @ 500’	Location 2 Level (dBA) @ 400’	Location 3 Level (dBA) @ 940’	Location 4 Level (dBA) @ 950’
Grader	65	67	60	59
Piles (Drilled)	61	63	56	55
Excavator	61	63	56	55
Generator	61	63	56	55
Welding Machine	39	42	34	34
Impact Wrench	65	67	60	59
Pneumatic Tool	65	67	60	59
Saw	56	58	51	50
Forklift	48	50	43	42

Table 36 - CEP Expansion phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the CEP Expansion phase during allowed construction hoursdue to use of all equipment is indicated in Table 37 and Figure 15.

Total sound level	Location 1 Level (dBA) @ 500’	Location 2 Level (dBA) @ 400’	Location 3 Level (dBA) @ 940’	Location 4 Level (dBA) @ 950
Leq for phase	68	70	62	62

Table 37 - CEP Expansion phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 15 - CEP Expansion phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

No significant impacts are expected during this construction phase.

4.4.10 Facility and Generator Building Demolition

The Facility and Generator Building Demolition phase is scheduled to occur in 2033.

The anticipated maximum sound level for each equipment type scheduled for use during the Facility and Generator Building Demolition phase at the four nearest receiver locations are shown in Table 38.

Equipment	Location 1 Level (dBA) @ 360’	Location 2 Level (dBA) @ 640’	Location 3 Level (dBA) @ 1120’	Location 4 Level (dBA) @ 1140’
Air Compressor	64	59	54	54
Backhoe	63	58	53	53
Mobile Crane	66	61	56	56
Loader	68	63	58	58
Truck	71	66	61	61
Piles (Drilled)	64	59	54	54
Excavator	64	59	54	54
Welding Machine	43	38	33	33
Jack Hammer	71	66	61	61
Pneumatic Tool	68	63	58	58
Saw	59	54	49	49

Table 38 - Facility and Generator Building Demolition phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Facility and Generator Building Demolition phase during allowed construction hoursdue to use of all equipment as indicated in Table 39 and Figure 16.

Total sound level	Location 1 Level (dBA) @ 360’	Location 2 Level (dBA) @ 640’	Location 3 Level (dBA) @ 1120’	Location 4 Level (dBA) @ 1140’
Leq for phase	77	72	67	67

Table 39 - Facility and Generator Building Demolition - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 16 - Facility and Generator Building Demolition phase - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Mitigation measures presented in Section 4.4.14 would be implemented to ensure adequate noise attenuation during construction such that noise levels at Location 1 do not exceed City requirements.

4.4.11 Hospital II Construction

The Hospital II Construction phase is scheduled to occur from 2034 to 2038.

The anticipated maximum sound level for each equipment type scheduled for use during the Hospital II Construction phase at the four nearest receiver locations are shown in Table 40.

Equipment	Location 1 Level (dBA) @ 590’	Location 2 Level (dBA) @ 550’	Location 3 Level (dBA) @ 750’	Location 4 Level (dBA) @ 600’
Air Compressor	60	60	57	59
Backhoe	59	59	56	58
Compactor	61	61	58	60
Concrete Mixer	64	64	61	63
Concrete Pump	61	61	58	60
Concrete Vibrator	55	55	52	54
Mobile Crane	62	62	59	61
Loader	64	64	61	63
Truck	67	67	64	66
Grader	64	64	61	63

Equipment	Location 1 Level (dBA) @ 590’	Location 2 Level (dBA) @ 550’	Location 3 Level (dBA) @ 750’	Location 4 Level (dBA) @ 600’
Piles (Drilled)	60	60	57	59
Excavator	60	60	57	59
Welding Machine	38	39	36	38
Impact Wrench	64	64	61	63
Pneumatic Tool	64	64	61	63
Saw	55	55	52	54
Forklift	47	47	44	46

Table 40 - Hospital II Construction phase - equipment sound levels at four receiver locations

The anticipated average total sound level during the duration of the Hospital II Construction phase during allowed construction hoursdue to use of all equipment is indicated in Table 41 and Figure 17.

Total sound level	Location 1 Level (dBA) @ 590’	Location 2 Level (dBA) @ 550’	Location 3 Level (dBA) @ 750’	Location 4 Level (dBA) @ 600’
Leq for phase	66	67	64	66

Table 41 - Hospital II Construction - total sound levels during allowed construction hours, at four receiver locations for the demolition period

Figure 17 - Hospital II Construction - total sound levels during allowed construction hours, at four receiver locations for the demolition period

No significant impacts are expected during this construction phase.

4.4.12 Analysis

Based on a review of scheduled equipment and their respective sound levels at the five receiver locations, location 2 (the neighboring "Warwick" apartment complex) would experience the highest sound levels due to direct proximity to most of the demolition and construction zones. For certain construction and demolition phases, the anticipated average sound levels during a construction day are anticipated to exceed 75 dBA Leq (12-hour) at locations closest to construction and demolition activities as summarized in Table 19. Similar to the case of the neighboring "Warwick" apartment, occupied buildings on the project campus (e.g. the hospital and chapel) would be exposed to levels exceeding 75 dBA Leq (12-hour) during certain construction and demolition phases. The project would require that the mitigation measures presented in Section 4.4.14 that would be implemented to attenuate noise during construction such that levels do not exceed City requirements at buildings both inside and outside the property line. As such, significant noise impacts would be reduced to below a level of significance with mitigation.

4.4.13 Construction Noise Mitigation Measures

The following noise control mitigation measures would be required during demolition and construction. The measures would be planned and reviewed by a qualified acoustic consultant to limit noise levels to meet Municipal Code requirements and would result in reducing construction noise impacts to below a level of significance outside the Scripps campus, as well as at existing buildings. These measures would be applied to all phases of the project site demolition and construction work.

- Ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational.
- Turn off idling equipment, whenever possible.
- Construction activities shall be limited to daytime hours, 7 a.m. to 7 p.m. No noise generating construction activities shall take place on Sundays and holidays.
- Include in tenders, employment contracts, subcontractor agreements and work method statements clauses that assure the minimization of noise and compliance with directions from management to minimize noise.
- Give preference to the use quieter technology or other measures rather than lengthening construction duration (i.e. it is not recommended to lower noise by having fewer pieces of equipment running at a time thereby leading to extended construction duration).

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways that minimize noise.
- Ensure that site managers periodically check the site, nearby residences and other sensitive receptors for noise problems so that solutions can be quickly applied.
- Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours and other relevant practices (e.g. minimizing the use of engine brakes and periods of engine idling).
- Consider alternatives to diesel and gasoline engines and pneumatic units such as hydraulic or electric-controlled units where, feasible and reasonable.
- Examine and implement, where feasible and reasonable, alternatives to pile driving using a diesel hammer, such as hydraulic hammer, hydraulic press-in, or vibratory piledriver.
- To reduce the impact of backup alarms, examine and consider implementing, where feasible and reasonable, ambient sensitive back-up alarms, signal workers, turning circles and side loading/unloading trucks.
- To reduce the line-of-sight noise transmission to residences and other sensitive receptors, temporary noise barriers shall be erected as required prior to demolition of the Parking Lot 4.1, Behavioral Health Building, 550 Washington Street, Emergency Department, Existing Hospital, and Facility and Generator Building, and prior to construction of MOB II, Hospital I, Hospital Support Building, and Mercy Manor. Temporary noise barriers can be constructed from boarding (plywood boards, panels of steel sheeting or compressed fiber cement board) with no gaps between the panels at the site boundary. Stockpiles and shipping containers can be also be used as effective noise barriers. Planned barrier type, height, and placement shall be outlined in a Noise Report prepared by a qualified acoustic consultant at the time of issuance of building permits for the aforementioned buildings.

4.5 Construction Ground-borne Vibration Impact

4.5.1 Predicted Vibration

Maximum predicted ground-borne construction vibration is tabulated for four (4) representative receiver locations for each construction phase, and is assessed using the methodology and inputs presented in §3.6.2. The receiver locations and construction phase boundaries are shown graphically in Figure 6 through

.

	Predicted vibration due to construction (PPV in inches/second)										
Receiver	4.1 Parking Demo	MOB II Const.	BHU Demo.	550 Demo.	MRH & HSB Const.	Ed Demo Ambul.	Existing Hosp Demo	Mercy Manor Demo	CEP Expansion	Fac. And Gen Demo	Hosp II Const.
#1	0.003	0.008	0.002	0.002	0.005	0.005	0.002	0.009	0.008	0.005	0.006
#2	0.002	0.005	*0.010*	0.009	*0.023*	*0.012*	0.004	0.002	0.010	0.003	0.007
#3	0.002	0.004	0.002	0.005	0.006	0.008	0.002	0.002	0.004	0.001	0.005
#4	0.002	0.005	0.002	0.004	0.006	0.009	0.003	0.002	0.004	0.001	0.006

Table 42 – Predicted ground-borne vibration from construction equipment for each construction phase.

A summary of potential perception by nearby receivers is presented below:

- Receiver #1: Ground-borne vibration is predicted to be below "barely perceptible" impact criteria for all construction phases.
- Receiver #2: Ground-borne vibration is predicted to be above "barely perceptible" impact criteria, but below the "distinctly perceptible" impact criteria during BHU Demo, MRH & HSB Construction, and Ed Demo/Ambulance phases.
- Receiver #3: Ground-borne vibration is predicted to be below "barely perceptible" impact criteria for all construction phases.

- Receiver #4: Ground-borne vibration is predicted to be below "barely perceptible" impact criteria for all construction phases.

4.5.2 Analysis

The predicted construction ground-borne vibration at the four receivers is well below impact thresholds for potential building damage. Several receivers are predicted to be subject to "barely perceptible" vibration during some construction phases.

Specialized equipment for research, medical diagnostics, and microelectronics manufacturing can be adversely affected by vibration at levels well below human perception threshold. No facilities containing such sensitive equipment in the vicinity of Scripps have been identified.

There are no requirements in the City of San Diego Municipal Code specific to construction vibration impact. Assessment for potential of building damage and human annoyance is based on guidelines in the Caltrans Transportation and Construction Vibration Guidance Manual[3] (chapter 7.3), summarized in Table 13 and Table 14. For the purposes of this assessment, "Distinctly perceptible" vibrations (0.25 inches/sec for transient sources or 0.10 inches/sec for continuous/frequent intermittent sources) are used as the threshold of acceptability for construction projects near sensitive receiver locations.

Vibration due to construction activity would not result in distinctly perceptible levels (as defined in the Caltrans transportation and Construction Vibration Guidance Manual) to nearby receiver locations.

4.5.3 Construction Ground-borne Vibration Considerations

The current construction plan does not include impact piling and blasting, which are typically the most severe construction vibration sources. The predicted ground-borne construction vibration does not severely impact the neighboring receivers studied (relative to building damage or human annoyance).. No significant impact due to construction vibration is expected.

5 References

1. City of San Diego General Plan Noise Element, March 2015
2. California Environmental Quality Act, Significance Determination Thresholds, Development Services Department, July 2016 https://www.sandiego.gov/sites/default/files/july_2016_ceqa_thresholds_final_0.pdf
3. U.S. Department of Transportation, Federal Aviation Administration (2017) *Aviation Environmental Design Tool (AEDT) Technical Manual: Version 2d* (No. DOT-VNTSC-FAA-17-16)
4. California Department of Transportation (April 2020), *Transportation and Construction Vibration Guidance Manual* (Report No. CT-HWANP-RT-20-365.01.01)
5. Federal Transit Administration (September 2018), *Transit Noise and Vibration Impact Assessment Manual* (FTA Report No. 0123)
6. John F. Wiss, "Construction Vibrations: State-of-the-Art," *Journal of the Geotechnical Engineering Division*, vol. 107, issue 2, pp. 167-181, 1981
7. The City of San Diego (January 2005) *Acoustical Report Guidelines*

6 APPENDIX

APPENDIX A – TRAFFIC NOISE MODELING

1. Traffic Noise Model CNEL Contour Results

[See following page]

2. Traffic Noise Modeling Assumptions

In order to calculate the existing and future CNEL (Community Noise Equivalent Level) from the traffic data, a daily distribution was extrapolated from the ADT values based on a comprehensive distribution profile.

Appendix B of the *2011 Congested Corridor Report (CCR)*, by the Texas Transportation Institute and Texas A&M University System consolidates traffic volume data for 713 continuous traffic monitoring locations in urban areas of 37 states. The traffic volume data is provided by the HPMS dataset from the FHWA and combined with similar data sources to develop a comprehensive distribution profile. This distribution profile is used to simulate the hourly traffic distribution to calculate a CNEL in this urban environment.

The distribution profile to simulate hourly traffic distribution from the given ADT was chosen based on a similar AM and PM peak loads in the CCR. The percentages for Freeway and Non-Freeway traffic are displayed in the table below.

	Hour of Day											
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Freeway	1.1%	0.8%	0.6%	0.5%	0.6%	1.8%	5.2%	6.8%	6.3%	5.5%	5.3%	5.7%
Non-Freeway	1.1%	0.6%	0.7%	0.5%	1.2%	3.0%	5.0%	6.1%	5.5%	5.1%	5.0%	5.4%
	12	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Freeway	5.7%	5.9%	6.1%	6.6%	6.8%	6.6%	5.6%	4.7%	3.6%	3.4%	2.8%	2.0%
Non-Freeway	5.6%	5.5%	5.7%	5.9%	6.3%	6.4%	5.9%	5.0%	4.4%	4.4%	3.3%	2.4%

Table B1 – Hourly traffic distribution profile

Where there were no ADT volumes available, the ADT was estimated using the AM/PM Peak volume as 6.5% ADT based on the distribution in Table B1.

Speed limits are as presented in the mobility analysis and documented in the table below. Site visit observations did not show a large amount of trucks. A typical breakdown of 96 percent automobiles, 2 percent medium trucks and 2 percent heavy trucks was used for modelling the existing and future noise conditions for all roads.

Road	**Speed**
SR 163	55 mph
Washington Street	35 mph
University Avenue	25 mph
4^{th} Avenue	25-30 mph
5^{th} Avenue	25-30 mph
6^{th} Avenue	40 mph

3. SoundPlan Run Parameters

The following run parameters applied to all SoundPlan models run for traffic noise modeling.

Project description

Project title:	Scripps Mercy
Project No.:	2631118-00
Project engineer:	Bettine Gommer
Customer:	

Description:

Run description

Calculation type:	Single Point Sound
Title:	10.17.2020 V2 AM PM Peak Forecast
Group	
Run file:	RunFile.runx
Result number:	19
Local calculation (ThreadCount=12)	
Calculation start:	10/17/2020 7:51:24 PM
Calculation end:	10/17/2020 7:58:25 PM
Calculation time:	06:59:087 [m:s:ms]
No. of points:	15
No. of calculated points:	15
Kernel version:	SoundPLAN 8.2 (1/28/2020) - 64 bit

Run parameters

Reflection order: 3
Maximum reflection distance to receiver
200 m
Maximum reflection distance to source
50 m
Search radius 5000 m
Weighting: dB(A)
Allowed tolerance (per individual source): 0.100 dB
Create ground effect areas from road surfaces:
Yes

Standards:
Road: TNM 2.5
Emission according to: TNM 2.5
Road gradient smoothed with smooth length of: 15 m
Air absorption: ISO 9613-1
Side diffraction: disabled
Allow changes (bugs) to be conform with TNM 2.5
Environment:
Air pressure 1013.3 mbar
rel. humidity 50.0 %

Temperature	20.0 °C	
Dissection parameters:		
Distance to diameter factor		8
Minimal distance		1 m
Attenuation		
Foliage:		ISO 9613-2
Built-up area:		ISO 9613-2
Industrial site:		ISO 9613-2
Assessment:		CNEL (CA)
Reflection of "own" facade is suppressed		

Geometry data

Forecast Traffic Volumes _Run-PeakAMPM v2.sit		10/17/2020 1:52:30 PM
- contains:		
Buildings_4.geo	10/13/2020 9:16:50 PM	
Buildings_5.2.geo	10/17/2020 1:42:56 PM	
Buildings_7.geo	10/16/2020 9:23:10 AM	
Geo-File1.geo	10/1/2020 4:33:32 PM	
Receivers.geo	10/17/2020 1:42:56 PM	
Roads_3_AM_Forecast_V2 DUP1.geo		10/17/2020 10:39:26 AM
Roads_3_AM_Forecast_V2 DUP2.geo		10/17/2020 11:02:38 AM
Topo_7.geo	10/14/2020 11:38:34 AM	
RDGM0003.dgm	10/11/2020 12:02:56 PM	

APPENDIX B – HELICOPTER SOUND DATA

Sound data for the Black Hawk UH-60A was extracted from AEDT per reference above.

Sound data for the Sikorsky S-76 is provided below.

TABLE NO. C.4-1H.2

SIKORSKY S-76 HELICOPTER (SPIRIT)

1/3 OCTAVE NOISE DATA -- STATIC TESTS

AS MEASURED****

DOT/TSC
4/24/84

SITE: 1H (SOFT) - 150 M. NW JUNE 13,1983

FLIGHT IDLE

BAND NO.	LEVELS @ ACOUSTIC EMMISION ANGLES OF (DEGREES)								AVERAGE LEVEL OVER 360 DEGREES			
	0	45	90	135	180	225	270	315	ENERGY *	AVE **	ARITH ***	Std Dv
	SOUND PRESSURE LEVEL dB re 20 microPascal											
14	51.4	52.4	50.8	-	-	52.3	51.6	51.3	51.7	7.0	51.6	0.6
15	48.5	48.5	49.8	-	-	49.5	54.3	50.0	50.6	11.2	50.1	2.2
16	66.9	64.5	64.0	-	-	64.6	68.7	66.9	66.3	31.7	65.9	1.8
17	49.9	50.0	50.0	-	-	52.5	57.9	49.8	53.0	22.8	51.7	3.2
18	58.2	54.9	55.3	-	-	59.2	64.8	52.2	59.5	33.3	57.4	4.4
19	51.4	56.3	57.1	-	-	57.4	61.5	56.3	57.6	35.1	56.7	3.2
20	70.9	64.7	73.3	-	-	71.2	73.4	73.4	71.9	52.8	71.1	3.4
21	63.1	58.8	63.7	-	-	62.2	64.2	65.3	63.3	47.2	62.9	2.3
22	54.7	55.5	57.8	-	-	58.0	59.9	56.2	57.4	44.0	57.0	1.9
23	54.5	60.9	61.2	-	-	63.0	63.1	59.7	61.1	50.2	60.4	3.2
24	51.3	55.4	56.7	-	-	57.4	57.8	53.9	55.9	47.3	55.4	2.5
25	46.7	48.4	50.7	-	-	50.7	52.2	49.9	50.1	43.5	49.8	1.9
26	42.9	40.6	41.8	-	-	42.2	43.7	43.2	42.5	37.7	42.4	1.1
27	41.4	39.4	39.8	-	-	41.6	42.4	41.4	41.1	37.9	41.0	1.2
28	40.7	37.9	39.6	-	-	44.3	43.7	41.3	41.8	39.9	41.2	2.4
29	41.8	38.8	40.6	-	-	47.6	44.8	42.1	43.6	42.8	42.6	3.1
30	41.0	38.6	40.1	-	-	46.6	43.7	40.9	42.7	42.7	41.8	2.9
31	40.4	38.4	39.5	-	-	45.4	44.5	41.4	42.4	43.0	41.6	2.8
32	39.7	38.0	38.6	-	-	44.3	44.1	41.3	41.7	42.7	41.0	2.7
33	39.7	37.4	38.1	-	-	44.7	43.6	41.5	41.7	42.9	40.8	3.0
34	39.5	36.5	36.9	-	-	45.7	42.0	41.3	41.5	42.8	40.3	3.5
35	40.8	36.0	35.9	-	-	45.4	40.5	41.1	41.2	42.4	39.9	3.6
36	42.1	36.3	35.5	-	-	43.9	38.8	40.2	40.5	41.5	39.5	3.3
37	44.4	38.4	32.7	-	-	41.3	36.7	41.5	40.6	41.1	39.2	4.1
38	44.5	38.3	30.9	-	-	37.5	33.8	41.6	39.9	39.8	37.8	5.0
39	39.7	34.4	28.0	-	-	33.4	30.6	38.0	35.7	34.6	34.0	4.4
40	33.2	29.7	25.2	-	-	29.7	28.4	32.7	30.6	28.1	29.8	2.9
AL	56.7	55.0	58.0	-	-	59.5	59.6	58.4	58.1	58.1	57.9	1.8
OASPL	73.3	69.9	74.8	-	-	73.7	76.2	75.2	74.2	-	73.8	2.2
PNL	72.8	69.2	73.6	-	-	74.5	75.4	74.7	74.0	-	73.4	2.2
PNLT	75.1	70.4	75.7	-	-	76.4	77.2	76.8	75.9	-	75.3	2.5

BANDS 14 TO 40 - STANDARD 1/3 OCTAVE BANDS 25 TO 10KHz

* - UNWEIGHTED ENERGY AVERAGE OF MEASURED LEVELS OVER 360 DEGREES
** - A-WEIGHTED ENERGY AVERAGE OF MEASURED LEVELS OVER 360 DEGREES
*** - UNWEIGHTED ARITHMETIC AVERAGE OF MEASURED LEVELS OVER 360 DEGREES

**** - 32 SECOND AVERGING TIME

APPENDIX C – HELICOPTER FLIGHT PATH INFORMATION

[See following page]

APPENDIX D – SUPPLEMENTARY CONSTRUCTION NOISE CALCULATIONS

To determine the maximum sound level for each piece of equipment at thereceptor sites, we used distance attenuation based on distances between the construction/demolition zone and each of the receptors. The distance was found using the measurement function in Google Earth. The decibel attenuation was found by assuming point-source noise propagation, expressed mathematically by:

$$L_x = L_s - 20\,log_{10}\left(\frac{D}{50}\right)$$

where:

L_x = maximum sound level at a receptor

L_s = sound level for a piece of equipment at 50 feet

D = distance between the construction zone and the receptor

To determine the average sound level from construction activities over the course of the period of construction/demolition for each phase, we employed the following methodology:

$$L_{avg} = 10\log_{10}\left((1-\text{use\%})10^{L_{amb}/10} + (\text{use\%})10^{L_s/10}\right) - 20\log_{10}\left(\frac{D}{50}\right)$$

where:

L_{avg} = average sound level at a receptor from use of a piece of equipment

L_{amb} = average ambient sound level without construction, assumed to be 60dBA

use% = percent of time during construction phase that equipment would be used, from use information provided Layton Construction

L_s = published sound level (dBA) of equipment at 50 feet

D	=	distance between the construction zone and the receptor

To determine the total average level from all pieces of equipment in each construction phase at each receptor, we used decibel (logarithmic) addition,

$$L_{total} = 10\log_{10}\left(10^{L_{avg,1}/10} + 10^{L_{avg,2}/10} \ldots + 10^{L_{avg,n}/10}\right)$$

where:

$L_{avg,n}$	=	average level for an individual piece of equipment

We did not consider attenuation caused by topographical features, though typically topographical specifics (intervening buildings, barriers, hills, vegetation, etc), can serve to provide additional attenuation.