

ENVIRONMENTAL NOISE STUDY FOR:

1700 Webster Street

Oakland, CA

RGDL Project #: 15-025

PREPARED FOR:

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DATE:

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Project Description

The proposed project is the construction of a mixed-use facility consisting of 234 apartment units and 8,500 square feet of commercial space located at 1700 Webster Street, Oakland, CA.

Environmental noise sources in the vicinity are primarily traffic on 17th and Webster Streets. This noise analysis quantifies the existing noise environment at the site, determines future noise level associated with the project and cumulative growth and compares these noise levels to the City of Oakland's CEQA thresholds of significance.

Setting

Environmental Noise Fundamentals

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter captures the sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels. To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car passby or airplane flyover. To express the average noise level the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 15 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time.

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (DNL or L_{dn}) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the L_{eq} except they include a 10 dB penalty during nighttime hours (and a 5 dB penalty during evening hours in the CNEL) to account for peoples increased sensitivity during these hours. The CNEL and L_{dn} are typically less than one decibel from each other.

In environmental noise, a change in noise level of 3 dB is considered a just noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness.

Existing Noise Environment

A noise measurement program was conducted at the project site to quantify existing noise levels. The program included two long-term (24-hour) noise measurements and four short-term (15-minute) measurements. The measurement locations are shown in Figure 1. The measurement locations were chosen to represent the traffic noise exposure at the project building facades closest to the major roadways, as well as the noise exposure at existing nearby residences that are potentially affected by project generated noise. The results of the noise measurements are shown in Table 1 and Figure 2.

Location LT-1 was along 17th Street and Location LT-2 was along Webster Street. The noise monitors at these two locations documented the day/night variation in traffic noise from the two roadways.

The short-term measurements at locations ST-2 and ST-4 were made simultaneously with the measurements at LT-1 and LT-2 to quantify the traffic noise exposure at the setback of the proposed building. Short-term measurement locations ST-1 and ST-3 were along the northern property line abutting the existing residential land use. These locations are used as a baseline for comparison with future project noise related to the operation of the project.

Figure 1: Noise Measurement Locations

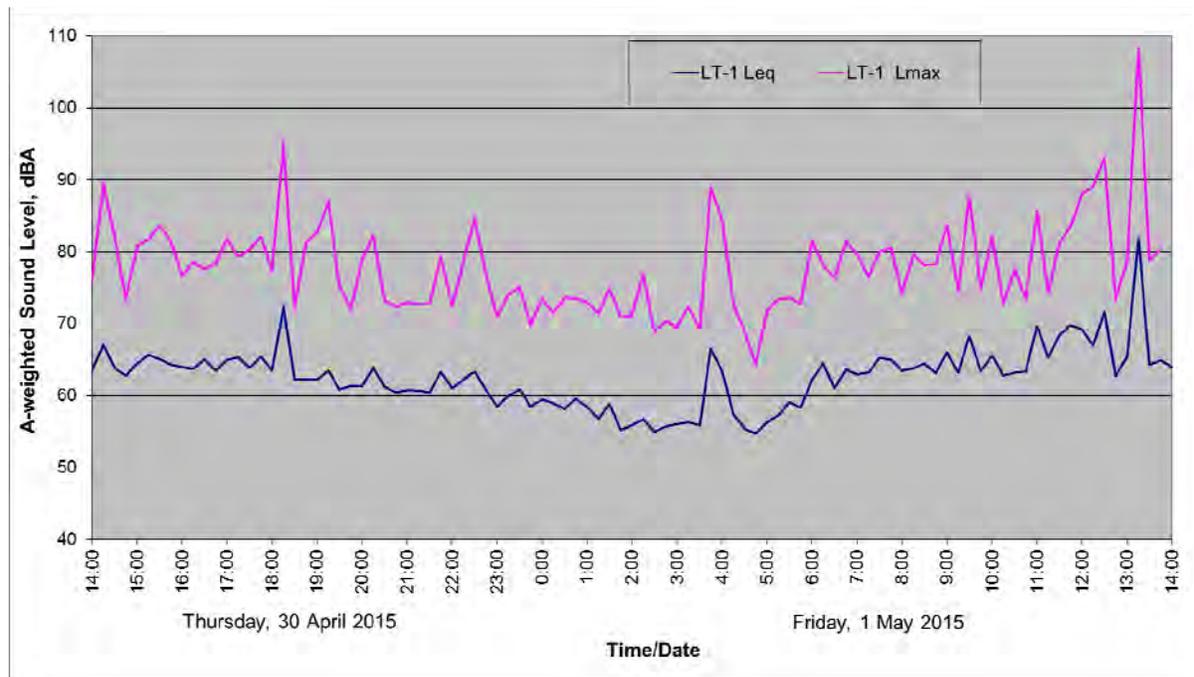


Table 1: Short-Term Noise Measurement Results

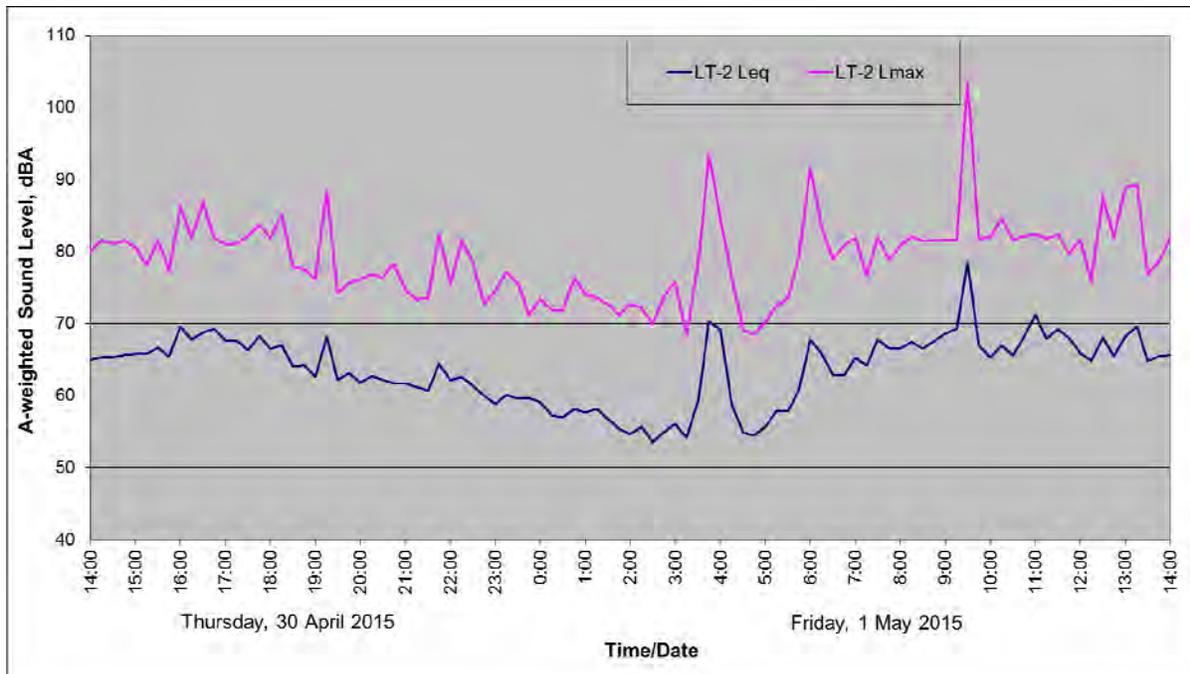
Location		Time	A-weighted Noise Level, dBA						
			L _{eq}	L _{max}	L ₁	L ₁₀	L ₃₃	L ₅₀	L _{dn} *
ST-1	Property Line North of Mentone Arms Apts.	1 May 2015 10:15 – 10:30 AM	57.9	68.2	65.5	60	57.5	56.6	61
ST-2	Tower setback from 17 th & Webster on Roof	1 May 2015 2:20 – 2:35 PM	58.9	70.9	63.7	60.3	58.7	58.2	62
ST-3	Northern Property Line on Roof	1 May 2015 2:36 – 2:58 PM	56.1	67.3	63.6	58.4	55.3	54	59.2
ST-4	Corner of 17 th & Webster Roof	1 May 2015 3:08 – 3:23 PM	63.7	80.2	70.1	65.8	63.4	62.3	66.8

*L_{dn} based on correlation of short-term noise measurement with long-term noise measurement.

**Figure 2: Long-Term Noise Measurement Results (LT-1)
 30 April – 1 May 2015**



**Figure 3: Long-Term Noise Measurement Results (LT-2)
30 April – 1 May 2015**



Regulatory Setting

State of California Noise Insulation Standards

The California Noise Insulation Standards found in CCR, Title 24 establish requirements for new multi-family residential units, hotels, and motels that may be subject to relatively high levels of transportation noise. In this case, the noise insulation criterion is 45 dB Ldn inside noise sensitive spaces. For developments with exterior transportation noise exposure exceeding 60 dB Ldn, an acoustical analysis and mitigation (if required) must be provided showing compliance with the 45 dB Ldn interior noise exposure limit.

City of Oakland

Oakland General Plan

The City of Oakland's General Plan Noise Element compatibility guidelines are shown in **Error! Reference source not found.** Residences are considered "normally acceptable" when exposed to an L_{dn} of 60 dBA or less, "conditionally acceptable" when exposed to an L_{dn} between 60 and 70 dBA, and "normally unacceptable" between L_{dn} 70 and 75 dBA. In some instances the guidelines require that noise insulation be included in the design to reduce interior noise.

Table 2: Oakland General Plan Noise - Land Use Compatibility Matrix

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE (L _{DN} OR CNEL, dB)					
	55	60	65	70	75	80
Residential						
Transient lodging—motels, hotels						
Schools, libraries, churches, hospitals, nursing homes						
Auditoriums, concert halls, amphitheaters						
Sports arenas, outdoor spectator sports						
Playgrounds, neighborhood parks						
Golf courses, riding stables, water recreation, cemeteries						
Office buildings, business commercial and professional						
Industrial, manufacturing, utilities, agriculture						

INTERPRETATION

 NORMALLY ACCEPTABLE: Development may occur without an analysis of potential noise impacts *to the proposed development* (though it might still be necessary to analyze noise impacts that the project might have *on its surroundings*).

 CONDITIONALLY ACCEPTABLE: Development should be undertaken only after an analysis of noise-reduction requirements is conducted, and if necessary noise-mitigating features are included in the design. Conventional construction will usually suffice as long as it incorporates air conditioning or forced fresh-air-supply systems, though it will likely require that project occupants maintain their windows closed.

 NORMALLY UNACCEPTABLE: Development should generally be discouraged; it may be undertaken only if a detailed analysis of the noise-reduction requirements is conducted, and if highly effective noise insulation, mitigation or abatement features are included in the design.

 CLEARLY UNACCEPTABLE: Development should not be undertaken.

The Noise Element also discusses acceptable noise levels for interior spaces as follows:

Conventional contemporary construction methods and materials decrease outdoor noise by 12-18 dB (with partially open windows). At the same time, according to common practice, the following are the maximum interior noise levels generally considered acceptable for various common land uses:

45 dB: residential, hotels, motels, transient lodging, institutional (churches, hospitals, classrooms, libraries), movie theaters

50 dB: professional offices, research and development, auditoria, meeting halls

55 dB: retail, banks, restaurants, sports clubs

65 dB: manufacturing, warehousing

City of Oakland Noise Ordinance

The City of Oakland also regulates noise through enforcement of its Noise Ordinance, which is found in Sections 8.18 and 17.120 of the Oakland Municipal Code.

Per Chapter 8.18.020:

The persistent maintenance or emission of any noise or sound produced by human, animal or mechanical means, between the hours of 9:00 p.m. and 7:00 a.m. which shall disturb the peace or comfort, or be injurious to the health of any person shall constitute a nuisance.

Failure to comply with the following provisions shall constitute a nuisance.

- a) All construction equipment powered by internal combustion engines shall be properly muffled and maintained.*
- b) Unnecessary idling of internal combustion engines is prohibited.*
- c) All stationary noise-generating construction equipment such as tree grinders and air compressors are to be located as far as is practical from existing residences.*
- d) Quiet construction equipment, particularly air compressors, is to be selected whenever possible.*
- e) Use of pile drivers and jack hammers shall be prohibited on Sundays and holidays, except for emergencies and as approved in advance by the Building Official.*

Whenever the existence of any such nuisance shall come to the attention of the Health Officer, it shall be his or her duty to notify in writing the occupant of the premises upon which such nuisance exists, specifying the measures necessary to abate such nuisance, and unless the same is abated within forty-eight (48) hours thereafter, the occupant so notified shall be guilty of an infraction, and the Health Officer shall summarily abate such nuisance.

Chapter 17.120.050 of the Oakland Planning Code regulates operational noise from stationary sources. Table 3 presents maximum allowable receiving noise standards applicable to long-term exposure for residential and civic land uses, for noise from stationary noise sources (not transportation noise). For example, between 7:00 a.m. and 10:00 p.m., residential and civic land uses, including public open spaces, may only be exposed to noises up to 60 dBA for a period of 20 cumulative minutes in a one-hour time period and a maximum of 80 dBA.

Per Chapter 17.120.060 of the Oakland Planning Code:

All activities, except those located within the M-40 zone, or in the M-30 zone more than 400 feet from any legal residentially occupied property, shall be so operated as not to create a vibration which is perceptible without instruments by the average person at or beyond any lot line of the lot containing such activities. Ground vibration caused by motor vehicles, trains, and temporary construction or demolition work is exempted from this standard. (Ord. 11895 Section 8, 1996: prior planning code Section 7711).

Table 4 presents noise level standards from the Noise Ordinance that applies to temporary exposure to short- and long-term construction noise. In this context, short-term refers to construction activity lasting less than 10 days at a time while long-term refers to construction activities lasting greater than 10 days at a time.

Table 3: Maximum Allowable Receiving Noise Level Standards (dBA)

Cumulative Number of Minutes in Either the Daytime or Nighttime One Hour Time Period	Commercial	Residential³	
	Anytime	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
20 (L ₃₃)	65	60	45
10 (L ₁₇)	70	65	50
5 (L ₈)	75	70	55
1 (L ₂)	80	75	60
0 (L _{max})	85	80	65

Notes:

- 1. These standards are reduced 5 dBA for simple tone noise, noise consisting primarily of speech or music, or recurring impact noise. If the ambient noise level exceeds these standards, the standard shall be adjusted to equal the ambient noise level.**
- 2. L_x represents the noise level that is exceeded X percent of a given period. L_{max} is the maximum instantaneous noise level.**
- 3. Legal residences, schools and childcare facilities, health care or nursing home, public open space, or similarly sensitive land uses.**

Source: OMC Section 17.120.050.

Table 4: Construction Noise Level Standards¹ (dBA)

Receiving Land Use	Less Than 10 Days		More Than 10 Days	
	Weekdays	Weekends	Weekdays	Weekends
	7 AM to 7 PM	9 AM to 8 PM	7 AM to 7 PM	9 AM to 8 PM
Residential	80	65	65	55
Commercial, Industrial	85	70	70	60
<p>Notes:</p> <p>1. <i>If the ambient noise level exceeds these standards, the standard shall be adjusted to equal the ambient noise level.</i></p> <p>Source: OMC Section 17.120.050.</p>				

City of Oakland Standard Conditions of Approval and Uniformly Applied Development Standards Imposed as Standard Conditions of Approval

The City of Oakland’s Standard Conditions of Approval¹ (SCA) relevant to reducing noise and vibration impacts due to adoption and development under the Specific Plan are listed below. If the Project is approved by the City, all applicable SCA would be adopted as conditions of approval, as applicable, to help ensure less-than-significant impacts from noise and vibration. The SCA are incorporated and required as part of all approved projects, so they are not listed as mitigation measures.

27. Days/Hours of Construction Operation

Ongoing throughout demolition, grading, and/or construction

The project applicant shall require construction contractors to limit standard construction activities as follows:

- a) *Construction activities are limited to between 7:00 AM and 7:00 PM Monday through Friday, except that pile driving and/or other extreme noise generating activities greater than 90 dBA shall be limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday.*

¹ *Conditions of Approval & Uniformly Applied Development Standards Imposed as Standard Conditions of Approval, City of Oakland Planning and Zoning Division, Revised 9/5/2007, Amended 1/17/2008 and 9/17/2008*

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- b) *Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities (such as concrete pouring which may require more continuous amounts of time) shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened and such construction activities shall only be allowed with the prior written authorization of the Building Services Division.*
- c) *Construction activity shall not occur on Saturdays, with the following possible exceptions:*
- i. *Prior to the building being enclosed, requests for Saturday construction for special activities (such as concrete pouring which may require more continuous amounts of time), shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened. Such construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division.*
 - ii. *After the building is enclosed, requests for Saturday construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division, and only then within the interior of the building with the doors and windows closed.*
- d) *No extreme noise generating activities (greater than 90 dBA) shall be allowed on Saturdays, with no exceptions.*
- e) *No construction activity shall take place on Sundays or Federal holidays.*
- f) *Construction activities include but are not limited to: truck idling, moving equipment (including trucks, elevators, etc) or materials, deliveries, and construction meetings held on-site in a non-enclosed area.*
- g) *Applicant shall use temporary power poles instead of generators where feasible.*

28. Noise Control

Ongoing throughout demolition, grading, and/or construction

To reduce noise impacts due to construction, the project applicant shall require construction contractors to implement a site-specific noise reduction program, subject to the Planning and Zoning Division and the Building Services Division review and approval, which includes the following measures:

- a) *Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).*

- b) Except as provided herein, Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used, if such jackets are commercially available and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.*
- c) Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures as determined by the City to provide equivalent noise reduction.*
- d) The noisiest phases of construction shall be limited to less than 10 days at a time. Exceptions may be allowed if the City determines an extension is necessary and all available noise reduction controls are implemented.*

29. Noise Complaint Procedures

Ongoing throughout demolition, grading, and/or construction

Prior to the issuance of each building permit, along with the submission of construction documents, the project applicant shall submit to the Building Services Division a list of measures to respond to and track complaints pertaining to construction noise. These measures shall include:

- a) A procedure and phone numbers for notifying the Building Services Division staff and Oakland Police Department; (during regular construction hours and off-hours);*
- b) A sign posted on-site pertaining with permitted construction days and hours and complaint procedures and who to notify in the event of a problem. The sign shall also include a listing of both the City and construction contractor's telephone numbers (during regular construction hours and off-hours);*
- c) The designation of an on-site construction complaint and enforcement manager for the project;*
- d) Notification of neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities about the estimated duration of the activity; and*
- e) A preconstruction meeting shall be held with the job inspectors and the general contractor/on-site project manager to confirm that noise measures and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.*

30. Interior Noise

Prior to issuance of a building permit and Certificate of Occupancy

If necessary to comply with the interior noise requirements of the City of Oakland's General Plan Noise Element and achieve an acceptable interior noise level, noise reduction in the form of sound-rated assemblies (i.e., windows, exterior doors, and walls), and/or other appropriate features/measures, shall be incorporated into project building design, based upon recommendations of a qualified acoustical engineer and submitted to the Building Services Division for review and approval prior to issuance of building permit. Final recommendations for sound-rated assemblies, and/or other appropriate features/measures, will depend on the specific building designs and layout of buildings on the site and shall be determined during the design phases. Written confirmation by the acoustical consultant, HVAC or HERS specialist, shall be submitted for City review and approval, prior to Certificate of Occupancy (or equivalent) that:

- a) Quality control was exercised during construction to ensure all air-gaps and penetrations of the building shell are controlled and sealed; and*
- b) Demonstrates compliance with interior noise standards based upon performance testing of a sample unit.*
- c) Inclusion of a Statement of Disclosure Notice in the CC&R's on the lease or title to all new tenants or owners of the units acknowledging the noise generating activity and the single event noise occurrences. Potential features/measures to reduce interior noise could include, but are not limited to, the following:*
 - i. Installation of an alternative form of ventilation in all units identified in the acoustical analysis as not being able to meet the interior noise requirements due to adjacency to a noise generating activity, filtration of ambient make-up air in each unit and analysis of ventilation noise if ventilation is included in the recommendations by the acoustical analysis.*
 - ii. Prohibition of Z-duct construction.*

31. Operational Noise-General

Ongoing

Noise levels from the activity, property, or any mechanical equipment on site shall comply with the performance standards of Section 17.120 of the Oakland Planning Code and Section 8.18 of the Oakland Municipal Code. If noise levels exceed these standards, the activity causing the noise shall be abated until appropriate noise reduction measures have been installed and compliance verified by the Planning and Zoning Division and Building Services.

38. Pile Driving and Other Extreme Noise Generators

Ongoing throughout demolition, grading, and/or construction

To further reduce potential pier drilling, pile driving and/or other extreme noise generating construction impacts greater than 90dBA, a set of site-specific noise attenuation measures shall be completed under the supervision of a qualified acoustical consultant. Prior to commencing construction, a plan for such measures shall be submitted for review and approval by the Planning and Zoning Division and the Building Services Division to ensure that maximum feasible noise attenuation will be achieved. This plan shall be based on the final design of the project. A third-party peer review, paid for by the project applicant, may be required to assist the City in evaluating the feasibility and effectiveness of the noise reduction plan submitted by the project applicant. The criterion for approving the plan shall be a determination that maximum feasible noise attenuation will be achieved. A special inspection deposit is required to ensure compliance with the noise reduction plan. The amount of the deposit shall be determined by the Building Official, and the deposit shall be submitted by the project applicant concurrent with submittal of the noise reduction plan. The noise reduction plan shall include, but not be limited to, an evaluation of implementing the following measures. These attenuation measures shall include as many of the following control strategies as applicable to the site and construction activity:

- a) Erect temporary plywood noise barriers around the construction site, particularly along on sites adjacent to residential buildings;
- b) Implement “quiet” pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration), where feasible, in consideration of geotechnical and structural requirements and conditions;
- c) Utilize noise control blankets on the building structure as the building is erected to reduce noise emission from the site;
- d) Evaluate the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings by the use of sound blankets for example and implement such measure if such measures are feasible and would noticeably reduce noise impacts; and
- e) Monitor the effectiveness of noise attenuation measures by taking noise measurements.

56. Vibrations Adjacent Historic Structures

Prior to issuance of a demolition, grading or building permit

The project applicant shall retain a structural engineer or other appropriate professional to determine threshold levels of vibration and cracking that could damage the **insert historic building name** (Historic Structure) and design means and methods of construction that shall be utilized to not exceed the thresholds.

Noise and Vibration Impact Assessment

Significance Criteria

The significance thresholds used in this noise assessment are based on the compatibility criteria of the City of Oakland General Plan. The *City of Oakland CEQA Thresholds of Significance Guidelines* state that the project would have a significant impact on the environment if it would:

1. Generate noise in violation of the City of Oakland Noise Ordinance (Oakland Planning Code section 17.120.050) regarding construction noise, except if an acoustical analysis is performed that identifies recommend measures to reduce potential impacts:² During the hours of 7 p.m. to 7 a.m. on weekdays and 8 p.m. to 9 a.m. on weekends and federal holidays, noise levels received by any land use from construction or demolition shall not exceed the applicable nighttime operational noise level standard (see Table 2);
2. Generate noise in violation of the City of Oakland nuisance standards (Oakland Municipal Code section 8.18.020) regarding persistent construction-related noise;
3. Generate noise in violation of the City of Oakland Noise Ordinance (Oakland Planning Code section 17.120.050) regarding operational noise;
4. Generate noise resulting in a 5 dBA permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or, if under a cumulative scenario where the cumulative increase results in a 5 dBA permanent increase in ambient noise levels in the project vicinity without the project (i.e., the cumulative condition including the project compared to the existing conditions) and a 3 dBA permanent increase is attributable to the project (i.e., the cumulative condition including the project compared to the cumulative baseline condition without the project) [NOTE: Outside of a laboratory, a 3 dBA change is considered a just-perceivable difference. Therefore, 3 dBA is used to determine if the project-related noise increases are cumulative considerable. Project-related noise should include both vehicle trips and project operations.];
5. Expose persons to interior L_{dn} or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities (and may be extended by local legislative action to include single-family dwellings) per California Noise Insulation Standards (CCR Part 2, Title 24);

² The acoustical analysis must identify, at a minimum, (a) the types of construction equipment expected to be used and the noise levels typically associated with the construction equipment and (b) the surrounding land uses including any sensitive land uses (e.g., schools and childcare facilities, health care and nursing homes, public open space). If sensitive land uses are present, the acoustical analysis must recommend measures to reduce potential impacts.

6. Expose the project to community noise in conflict with the land use compatibility guidelines of the Oakland General Plan after incorporation of all applicable Standard Conditions of Approval³;
7. Expose persons to or generate noise levels in excess of applicable standards established by a regulatory agency (e.g., occupational noise standards of the Occupational Safety and Health Administration [OSHA]);
8. During either project construction or project operation expose persons to or generate groundborne vibration that exceeds the criteria established by the Federal Transit Administration (FTA).⁴
9. Be located within an airport land use plan and would expose people residing or working in the project area to excessive noise levels; or
10. Be located within the vicinity of a private airstrip, and would expose people residing or working in the project area to excessive noise levels.

Construction Noise and Vibration

Construction of the project is expected to occur over a period of roughly 20 months. The noisiest activities (demolition, excavation and foundation) are expected to occur during the first phases. The later phases of construction include many activities that will occur indoors and are, therefore, much quieter. Table 5 shows a typical project sequence.

Project construction would begin with the demolition of the existing building on the site. Demolition would involve abating any hazards present within the building, demolishing and removing the existing structure, and removing the existing foundation slabs and underground utilities. The Project would be constructed in the following general phases:

- Demolition of existing buildings and mass excavation: approximately 40 work days;
- Construction of the mixed-use building: approximately 280 work days;
- Site improvements: approximately 40 work days;
- Commissioning, testing, and final inspection: approximately 40 work days.

³ The evaluation of land use compatibility should consider the following factors: type of noise source; the sensitivity of the noise receptor; the noise reduction likely to be provided by structures; the degree to which the noise source may interfere with speech, sleep or other activities characteristic of the land use; seasonal variations in noise source levels; existing outdoor ambient levels; general societal attitudes towards the noise source; prior history of the noise source; and tonal characteristics of the noise source. To the extent that any of these factors can be evaluated, the measured or computed noise exposure values may be adjusted in order to more accurately assess local sentiments towards acceptable noise exposure. (Oakland General Plan, Noise Element, 2005)

⁴ The FTA criteria were developed to apply to transit-related groundborne vibration. However, these criteria should be applied to transit-related and non-transit-related sources of vibration.

Table 5 presents the typical noise levels from various types of equipment that will likely be used during the project construction. The noisier equipment are generally diesel powered and generate noise levels in the range of 80 to 89 dBA at a distance of 50 feet. Pile driving is expected to occur during construction, but the piles will be pre-drilled as per Standard Condition of Approval 38.

An existing residential property borders the site on the north property line. The project building footprint is less than 1 foot from the residential property line. Since noise from construction equipment is attenuated at a rate of 6 dBA for each doubling of distance, the noisiest equipment could generate noise levels greater than 100 dBA at the nearest residential property lines when the equipment is at its nearest point.

Table 5: Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pneumatic Tool	85
Pile-driver (Impact)	101
Pile-driver (Sonic)	96
Pump	76
Roller	74
Saw	76
Scraper	89
Truck	88

Source: Federal Transit Administration *Transit Noise and Vibration Impact Assessment*, May 2006, FTA-VA-90-1003-06, (FTA 2006)

Construction activities are expected to generate noise levels at residential properties that are in excess of the Noise Ordinance standard of 65 dBA for construction lasting more than 10 days. This is the case for residences that border the site on the north side as well as residences across 17th & Webster Streets that have line of sight to the site.

Construction activities are expected to generate noise levels at commercial properties that are in excess of the Noise Ordinance standard of 70 dBA for construction lasting more than 10 days. This is the case for commercial properties that border the site on the north & east side as well as commercial properties across 17th & Webster Streets that have line of sight to the site.

Other noise sensitive receivers are farther away from the site. These include residences across Franklin Street and across 19th Street. Since these receivers are closer to the

major roadways than the project site, they are already exposed to comparable noise levels from loud vehicles such as trucks and motorcycles.

Construction activities will also generate groundborne vibration. Vibration effects are typically limited to land uses that are very close to the project site. Table 6 shows ground vibration levels for the various types of construction equipment that may be used at the project site.

Table 6: Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft (in/sec)
Pile Driver (impact)	Upper range	1.518
	typical	0.644
Pile Driver (sonic)	Upper range	0.734
	typical	0.170
Vibratory Roller		0.210
Hoe Ram		0.089
Large Bulldozer		0.089
Loaded Truck		0.076
Jackhammer		0.035
Small Bulldozer		0.003
PPV: Peak particle velocity Source: FTA (2006)		

The City’s Thresholds of Significance Guidelines has adopted the Federal Transit Administration’s (FTA 2006) recommended construction vibration damage criteria that should be used during the environmental impact assessment phase of a project to identify problem locations that must be addressed in the final design. These criteria include a threshold of 0.20 inches per second peak particle velocity (PPV) for *non-engineered timber and masonry buildings*. Other, less restrictive, criteria are recommended for engineered and reinforced buildings.

Since the nearest neighboring residential buildings are less than one foot from the building footprint, vibration levels could exceed the PPV 0.20 in/sec threshold. Based on calculations using a standard attenuation rate of ground vibration, the threshold could be exceeded by pile driving or if heavy equipment is used along property line near adjacent buildings (i.e. when a vibratory roller is within 26 feet of an adjacent building, or when a large bulldozer or hoe ram is within 15 feet of an adjacent building).

The City of Oakland’s standard conditions of approval (SCA) will lessen the impacts of the construction period noise and vibration. SCA 27 provides reasonable limits on the days and hours of construction to avoid generating noise when it would be most objectionable to neighboring residences. SCA 28 requires that the project applicant

prepare and implement a noise reduction program that addresses noise attenuation measures for equipment and tools. SCA 29 provides measures to respond to and track construction noise complaints. SCA 38 reduces extreme noise generation by requiring that a plan for site specific noise attenuation measures be developed under the supervision of a qualified acoustical consultant to provide the maximum feasible noise attenuation.

SCA 38 is relevant for this project because construction noise is expected to exceed 90 dBA at residential property lines. Measures such as an 8 to 12 foot high solid plywood walls would provide a noticeable reduction in noise (5 dBA) at first floor receivers when construction equipment is at or below ground level.

The following additional measures, carried out in furtherance of Standard Condition #38 above, would minimize potential adverse vibration effects from Project-related construction activities:

- The noise reduction program required by Standard Condition of Approval #38 (Pile Driving and Other Extreme Noise Generators) should be supplemented to include measures to reduce potential adverse effects of vibration on adjacent properties. The project applicant shall retain a structural engineer or other appropriate professional to determine threshold levels of vibration that could damage nearby existing structures and design means and methods of construction that shall be utilized to not exceed the thresholds. Measures could include limiting the types of equipment or the manner that equipment can operate within certain distances of existing buildings. For example, vibratory rollers used for compaction may need to be operated without the vibration feature within some pre-determined distance of some property lines. Vibration monitoring could be used to help determine the appropriate setback distances and to verify that damage threshold levels are not exceeded.

With the implementation of the City of Oakland's SCAs as discussed above, the construction noise and vibration impact would be reduced to a less than significant level.

Permanent Increases in Ambient Traffic Noise

To assess the potential noise impact from increased traffic on roadways near the project, noise levels were calculated based on volume data in the project's traffic study⁵. The calculated noise levels are shown in Table 7. Since the maximum increase in traffic noise is less than the City of Oakland's 5 dBA threshold of significance, this is a less than significant impact.

⁵ Transportation Impact Analysis Memorandum by Fehr & Peers, April 2015

Table 7: Traffic Noise Level Increase Due to Project Generated Traffic

Roadway	L _{dn} (dBA) at Existing Land Uses		
	Existing	Existing + Project	Increase due to project
17 th Street	68.7	68.7	<0.1
Webster Street	69.6	69.8	0.2

Conflicts with Land Use Compatibility Guidelines

Based on the results of the noise measurement program, the L_{dn} at the project building setback at the corner of 17th Street and Webster Street (ST-4) is 67 dBA. With the predicted increase in future traffic (Year 2040), the noise level at this location will increase to an L_{dn} of 68 dBA.

The future noise levels at the project site are at the upper end of the *conditionally acceptable* range of the City’s noise and land use compatibility standards for residential land use (**Error! Reference source not found.**). According to these guidelines, projects exposed to this noise level may be undertaken only after a detailed analysis of the noise-reduction requirements is conducted, and if necessary noise mitigating features are included in the design. Conventional construction will usually suffice as long as it incorporates air-conditioning or forced fresh-air-supply systems, though it will likely require that project occupants maintain their windows closed.

SCA 30 requires that projects of this type achieve an acceptable interior noise level with sound-rated assemblies as recommended by a qualified acoustical engineer and based on the specific building design and layout. With the implementation of SCA 30, interior noise is a less than significant impact.

Operational Noise in Excess of Standards or Resulting in a Permanent Increase in Noise

Operational noise from the project will be from mechanical equipment associated with ventilation or refrigeration, the loading dock on Webster Street and vehicles entering and exiting the parking garage from Webster Street.

Mechanical noise associated with any heating, ventilation or air conditioning systems will be subject to SCA#31 which requires that noise levels conform to the standards in the City’s Planning Code and Municipal Code.

The loading dock would be used by vehicles delivering goods, trash pick-up and move-ins. Exact hours of operation and frequency of use are not currently known but any noises that occur within the loading dock area will also be subject to the noise standards in the City’s Planning Code and Municipal Code as per the City’s Standard Condition of Approval #31.

The entrance to the parking garage to the existing building has an alarm to alert pedestrians that a car will be exiting the garage. The alarm generates increased noise levels of up to 5 dBA for just under 3 seconds. It is expected that the new building will have a similar warning system and it will be required to conform to the noise standards set forth in the City’s Planning and Municipal Code.

Since all operational noise associated with the project will be required to conform to the noise standards in the City’s Planning and Municipal Code per SCA #31, operational noise associated with the project is considered a less than significant impact.

Vibration

The project site, is not exposed to significant levels of ambient vibration since it is not located along a rail line or other source of vibration. Also, the operation of the project will not include any significant vibration sources. Since operation of the project would not expose persons to or generate vibration levels in excess of the applicable FTA vibration criteria this is a less than significant impact.

Cumulative Noise Impacts

Table 8 shows the future traffic noise levels including caused by cumulative growth and the project.

Table 8: Traffic Noise Level Increase Due to Cumulative Growth

Roadway Segment	L _{dn} (dBA) at Existing Land Uses				
	Existing	2040 No Project	2040 + Project	Increase Due to Project	Cumulative Increase
17 th Street, East of Webster Street	68.7	69.5	69.5	<0.1	0.8
Webster Street, North of 17 th Street	69.6	69.7	70.7	<0.1	1.1

Cumulative noise levels increases are less than 2 dBA on Webster and 17th Street. The portion of this increase due to the project is less than 0.1 dBA (see Table 9). Since the increase in traffic noise is less than the City of Oakland’s 5 dBA threshold of significance, this is a less than significant cumulative impact.

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