4.9.1 Introduction

This section evaluates the potential noise impacts of the Computation Research and Theory (CRT) Facility project. Information presented in the discussion and analysis below was obtained from a site visit, the Lawrence Berkeley National Laboratory (LBNL) 2006 LRDP EIR, other California Environmental Quality Act (CEQA) documents prepared for projects at LBNL, and other noise surveys completed for the University of California, Berkeley. This section discusses the existing noise environment at sensitive receivers that could potentially be affected by project-generated noise, the regulatory framework for control of excessive noise, and analyzes the potential for the proposed project to affect the existing ambient noise environment during construction and operations.

No comments were received regarding potential noise impacts in response to the Notice of Preparation circulated for this EIR.

4.9.2 Environmental Setting

Background Information on Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its pitch or its loudness. Pitch is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. Loudness is amplitude of sound waves combined with the reception characteristics of the ear. Amplitude may be compared with the height of an ocean wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A decibel (dB) is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibel are calculated on a logarithmic basis. An increase of 10 dB represents a ten-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its level. Each 10 dB increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 4.9-1, Definitions of Acoustical Terms Used in this Report.

Table 4.9-1
Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measures to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter
Frequency, Hz*	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period. The hourly L_{eq} used for this report is denoted as dBA $L_{eq[h]}$.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 dB in the evening from 7:00 PM to 10:00 PM and after addition of 10 dB to sound levels in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Illingworth & Rodkin, Inc.
* Hz = Hertz

There are several methods of characterizing sound. The most common in California is the A-weighted sound level or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 4.9-2, Typical Noise Levels in the Environment. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

Table 4.9-2
Typical Noise Levels in the Environment

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
	120 dBA	
Jet fly-over at 300 meters		Rock concert
	110 dBA	
Pile driver at 20 meters	100 dBA	
		Night club with live music
	90 dBA	
Large truck pass by at 15 meters		
	80 dBA	Noisy restaurant
		Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters
Commercial/Urban area daytime		Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	
Suburban daytime		Active office environment
	50 dBA	
Urban area nighttime		Quiet office environment
	40 dBA	
Suburban nighttime		
Quiet rural areas	30 dBA	Library
		Quiet bedroom at night
Wilderness area	20 dBA	
	10 dBA	Quiet recording studio
Threshold of human hearing	0 dBA	Threshold of human hearing

Source: Illingworth & Rodkin, Inc.

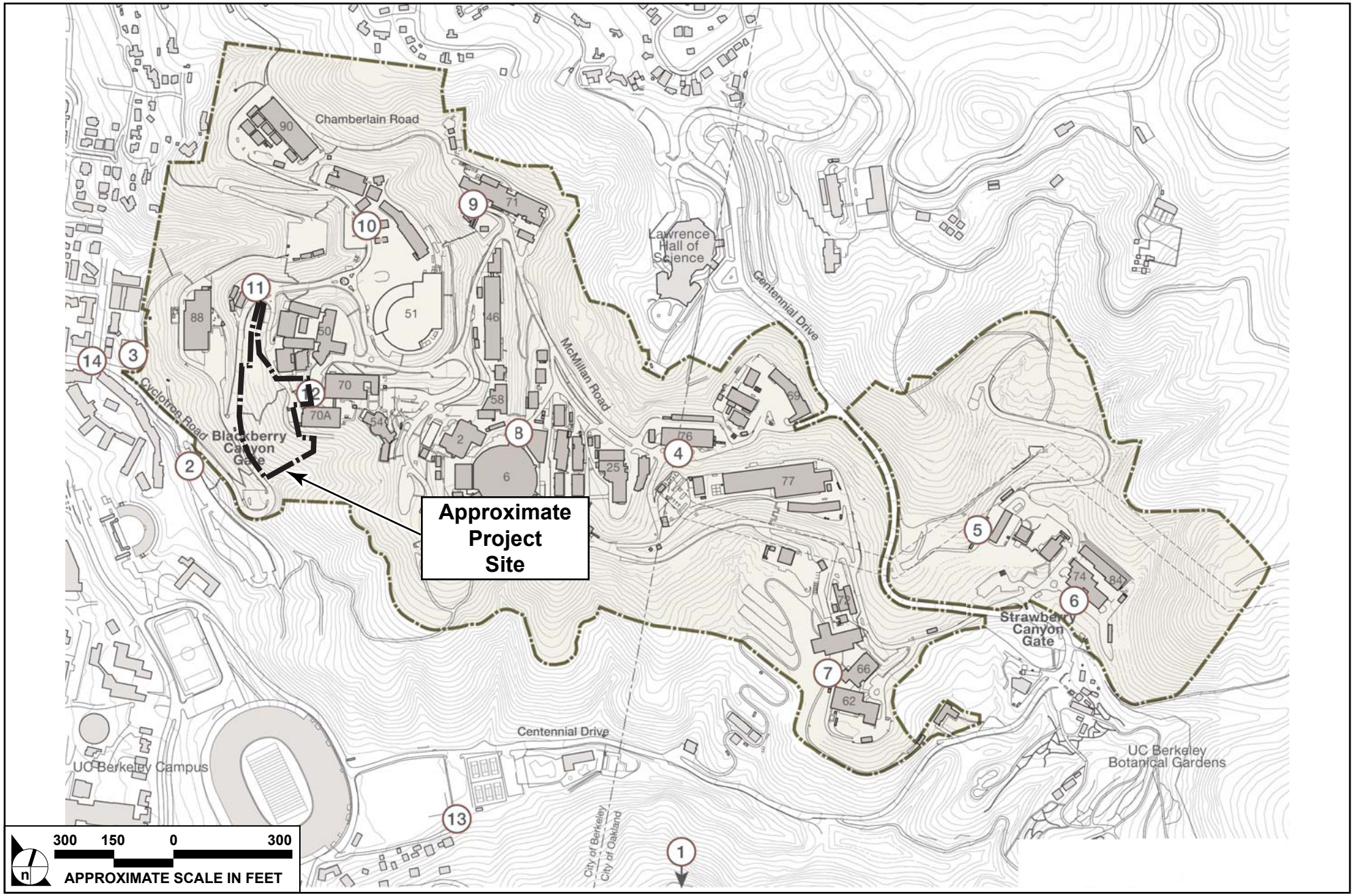
The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night – because excessive noise interferes with the ability to sleep – 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level, (CNEL), is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 PM - 10:00 PM) and a 10 dB addition to nocturnal (10:00 PM - 7:00 AM) noise levels. The Day/Night Average Sound Level, DNL, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Project Site and Surrounding Land Uses

The site for the CRT project is located in the western portion of the LBNL property, and is flanked on three sides by Buildings 70 and 70A to the east, the Building 50 complex to the north, and Cyclotron Road and the Blackberry Canyon entrance gate to the west. LBNL is surrounded by a mix of land uses, including open space, institutional, residential, and commercial uses, the UC Berkeley campus, the Tilden Regional Park, and residences. The nearest noise sensitive receptors located off the LBNL site are students who live in the Foothill Student Housing Complex located below and about 600 feet to the southwest of the project site. The Greek Theater, an entertainment venue on the campus, is located adjacent to Foothill Student Housing Complex. There are also multi-family residences and the Tibetan Nyingma Institute located approximately 700–800 feet south of the project site along Highland Place.

Noise in the project area results primarily from vehicular traffic on the road network. Noise from intermittent high-altitude jet aircraft overflights also contributes to the ambient noise levels. Measured data reported in the LBNL 2006 LRDP EIR are shown in Table 4.9-3, Measured Noise Levels in the Project Vicinity and measurement locations are shown on Figure 4.9-1, Noise Measurement Locations. Data at Site 11 represents the project site. It can be seen that the average noise level measured at the project site during the daytime measurement was 66 dBA L_{eq} and noise levels ranged from 48 dBA L_{90} to 83 dBA L_{max}. Site 2, at the Foothill Student Housing parking lot above the housing on Cyclotron Road, represents the noise environment at that receiver location. During the daytime, the average noise level was 57 dBA L_{eq} and noise levels ranged from 49 dBA L_{90} to 67 dBA L_{max}. A noise measurement was made in this parking lot by Illingworth & Rodkin, Inc. on August 6, 2007. During the midday measurement, the average noise level was 52 dBA L_{eq} and noise levels ranged from 49 dBA L_{90} to 64 dBA L_{max}.



SOURCE: LBNL; ESA - 2007, Perkins+Will - September 2007

FIGURE **4.9-1**

Noise Measurement Location

924-002•11/07

The lower range of noise levels was likely due to the measurement location, which was close to the housing and away from the nearby vehicular traffic on Cyclotron Road. During this measurement, jet aircraft overflights generated maximum noise levels ranging from 54 dBA to 60 dBA. Vehicular traffic on Cyclotron Road, including automobiles, pickup trucks, and a lab shuttle, generated maximum noise levels ranging from 53 dBA to 63 dBA L_{max}. The steady noise from distant traffic and heating, ventilating, and air conditioning equipment caused background noise levels in the range of 48-50 dBA. Site 3 was at the Tibetan Nyingma Institute. The average noise level at this site was 48 dBA during the daytime measurement and noise levels ranged from 46 dBA L_{90} to 57 dBA L_{max}.

Table 4.9-3
Measured Noise Levels in the Project Vicinity

Site No.[b]	Measurement Location	Noise Level in dBA[a]			
		L_{eq}	L_{max}	L_{10}	L_{90}
Based on 15-Minute Noise Measurement Data					
1	299 Panoramic Way	46	53	NM	NM
2	Foothill Parking Lot	57	67	58	49
3	Tibetan Nyingma Institute (n. side)	48	57	49	46
4	LBNL Building 76	68	81	68	64
5	LBNK Building 85	53	72	51	46
6	LBNL Building 74	64	81	63	59
7	LBNL Buildings 62 and 63	54	71	53	45
8	LBNL Buildings 6 and 7	58	68	60	54
9	LBNL Building 71	60	74	62	46
10	LBNL Buildings 56 and 61	52	61	54	49
11	LBNL Building 65	66	83	70	48
12	LBNL Building 70A	58	73	59	50
13[c]	End of Canyon Road	58	68	60	53
14[c]	Hearst Avenue at Highland Place	64	80	55	57

a L_{eq} = equivalent steady-state noise level over a one-hour period produced by the same noise energy as the variable noise levels during that period; L_{max} = instantaneous maximum noise level; L_{10} = noise level exceeded 10 percent of the time; L_{90} = noise level exceed 90 percent of the time.
b Measurement locations correspond to those shown in Figure 4.9-1.
c Noise measurement reported in UC Berkeley LRDP EIR, Table 4.9-3.
NM = Not Measured

Source: Environmental Science Associates 2003 and 2004; UC Berkeley 2004.

Ambient noise levels were monitored by Illingworth & Rodkin, Inc. on Panoramic Hill in February 2006. Noise measurements were made continuously over several weekdays and a weekend at three different locations in the neighborhood. The 24-hour day/night average noise level typically ranged from about

54 dBA DNL to 57 dBA DNL at each of the three sites over the five-day period. Background ambient noise levels were typically in the range of 45-50 dBA L_{90} during the daytime and 40-45 dBA L_{90} at night.[1]

4.9.3 Regulatory Considerations

LBNL is a federal facility managed and operated by the University of California under a U.S. DOE-UC contract. The research, service, and training work conducted at LBNL is within the University's mission and the land is owned by The Regents of the University of California. As such, LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, LBNL seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The western part of the LBNL site is within the Berkeley city limits, and the eastern part is within the Oakland city limits. This section summarizes relevant policies contained in both the Berkeley and Oakland general plans, as well as the City of Berkeley and City of Oakland ordinances relevant to noise impacts at LBNL.

Local Plans and Policies

City of Berkeley General Plan and Noise Ordinance

The City of Berkeley's General Plan Environmental Management Element contains guidelines for determining the compatibility of various land uses with different noise environments. Generally, the noise level for residential, hotel and motel uses is 60 dBA L_{dn} or less, while conditionally acceptable noise levels range from over 60 dBA L_{dn} to 75 dBA L_{dn} (may require insulation, etc.). Noise levels over 75 dBA L_{dn} are, in general, unacceptable. The City of Berkeley's Community Noise Ordinance sets limits for permissible noise levels during the day and night according to the zoning of the area. If ambient noise exceeds the standard, the ambient noise level becomes the allowable noise level. Areas adjacent to the southwestern portion of LBNL are zoned R-1H, R-2AH, and R-3H.[2] Table 4.9-4 presents the maximum allowable receiving noise standards for residential land uses.

1 Southeast Campus Integrated Projects Draft EIR, 2006.

2 "H" is a Hillside overlay district designed to protect views and character of Berkeley's hills, and allows modification of lot sizes and building heights when justified by steep topography, irregular lot sizes, etc. R-2A districts permit small multiple-family and garden-type apartment structures consistent with adjacent areas and with a maximum of open space.

Table 4.9-4
City of Berkeley Maximum Allowable Receiving Noise Standards[a]
for Residential Land Uses, dBA

Residential Zoning District	Daytime 7:00 AM to 10:00 PM	Nighttime 10:00 PM to 7:00 AM
R-1, R-2	55	45
R-3	60	55

Source: Berkeley Noise Ordinance
[a] Noise level not to be exceeded by more than 30 minutes any hour.

For construction/demolition noise, with certain exceptions, the Noise Ordinance (Sec. 13.40.070 of the Municipal Code) prohibits operating tools and equipment used in these activities between 7:00 PM and 7:00 AM on weekdays and 8:00 PM and 9:00 AM on weekends or holidays such that the sound creates a noise disturbance across a residential or commercial real property line. The Noise Ordinance states that, "where technically and economically feasible," maximum weekday construction noise levels must be controlled so as not to exceed 75 dBA at the nearest properties for mobile equipment ("nonscheduled, intermittent, short-term operation (less than 10 days)") and 60 dBA at the nearest properties for stationary equipment ("repetitively scheduled and relatively long-term operation (periods of 10 days or more)"), in R-1 and R-2 zoning districts; in the R-3 district, the permitted noise levels are 5 dBA higher. The noise standards are more restrictive on weekends, by 10 dBA for stationary equipment and 15 dBA for mobile equipment.

Berkeley General Plan policies pertaining to noise that are relevant to the proposed project include the following:

Environmental Management Objective 8: Protect the community from excessive noise levels.

Policy EM-43 Noise Reduction: Reduce significant noise levels and minimize new sources of noise.

Policy EM-44 Noise Prevention and Elimination: Protect public health and welfare by eliminating existing noise problems where feasible and by preventing significant future degradation of the acoustic environment.

Policy EM-45 Traffic Noise: Work with local and regional agencies to reduce local and regional traffic, which is the single largest source of unacceptable noise in the city.

Policy EM-46 Noise Mitigation: Require operational limitations and all feasible noise buffering for new uses that generate significant noise impacts near residential, institutional, or recreational uses.

Policy EM-47 Land Use Compatibility: Ensure that noise-sensitive uses, including, but not limited to, residences, child-care centers, hospitals and nursing homes, are protected from detrimental noise levels.

City of Oakland General Plan and Noise Ordinance

The Oakland General Plan contains guidelines for determining the compatibility of various land uses with different noise environments. The Noise Element recognizes that some land uses are more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved.

The City of Oakland also regulates short-term noise through city ordinances, which include a general provision against nuisance noise sources (Planning Code, Section 17.120). The factors that are considered when determining whether the ordinance is violated include (a) the level, intensity, character, and duration of the noise; (b) the level, intensity, and character of the background noise; and (c) the time when, and the place and zoning district where, the noise occurred. Table 4.9-5, City of Oakland Maximum Allowable Receiving Noise Standards, dBA, presents the maximum allowable receiving noise standards for land uses in Oakland.

Table 4.9-5
City of Oakland Maximum Allowable Receiving Noise Standards, dBA

Cumulative Number of Minutes in the Daytime and Nighttime One-Hour Period[b]	Residential and Civic Uses[a]		Commercial Uses
	Daytime 7:00 AM to 10:00 PM	Nighttime 10:00 PM to 7:00 AM	Day or Night
20	60	45	65
10	65	50	70
5	70	55	75
1	75	60	80
0	80	65	85

Source: Oakland Planning Code Sec. 17.120.050

a Legal residences, schools and childcare facilities, health care and nursing homes, public open space, or similarly sensitive land uses.

b The concept of "20 minutes in an hour" is equivalent to the $L_{33.3}$, which is a noise descriptor identifying the noise level exceeded one-third (33.3 percent) of the time. Likewise, "10 minutes in an hour," "5 minutes in an hour," and "1 minute in an hour" are equivalent to the $L_{16.7}$, $L_{1.7}$, respectively. L_{max}, or maximum noise level, represents the standard defined in terms of "0 minutes in an hour."

The Oakland Ordinance (Oakland Planning Code Sec. 17.120.050) specifies that, for residential receptors, the maximum allowable receiving noise for weekday (Monday through Friday, 7:00 AM to 7:00 PM) construction activity of greater than 10 days in duration is 65 dBA, while on weekends (9:00 AM to 8:00 PM), the maximum allowable receiving noise for long-term construction is 55 dBA. For commercial and industrial receptors, the maximum allowable receiving noise for construction activity greater than 10 days is 70 dBA on weekdays and 60 dBA on weekends. For construction activity of 10 days or less, the residential receiving standard is 80 dBA on weekdays and 65 dBA on weekends, while the commercial/industrial standards are 85 dBA on weekdays and 70 dBA on weekends. Nighttime construction is subject to the nighttime noise standards in Table 4.9-5.

4.9.4 Impacts and Mitigation Measures

Significance Criteria

The impact of the proposed project related to noise would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the CEQA Guidelines and the UC CEQA Handbook:

- Expose people to or generate noise levels in excess of standards established in any applicable plan or noise ordinance, or applicable standards of other agencies;
- Expose people to or generate excessive ground-borne vibration or ground-borne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in exposure of people residing or working in the project area to excessive noise levels if the project is located within an area covered by an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport; or
- Result in exposure of people residing or working in the project area to excessive noise levels if the project is located in the vicinity of a private airstrip.

Issues Not Discussed Further

The Initial Study prepared for the CRT project found that the project site is not located within the boundaries of any airport land use plan, is more than 2 miles from the nearest public airport, and is not located within the vicinity of a private airstrip. Therefore, implementation of the proposed project would

not be affected by operation of a public airport or a private airstrip. These issues are not addressed further in this section.

Methodology

To assess whether the proposed project would expose persons to or generate noise levels that are excessively high, the EIR evaluates the absolute change in noise levels due to the project and the relationship between the resultant noise level and the noise/land use compatibility guidelines of the Governor's Office of Planning and Research (OPR 1998). OPR has developed specific planning guidelines for noise/land use compatibility, which are shown in Table 4.9-6. These form the basis of the noise/land use compatibility guidelines adopted by the cities of Berkeley and Oakland in the noise elements of their general plans.

For low-density residential uses, normally acceptable exterior noise levels are those below 60 dBA day/night noise level (DNL) or community noise equivalent level (CNEL). For multi-family residences, normally acceptable exterior noise levels are those below 65 dBA DNL or CNEL. Campus support housing falls into the category of multifamily housing (medium- to high-density) and therefore is subject to the 65-dBA acceptability level for normally acceptable noise levels. Offices, laboratories, and academic buildings on the LBNL site would be subject to the 70-dBA acceptability level for normally acceptable noise levels, which is the same threshold for schools and office buildings.

For the purposes of this EIR, noise impacts would be considered significant if the project resulted in the following DNL levels at locations that affect human receptors:

- An increase of 3 dBA DNL where the noise levels without the project are above the OPR standards for "normally acceptable" noise levels; or
- An increase of 5 dBA DNL, where the noise levels without the project are 50 to 65 dBA DNL for residential uses and the increase in noise from the project does not cause the OPR standards to be exceeded.

It should be noted that a noise increase of 3 dB is generally regarded as the minimum perceptible increase and has been used as a standard in this EIR to evaluate impacts in areas where the ambient or background noise levels without the project are close to or exceed the OPR noise/land use compatibility standard for affected land uses. Increases of 5 dB have been used as a standard in areas where the ambient or background noise levels without the project are moderate. The use of this "sliding scale" is appropriate because where ambient/background levels are low, an increase over 3 dB would be perceptible but would not cause annoyance or activity interference. In contrast, if the ambient/background noise levels are high (above 65 dBA in multi-family residential areas), any

perceptible increase could cause an increase in annoyance. These standards have been used to assess the significance of any long-term increases in noise generated by the project.

Table 4.9-6
Acceptable Exterior Noise Levels for Land Use Categories

Land Use	Levels of Acceptability[a], DNL[b], or CNEL[c] (dBA)[d]			
	Normally Acceptable	Conditionally Acceptable	Normally Acceptable	Clearly Unacceptable
Residential : Low Density Single Family, Duplex, Mobile Homes	Less than 60	55 to 70	70 to 75	More than 75
Residential : Multi-Family	Less than 65	60 to 70	70 to 75	More than 75
Transient Lodging: Motels, Hotels	Less than 65	60 to 70	70 to 80	More than 80
Schools, Libraries, Churches, Hospitals, Nursing Homes	Less than 70	60 to 70	70 to 80	More than 80
Auditoriums, Concert Halls, Amphitheaters	--	Less than 70	--	More than 65
Sports Arena, Outdoor Spectator Sports	--	Less than 75	--	More than 70
Playgrounds, Neighborhood Parks	Less than 70	--	67 to 75	More than 73
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Less than 75	--	70 to 80	More than 80
Office Buildings, Business Commercial and Professional	Less than 70	68 to 73	More than 75	--
Industrial, Manufacturing, Utilities, Agriculture	Less than 75	70 to 80	More than 75	--

Source: Governor's Office of Planning and Research, General plan Guidelines, Appendix A: Guidelines for the Preparation and Content of the Noise Element of the General Plan, 1998.

a Levels of Acceptability are defined as follows:
Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air systems or air conditioning, will normally suffice.
Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

b Day/Night Level (DNL) is a descriptor of the community noise environment that represents the energy average of the A-weighted sound levels occurring during a 24-hour period, and that accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 PM and 7:00 AM is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

c Community Noise Equivalent Level (CNEL) is the average A-weighted noise level during a 24-hour day, obtained by addition of 5 dB in the evening from 7:00 to 10:00 PM, and an addition of a 10 dB penalty in the night between 10:00 PM and 7:00 AM.

d A definition of decibels and A-weighted decibels (dBA) is provided under "Background Information" in this section.

Construction noise associated with the project is analyzed to assess whether the project would result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. The criterion noise level for determining the impact significance of such noise on sensitive receptors varies according to the time of day, as noted in the discussion of the Berkeley and Oakland noise ordinances. The impact from construction noise is considered significant if it would

result in a violation of noise ordinance standards of the cities of Berkeley or Oakland (as applicable, depending on the location of off-site receptors). Because the sensitive receptors that are the closest to the project site are located in the city of Berkeley, noise from the operation of stationary construction equipment at the project site would result in a significant impact if the noise levels at the receptor exceeded 60 dBA during daytime hours. The construction noise impact would also be significant if construction noise levels at the receptors exceeded the noise levels in the Berkeley community Noise Ordinance for weekends and nighttime.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the 2006 LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM NOISE-1a: To reduce daytime noise impacts due to construction/ demolition, LBNL shall require construction/demolition to implement noise reduction measures appropriate for the project being undertaken. Measures that might be implemented could include, but not be limited to, the following:

- Construction/demolition activities would be limited to a schedule that minimizes disruption to uses surrounding the project site as much as possible. Such activities would be limited to the hours designated in the Berkeley and/or Oakland noise ordinance(s), as applicable to the location of the project. This would eliminate or substantially reduce noise impacts during the more noise-sensitive nighttime hours and on days when construction noise might be more disturbing.

- To the maximum extent feasible, 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).

- Stationary noise sources shall be located as far from adjacent receptors as possible.

- At locations where noise may affect neighboring residential uses, LBNL will develop a comprehensive construction noise control specification to implement construction/demolition noise controls, such as noise attenuation

barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification will include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.

LRDP MM NOISE-1b: For each subsequent project pursuant to the LRDP that would involve construction and/or demolition activities, LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property line receiving noise standards of the cities of Berkeley or Oakland (as applicable). If the consultant determines that the standards would not be exceeded, no further mitigation is required. If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures would be required, as determined necessary by the noise consultant.

- Stationary noise sources shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible 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 where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

- Noise from idling trucks shall be kept to a minimum. No trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.

- If determined necessary by the noise consultant, a set of site-specific noise attenuation measures shall be developed before construction begins; possible measures might include erection of temporary noise barriers around the construction site, use of noise control blankets on structures being erected to reduce noise emission from the site, evaluation of the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.

- If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, LBNL or its contractor shall provide written notification to all neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of party responsible for construction). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the LBNL boundaries.

LRDP MM NOISE-4: Mechanical equipment shall be selected and building designs prepared for all future development projects pursuant to the 2006 LRDP so that noise levels from future building and other facility operations would not exceed the Noise Ordinance limits of the cities of Berkeley or Oakland for commercial areas or residential zones as measured on any commercial or residential property in the area surrounding the future LRDP project. Controls that would typically be incorporated to attain adequate noise reduction would include selection of quiet equipment, sound attenuators on fans, sound attenuator packages for cooling towers and emergency generators, acoustical screen walls, and equipment enclosures.

Project Impacts and Mitigation Measures

CRT Impact NOISE-1: Construction activities would temporarily elevate noise levels at the project site and surrounding areas. (Significant and Unavoidable)

On-Site Construction Activities

Construction activities would begin in mid-2008 and would last approximately two years.[3] Noise from construction activities would result primarily from the operation of equipment. Construction preparation activities, such as excavation, grading, earth moving, and stockpiling operations, generate noise. Construction activities, such as foundation work, framing, and finishing operations, would also generate noise. Construction-related noise levels at and near the project site would fluctuate, depending on the particular type, number, and duration of uses of various pieces of construction equipment. Noise levels representative of the various construction phases are shown on Table 4.9-7, Typical Construction Noise

[3] For the purposes of this EIR, the term "construction" unless specifically indicated otherwise, includes activities that involve construction of new facilities, major rehabilitation, or modification of existing facilities, and demolition of existing facilities.

Levels. Illingworth and Rodkin used noise standards in compliance with LRDP EIR Mitigation Measure NOISE 1b. Results of that analysis are set forth below.

Table 4.9-7
Typical Construction Noise Levels

Construction Activity	Noise Level (L_{eq})[a]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

Source: U.S. Environmental Protection Agency, Noise from Construction Equipment and Building Operations, Building Equipment, and Home Appliances, December 1971.

a Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.

In addition, impulsive noises generated by certain types of construction (such as earth compactors and pile driving) can be particularly annoying. Table 4.9-8, Typical Noise Levels from Construction Equipment, shows typical noise levels produced by various types of construction equipment.

Construction noise is a short-term phenomenon; CRT project construction would last approximately two years. Construction noise levels would vary from hour to hour and from day to day during this time, depending on the type of work being done and equipment in use. Major noise-generating construction activities include excavation, foundation work, building erection, and exterior finishing. Noise levels attenuate with distance. Taking into account the distance between the project site and the nearest sensitive offsite receptors, Foothill Student Housing and the Nyingma Institute, and without considering any attenuation due to topographical shielding, molecular absorption, or ground absorption, the predicted maximum noise level is 65 to 70 dBA L_{eq} at the nearest receptors. Projected noise levels would be above the maximum allowable level of 60 dBA set forth in the City of Berkeley Noise Ordinance for typical weekday daytime construction. Other sensitive receptors in the surrounding area within 1,100 to 1,200 feet of the construction site, and with direct line of sight, would also experience significant noise impacts as construction noise levels would exceed 60 dBA.

Table 4.9-8
Typical Noise Levels from Construction Equipment

Construction Equipment	Noise Level (dBA at 50 feet)
Dump Truck	88
Portable Air Compressor	81
Concrete Mixer (Truck)	85
Jack Hammer	88
Scraper	88
Dozer	87
Paver	89
Generator	76
Pile Driver	101
Rock Drill	98
Pump	76
Pneumatic Tools	85
Backhoe	85

Source: Cunnif, Environmental Noise Pollution 1977.

Construction activities on weekends, or at night, would also exceed the allowable noise limits. LRDP Mitigation Measure NOISE-1a, which would limit project construction to the hours between 7:00 AM and 7:00 PM on weekdays, non-holidays, is incorporated into the proposed project. While this would avoid the impact from construction activities on weekends and at night, it would not avoid the significant noise impact related to weekday construction activities. Other measures specified in LRDP Mitigation Measure NOISE-1a and NOISE-1b, including muffling equipment, placing equipment and laydown areas away from or shielded sensitive receptors, and developing a comprehensive noise-control plan, would be required and would reduce construction noise to varying degrees. It is possible that the combined use of such measures could reduce typical noise levels during construction to below threshold levels during most working hours. However, the efficacy of these noise-reduction measures cannot be definitively and quantitatively established, and noise from some types of equipment would occasionally exceed the 60 dBA threshold. Further mitigation is not feasible. Therefore, the impact, although temporary in nature, would be significant and unavoidable.

Construction Traffic

Construction-related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. As discussed in Section 3.0, Project Description, about 9,000 cubic yards (CY) of fill material would be needed in the early stages of construction. Approximately 7,000 CY of this fill material would likely need to be imported from outside the LBNL site. Assuming that each truck has a 12 CY capacity, the delivery of fill material for the CRT project would result in up to 1,166 one-way truck trips (583 inbound full trucks and 583 outbound empty trucks). The fill stage of the construction, expected to last about three months, would generate up to 19 one-way truck trips per work day using city streets. Following completion of grading activities, construction of the building and utilities is expected to require about 10 major truck deliveries per day, resulting in 20 one-way truck trips that would use city streets. All construction trucks are expected to travel to and from the site via Cyclotron Road. Construction trucks are expected to use University Avenue and Hearst Avenue to access Cyclotron Road. Existing noise levels along these city streets range between 69 - 70 dBA L_{dn} along Hearst Avenue and between 70 - 73 dBA L_{dn} along University Avenue. The addition of 20 truck trips to these city roads due to project construction would increase ambient noise levels by less than 1 dB. In addition to large construction trucks, there would be approximately 50 small and medium truck trips and vehicle trips associated with about 100 construction workers per day during the construction of the proposed project. The noise from these vehicles combined with that from the large construction trucks would be less than 2 dB. The impact related to noise from project-related construction vehicle trips would be less than significant.

In summary, although noise from construction traffic would not result in a significant noise impact, on-site construction activities, even with LRDP mitigation, would result in noise levels that would exceed the significance threshold.

Mitigation Measure: None available.

Significance after Mitigation: Significant and unavoidable.

CRT Impact NOISE-2: Temporary vibration impacts related to construction activities would not cause a significant impact. (Less than Significant)

Construction activities can cause vibration that varies in intensity, depending on several factors. Of all construction activities, use of pile driving equipment typically generate the highest ground-borne vibration levels. No pile driving is anticipated for this project. Although the foundation of the CRT Facility would be built on piers installed in bedrock, the piers would be drilled. Sensitive offsite residential receptors are located more than 500 feet from the project site. Vibration levels from the

proposed construction activities would be imperceptible at these locations. The impact would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact NOISE-3: Vehicular traffic associated with the CRT project would result in an incremental, but imperceptible, long-term increase in ambient noise levels. (Less than Significant)

Traffic data was developed by Fehr & Peers Transportation Consultants at five study intersections. Four different scenarios were analyzed, existing peak hour traffic volumes, near-term no project peak hour traffic volumes, near-term with project peak hour traffic volumes, and cumulative with project peak hour traffic volumes. These traffic data were used to determine whether or not there would be a substantial increase in traffic noise on streets serving the project site as a result of project-generated traffic. Project-generated traffic is calculated to make no noticeable or measurable change (less than 0.5 dBA L_{dn}) at any of the roadway segments associated with the study intersections. Project-generated traffic would therefore cause an imperceptible change to the noise environment. The impact would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact NOISE-4: The operation of heating, ventilating, and air conditioning equipment at the CRT site would not result in a substantial long-term increase in ambient noise levels. (Less than Significant)

The major sources of mechanical equipment noise planned at the project site are cooling towers and optional cogeneration equipment proposed near the east side of the building. Community noise levels at offsite noise sensitive receptor locations from the operation of these cooling towers were calculated based on manufacturer's noise data supplied by the consulting mechanical engineer.

The site plan shows up to nine cooling tower cells adjacent to Building 70A, generally north and east of the CRT Facility. Where the towers are proposed, the new CRT facility would effectively buffer the cooling tower noise that would otherwise propagate toward the offsite sensitive receptors to the south and west. Taking into consideration the attenuation due to distance and the shielding provided by the buildings and topography, the calculated noise level from the cooling towers is 43 to 44 dBA at the Foothill Student Housing, and at the Nyingma Institute and surrounding areas. Noise levels would be less at all other offsite sensitive receiver locations. Noise from mechanical equipment would be at or below existing ambient baseline noise levels. There would be no change in the DNL as a result of noise

from the mechanical systems. Ambient noise levels in the middle of the night may increase slightly but there would not be a substantial increase of noise at any sensitive receptor. The impact would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

4.9.5 References

City of Oakland, Planning Code Sec. 17.120.050.

Governor's Office of Planning and Research. 1998. General Plan Guidelines, Appendix A: Guidelines for the Preparation and Content of the Noise Element of the General Plan.

Lawrence Berkeley National Laboratory. 2007. 2006 Long Range Development Plan Final Environmental Impact Report, SCH No. 200102046, July.

UC (University of California) Berkeley. 2006. Southeast Campus Integrated Projects Tiered Focused Final Environmental Impact Report, SCH No. 2005112056; October 31.

U.S. Environmental Protection Agency. 1971. Noise from Construction Equipment and Building Operations, Building Equipment, and Home Appliances, December.