3.10 Noise and Vibration

3.10.1 Approach to Analysis

This analysis uses two approaches to evaluate temporary construction-phase noise impacts. To evaluate short-term effects of noise peaks, typical construction equipment noise levels were used to estimate corresponding noise levels at the nearest residences. These estimates were then compared against a speech interference criterion. For projects where construction activities would occur at varying levels 24 hours per day and seven days per week, the analysis also evaluates the consistency of construction-related noise with the daytime and nighttime noise ordinance limits and compares them to the speech interference criterion. Noise measurements were taken in various neighborhoods in order to characterize ambient noise. Measurements were also taken at two existing pump stations to characterize the representative noise generation potential of such facilities. The terms defined below are used throughout this section.

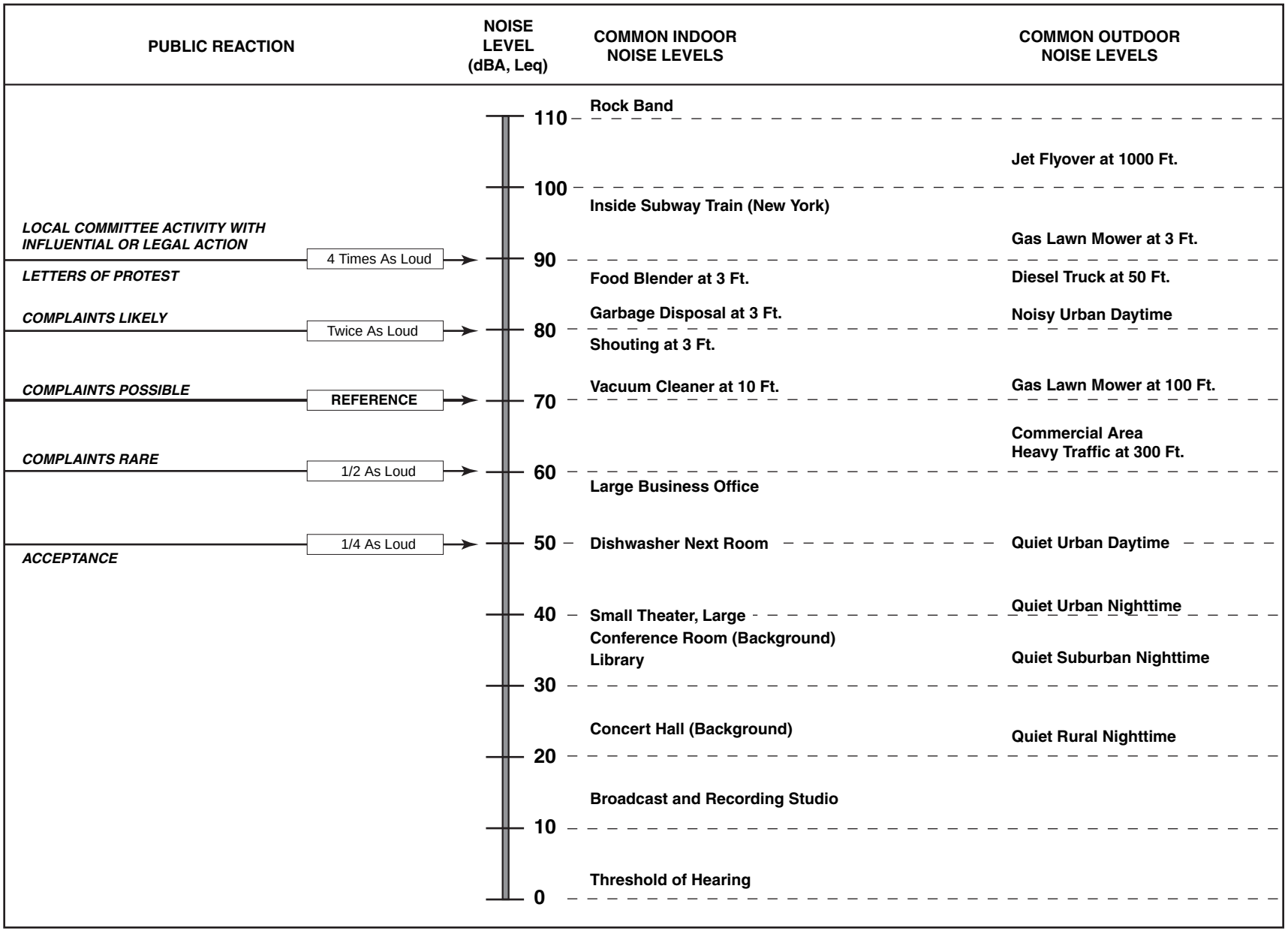
Noise Descriptors

dB, dBA

Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound. The decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented herein are expressed in terms of dBA, unless otherwise indicated. Figure 3.10-1 shows some representative noise sources and their corresponding noise levels in dBA.

Leq, CNEL, Ldn

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period. L_{10} is the noise level that is exceeded 10 percent of the measurement period. Lmax refers to peak noise levels. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to "quiet time" noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA "penalty" during the evening hours (7:00 p.m. to 10:00 p.m.) and a 10-dBA



SOURCE: Caltrans Transportation Laboratory Noise Manual, 1982; and Modification by Environmental Science Associates

Figure 3.10-1
Noise Sources and Effects on People

penalty during the night hours (10:00 p.m. to 7:00 a.m.). Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 p.m. and 7:00 a.m., Ldn does not add the evening 5-dBA penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

Vibration

Vibrations caused by construction activities can be interpreted as energy transmitted in waves through the soil mass. These energy waves generally dissipate with distance from the vibration source (e.g., pile driving or sheetpile driving). Since energy is lost during the transfer of energy from one particle to another, vibration that is distant from a source is usually less perceptible than vibration closer to the source. However, actual human and structure response to different vibration levels is influenced by a combination of factors, including soil type, distance between source and receptor, duration, and the number of perceived events.

If great enough, the energy transmitted through the ground as vibration can result in structural damage. To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec). A freight train passing at 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibration in the range of 10 in/sec PPV.

3.10.2 Setting

Regulatory Framework

Local noise issues are addressed by assessing consistency with applicable noise ordinance standards or general plan guidelines (if there is no noise ordinance). Noise ordinances regulate such sources as mechanical equipment and amplified sounds as well as prescribe hours of heavy equipment operation. Although ordinances do not strictly apply to EBMUD projects, it is the practice of EBMUD to work with host jurisdictions and neighboring communities during project planning and to conform to local environmental protection policies to the extent possible. For this project, noise regulations and standards of Orinda, Lafayette, Moraga, Walnut Creek, Oakland, or Contra Costa County would apply to proposed facilities. Noise ordinance standards that are relevant to the construction of WTTIP facilities are incorporated into the significance criteria and summarized in Table 3.10-1.

Existing Noise Environment and Sensitive Receptors

Human response to noise varies from individual to individual and depends on the ambient environment in which the noise is perceived. The same noise that would be highly intrusive to a sleeping person or in a quiet park might be barely perceptible at an athletic event or in the middle of a freeway at rush hour. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given

TABLE 3.10-1
APPLICABLE ORDINANCE TIME LIMITS AND NOISE STANDARDS

	Construction Time Limits			Ordinance Noise Limits for Various Activities in Single-Family Residential Zones (dBA)	
				Day (Leq)	Night (Leq)
Jurisdiction	**Weekdays**	**Saturdays**	**Sundays and Holidays**	**7 a.m. to 10 p.m.**	**10 p.m. to 7 a.m.**
Orinda[a]	8 a.m. to 6 p.m.	10 a.m. to 5 p.m.	Not Allowed	60 (Ldn)	55
Lafayette[b]	Allowed 8 a.m. to 8 p.m. if <83 dBA at 50 feet or 80 dBA at affected property	Same as weekday limits	Allowed 10 a.m. to 6 p.m. if <83 dBA at 50 feet or 80 dBA at affected property	58	53
Moraga[c]	8 a.m. to 5 p.m.	–	–	–	–
Walnut Creek[d]	7 a.m. to 6 p.m.	City permit required	City permit required	Increase of 3 dBA or more	
Contra Costa County[e]	Daytime work hours	–	–	–	–
Oakland[f]	7 a.m. to 7 p.m. with 80 dBA limit for <10 days and 65 dBA limit for >10 days	9 a.m. to 8 p.m. with 65 dBA limit for <10 days and 55 dBA limit for >10 days	9 a.m. to 8 p.m. with 65 dBA limit for <10 days and 55 dBA limit for >10 days	68	53

– not specified

a Time Limits: Orinda Municipal Code, Chapter 17.39.3 specifies construction time limits. Operation of heavy construction equipment is not allowed on Saturdays or Sundays. Noise Limits: To account for duration and timing, the Orinda Municipal Code, Chapter 17.15.2, stipulates a noise limit of 60 dBA (Ldn) in residential districts. The ordinance further reduces noise levels by 5 dB between 10 p.m. and 7 a.m. relative to the 60 Ldn. The ordinance suggests that the energy-averaged sound level between 10 p.m. and 7 a.m. should be 55 dBA. Noise that is produced for cumulative periods of no more than 5 minutes and 1 minute in any hour may exceed the standards by 5 dB and 10 dB, respectively. Presumably, these noise levels would be limited to 65 and 70 dBA, respectively. Construction activities are exempt from the daytime limits if they occur during specified construction time limits (Shunitzer, 2006). Title 17, Section 17.39.9 of Orinda Municipal Code specifies a maximum noise level of 45 dBA for mechanical equipment which is permanently affixed to a structure or on the ground (but not limited to air conditioners, pool equipment, spa equipment), except for emergency backup power generators.

b Time Limits: Lafayette Municipal Code, Section 5-208 (Special Provisions) allows construction between 8:00 a.m. and 8:00 p.m. on weekdays and between 10:00 a.m. and 6:00 p.m. on Sundays and holidays with a permit if noise is less than 83 dBA at 50 feet (25 feet if enclosed) or the noise level at the nearest affected property shall not exceed 80 dBA. Section 5-209 provides exceptions if compliance would be impractical or unreasonable. Noise Limits: Lafayette Municipal Code, Section 5-205, stipulates that between 7 a.m. and 10 p.m., noise must not exceed 50 dBA more than 30 minutes in any hour, 55 dBA more than 15 minutes in any hour, 60 dBA more than 5 minutes in any hour, 65 dBA more than 1 minute in any hour, and 70 dBA for any period of time. These limits are reduced by 5 dBA between 10 p.m. and 7 a.m. These standards result in a converted Leq noise limit equivalent of 58 dBA between 7 a.m. and 10 p.m. and 53 dBA between 10 p.m. and 7 a.m. If the existing ambient exceeds these standards, the allowable noise exposure standard shall be increased at 5 dB increments as appropriate to reflect the ambient. Noise limits apply to operational noise (Sinnette, 2006).

c Time Limits: Moraga Municipal Code, Chapter 7.12, Article 3, specifies nighttime hourly restrictions for any construction work within 500 feet of a residential zone. Article 2, Section 7.12.080, limits noise from fans or equipment to a level that disturbs the peace, quiet and comfort of neighboring residents or a reasonable person of normal sensitiveness residing in the area in the quiet and peaceful enjoyment of his property.

d Time Limits: Walnut Creek Municipal Code, Chapter 6, Article 2, specifies hourly restrictions for construction work. For operational noise, the City of Walnut Creek Noise Element requires mitigation for projects resulting in noise increases of 3 dB or more.

e Time Limits: Policy 11-8 of the Contra Costa County General Plan (Contra Costa County, 2005) states that construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods.

f Noise Limits: Section 17.120.050 of the Oakland Planning Code stipulates that the noise level between 7 a.m. and 10 p.m. at the property line of any legal residential activity, school, child care, health care or nursing home, public open space, and similarly sensitive land use must not exceed 60 dBA more than 20 minutes in any hour, 65 dBA more than 10 minutes in any hour, 70 dBA more than 5 minutes in any hour, 75 dBA more than 1 minute in any hour, and 80 dBA for any period of time. These limits are reduced by 15 dBA between 10 p.m. and 7 a.m. These standards result in a converted Leq noise limit equivalent of 68 dBA between 7 a.m. and 10 p.m. and 53 dBA between 10 p.m. and 7 a.m.

these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences and schools are among the uses considered to be the most sensitive to noise.

The project area primarily encompasses the communities of Orinda, Lafayette, Moraga, and Walnut Creek. However, the WTTIP also includes facilities in unincorporated areas of Contra Costa County and in southeast Oakland. In the Lamorinda/Walnut Creek area, Highway 24 is the predominant source of noise. However, arterials including Camino Pablo, Moraga Way, Rheem Boulevard, Moraga Road, and Mt. Diablo Boulevard also generate traffic noise. Camino Pablo becomes San Pablo Dam Road and is the primary source of traffic noise in El Sobrante. In the Walnut Creek area, Highway 24 and I-680 are the primary sources of noise; arterials near facility sites include Reliez Valley Road to the north and Danville Boulevard to the south. The I-580 freeway dominates the noise environment in southeast Oakland.

Weekday and weekend, 24-hour noise measurements were collected in the Orinda area to characterize the range of noise environments in the Lamorinda area. Noise measurements are summarized in Table 3.10-2. Noise measurement locations are shown on Figure 3.10-2. As indicated in the table, noise levels along Highway 24 exceed 72 to 75 dBA (Ldn) within approximately 350 feet of the centerline. Noise levels along Camino Pablo exceed 61 to 63 dBA (Ldn) within 65 feet from the centerline. Noise levels adjacent to two residential streets, Lombardy Lane and Manzanita Drive, range between 54 and 56 dBA (Ldn) at 40 to 50 feet from the roadway centerline. These measurements generally indicate that noise levels near freeways range between 70 and 80 dBA (Ldn), while noise levels near arterials range between 60 and 70 dBA (Ldn). Noise levels in quiet neighborhoods away from freeways and arterials range between 50 and 60 dBA (Ldn), depending on the distance to the street. Measurements also indicate that weekend noise levels are generally lower than weekday levels, ranging between 1 and 3 dB less. It should be noted that noise levels exceed the Orinda noise limits along Camino Pablo and Highway 24.

3.10.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR and consistent with Appendix G of the CEQA Guidelines, a WTTIP project is considered to have a significant impact if it would substantially increase the ambient noise levels for adjoining areas. This analysis uses the following criteria to define the significance of a predicted increase in noise levels:

- *Speech Interference*. Speech interference is an indicator of impact on typical daytime and evening activities. A speech interference criterion, in the context of impact duration and time of day, was used to identify "substantial" increases in noise from temporary construction activities. Noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the building exceeds 45 to 60 dBA.[1] A

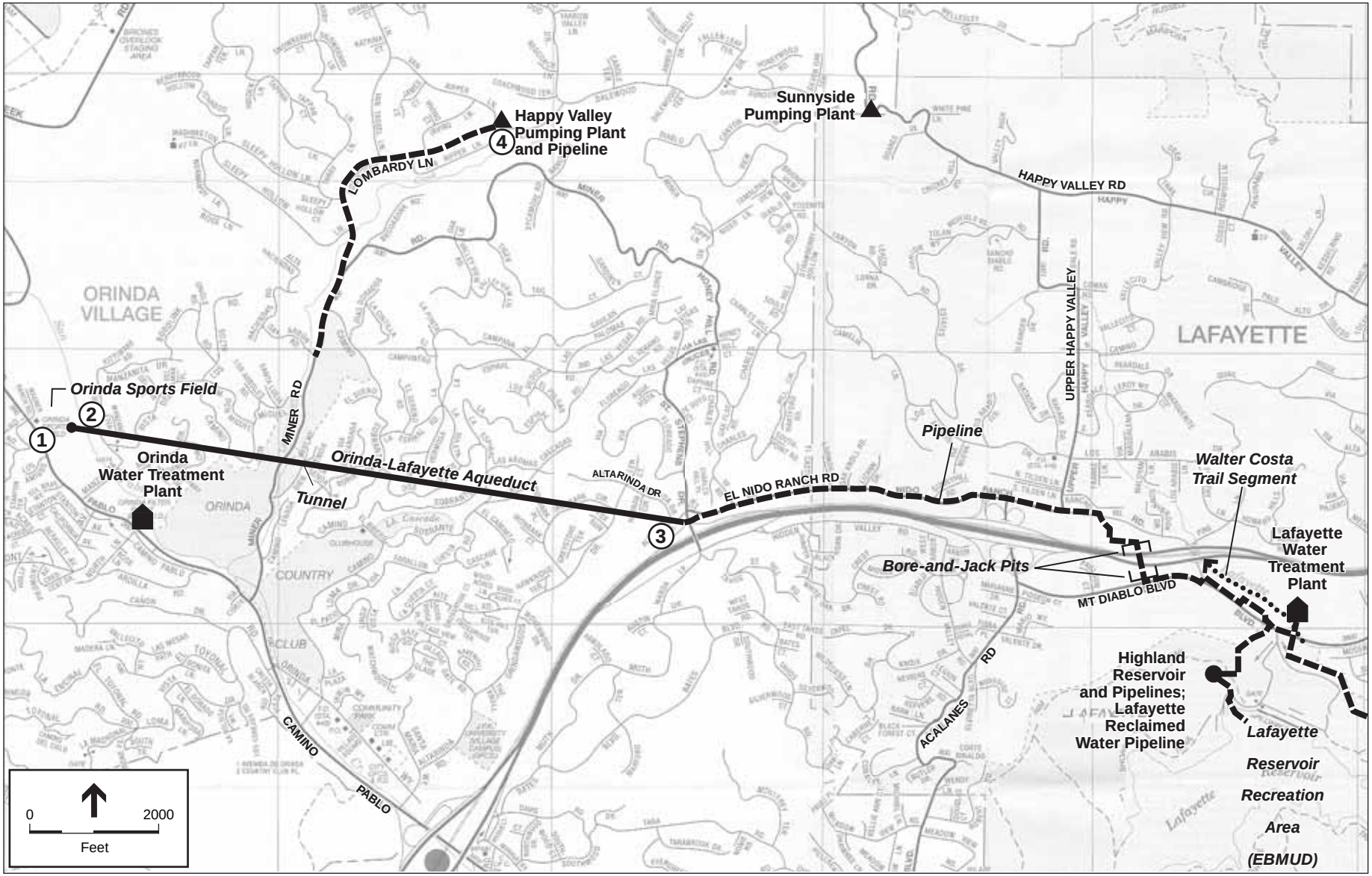
[1] For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dBA. Speech interference is considered to become intolerable when normal conversation is precluded at 3 feet, which occurs when background noise levels exceed 60 dBA. For outdoor environments, the highest noise level that permits normal conversation at 3 feet with 95 percent sentence intelligibility is 66 dBA (U.S. EPA, 1974).

TABLE 3.10-2
EXISTING AMBIENT NOISE ENVIRONMENT IN PROJECT AREA

	Average Leq Noise Level (in dBA)													
	Site 1 – West of Orinda WTP (Camino Pablo)				Site 2 – Neighborhood East of Orinda WTP (Manzanita Drive)				Site 3 – Near Highway 24 (Altarinda Drive)				Site 4 – Orinda (Lombardy Lane)	
	Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekend	
Noise Descriptor	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Hourly Leq														
12:00–1:00	51.3	60.0	51.6	58.2	43.5	52.8	45.9	51.8	65.5	69.3	65.8	68.5	52.5	55.8
1:00–2:00	48.8	60.0	50.9	67.7	43.6	57.2	41.5	52.4	62.0	70.8	63.7	68.1	49.1	52.7
2:00–3:00	47.5	61.6	49.3	62.1	44.2	54.9	45.9	51.1	60.9	70.8	63.1	68.6	48.5	53.2
3:00–4:00	47.1	62.4	50.2	59.5	44.1	54.3	44.7	53.7	61.1	71.1	61.2	68.8	47.5	51.4
4:00–5:00	51.2	62.6	45.8	59.1	45.8	53.6	45.3	50.4	65.1	70.8	60.7	69.8	42.0	52.5
5:00–6:00	56.0	64.1	46.5	60.1	48.9	54.4	42.7	53.9	69.8	69.0	62.2	69.4	47.8	51.7
6:00–7:00	61.6	61.7	51.0	59.6	51.4	55.8	42.5	50.8	71.7	68.8	64.7	69.0	49.5	51.0
7:00–8:00	61.0	58.7	54.2	57.8	52.1	51.0	45.1	49.2	71.9	70.6	65.8	68.8	51.6	49.9
8:00–9:00	59.9	57.7	55.4	56.5	53.3	51.9	46.0	54.3	70.5	69.5	66.9	68.1	53.0	49.6
9:00–10:00	60.9	55.8	56.4	55.5	53.3	50.7	48.0	46.6	69.0	69.8	68.3	67.7	53.3	51.3
10:00–11:00	60.6	54.3	57.3	54.3	54.7	49.7	42.0	46.7	67.8	68.9	68.9	67.6	55.5	53.1
11:00–12:00	59.7	52.4	58.1	53.0	58.1	48.5	54.5	46.3	68.6	66.9	69.2	66.8	56.2	52.4
CNEL	63		61		56		55		75		72		58	
Ldn	63		61		56		54		74		72		57	
Average Daytime (7 a.m. to 7 p.m.)	61		61		55		54		70		69		54	
Average Evening (7 p.m. to 10 p.m.)	58		57		51		51		70		68		50	
Average Night (10 p.m. to 7 a.m.)	55		51		48		45		67		65		50	

NOTES: Noise measurements were taken on eight occasions from October 27, 2005 through December 17, 2005 using Metrosonics db-308 noise meters. Measurement locations are indicated on **Figure 3-10.2**. Site #1 is approximately 65 feet from the centerline of Camino Pablo between the sports field and Orinda WTP. Site #2 is approximately 50 feet from the centerline of Manzanita Drive and about 1,165 feet east of Camino Pablo. Site #3 is approximately 50 feet south of East Altarinda Drive centerline and 350 feet north of the Highway 24 centerline. Site #4 is approximately 40 feet south of the centerline of Lombardy Lane near its intersection with Van Ripper Lane.

SOURCE: Table compiled by Orion Environmental Associates.



(1) Noise Measurement Locations

SOURCE: ESA

EBMUD Water Treatment and Transmission Improvements Program . 204369

Figure 3.10-2
Noise Measurement Locations

typical building can reduce noise levels by 25 dBA with the windows closed (U.S. EPA, 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Since a typical building can reduce noise levels by 25 dBA (with closed windows), an exterior noise level of 70 dBA at receptors, would maintain an acceptable interior noise environment of 45 dBA. It should be noted that such noise levels would be sporadic rather than continuous in nature, because different types of construction equipment would be used throughout the construction process.

For outdoor recreation uses such as Lafayette Reservoir Recreation Area, there would be no building attenuation (i.e., noise reduction) benefits. Normal speech at a distance of a few feet generates about 65 dBA. In quiet outdoor environments (noise levels of 45 to 50 dBA), normal speech can occur at distances up to approximately 16 feet (U.S. EPA, 1974). If background noise levels exceed 60 dBA, speech interference can occur at distances greater than 7 to 10 feet. Therefore, the speech interference criterion applied to recreationists is 60 dBA (Leq).

- *Local Noise Ordinances*. WTTIP projects are located in Orinda, Lafayette, Moraga, Walnut Creek, and Oakland as well as in Contra Costa County. Therefore, project-related noise increases and proposed construction hours were compared to the noise level and construction time limits contained in applicable city noise ordinances for consistency. Where proposed construction activities extend beyond specified time limits, noise level limits contained in applicable city noise ordinances were applied in the analysis (listed in Table 3.10-1). The Contra Costa County Code does not specify construction or operational noise levels or construction time limits.

  Based on available sleep criteria data, an interior nighttime level of 35 dBA is considered acceptable (U.S. EPA, 1974). The exterior shell of a house can reduce exterior noise levels by 25 dBA with the windows closed and 15 dBA with the windows open. Due to the long-term nature of project construction, it is expected that affected residents would have their windows open at times during warm weather periods for ventilation. Therefore, exterior noise levels of 50 dBA (windows open) or 60 dBA (windows closed) would maintain an acceptable interior noise environment of 35 dBA. Local ordinance limits of 53 to 55 dBA (Leq) would allow windows to be open partially during the night.

Impacts and Mitigation Measures

Table 3.10-3 summarizes the significance determinations of identified noise impacts for each WTTIP facility.

Construction Impacts

Impact 3.10-1: Intermittent and temporary noise above existing ambient levels during construction.

Construction activities associated with implementation of the WTTIP would result in temporary noise increases at sensitive receptors near facility sites. Construction noise levels would fluctuate at any given receptor depending on the type of project, construction phasing, equipment type/duration of use, distance between the noise source and receptor, and the presence or absence of barriers between the noise source and receptor. Typical construction equipment generates noise levels ranging from about 76 to 88 dBA at a distance of 50 feet from the source, with slightly higher levels of about 88 to 91 dBA for certain types of earthmoving and impact equipment. The

TABLE 3.10-3
SUMMARY OF POTENTIAL PROJECT-LEVEL NOISE IMPACTS

Facility	Impact 3.10-1 Construction Noise Increases	Impact 3.10-2 Noise Increases Along Haul Routes	Impact 3.10-3 Construction-Related Vibration Effects	Impact 3.10-4 Operational Noise Increases
Lafayette WTP				
Alternative 1	SM	LTS	SM	SM
Alternative 2	SM	LTS	SM	LTS
Orinda WTP				
Alternative 1	SM	LTS	SM	LTS
Alternative 2	SM	LTS	SM	SM
Walnut Creek WTP				
Alternative 1 or 2	SM	LTS	SM	SM
Sobrante WTP				
Alternative 1 or 2	SM	LTS	SM	LTS
Upper San Leandro WTP				
Alternative 1 or 2	SM	LTS	SM	LTS
Orinda-Lafayette Aqueduct				
Alternative 2	SM	LTS	SM	LTS
Ardith Reservoir/ Donald Pumping Plant	SM	LTS	LTS	SM
Fay Hill Pumping Plant and Pipeline Improvements	SM	LTS	LTS	SM
Fay Hill Reservoir	SM	LTS	LTS	LTS
Glen Pipeline Improvements	SM	LTS	LTS	LTS
Happy Valley Pumping Plant and Pipeline	SM	LTS	LTS	SM
Highland Reservoir and Pipelines	SM	LTS	LTS	LTS
Lafayette Reclaimed Water Pipeline	SM	LTS	LTS	LTS
Leland Isolation Pipeline and Bypass Valves	SM	LTS	LTS	LTS
Moraga Reservoir	SM	LTS	SM	LTS
Moraga Road Pipeline	SM	LTS	SM	LTS
Sunnyside Pumping Plant	SM	LTS	LTS	SM
Tice Pumping Plant and Pipeline	SM	LTS	SM	SM
Withers Pumping Plant	SM	LTS	LTS	SM

SM = Significant Impact, Can Be Mitigated
SU = Significant Impact, Unavoidable
LTS = Less-Than-Significant Impact
– = No Impact

rate of attenuation (i.e., reduction) is about 6 dBA for every doubling of distance from a point source. Noise levels from pile drivers can generate noise peaks of approximately 101 dBA at 50 feet. Table 3.10-4 indicates noise levels at 25, 50, and 100 feet from the noise source for typical construction equipment.

When these typical noise levels are consolidated and applied to each facility site, worst-case, project-related, temporary noise increases can be estimated based on the minimum distance to the closest sensitive receptor. Estimated maximum construction noise levels are presented by facility

TABLE 3.10-4
NOISE LEVELS AND ABATEMENT POTENTIAL OF CONSTRUCTION EQUIPMENT NOISE AT 25, 50 AND 100 FEET (IN DBA)

Equipment	Noise Level at 25 Feet		Noise Level at 50 Feet		Noise Level at 100 Feet	
	Without Controls[a]	With Controls[a]	Without Controls[a]	With Control[a]	Without Controls[a]	With Controls[a]
Earthmoving						
Front Loaders	85	81	79	75	73	69
Backhoes	91	81	85	75	79	69
Dozers	86	81	80	75	74	69
Tractors	86	81	80	75	74	69
Graders	91	81	85	75	79	69
Trucks[b]	97	81	91	75	85	69
Materials Handling						
Concrete Mixers	91	81	85	75	79	69
Concrete Pumps	88	81	82	75	76	69
Cranes	89	81	83	75	77	69
Derricks	94	81	88	75	82	69
Stationary						
Pumps	82	81	76	75	70	69
Generators	84	81	78	75	72	69
Compressors	87	81	81	75	75	69
Impact						
Pile Drivers	107	101	101	95	95	89
Rock Drills	104	86	98	80	92	74
Jack Hammers	94	81	88	75	82	69
Pneumatic Tools	92	86	86	80	80	74
Other						
Saws	84	81	78	75	72	69
Vibrators	82	81	76	75	70	69

[a] Estimated levels can be obtained by selecting quieter procedures or machines and implementing noise-control features that do not require major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).
[b] This noise level represents the maximum noise level (Lmax) associated with a single passing truck.

SOURCE: U.S. Environmental Protection Agency, 1971.

site in Table 3.10-5 (identified as "adjusted Leq"). Maximum noise levels listed in this table are intended to depict worst-case conditions at the closest receptor; noise levels would vary at each receptor during construction, with the highest noise levels occurring during heavy equipment operation in proximity to the closest receptors. Noise level estimates at residential receptors may be conservatively high, since they do not account for noise attenuation from existing development or topography between a site and receptors. Buildings located between a noise source and receptors can act as noise barriers wherever they interrupt direct lines-of-sight, helping to reduce noise levels at receptors.

The significance of these temporary increases is evaluated by comparing estimated noise levels with the 70-dBA speech interference criterion (daytime noise), the 60-dBA sleep interference criterion (nighttime noise at tunnel shafts only) (see Table 3.10-6 for estimated nighttime noise

TABLE 3.10-5
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project and Receptor Location	Construction Hours and Duration / Jurisdiction	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Distance between Closest Project and Receptor[b]	Distance Adjustment[c]	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Applicable Noise Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Controls[d]	Mitigated Leq with Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Applicable Noise Limit	Mitigated Leq Exceeds Limit?
Water Treatment Facilities																
Lafayette WTP – Alternative 1 Facilities	7 a.m. to 6 p.m.	Earthmoving Equipment	85	800	-24	61	70	No	83 @ 50'	**Yes**	-10	51	70	No	83 @ 50'	No
	4 to 6 years	Truck (Lmax, single passing truck)	91	800	-24	67	70	No	83 @ 50'	**Yes**	-16	51	70	No	83 @ 50'	No
Closest residential receptors are	Lafayette	Materials Handling	85	800	-24	61	70	No	83 @ 50'	**Yes**	-10	51	70	No	83 @ 50'	No
800 feet from proposed facilities.		Stationary Equipment	80	800	-24	56	70	No	83 @ 50'	No	-6	50	70	No	83 @ 50'	No
		Impact Equipment	87	800	-24	63	70	No	83 @ 50'	**Yes**	-6	57	70	No	83 @ 50'	No
Lafayette WTP – Alternative 1 or 2	7 a.m. to 6 p.m.	Earthmoving Equipment	85	300	-16	69	70	No	83 @ 50'	**Yes**	-10	59	70	No	83 @ 50'	No
Pipeline	4 to 6 years	Truck (Lmax, single passing truck)	91	300	-16	75	70	**Yes**	83 @ 50'	**Yes**	-16	59	70	No	83 @ 50'	No
	Lafayette	Materials Handling	85	300	-16	69	70	No	83 @ 50'	**Yes**	-10	59	70	No	83 @ 50'	No
Closest residential receptors are		Stationary Equipment	80	300	-16	64	70	No	83 @ 50'	No	-6	58	70	No	83 @ 50'	No
300 feet from pipeline alignment.		Impact Equipment	87	300	-16	71	70	**Yes**	83 @ 50'	**Yes**	-6	65	70	No	83 @ 50'	No
Lafayette WTP – Alternative 2	7 a.m. to 6 p.m.	Earthmoving Equipment	85	1,200	-28	57	70	No	83 @ 50'	**Yes**	-10	47	70	No	83 @ 50'	No
	1 to 2 years	Truck (Lmax, single passing truck)	91	1,200	-28	63	70	No	83 @ 50'	**Yes**	-16	47	70	No	83 @ 50'	No
Closest residential receptors are	Lafayette	Materials Handling	85	1,200	-28	57	70	No	83 @ 50'	**Yes**	-10	47	70	No	83 @ 50'	No
1,200 feet away from closest		Drilling/Stationary Equipment	80	1,200	-28	52	70	No	83 @ 50'	No	-6	46	70	No	83 @ 50'	No
construction.		Impact Equipment	87	1,200	-28	59	70	**Yes**	83 @ 50'	**Yes**	-6	53	70	No	83 @ 50'	No
Orinda WTP– Alternative 1	7 a.m. to 6 p.m.	Earthmoving Equipment	85	170	-11	74	70	**Yes**	NA	NA	-10	64	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	170	-11	80	70	**Yes**	NA	NA	-16	64	70	No	NA	NA
Closest residential receptors are	Orinda	Materials Handling	85	170	-11	74	70	**Yes**	NA	NA	-10	64	70	No	NA	NA
170 feet to the west		Drilling/Stationary Equipment	80	170	-11	69	70	No	NA	NA	-6	63	70	No	NA	NA
and 250 feet to the east.		Impact Equipment	87	170	-11	76	70	**Yes**	NA	NA	-6	70	70	No	NA	NA
Orinda WTP – Alternative 2	7 a.m. to 6 p.m.	Earthmoving Equipment	85	170	-11	74	70	**Yes**	NA	NA	-10	64	70	No	NA	NA
	4 to 6 years	Truck (Lmax, single passing truck)	91	170	-11	80	70	**Yes**	NA	NA	-16	64	70	No	NA	NA
Closest residential receptors are	Orinda	Materials Handling	85	170	-11	74	70	**Yes**	NA	NA	-10	64	70	No	NA	NA
170 feet to the west		Drilling/Stationary Equipment	80	170	-11	69	70	No	NA	NA	-6	63	70	No	NA	NA
and 250 feet to the east.		Impact Equipment	87	170	-11	76	70	**Yes**	NA	NA	-6	70	70	No	NA	NA
Walnut Creek WTP –	7 a.m. to 6 p.m.	Earthmoving Equipment	85	300	-16	69	70	No	NA	NA	-10	59	70	No	NA	NA
Alternative 1 or 2	1 to 2 years	Truck (Lmax, single passing truck))	91	300	-16	75	70	**Yes**	NA	NA	-16	59	70	No	NA	NA
	Walnut Creek	Materials Handling	85	300	-16	69	70	No	NA	NA	-10	59	70	No	NA	NA
Closest residential receptors are		Drilling/Stationary Equipment	80	300	-16	64	70	No	NA	NA	-6	58	70	No	NA	NA
300 feet away.		Impact Equipment	87	300	-16	71	70	**Yes**	NA	NA	-6	65	70	No	NA	NA
Sobrante WTP – Alternative 1 or 2	7 a.m. to 6 p.m.	Earthmoving Equipment	85	150	-10	75	70	**Yes**	NA	NA	-10	65	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	150	-10	81	70	**Yes**	NA	NA	-16	65	70	No	NA	NA
Closest residential receptors are	El Sobrante–	Materials Handling	85	150	-10	75	70	**Yes**	NA	NA	-10	65	70	No	NA	NA
150 feet away.	Unincorp. Contra	Drilling/Stationary Equipment	80	150	-10	70	70	No	NA	NA	-6	64	70	No	NA	NA
	Costa County	Impact Equipment	87	150	-10	77	70	**Yes**	na	NA	-6	71	70	**Yes**	NA	NA
Upper San Leandro WTP –	7 a.m. to 6 p.m.	Earthmoving Equipment	85	170	-11	74	70	**Yes**	65	**Yes**	-10	64	70	No	65	No
Alternative 1 or 2	1 to 2 years	Truck (Lmax, single passing truck)	91	170	-11	80	70	**Yes**	65	**Yes**	-16	64	70	No	65	No
	Oakland	Materials Handling	85	170	-11	74	70	**Yes**	65	**Yes**	-10	64	70	No	65	No
Closest residential receptors are		Drilling/Stationary Equipment	80	170	-11	69	70	No	65	**Yes**	-6	63	70	No	65	No
170 feet away.		Impact Equipment	87	170	-11	76	70	**Yes**	65	**Yes**	-6	70	70	No	65	**Yes**

TABLE 3.10-5 (Continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project and Receptor Location	Construction Hours and Duration / Jurisdiction	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Distance between Closest Project and Receptor[b]	Distance Adjustment[c]	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Applicable Noise Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Controls[d]	Mitigated Leq with Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Applicable Noise Limit	Mitigated Leq Exceeds Limit?
Pipeline and Tunnel Facilities																
Orinda-Lafayette Aqueduct – Tunnel Entrance Portal	Day & night (24 hours per day)	Tunnel Activities (includes loader, crane, muck train, ventilation fan)	75[e]	500	-20	55	70	No	NA (day only)	NA	0	55	70	No	NA (day only)	NA NA
	7 days per week	Earthmoving Equipment	85	500	-20	65	70	No	NA (day only)	NA	-10	55	70	No	NA (day only)	NA
Closest residential receptors are 500 feet from tunnel entrance portal.		Truck (Lmax, single passing truck)	91	500	-20	71	70	**Yes**	NA (day only)	NA	-16	55	70	No	NA (day only)	NA
		Materials Handling	85	500	-20	65	70	No	NA (day only)	NA	-10	55	70	No	NA (day only)	NA
	2 to 3 years Orinda	Drilling/Stationary Equipment (including compressors, generators)	80	500	-20	60	70	No	NA (day only)	NA	-6	54	70	No	NA (day only)	NA
		Impact Equipment	87	500	-20	67	70	No	NA (day only)	NA	-6	61	70	No	NA (day only)	NA
Orinda-Lafayette Aqueduct – Tunnel Exit Portal	Day & night (24 hours per day)	Tunnel Activities	75	100	-6	69	70	No	NA (day only)	NA	-0	69	70	No	NA (day only)	NA
		Earthmoving Equipment	85	100	-6	79	70	**Yes**	NA (day only)	NA	-10	69	70	No	NA (day only)	NA
Closest residential receptors are 100 feet from portal.	7 days per week	Truck (Lmax, single passing truck)	91	100	-6	85	70	**Yes**	NA (day only)	NA	-16	69	70	No	NA (day only)	NA
		Drilling/Stationary Equipment (including compressors, generators)	80	100	-6	74	70	**Yes**	NA (day only)	NA	-6	68	70	No	NA (day only)	NA
	2 to 3 Years Orinda	Impact Equipment	87	100	-6	81	70	**Yes**	NA (day only)	NA	-6	75	70	**Yes**	NA (day only)	NA
Orinda-Lafayette Aqueduct – Pipeline	8:30 a.m. to 4:30 p.m.	Earthmoving Equipment	85	25	6	91	70	**Yes**	83 @ 50'	**Yes**	-10	81	70	**Yes**	83 @ 50'	No
		Truck (Lmax, single passing truck)	91	25	6	97	70	**Yes**	83 @ 50'	**Yes**	-16	81	70	**Yes**	83 @ 50'	No
Closest residential receptors are 25 feet away.	1 to 2 years Lafayette and Orinda	Materials Handling	85	25	6	91	70	**Yes**	83 @ 50'	**Yes**	-10	81	70	**Yes**	83 @ 50'	No
		Drilling/Stationary Equipment	80	25	6	86	70	**Yes**	83 @ 50'	No	-6	80	70	**Yes**	83 @ 50'	No
		Impact Equipment	87	25	6	93	70	**Yes**	83 @ 50'	**Yes**	-6	87	70	**Yes**	83 @ 50'	No
Fay Hill Pipeline	8:30 a.m. to 4:30 p.m.	Earthmoving Equipment	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
		Truck (Lmax, single passing truck)	91	100	-6	85	70	**Yes**	NA	NA	-16	69	70	No	NA	NA
Closest residential receptors are 100 feet away.	1 to 2 years Moraga	Materials Handling	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
		Drilling/Stationary Equipment	80	100	-6	74	70	**Yes**	NA	NA	-6	68	70	No	NA	NA
		Impact Equipment	87	100	-6	81	70	**Yes**	NA	NA	-6	75	70	**Yes**	NA	NA
Glen Pipeline Improvements	8:30 a.m. to 4:30 p.m.	Earthmoving Equipment	85	25	6	91	70	**Yes**	83 @ 50'	**Yes**	-10	81	70	**Yes**	83 @ 50'	No
		Truck (Lmax, single passing truck)	91	25	6	97	70	**Yes**	83 @ 50'	**Yes**	-16	81	70	**Yes**	83 @ 50'	No
Closest residential receptors are 25 feet away.	1 year Lafayette	Materials Handling	85	25	6	91	70	**Yes**	83 @ 50'	**Yes**	-10	81	70	**Yes**	83 @ 50'	No
		Drilling/Stationary Equipment	80	25	6	86	70	**Yes**	83 @ 50'	No	-6	80	70	**Yes**	83 @ 50'	No
		Impact Equipment	87	25	6	93	70	**Yes**	83 @ 50'	**Yes**	-6	87	70	**Yes**	83 @ 50'	No
Happy Valley Pipeline	8:30 a.m. to 4:30 p.m.	Earthmoving Equipment	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
		Truck (Lmax, single passing truck)	91	50	0	91	70	**Yes**	NA	NA	-16	75	70	**Yes**	NA	NA
Closest residential receptors are 50 feet away.	1 to 2 years Orinda	Materials Handling	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
		Drilling/Stationary Equipment	80	50	0	80	70	**Yes**	NA	NA	-6	74	70	**Yes**	NA	NA
		Impact Equipment	87	50	0	87	70	**Yes**	NA	NA	-6	81	70	**Yes**	NA	NA
Highland Inlet/Outlet Pipeline and Lafayette Reclaimed Water Pipeline	Daytime with limited night construction	Earthmoving Equipment	85	620	-22	63	70	No	83 @ 50'	**Yes**	-10	53	70	No	83 @ 50'	No
		Truck (Lmax, single passing truck)	91	620	-22	69	70	No	83 @ 50'	**Yes**	-16	53	70	No	83 @ 50'	No
Closest residential receptors are 620 feet away.	1 to 2 years Lafayette	Materials Handling	85	620	-22	63	70	No	83 @ 50'	**Yes**	-10	53	70	No	83 @ 50'	No
		Drilling/Stationary Equipment	80	620	-22	58	70	No	83 @ 50'	No	-6	52	70	No	83 @ 50'	No
		Impact Equipment	87	620	-22	65	70	No	83 @ 50'	**Yes**	-6	59	70	No	83 @ 50'	No
Lacassie (Leland Isolation) Pipeline	8:30 a.m. to 4:30 p.m.	Earthmoving Equipment	85	300	-16	69	70	No	NA	NA	-10	59	70	No	NA	NA
		Truck (Lmax, single passing truck)	91	300	-16	75	70	**Yes**	NA	NA	-16	59	70	No	NA	NA
Closest residential receptors are 300 feet away.	1 year Walnut Creek	Materials Handling	85	300	-16	69	70	No	NA	NA	-10	59	70	No	NA	NA
		Drilling/Stationary Equipment	80	300	-16	64	70	No	NA	na	-6	58	70	No	na	NA

TABLE 3.10-5 (continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project and Receptor Location	Construction Hours and Duration / Jurisdiction	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Distance between Closest Project and Receptor[b]	Distance Adjustment[c]	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Applicable Noise Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Controls[d]	Mitigated Leq with Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Applicable Noise Limit	Mitigated Leq Exceeds Limit?
		Impact Equipment	87	300	-16	71	70	**Yes**	NA	na	-6	65	70	No	na	NA
Moraga Road Pipeline	8:30 a.m. to	Earthmoving Equipment	85	50	0	85	70	**Yes**	83 @ 50'	**Yes**	-10	75	70	**Yes**	83 @ 50'	No
	4:30 p.m.	Truck (Lmax, single passing truck)	91	50	0	91	70	**Yes**	83 @ 50'	**Yes**	-16	75	70	**Yes**	83 @ 50'	No
Most residential receptors are	1 to 2 years	Materials Handling	85	50	0	85	70	**Yes**	83 @ 50'	**Yes**	-10	75	70	**Yes**	83 @ 50'	No
50 feet away; a few are as close as	Lafayette and	Drilling/Stationary Equipment	80	50	0	80	70	**Yes**	83 @ 50'	No	-6	74	70	**Yes**	83 @ 50'	No
25 feet.	Moraga	Impact Equipment	87	50	0	87	70	**Yes**	83 @ 50'	**Yes**	-6	81	70	**Yes**	83 @ 50'	No
Tice Pipeline	8:30 a.m. to	Earthmoving Equipment	85	25	6	91	70	**Yes**	NA	NA	-10	81	70	**Yes**	NA	NA
	4:30 p.m.	Truck (single passing truck)	91	25	6	97	70	**Yes**	NA	NA	-16	81	70	**Yes**	NA	NA
Closest residential receptors are	1 to 2 years	Materials Handling	85	25	6	91	70	**Yes**	NA	NA	-10	81	70	**Yes**	NA	NA
25 feet away.	Unincorp. Contra	Drilling/Stationary Equipment	80	25	6	86	70	**Yes**	NA	NA	-6	80	70	**Yes**	NA	NA
	Costa County	Impact Equipment	87	25	6	93	70	**Yes**	NA	NA	-6	87	70	**Yes**	NA	NA
Reservoir Facilities																
Ardith Reservoir	7 a.m. to 6 p.m.	Earthmoving Equipment	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	100	-6	85	70	**Yes**	NA	NA	-16	69	70	No	NA	NA
Closest residential receptors are	Orinda	Materials Handling	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
100 feet away.		Drilling/Stationary Equipment	80	100	-6	74	70	**Yes**	NA	NA	-6	68	70	No	NA	NA
		Impact Equipment	87	100	-6	81	70	**Yes**	NA	NA	-6	75	70	**Yes**	NA	NA
Fay Hill Reservoir	7 a.m. to 6 p.m.	Earthmoving Equipment	85	100[f]	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	100[f]	-6	85	70	**Yes**	NA	NA	-16	69	70	No	NA	NA
No existing residential receptors.	Moraga	Materials Handling	85	100[f]	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
		Drilling/Stationary Equipment	80	100[f]	-6	74	70	**Yes**	NA	NA	-6	68	70	No	NA	NA
		Impact Equipment	87	100[f]	-6	81	70	**Yes**	NA	NA	-6	75	70	**Yes**	NA	NA
Highland Reservoir	7 a.m. to 6 p.m.	Earthmoving Equipment	85	25	6	91	60	**Yes**	83 @ 50'	**Yes**	-10	81	60	**Yes**	83 @ 50'	No
	1 to 2 years	Truck (Lmax, single passing truck)	91	25	6	97	60	**Yes**	83 @ 50'	**Yes**	-16	81	60	**Yes**	83 @ 50'	No
Closest recreational receptors are	Lafayette	Materials Handling	85	25	6	91	60	**Yes**	83 @ 50'	**Yes**	-10	81	60	**Yes**	83 @ 50'	No
250 feet from Lakeside Trail and		Drilling/Stationary Equipment	80	25	6	86	60	**Yes**	83 @ 50'	No	-6	80	60	**Yes**	83 @ 50'	No
25 feet from Rim Trail.		Impact Equipment	87	25	6	93	60	**Yes**	83 @ 50'	**Yes**	-6	87	60	**Yes**	83 @ 50'	No
Moraga Reservoir	7 a.m. to 6 p.m.	Earthmoving	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	50	0	91	70	**Yes**	NA	NA	-16	75	70	**Yes**	NA	NA
Closest residential receptor is	Moraga	Materials Handling	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
50 feet away.		Drilling/Stationary Equipment	80	50	0	80	70	**Yes**	NA	NA	-6	74	70	**Yes**	NA	NA
		Impact Equipment	87	50	0	87	70	**Yes**	NA	NA	-6	81	70	**Yes**	NA	NA
Pumping Plants																
Donald Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	100	-6	85	70	**Yes**	NA	NA	-16	69	70	No	NA	NA
Closest residential receptors are	Orinda	Materials Handling	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
100 feet away.		Drilling/Stationary Equipment	80	100	-6	74	70	**Yes**	NA	NA	-6	68	70	No	NA	NA
		Impact Equipment	87	100	-6	81	70	**Yes**	NA	NA	-6	75	70	**Yes**	NA	NA
Fay Hill Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	100	-6	85	70	**Yes**	NA	NA	-16	69	70	No	NA	NA
Closest residential receptors are	Moraga	Materials Handling	85	100	-6	79	70	**Yes**	NA	NA	-10	69	70	No	NA	NA
100 feet away.		Drilling/Stationary Equipment	80	100	-6	74	70	**Yes**	NA	NA	-6	68	70	No	NA	NA
		Impact Equipment	87	100	-6	81	70	**Yes**	NA	NA	-6	75	70	**Yes**	NA	NA

TABLE 3.10-5 (Continued)
ESTIMATED DAYTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project and Receptor Location	Construction Hours and Duration / Jurisdiction	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Distance between Closest Project and Receptor[b]	Distance Adjustment[c]	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Applicable Noise Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Controls[d]	Mitigated Leq with Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Applicable Noise Limit	Mitigated Leq Exceeds Limit?
Happy Valley Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	50	0	91	70	**Yes**	NA	NA	-16	75	70	**Yes**	NA	NA
Closest residential receptors are	Orinda	Materials Handling	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
50 feet away.		Drilling/Stationary Equipment	80	50	0	80	70	**Yes**	NA	NA	-6	74	70	**Yes**	NA	NA
		Impact Equipment	87	50	0	87	70	**Yes**	NA	NA	-6	81	70	**Yes**	NA	NA
Sunnyside Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	175	-11	74	70	**Yes**	83 @ 50'	**Yes**	-10	64	70	No	83 @ 50'	No
	1 to 2 years	Truck (Lmax, single passing truck)	91	175	-11	80	70	**Yes**	83 @ 50'	**Yes**	-16	64	70	No	83 @ 50'	No
Closest residential receptors are	Lafayette and	Materials Handling	85	175	-11	74	70	**Yes**	83 @ 50'	**Yes**	-10	64	70	No	83 @ 50'	No
175 feet away in Orinda.	Orinda	Drilling/Stationary Equipment	80	175	-11	69	70	No	83 @ 50'	No	-6	63	70	No	83 @ 50'	No
		Impact Equipment	87	175	-11	76	70	**Yes**	83 @ 50'	**Yes**	-6	70	70	No	83 @ 50'	No
Tice Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	200	-12	73	70	**Yes**	NA	NA	-10	63	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	200	-12	79	70	**Yes**	NA	NA	-16	63	70	No	NA	NA
Closest residential receptors are	Unincorp. Contra	Materials Handling	85	200	-12	73	70	**Yes**	NA	NA	-10	63	70	No	NA	NA
200 feet away.	Costa County	Drilling/Stationary Equipment	80	200	-12	68	70	**Yes**	NA	NA	-6	62	70	No	NA	NA
		Impact Equipment	87	200	-12	75	70	**Yes**	NA	NA	-6	69	70	No	NA	NA
Withers Pumping Plant	7 a.m. to 6 p.m.	Earthmoving Equipment	85	150	-10	75	70	**Yes**	NA	NA	-10	65	70	No	NA	NA
	1 to 2 years	Truck (Lmax, single passing truck)	91	150	-10	81	70	**Yes**	NA	NA	-16	65	70	No	NA	NA
Closest residential receptors are	Unincorp. Contra	Materials Handling	85	150	-10	75	70	**Yes**	NA	NA	-10	65	70	No	NA	NA
150 feet away.	Contra County	Drilling/Stationary Equipment	80	150	-10	70	70	No	NA	NA	-6	64	70	No	NA	NA
		Impact Equipment	87	150	-10	77	70	**Yes**	NA	NA	-6	71	70	**Yes**	NA	NA
Bypass Valves																
Leland Pressure Zone Isolation Bypass	8:30 a.m. to	Earthmoving Equipment	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
Valves	4:30 p.m.	Truck (Lmax, single passing truck)	91	50	0	91	70	**Yes**	NA	NA	-16	75	70	**Yes**	NA	NA
	1 week	Materials Handling	85	50	0	85	70	**Yes**	NA	NA	-10	75	70	**Yes**	NA	NA
Closest residential receptors could be		Drilling/Stationary Equipment	80	50	0	80	70	**Yes**	NA	NA	-6	74	70	**Yes**	NA	NA
50 feet away.	Walnut Creek	Impact Equipment	87	50	0	87	70	**Yes**	NA	NA	-6	81	70	**Yes**	NA	NA

NA = not applicable or no applicable standard

a Reference noise levels represent the highest noise level by equipment type (without controls) listed in Table 3.10-4 at 50 feet.
b The distances represent the minimum distance between the receptor and the closest facility location.
c Distance adjustment accounts for the rate of noise attenuation that occurs with distance from a noise source. The rate of attenuation (i.e., reduction) is about 6 dBA for every doubling of distance from a point source.
d Noise control reductions represent the difference between the highest noise levels listed in Table 3.10-4 with controls versus without controls.
e Reference noise level for tunneling activities under the Orinda-Lafayette Tunnel project is based on noise measurements taken at the Hollywood Hills Tunnel project, which included a crane and involved similar tunneling construction techniques.
f No sensitive receptors currently exist within 100 feet of the site, but residential projects are proposed along the lower section of the access road (off Rheem Boulevard) and east of the reservoir site.

SOURCE: Table compiled by Orion Environmental Associates.

TABLE 3.10-6
ESTIMATED NIGHTTIME CONSTRUCTION NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project and Receptor Location	Construction Hours and Duration / Jurisdiction	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet	Distance between Closest Project and Receptor	Distance Adjustment	Adjusted Leq	Applicable Noise Ordinance Noise Limit[a]	Unmitigated Leq Exceeds Applicable Limit?	Reduction due to Engine Controls[b]	Mitigated Leq with Engine Controls	Mitigated Leq Exceeds Applicable Limit?	Noise Reduction due to Sound Barrier[c]	Mitigated Leq with Sound Barrier	Mitigated Leq Exceed Applicable Noise Limits?
Orinda-Lafayette Aqueduct – Tunnel Entrance Portal	Day & night (24 hours per day)	Tunnel Activities (includes crane, muck train, ventilation fan in shaft)	75	500	-20	55	55	No	0	55	No	-6	49	No
Closest residential receptors are 500 feet from tunnel entrance portal.	7 days per week	Earthmoving Equipment	NA (limited to daytime operation only)											
		Truck (Lmax, single passing truck)	NA (limited to daytime operation only)											
		Materials Handling	NA (limited to daytime operation only)											
	2 to 3 years Orinda	Drilling/Stationary Equipment (including compressor, generator)	80	500	-20	60	55	**Yes**	-6	54	No	-6	48	No
		Impact Equipment	NA (limited to daytime operation only)											
Orinda-Lafayette Aqueduct – Tunnel Exit Portal	Day & night (24 hours per day)	Tunnel Activities (ventilation fan in shaft only)	55	100	-6	49	55	No	0	55	No	-6	49	No
Closest residential receptors are 100 feet from tunnel exit portal.	7 days per week	Earthmoving Equipment	NA (limited to daytime operation only)											
		Truck (Lmax, single passing truck)	NA (limited to daytime operation only)											
	2 to 3 years Orinda	Drilling/Stationary Equipment (including pump)	80	100	-6	74	55	**Yes**	-6	68	**Yes**	-6	62	**Yes**
		Impact Equipment	NA (limited to daytime operation only)											
Highland Inlet/Outlet Pipeline and Lafayette Reclaimed Water Pipeline	Daytime with limited night construction	Earthmoving Equipment	85	700	-23	62	53	**Yes**	-10	52	No	-6	46	No
		Truck (Lmax, single passing truck)	91	700	-23	68	53	**Yes**	-16	52	No	-6	46	No
		Materials Handling	85	700	-23	62	53	**Yes**	-10	52	No	-6	46	No
Closest residential receptors are 700 feet from nighttime pipeline work.	1 to 2 years Lafayette	Drilling/Stationary Equipment	80	700	-23	57	53	**Yes**	-6	51	No	-6	45	No
		Impact Equipment	87	700	-23	64	53	**Yes**	-6	58	**Yes**	-6	52	No

NA = not applicable or no applicable standard

[a] The applicable noise standard is the Orinda Noise Ordinance limit of 61 dBA Leq for day (7:00 a.m. to 10:00 p.m.) and 56 dBA night (10:00 p.m. to 7:00 a.m.).
[b] Noise control reductions represent the difference between the highest noise levels listed in Table 3.10-4 with controls versus without controls.
[c] Noise barriers reduce noise levels by 6 to 10 decibels if located near the noise source. Barrier effectiveness can be increased by as much as 5 decibels by applying sound-absorbing material to the inner surface of the barrier (Federal Transit Administration, 1995).

SOURCE: Table compiled by Orion Environmental Associates.

levels), and applicable noise ordinance standards (time and noise limits depending on the jurisdiction). Estimated noise levels were compared to these criteria (see Table 3.10-5). Each project's consistency with the applicable criteria at the closest sensitive receptors is discussed below by facility.

In general, construction noise would exceed the speech interference criterion when heavy equipment is operated within 150 to 500 feet of a sensitive receptor (distance depends on the type of equipment operated). If feasible noise controls are implemented (see recommended measures), most construction noise levels could be reduced to below this criterion. For pipelines, sensitive receptors are located closer to construction activities than would be the case at other facility sites (as close as 25 feet), and construction noise levels would exceed the speech interference criterion with or without feasible noise controls. However, pipeline construction progresses along an alignment (rather than persisting at one location) so that any given sensitive receptor is typically subject to construction noise for approximately two weeks (and not for the entire duration of project construction indicated in Table 3.10-5), followed later by a couple of additional days for paving the trench. Refer to Figure 2-9 in Chapter 2, Project Description, for a description of pipeline construction.

Most project facilities are proposed to be constructed during daytime, weekday hours, which would be generally consistent with the time restrictions specified in local noise ordinances. There would be some minor inconsistencies in the time limits and construction hours, as identified below and in Table 3.10-5. The only exceptions to the daytime weekday hours for construction would be the Orinda-Lafayette Aqueduct (Alternative 2) and the pipeline segment that crosses the Lafayette Reservoir Recreation Area entrance/exit road for the Highland Inlet/Outlet Pipeline and Lafayette Reclaimed Water Pipeline projects. The pipeline crossing construction work would occur for two to four nights and would be performed at night to minimize conflicts with recreation traffic. Tunnel construction would occur 24 hours per day, 7 days per week, at tunnel shafts (primarily the entry shaft at the Orinda Sports Field north of the Orinda WTP), and limited maintenance and inspection work would occur on weekend days. Ordinance noise limits listed in Table 3.10-1 are applied only where construction is proposed to occur outside the hours specified by local ordinances (e.g., at night) or if the applicable noise ordinance specifies construction noise limits.

The construction impacts identified for each project facility below have been developed to allow a general assessment of the nature and magnitude of potential construction impacts associated with each individual facility. The final construction scheduling of specific facility projects could result in overlapping impacts due to simultaneous construction for more than one facility. Since most construction noise impacts would be specific to each facility site, overlapping noise impacts would be limited to impacts along haul routes, where overlapping construction schedules for two or more facilities with a common haul route could result in combined noise increases. Overlapping noise impacts along haul routes are discussed under Impact 3.10-2 and in Chapter 5, Cumulative Impacts.

Lafayette WTP

Alternative 1

The nearest sensitive receptors in the project vicinity include residences located 800 feet south of proposed facilities, and recreational uses at the Lafayette Reservoir Recreational Area farther to the south. As indicated in Table 3.10-5, construction-related noise increases would occur over a four- to six-year period, but would occur during the daytime hours only. Therefore, construction noise levels were compared to Lafayette's daytime construction noise and time limits. Construction noise would exceed the Lafayette Noise Ordinance noise limit of 83 dBA at 50 feet for any equipment operated between 8 a.m. and 8 p.m. However, since the closest homes are a minimum of 800 feet from project construction, construction noise would not exceed the 70-dBA speech interference criterion at the closest residential receptors or the 80-dBA noise ordinance limit at the closest affected property. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a, below) would reduce construction noise levels to below the noise ordinance limit of 83 dBA at 50 feet, thereby reducing any potential construction noise impacts to a less-than-significant level.

This alternative would include construction of new pipelines along the north side of Mt. Diablo Boulevard as well as across this road. Construction would occur within 300 feet of the closest residential receptors to the south. As indicated in Table 3.10-5, operation of most types of construction equipment would exceed the Lafayette Noise Ordinance noise limit of 83 dBA at 50 feet, while operation of trucks and impact equipment could exceed the 70-dBA speech interference criterion at the closest residential receptors. The 80-dBA noise ordinance limit at the closest affected property would not be exceeded. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a, below) would reduce construction noise levels to below the noise ordinance limit of 83 dBA at 50 feet and the speech interference criterion, thereby reducing any potential pipeline construction noise impacts to a less-than-significant level.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Lafayette Noise Ordinance (8:00 a.m. to 8:00 p.m.). Implementation of Measure 3.10-1b, below, would require adjusting proposed construction hours to be consistent with those in the Lafayette Noise Ordinance, which would reduce this potential impact to a less-than-significant level. When weekend construction is required, the hours would comply with local ordinances except possibly during critical water service outages or other emergencies and special situations.

Alternative 2

Proposed decommissioning and facility conversion at the Lafayette WTP would require limited earthmoving activities and would therefore have a limited potential for construction-related noise impacts. This alternative would avoid some of the potential noise impacts at the Lafayette WTP that would be associated with Alternative 1 (significant but mitigable), but much more significant noise impacts would occur along the Orinda-Lafayette Aqueduct alignment, including the tunnel entry and exit shafts (discussed below) and along the pipeline alignment in El Nido Ranch Road. This alternative would result in the same pipeline-related construction noise impacts on

Mt. Diablo Boulevard (south of the WTP) that would occur under Alternative 1. The same feasible noise controls that would be required for Alternative 1 would also be required for Alternative 2 (but fewer of the control measures would be required since construction would be more limited in scope).

Orinda WTP

Alternative 1

The nearest sensitive receptors in the vicinity of the Orinda WTP include residences 170 feet west and 250 feet east of the Alternative 1 construction boundary. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but would occur during the daytime hours only. Construction noise would exceed the 70-dBA speech interference criterion at the closest residential receptors. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a, below) would reduce construction noise levels to below the speech interference criterion, thereby reducing any potential construction noise impacts to a less-than-significant level. Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Orinda Noise Ordinance (8:00 a.m. to 6:00 p.m.). Orinda prohibits the operation of heavy equipment on weekends, and EBMUD proposes to limit weekend construction activities to maintenance and inspections (except possibly during critical water service outages or other emergencies and special situations). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Orinda Noise Ordinance and restricting the operation of heavy equipment on weekends, which would reduce this potential impact to a less-than-significant level.

Alternative 2

This alternative would entail significantly more extensive earthmoving activities at the Orinda WTP than Alternative 1; however, like Alternative 1, sensitive receptors include residences located as close as 170 feet west and 250 feet east of facility locations. As indicated in Table 3.10-5, construction-related noise increases would occur over four to six years, but during the daytime hours only. With a minimum distance of 170 feet from project construction, construction noise would exceed the 70-dBA speech interference criterion at the closest residential receptors. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 70-dBA speech interference criterion, thereby reducing any potential construction noise impacts to a less-than-significant level.

Under this alternative, a micro-tunnel is proposed to extend from the Los Altos Pumping Plant to the Orinda-Lafayette Aqueduct tunnel portal (using the tunnel portal's shaft). The micro-tunnel would require a shaft at the south end, adjacent to the pumping plant. If the micro-tunnel requires a pump, residential receptors located 400 feet to the southeast and 500 feet to the west could be subject to nighttime noise associated with operation of this equipment. Implementation of noise controls specified in Measures 3.10-1a, 3.10-1d (including compliance with ordinance noise limits listed in Table 3.10-1, use of line power instead of generators, and noise controls on pile drivers), and possibly Measure 3.10-1e (erection of temporary sound barriers), if necessary, would help minimize the effects of such construction noise.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Orinda Noise Ordinance (8:00 a.m. to 6:00 p.m.). Orinda prohibits the operation of heavy equipment on weekends, and EBMUD proposes to limit weekend construction activities to maintenance and inspections (except possibly during critical water service outages or other emergencies and special situations). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Orinda Noise Ordinance and restricting the operation of heavy equipment on weekends, which would reduce this potential impact to a less-than-significant level.

Walnut Creek WTP – Alternative 1 or 2

Residences are as close as 300 feet east of proposed facilities. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. At 300 feet, construction noise would not exceed the 70-dBA speech interference criterion, except when trucks and impact equipment are operated. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the speech interference criterion, thereby reducing any potential construction noise impacts to a less-than-significant level.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Walnut Creek Noise Ordinance (7:00 a.m. to 6:00 p.m.). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Walnut Creek Noise Ordinance, which would reduce this potential impact to a less-than-significant level.

Sobrante WTP – Alternative 1 or 2

Although residential receptors are 600 feet or more from existing WTP facilities east of Valley View Road, they are as close as 150 feet from facilities that would be west of Valley View Road. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. Proposed construction hours of 7:00 a.m. to 6:00 p.m. on weekdays would be consistent with daytime work hours specified by the Contra Costa County General Plan. At 150 feet, construction noise would exceed the 70-dBA speech interference criterion. Contra Costa County does not specify construction noise limits. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the speech interference criterion (although this criterion could be exceeded by 1 dB at the closest receptor if impact equipment is operated), thereby reducing any potential construction noise impacts to a less-than-significant level.

Upper San Leandro WTP – Alternative 1 or 2

Sensitive receptors in the vicinity of proposed construction include residences as close as 170 feet to the east and south. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. Proposed construction hours of 7:00 a.m. to 6:00 p.m. on weekdays would be consistent with those specified by the Oakland Noise Ordinance (7:00 a.m. to 7:00 p.m.). At 170 feet, construction noise would exceed

the 70-dBA speech interference criterion as well as the 65-dBA weekday noise limit specified by the Oakland Noise Ordinance for construction occurring for more than 10 days. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the speech interference criterion and Oakland noise limit (although this criterion could be exceeded by 5 dB at the closest receptor if impact equipment is operated), thereby reducing any potential construction noise impacts to a less-than-significant level. Implementation of Measure 3.10-1c would limit the operation of impact equipment to less than 10 days, which would maintain impact equipment at levels consistent with the Oakland Noise Ordinance weekday noise limit of 80 dBA for less than 10 days.

Orinda-Lafayette Aqueduct – Alternative 2

Tunnel

Under this alternative, a tunnel would be constructed from the Orinda WTP to a location approximately 9,950 feet to the east near the Orinda-Lafayette boundary. The tunnel entry shaft would be located at the Orinda WTP (southeast corner of the Orinda Sports Field), while the tunnel exit shaft would be located at the southwest corner of the Altarinda Drive/St. Stephens Drive/ El Nido Ranch Road intersection. From the exit tunnel shaft, this facility would extend eastward to the Lafayette WTP as a pipeline. Tunnel construction would occur over two to three years.

Since the tunnel would be 75 to 400 feet below surface elevations, noise generated within the tunnel by the tunnel boring machine or tunnel muck removal system (conveyor belt and rail cars) would not be audible at the surface. The primary sources of noise associated with tunnel construction would be:

- Excavation of a 75-foot-deep entry shaft and 220-foot deep exit shaft, which could include pile driving
- Handling and removal of excavated materials (shaft and tunnel spoils) at the tunnel entry shaft, which would include operation of a crane at the surface, a skip hoist system that moves muck from the bottom of the shaft to the surface, and front loaders that load muck into haul trucks
- Operation of a crane to lower tunnel support segments into the shaft
- Continuous operation of a ventilation fan (which could be located at the bottom of the shaft or at the surface) and dewatering pumps (at the bottom of the shaft) at the entry shaft site (24 hours per day, seven days per week)
- Continuous operation of ventilation equipment and possibly dewatering pumps at the exit shaft (24 hours per day, seven days per week)
- Operation of compressors or generators at night at the entry shaft and possibly at the exit shaft
- Possible controlled detonations during shaft construction

Unlike construction of all other WTTIP facilities, tunnel construction would take place 24 hours per day, 7 days per week.

Although work in the tunnel entry shaft would typically take place 24 hours per day, construction activities at the surface (around the tunnel shaft) would be limited to operation of the crane and skip hoist during the more noise-sensitive nighttime hours. The crane would periodically lower tunnel support segments into the shaft and would also power the skip hoist (lifting muck bins along steel guide rails up the shaft). Muck handling would be limited to operation of the skip hoist (to transport muck from the bottom of the tunnel shaft to the surface) and the crane. Operation of front loaders and haul trucks would be limited to the daytime hours, although limited operation of a front loader could be required during the evening hours to stockpile muck until the next morning. The muck train, ventilation fan, and dewatering pumps would operate continuously, but would be in the tunnel and the bottom of the entry shaft; therefore, operation of this equipment would not contribute significantly to tunnel-related noise increases at the closest receptors.

Construction activities at the tunnel exit shaft would include limited worker access, daytime operation of a crane, and continuous operation of a ventilation fan and possibly dewatering pumps at the bottom of the shaft.

The nearest sensitive receptors are about 500 feet west of and 550 feet east of the tunnel entry shaft and 100 feet west of the tunnel exit shaft, both in Orinda. As indicated in Table 3.10-5, construction-related noise increases would occur over two to three years. At 500 feet from the tunnel entry shaft, daytime operation of trucks would exceed the 70-dBA speech interference criterion, but daytime operation of other types of equipment would not exceed this criterion. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the speech interference criterion.

Table 3.10-6 indicates that nighttime construction at the tunnel entrance portal would not exceed the Orinda Noise Ordinance 55-dBA nighttime noise limit at the closest residential receptors, although operation of pumps, compressors, or generators could exceed this limit. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 55-dBA nighttime noise limit. However, since estimated noise levels could approach this limit, provision of a temporary sound barrier (see Measure 3.10-1e) around the portal would help ensure that construction noise levels are maintained below this limit.

Tunnel construction activities at the exit portal also would not exceed the 55-dBA limit, but operation of dewatering pumps or other stationary equipment could exceed this limit, depending the location of this equipment relative to the closest residential receptor. Implementation of noise controls (see Measure 3.10-1a) and a temporary sound barrier (see Measure 3.10-1e) might not be adequate to reduce these noise levels to below the Orinda Noise Ordinance nighttime noise limit. However, noise measurements collected at this location indicate that nighttime ambient noise levels range between 65 and 67 dBA (the nighttime standard would be adjusted to reflect ambient levels, as described in Measure 3.10-1b), and mitigated construction noise levels would be well

below ambient noise levels. Therefore, implementation of Measures 3.10-1a, 3.10-1b, 3.10-1d, and 3.10-1e would maintain tunnel-related noise at a less-than-significant level.

Although noise level estimates demonstrate that Leq noise levels (i.e., all noises occurring during the measurement period) would not exceed the speech and sleep interference criteria or the applicable Orinda noise limits (see Tables 3.10-5 and 3.10-6), disturbance of the closest residential receptors could still occur, particularly if residents open windows at night. Operation of some types of equipment at both the entry and exit shafts could exceed existing nighttime ambient noise levels at the closest residential receptors. Pile-driving activities, if required during shaft construction, would be audible. Operation of generators and ventilation fans during the nighttime hours could also be audible. Implementation of noise controls specified in Measures 3.10-1a, 3.10-1d (including compliance with ordinance noise limits listed in Table 3.10-1 for ventilation fans, use of line power instead of generators, and noise controls on pile drivers), and Measure 3.10-1e (erection of temporary sound barriers) would help minimize the effects of such construction noise to a less-than-significant level, although the potential for occasional sleep disturbance cannot be completely eliminated.

During the nighttime hours, operation of the crane could generate peak noise levels (Lmax) that exceed the ambient noise levels at the closest residential receptors. When the muck bins reach the top of the shaft and are tipped to unload the muck, a clanging or booming noise can occur. These and other incidental, sudden noise peaks (as opposed to continuous noise that is more typical of traffic noise) could cause sleep disturbance, particularly if residents open windows at night. Construction of a temporary sound barrier around the tunnel shaft staging area would help reduce the adverse effects of these noise peaks.

During shaft construction, it is possible that controlled detonation could be required in areas of hard rock. Controlled detonation near the surface would be audible at adjacent receptors, resembling the sound of a very short succession of thunder claps, but noise generated by any underground controlled detonations would be somewhat attenuated by surrounding rock. Implementation of hourly limits and delay times, as specified in Measure 3.10-1d, would help to maintain the effects of controlled detonation activities at a less-than-significant level.

Proposed construction hours (24 hours per day, 7 days per week) would not be consistent with the hourly limits for construction activities specified by the Orinda Noise Ordinance (8 a.m. to 6 p.m.). Orinda prohibits the operation of heavy equipment on weekends; proposed tunnel construction would be inconsistent with this restriction. However, EBMUD generally intends (but would not be limited to) weekday construction and weekend maintenance and inspections for this project. In addition, construction noise beyond the ordinance time limits would be restricted to the ordinance's nighttime noise standards.

Pipeline

The nearest sensitive receptors are located about 25 feet from the pipeline alignment. Bentley School is also adjacent to the pipeline alignment. Pipeline construction would occur over approximately one to two years. As indicated in Table 3.10-5, construction-related noise

increases would occur during the daytime hours only. However, some equipment (e.g., pumps and generators for dewatering, if needed) associated with jack-and-bore construction would operate 24 hours per day in the vicinity of Bentley School. If a ventilation fan is required for the jack-and-bore pit and the fan must operate 24 hours per day, fan operation would need to be consistent with the noise ordinance limits listed in Table 3.10-1 (see Measure 3.10-1d, second bullet). Other noise control measures under Measure 3.10-1a, such as the bullet addressing pile driving, would also be applied for noise associated with pit construction.

At setback distances of 25 feet or less, construction noise would exceed the 70-dBA speech interference criterion and the City's 80-dBA noise ordinance limit at the closest affected property both without and with implementation of noise controls (see Measure 3.10-1a). Although noise levels would exceed these criteria, it should be noted that mitigated construction levels of 75 dBA or less (80 dBA for impact equipment) at 50 feet would be consistent with noise levels allowed by the Lafayette Noise Ordinance (83 dBA at 50 feet), as long as such noise occurs within specified construction times. Section 5-209 of the Lafayette Municipal Code also provides exceptions if compliance would be impractical or unreasonable (Sinnette, 2006). In addition, pipeline construction would not affect any one receptor for more than about two weeks (plus a couple of additional days for paving the trench), reducing the potential for significant noise impacts. Therefore, implementation of noise and time controls (see Measures 3.10-1a and 3.10-1b) would help maintain the potential effects of this temporary noise impact at a less-than-significant level.

Proposed pipeline construction hours (8:30 a.m. to 4:30 p.m.) would be consistent with construction time limits specified by the Lafayette and Orinda Noise Ordinances (8 a.m. to 8 p.m. and 8 a.m. to 6 p.m., respectively).

Ardith Reservoir and Donald Pumping Plant

Residences surround this site and are located as close as 100 feet from proposed construction. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period for construction of the Ardith Reservoir and Donald Pumping Plant, but during the daytime hours only. With a minimum distance of 100 feet from project construction, construction noise would exceed the 70-dBA speech interference criterion at the closest residential receptors. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 70-dBA speech interference criterion, except for impact equipment. However, impact-equipment-related noise would exceed the speech interference criterion by only 5 dB, and it is expected that the Leq noise level could be reduced by 5 dB by erecting a temporary sound barrier between the impact equipment and affected residential receptors (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Orinda Noise Ordinance (8:00 a.m. to 6:00 p.m.). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Orinda Noise Ordinance, which would reduce this potential impact to a less-than-significant level.

Fay Hill Pumping Plant and Pipeline Improvements

There are no sensitive receptors immediately adjacent to proposed facilities, although there are residential uses as close as 100 feet south of the southern end of the pipeline alignment. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period for both the pumping plant and pipeline. At 100 feet, construction noise would exceed the 70-dBA speech interference criterion. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 70-dBA speech interference criterion, except for impact equipment. However, impact equipment-related noise would exceed the speech interference criterion by only 5 dB, and the Leq noise level could be reduced by 5 dB by erecting a temporary sound barrier between the impact equipment and affected residential receptors (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level.

Proposed pumping plant construction hours (7:00 a.m. to 6:00 p.m.) and pipeline construction hours (8:30 a.m. to 4:30 p.m.) would be generally consistent with those specified by the Moraga Noise Ordinance (8:00 a.m. to 5:00 p.m.). Although there are no sensitive receptors in the vicinity of the pumping plant, adjusting the proposed construction hours to be consistent with the Moraga Noise Ordinance (Measure 3.10-1b) would reduce this potential impact to a less-than-significant level.

Fay Hill Reservoir

There are no existing residential uses near this site, but there are residences along Rheem Boulevard, and residential projects are proposed along the lower section of the access road (off Rheem Boulevard) and east of the reservoir site. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. If there are any future residences constructed within 100 feet of this site, construction noise would exceed the 70-dBA speech interference criterion, and implementation of noise controls (see Measure 3.10-1a) would be required. At 100 feet, these measures would reduce construction noise levels to below the 70-dBA speech interference criterion, except for impact equipment. However, impact-equipment-related noise would exceed the speech interference criterion by only 5 dB, and the Leq noise level could be reduced by 5 dB by erecting a temporary sound barrier between the impact equipment and affected residential receptors (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Moraga Noise Ordinance (8:00 a.m. to 5:00 p.m.). If there are any future residences constructed in the vicinity of this reservoir, Measure 3.10-1b (adjusting the proposed construction hours to be consistent with the Moraga Noise Ordinance) would need to be implemented to reduce this potential impact to a less-than-significant level.

Glen Pipeline Improvements

There are residential uses immediately adjacent to the proposed pipeline alignment (setbacks vary from 25 to 75 feet). As indicated in Table 3.10-5, construction-related noise increases would occur over a one-year period, but during the daytime hours only. Proposed construction hours (8:30 a.m. to 4:30 p.m.) would be consistent with those specified by the Lafayette Noise Ordinance (8 a.m. to 8 p.m.). At 25 feet, construction noise would exceed the 70-dBA speech interference criterion and the City's 80-dBA noise ordinance limit at the closest affected property both without and with implementation of noise controls (see Measure 3.10-1a). Although noise levels would exceed these criteria, it should be noted that mitigated construction levels of 75 dBA or less (80 dBA for impact equipment) at 50 feet would be consistent with noise levels allowed by the Lafayette Noise Ordinance (83 dBA at 50 feet), as long as such noise occurs within specified construction times. Section 5-209 of the Lafayette Municipal Code also provides exceptions if compliance would be impractical or unreasonable (Sinnette, 2006). In addition, pipeline construction would not affect any one receptor for more than about two weeks (plus a couple of additional days for paving the trench), reducing the potential for significant noise impacts. Residential setbacks vary from 25 to over 100 feet; noise levels at residences set back 100 feet or more would be reduced to a less-than-significant level. Therefore, implementation of noise and time controls (see Measures 3.10-1a and 3.10-1b) would help maintain the potential effects of this temporary noise impact at a less-than-significant level.

Happy Valley Pumping Plant and Pipeline

Sensitive receptors along the pipeline alignment include residential uses and the Orinda Country Club Golf Course, which are located as close as 50 feet from the pipeline alignment. Single-family residences are located approximately 50 feet to the east, 180 feet to the west, 200 feet to the north, and 350 feet to the south of the pumping plant site. As indicated in Table 3.10-5, pumping plant and pipeline construction would occur over one to two years. At 50 feet, construction noise would exceed the 70-dBA speech interference criterion both without and with implementation of noise controls (see Measure 3.10-1a). With noise controls, construction noise levels would still exceed the speech interference criterion by approximately 5 dB for most types of construction equipment and 11 dB for impact equipment (e.g., jackhammers). Provision of a temporary noise barrier between the pumping plant construction site and the closest residence to the east (any residence less than 100 feet from the construction site), as specified in Measure 3.10-1e, would be adequate to reduce construction noise to a less-than-significant level.

Proposed pipeline construction hours (8:30 a.m. to 4:30 p.m.) and pumping plant construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Orinda Noise Ordinance (8 a.m. to 6 p.m.). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Orinda Noise Ordinance, which would reduce this potential impact to a less-than-significant level.

Highland Reservoir and Pipelines

The closest sensitive receptors to the reservoir include recreationists at the Lafayette Reservoir (the Lakeside Trail is approximately 250 feet to the south, while the Rim Trail is located as close

as 25 feet) and residential uses (approximately 1,500 feet to the east and separated by topography). The pipeline alignment is located as close as 620 feet from residences. As indicated in Table 3.10-5, reservoir and pipeline construction-related noise increases would occur over a one- to two-year period. At 25 and 250 feet, reservoir construction would exceed the 60-dBA speech interference criterion for outdoor uses at the Rim Trail as well as the Lakeside Trail. However, existing topography between the reservoir site and Lakeside Trail would reduce construction noise to below the 60-dBA outdoor speech interference criterion. As shown in Table 3.10-5, at 25 feet, noise levels at the Rim Trail would still exceed this criterion with implementation of noise controls (see Measure 3.10-1a). However, Rim Trail users would be subject to noise levels above the 60-dBA speech interference criterion only briefly, while they are walking past the reservoir site. Therefore, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise impacts on Rim Trail users to a less-than-significant level.

At 620 feet, daytime construction noise associated with pipeline construction would not exceed the 70-dBA speech interference criterion or the City's noise ordinance limit of 80 dBA at the closest affected residential property. However, noise levels would exceed the Lafayette Noise Ordinance limit of 83 dBA at 50 feet. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 83-dBA noise ordinance limit, thereby reducing any potential daytime pipeline construction noise impacts to a less-than-significant level.

The section of pipeline that crosses under the Lafayette Reservoir Recreation Area's access road would be constructed at night to minimize conflicts with daytime recreation traffic. Nighttime construction would occur over two to four nights. Since construction would occur beyond the Lafayette Noise Ordinance's time limits (8 a.m. to 6:00 p.m.), the ordinance's nighttime noise limit of 53 dBA would apply (see Table 3.10-1). Table 3.10-6 indicates that pipeline-related construction noise levels at the closest residences would exceed the 53-dBA noise limit. Table 3.10-6 also indicates that implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 53-dBA noise ordinance limit, except for impact equipment. However, impact-equipment-related noise would exceed this criterion by only 5 dB, and the Leq noise level could be reduced to below this criterion (see Table 3.10-6) by erecting a temporary sound barrier between the impact equipment and affected residential receptors (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level. Proposed daytime reservoir and pipeline construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Lafayette Noise Ordinance (8:00 a.m. to 8:00 p.m.), but nighttime pipeline construction would occur beyond these ordinance time limits. Implementation of Measure 3.10-1b would require adjusting the proposed daytime construction hours to be consistent with the Lafayette Noise Ordinance, which would reduce this potential impact to a less-than-significant level. Nighttime construction would be subject to ordinance nighttime noise limits, as discussed above.

Lafayette Reclaimed Water Pipeline

The closest sensitive receptors to the pipeline alignment include recreationists at the Lafayette Reservoir (the Lakeside Trail is approximately 150 feet to the south, while the Rim Trail is

located adjacent to the south end of this pipeline) and residential uses (as close as 620 feet to the east). As indicated in Table 3.10-5, pipeline construction-related noise increases would occur over a one- to two-year period (occurring in conjunction with the Highland Reservoir and Pipelines project). At 620 feet, daytime construction noise associated with pipeline construction would not exceed the 70-dBA speech interference criterion or the City's noise ordinance limit of 80 dBA at the closest affected residential property. However, noise levels would exceed the Lafayette Noise Ordinance limit of 83 dBA at 50 feet. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 83-dBA noise ordinance limit, thereby reducing any potential daytime pipeline construction noise impacts on residential uses to a less-than-significant level.

Since the pipeline ends at the Rim Trail, there would be a brief period of construction adjacent to this trail when pipeline construction noise would exceed the 60-dBA speech interference criterion for outdoor uses. Topography would likely reduce pipeline construction noise at the Lakeside Trail to below the 60-dBA outdoor speech interference criterion. Although pipeline construction noise would exceed the 60-dBA criterion where it is located in proximity to the Rim Trail, it would only occur briefly, while people are walking past the pipeline construction area. Therefore, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise impacts on Rim Trail users to a less-than-significant level.

Like the Highland Inlet/Outlet Pipeline, the section of pipeline that crosses under the Lafayette Reservoir Recreation Area's access road would be constructed at night to minimize conflicts with daytime recreation traffic. Nighttime construction would occur over two to four nights. Since construction would occur beyond the Lafayette Noise Ordinance's time limits (8 a.m. to 8:00 p.m.), the ordinance's nighttime noise limit of 53 dBA would apply (see Table 3.10-1). As indicated in Table 3.10-6, pipeline-related construction noise levels at the closest residences would exceed the 53-dBA noise limit. The table also indicates that implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the 53-dBA noise ordinance limit, except for impact equipment. However, impact-equipment-related noise would exceed this criterion by only 5 dB, and the Leq noise level could be reduced to below this criterion (see Table 3.10-6) by erecting a temporary sound barrier between the impact equipment and affected residential receptors (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level.

Leland Isolation Pipeline and Bypass Valves

Sensitive receptors in the pipeline vicinity include residences along Lacassie Avenue, west of North California Boulevard, which are as close as 300 feet to the west. Sensitive receptors are located as close as 50 feet from the proposed bypass valves. As indicated in Table 3.10-5, construction-related noise increases would occur over a one-year period for the pipeline and a one-week period for the bypass valves, but during the daytime hours only. Proposed construction hours (8:30 a.m. to 4:30 p.m.) would be consistent with those specified by the Walnut Creek Noise Ordinance (7 a.m. to 6 p.m.). At 300 feet, pipeline construction noise would not exceed the 70-dBA speech interference criterion, except when trucks and impact equipment are operated. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce

construction noise levels to below the speech interference criterion, thereby reducing any potential construction noise impacts to a less-than-significant level. At 50 feet, bypass valve construction noise would exceed the 70-dBA speech interference criterion both with and without noise controls (see Measure 3.10-1a). However, implementation of noise controls is considered to reduce construction noise impacts to a less-than-significant level due to the short duration of project construction (one week).

Moraga Reservoir

Residential uses completely surround this project site and are located a minimum of approximately 50 feet to the east, 100 feet to the southwest, and 150 feet to the northwest and northeast. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. At 50 feet, construction noise would exceed the 70-dBA speech interference criterion both with and without implementation of noise controls (see Measure 3.10-1a). With noise controls, construction noise levels would still exceed the speech interference criterion by approximately 5 dB for most types of construction equipment and 11 dB for impact equipment (e.g., jackhammers). Provision of a temporary noise barrier between the reservoir construction site and the closest residences to the east (any residence less than 100 feet from the construction site), as specified in Measure 3.10-1e, would be adequate to reduce construction noise to a less-than-significant level.

While reservoir construction would occur during the daytime hours only, some equipment (e.g., pumps and generators for dewatering, if needed) associated with jack-and-bore construction would operate 24 hours per day. Equipment operation would be mitigated so as not to cause noise disturbance at adjacent residences, as required by the Moraga Municipal Code (see Table 3.10-1 and Measure 3.10-1d, second bullet). Proposed construction hours (7:00 a.m. to 6:00 p.m.) on weekdays only would not be entirely consistent with those specified by the Moraga Noise Ordinance (8:00 a.m. to 5:00 p.m.). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Moraga Noise Ordinance, which would reduce this potential impact to a less-than-significant level.

Moraga Road Pipeline

Sensitive receptors include residential uses immediately adjacent to some pipeline segments (mostly within about 50 feet, with a few homes as close as 25 feet), and Campolindo High School, which is as close as 100 feet west of the pipeline alignment. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, but during the daytime hours only. At 50 feet or less, construction noise would exceed the 70-dBA speech interference criterion both without and with implementation of noise controls (see Measure 3.10-1a). Although noise levels would exceed this criterion, mitigated construction levels of 75 dBA or less (80 dBA for impact equipment) at 50 feet would be consistent with noise levels allowed by the Lafayette Noise Ordinance (83 dBA at 50 feet or 80 dBA at the closest affected property), as long as such noise occurs within specified construction times. At 100 feet (such as Campolindo High School), these measures would reduce construction noise levels to below the 70-dBA speech interference criterion, except for impact equipment. Despite potential

exceedance of the speech interference criterion by 5 dB due to impact equipment, pipeline construction would not affect any one receptor for more than about two weeks (plus a couple of additional days for paving the trench), reducing the potential for significant noise impacts. Therefore, implementation of noise controls (see Measures 3.10-1a) and conformance with applicable ordinance time limits would help maintain the potential effects of this temporary noise impact at a less-than-significant level.

Proposed pipeline construction hours (8:30 a.m. to 4:30 p.m.) would be consistent with construction time limits specified by the Lafayette and Moraga Noise Ordinances (8 a.m. to 8 p.m. and 8 a.m. to 5 p.m., respectively).

Sunnyside Pumping Plant

There is a single-family residence approximately 175 feet to the north of this proposed facility, and a residence is planned on the property to the south. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, during the daytime hours only. At 175 feet, construction noise would exceed the 70-dBA speech interference criterion and Lafayette Noise Ordinance limits of 83 dBA at 50 feet, but not the 80-dBA limit at the closest affected property. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the noise ordinance limits and 70-dBA speech interference criterion, thereby reducing any potential construction noise impacts to a less-than-significant level. Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be generally consistent with those specified by the Lafayette or Orinda Noise Ordinances (8:00 a.m. to 8:00 p.m. and 8:00 a.m. to 6:00 p.m., respectively). Implementation of Measure 3.10-1b would require adjusting the proposed construction hours to be consistent with the Lafayette and Orinda Noise Ordinances, which would reduce this potential impact to a less-than-significant level.

Tice Pumping Plant and Pipeline

A single-family residence is about 200 feet west of the pumping plant site, and multiple residences are immediately adjacent to the proposed pipeline alignment (potentially as close as 25 feet). As indicated in Table 3.10-5, pumping plant and pipeline construction-related noise increases would occur over a one- to two-year period. At 200 feet, pumping plant construction noise would exceed the 70-dBA speech interference criterion. Implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the noise ordinance limit and 70-dBA speech interference criterion. Therefore, this potential impact would be reduced to less-than-significant. At 25 feet, pipeline construction noise would exceed the 70-dBA speech interference criterion both without and with implementation of noise controls (see Measure 3.10-1a). However, pipeline construction would not affect any one receptor for more than about two weeks (plus a couple of additional days for paving the trench), reducing the potential for significant noise impacts. Contra Costa County does not specify construction noise limits.

Proposed pumping plant construction hours (7:00 a.m. to 6:00 p.m.) and pipeline construction hours (8:30 a.m. to 4:30 p.m. on weekdays) would be consistent with daytime work hours specified by the Contra Costa County General Plan.

Withers Pumping Plant

Single-family residences surround the project site, approximately 150 feet to the south, 200 feet to the northeast (across Reliez Valley Road), and 300 feet to the northwest. As indicated in Table 3.10-5, construction-related noise increases would occur over a one- to two-year period, during the daytime hours only. At 150 feet, construction noise would exceed the 70-dBA speech interference criterion. Contra Costa County does not specify construction noise limits. As shown in Table 3.10-5, implementation of noise controls (see Measure 3.10-1a) would reduce construction noise levels to below the speech interference criterion (although this criterion could be exceeded by 1 dB at the closest receptor if impact equipment is operated), thereby reducing any potential construction noise impacts to a less-than-significant level.

Proposed construction hours (7:00 a.m. to 6:00 p.m.) would be consistent with daytime work hours specified by the Contra Costa County General Plan.

Mitigation Measures

Measure 3.10-1a: The District will incorporate into contract specifications a requirement that construction activities at the construction site not cause daytime noise levels to exceed the 70-dBA speech interference criterion at the closest affected sensitive receptors, as well as that noise levels are consistent with local ordinances (see Table 3.10-1). Measures that would be implemented to reduce noise levels (as demonstrated in Table 3.10-5) to meet this criterion include the following:

- Truck operations (haul trucks and concrete delivery trucks) will be limited to the daytime hours, as described in Measure 3.10-1b.

- Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) will be used for all equipment and trucks as necessary.

- If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used during project construction, hydraulically or electric-powered equipment will be used wherever possible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust will be used (a muffler can lower noise levels from the exhaust by up to about 10 dB). External jackets on the tools themselves will be used, where feasible, which could achieve a reduction of 5 dB. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible.

- Wherever pile driving is required (possibly at tunnel shafts, jack-and-bore pit shafts, Moraga Reservoir, and Tice Pumping Plant), pile holes will be predrilled to minimize the duration of pile driving.

- Stationary noise sources will be located as far from sensitive receptors as possible. If they must be located near receptors, adequate muffling (with enclosures) will be used to ensure local noise ordinance limits are met. Enclosure opening or venting will face away from sensitive receptors. Enclosures will be designed by a registered engineer regularly involved in noise control analysis and design. Operation of any stationary equipment beyond the time limits specified will meet applicable noise ordinance noise limits (see Measure 3.10-1b).

- Material stockpiles as well as maintenance/equipment staging and parking areas will be located as far as practicable from residential and school receptors.

- If any pipeline construction zones are located within 50 feet of school classrooms or childcare facilities, pipeline construction activities (or at least the noisier phases of construction) will be scheduled on weekend or school vacation days to the extent feasible, avoiding weekday hours when schools are in session. If construction must occur when school is in session, construction noise will comply with applicable noise ordinance noise limits (e.g., 83 dBA at 50 feet in Lafayette, etc.).

- An EBMUD contact person will be designated for responding to construction-related issues, including noise. The name and phone number of the liaison will be conspicuously posted at construction areas, on all advanced notifications, and on the EBMUD project website. This person will take steps to resolve complaints, including periodic noise monitoring, if necessary.

Measure 3.10-1b: Construction at the WTTIP project sites will be restricted to the hours of operation specified by each jurisdiction's noise ordinance (as listed in Table 3.10-1, including restrictions provided in footnotes and any other ordinance exceptions and provisions in effect at the time of EIR publication), except during critical water service outages or other emergencies and special situations. Any equipment operating beyond these hours will be subject to the day and night noise limits of each jurisdiction (as listed in Table 3.10-1) for various activities in single-family residential zones. To ensure that these standards could be met at the closest sensitive receptors, EBMUD will conduct a noise monitoring program prior to implementation of any project where construction would extend beyond ordinance time limits to accurately determine baseline ambient noise levels at the closest residential receptors and to measure noise levels at these receptors during a test run of equipment proposed to be operated on the site during the more noise-sensitive nighttime hours. Project noise limits will be adjusted appropriately depending on the existing ambient noise levels[2] to ensure noise disturbance is maintained at a less-than-significant level at the closest residential receptors. Measures that could be implemented to reduce noise levels (as demonstrated in Table 3.10-6) to meet local nighttime standards include engine controls listed in Measure 3.10-1a, tunnel-related measures listed in Measure 3.10-1c, and temporary sound barriers listed in Measure 3.10-1e.

Measure 3.10-1c: At the Upper San Leandro WTP, EBMUD will make a reasonable effort to limit operation of impact construction equipment to less than 10 days to be consistent with Oakland Noise Ordinance construction noise limits. However, if this limit cannot be achieved, construction at this site will occur in a manner consistent with the Oakland City

[2] If baseline noise levels already exceed standards at the closest residential receptors, the standards will be increased appropriately so that construction noise levels do not result in a noticeable increase in ambient noise levels at these receptors.

Council Adopted Construction Noise Mitigation Measures to the extent feasible (included as Appendix G).

Measure 3.10-1d: The District will incorporate into the contract specifications the following requirements to reduce construction-related noise levels associated with the Orinda-Lafayette Aqueduct and any other WTTIP projects that involve construction of tunnel shafts (including any jack-and-bore pits where equipment would operate 24 hours per day):

- The construction contractor will be required to retain an acoustical engineer to design sound abatement measures that will meet the local ordinance limits. Among other things, the acoustical engineer will provide design specifications for the sound barrier design and the specific ventilation fan to be used (based on type, size, orientation, location, exhaust, etc.) at tunnel portals.

- Quiet tunnel ventilation fans will be used and will be directed away from sensitive receptors. Since they would operate 24 hours per day, the fans must meet the noise ordinance limits listed in Table 3.10-1. Additional measures that could be employed to reduce fan noise, if necessary, include enclosing fans, treating the interior surface of the enclosure for acoustical absorption, or using silencers or acoustically lined inlet plena to control the inlet noise.

- Prior to construction, baseline noise measurements will be taken at the entry and exit shafts. If baseline ambient noise levels already exceed applicable noise ordinance limits at the closest residential receptors, the standards will be increased appropriately so that construction noise levels do not result in a noticeable increase in ambient noise levels at these receptors.

- Loader operations at the surface (the area outside the tunnel shaft) in the tunnel portal vicinities will cease at 6 p.m. on weekdays and not operate on weekends in accordance with the Orinda Noise Ordinance, except during critical water service outages or other emergencies and special situations.

- Other measures will be implemented wherever possible to reduce impact noise. For example, bins used to transport spoils, including rocks and debris, will be constructed of nonmetallic material or have a nonmetallic liner (such as cardboard), if feasible, to reduce impact noise. Muck box tipping/dumping at the surface will be performed in a manner that minimizes clanging, banging, or booming noises (metal to metal contact) during the evening and nighttime hours (6 p.m. to 8:00 a.m. on weekdays).

- Underground controlled detonation in the tunnel shaft areas will be restricted to the hours of 8:00 a.m. to 6:00 p.m. (in accordance with the Orinda Noise Ordinance). In addition, the amount of explosive and the delay times of any explosive charges used will be limited so as to produce a maximum noise level at the closest adjacent receptor of 60 dBA (Ldn).

- Backup alarms on any equipment will not be operated during nighttime hours (10:00 p.m. to 7:00 a.m.).

- Sound barriers will be erected around the tunnel entry and exit shafts to minimize noise impacts on adjacent receptors, as specified in Measure 3.10-1e.

- Proposed jack-and-bore pits will be located as far from sensitive receptors as technically feasible.

Measure 3.10-1e: Wherever a sensitive receptor is located within 150 feet of a construction site at a treatment plant, reservoir, or pumping plant, and at both tunnel shafts, temporary sound barriers will be provided between the construction site and the closest receptors to reduce noise levels to below the speech interference criterion at the closest receptor. The applicable ordinance nighttime noise standard will also be applied at tunnel portals where nighttime activities are proposed. As a rule, the elevation of the barrier should be sufficient to interrupt the line-of-sight between the residential receptors and the tops of stacks (exhaust pipes) of construction equipment by about 5 to 10 feet. Sound-absorbing blankets can also be used at appropriate locations as necessary to protect nearby residents.

Any openings in sound barriers that are provided for truck/vehicle access will be located away from sensitive receptors. For example, sound barriers could be constructed around the entrance tunnel shaft, and the opening to the tunnel staging area could be located on the south side so that tunnel-related noise would be oriented to the south, toward the existing WTP rather than toward residential receptors to the west and east and school receptors to the north.

It should be noted that although mitigation measures would reduce construction noise levels to meet local ordinance criteria (as indicated in Tables 3.10-5 and 3.10-6), mitigated construction noise could still cause occasional disturbance at the closest noise-sensitive receptors.

Impact 3.10-2: Increased noise levels along truck haul routes.

Truck noise levels depend on vehicle speed, load, terrain, and other factors. The effects of construction-related truck traffic would depend on the level of background noise already occurring at a particular receptor site. In quiet noise environments (Leq averaging 50 dBA), one truck per hour would be noticeable, even though such a low volume would not measurably increase noise levels. In slightly noisier environments (Leq averaging 60 dBA), the threshold level is higher, and it would take 10 trucks per hour to noticeably increase the noise exposure. In moderately noisy environments (Leq averaging 70 dBA), a noise increase would be perceptible with the addition of 100 trucks per hour.

In quiet environments or during quieter times of the day, truck noise is mainly a single-event disturbance; although the hourly average associated with short, single events is not very high, individual noise peaks of up to 91 dBA at 50 feet can occur during a single truck passage. In noisy environments or during less noise-sensitive hours, truck noise is perceived as a part of the total noise environment rather than as an individual disturbance. It is important to note that haul truck volumes would vary from day to day, and the maximum volumes listed in Table 3.10-7 would primarily occur during the excavation, concrete placement, and backfilling stages of construction.

TABLE 3.10-7
ESTIMATED MAXIMUM TRUCK TRIPS ALONG HAUL ROUTES

WTTIP Component	Maximum One-Way Truck Trips		Leq[a] (in dBA)
	Daily	Hourly	
Water Treatment Facilities			
Lafayette WTP			
Alternative 1	72	12	61
Alternative 2	12	2	53
Orinda WTP			
Alternative 1	72	10	60
Alternative 2	144	21	63
Walnut Creek WTP			
Alternative 1 or 2	24	4	56
Sobrante WTP			
Alternative 1 or 2	72	10	60
Upper San Leandro WTP			
Alternative 1 or 2	72	10	60
Pipeline and Tunnel Facilities			
Orinda-Lafayette Aqueduct (Tunnel)	158	16	62
Orinda-Lafayette Aqueduct (Pipeline)	84	10	60
Fay Hill Pipeline	22	3	55
Glen Pipeline Improvements	11	3	55
Happy Valley Pipeline	14	2	53
Highland Inlet/Outlet Pipeline and Lafayette Reclaimed Water Pipeline	34	4	56
Leland Isolation Pipeline	24	3	55
Moraga Road Pipeline	76	10	60
Tice Pipeline	36	4	56
Reservoir Facilities			
Ardith Reservoir	168	24	64
Fay Hill Reservoir	232	24	64
Highland Reservoir	168	24	64
Moraga Reservoir	168	24	64
Pumping Plants			
Donald Pumping Plant	76	10	60
Fay Hill Pumping Plant	6	1	50
Happy Valley Pumping Plant	14	2	53
Sunnyside Pumping Plant	14	2	53
Tice Pumping Plant	76	10	60
Withers Pumping Plant	98	12	61

[a] Leq noise levels for trucks are hourly Leq noise levels based on maximum overlapping haul truck and materials truck estimates for each project (see Appendix B), which occur primarily during the excavation or backfilling construction phases.

The hours for hauling excavated materials and for deliveries would be limited to 9:00 a.m. to 4:00 p.m.), and night and evening truck trips would not normally occur. Thus, there would be little or no contribution of truck noise to the CNEL during the more sensitive evening and nighttime hours. Haul routes that would be used during implementation of the WTTIP would vary from local residential streets with quiet noise environments to arterials with moderately noisy environments. In most cases, off-hauling of spoils from facility sites would require haul trucks to travel to/from the sites along local residential streets to arterial streets, and then to regional freeways. Table 3.10-7 presents the estimated maximum hourly one-way truck trips associated with construction of each WTTIP facility and corresponding hourly noise levels. When overlapping project schedules are considered, collective haul truck noise increases could occur if the same haul routes are used. These collective noise increases are discussed in Chapter 5, Cumulative Impacts.

Based on noise measurements collected in the Lamorinda area, most residential streets located away from freeways and major arterials are generally subject to daytime noise levels between 50 and 60 dBA (Leq). Daytime noise levels along arterials (such as Camino Pablo) are generally between 60 and 70 dBA (Leq). Areas adjacent to Highway 24 are generally subject to daytime noise levels of 70 dBA or higher. Based on a comparison of the haul truck noise levels shown in Table 3.10-7 with the ambient noise environments, project-related haul truck volumes would be noticeable on the quiet residential streets (average Leq of 50 to 60 dBA), since even one truck per hour may be noticeable. Along arterials (average Leq of 60 to 70 dBA), haul truck volumes would also be noticeable on days when peak truck volumes of 10 or more trips per hour occur. Peak hourly truck volumes would not be noticeable in areas adjacent to freeways (average Leq of 70 dBA or more).

Lafayette WTP

Alternative 1

As indicated in Table 3.10-7, the maximum hourly truck volume would generate a maximum noise level of 61 dBA (Leq). This increase over existing conditions could be noticeable[3] on arterials and residential streets. The primary access route to this site would be Highway 24 and Mt. Diablo Boulevard, a four-lane arterial roadway. Since no residential streets would be subject to haul truck noise increases, and no sensitive receptors are adjacent to this section of Mt. Diablo Boulevard, temporary increases in truck traffic along this route are not expected to significantly affect any sensitive receptors. Estimated maximum hourly truck noise levels would not exceed the 70-dBA speech interference criterion, and therefore short-term maximum noise increases that could result from project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

[3] The use of the term “noticeable” in this EIR section typically refers to an increase of 3 to 5 dB.

Alternative 2

As indicated in Table 3.10-7, the maximum hourly truck volume would generate a maximum noise level of 53 dBA (Leq). This increase over existing conditions would not be noticeable on arterials streets providing access to the Lafayette WTP. Under this alternative, no residential streets would be subject to haul truck noise increases, and no sensitive receptors are adjacent to this section of Mt. Diablo Boulevard. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Orinda WTP – Alternative 1 or 2

As indicated in Table 3.10-7, the maximum hourly truck volumes would generate maximum noise levels of 60 and 63 dBA (Leq). This increase over existing conditions could be noticeable on arterials and residential streets. The primary access route to this site from Highway 24 would be Camino Pablo, a two- and four-lane arterial roadway. Residential receptors along Camino Pablo could be subject to noise increases of 3 to 4 dB during the daytime hours. Although such increases could be noticeable to some residents, the estimated maximum hourly truck noise levels would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Walnut Creek WTP – Alternative 1 or 2

As indicated in Table 3.10-7, the maximum hourly truck volume would generate a maximum noise level of 56 dBA (Leq). This increase over existing conditions would be noticeable on residential streets providing access to this site. The primary access route to this site would be Larkey Lane and San Luis Road. Residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, but the estimated maximum hourly truck noise levels would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Sobrante WTP – Alternative 1 or 2

As indicated in Table 3.10-7, the maximum hourly truck volume would generate a maximum noise level of 60 dBA (Leq). This increase over existing conditions would be noticeable on arterial and residential streets providing access to this site. The primary access route to this site would be San Pablo Dam Road, Valley View Road, and Amend Road. Residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, but the estimated maximum hourly truck noise levels would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the

hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Upper San Leandro WTP – Alternative 1 or 2

As indicated in Table 3.10-7, the maximum hourly truck volume would generate a maximum noise level of 60 dBA (Leq). This increase over existing conditions would be noticeable on arterial and residential streets providing access to this site. The primary access route to this site would be Keller Avenue and Greenly Drive. Residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, but the estimated maximum hourly truck noise levels would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Pipeline and Tunnel Facilities

As indicated in Table 3.10-7, the maximum hourly truck volumes for all pipeline and tunnel facilities would generate maximum noise levels between 53 and 62 dBA (Leq). This increase over current levels would be noticeable on residential streets providing access to these facility sites. Arterials such as Camino Pablo and Moraga Road could be subject to noticeable noise increases when the Orinda-Lafayette Aqueduct and Moraga Road Pipeline are constructed. Although residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, the estimated maximum hourly truck noise levels associated with these projects would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Reservoir Facilities

As indicated in Table 3.10-7, the maximum hourly truck volumes for all reservoir facilities would generate maximum noise levels of 64 dBA (Leq). This increase over current levels would be noticeable on residential and arterial streets providing access to these facility sites. Although residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, the estimated maximum hourly truck noise levels associated with these projects would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Pumping Plants

As indicated in Table 3.10-7, the maximum hourly truck volumes for all pumping plant facilities would generate maximum noise levels between 50 and 61 dBA (Leq). This increase over current

levels would be noticeable on residential streets providing access to this site, but not likely noticeable along arterial roadways (except possibly Moraga Way near the Donald Pumping Plant site). Although residential receptors located along these roads would be subject to noticeable increases in truck traffic noise, the estimated maximum hourly truck noise levels associated with these projects would not exceed the 70-dBA speech interference criterion. Therefore, short-term maximum noise increases due to project-related trucks would be less than significant. In addition, offsite truck trips to or from project sites will be restricted to the hours of 9:00 a.m. until 4:00 p.m., Monday through Friday, which would further reduce the potential for noise impacts.

Impact 3.10-3: Construction of WTTIP facilities could cause vibration that could disturb local residents and cause cosmetic damage to buildings and structures.

Vibrations of 0.012 in/sec PPV can cause residential annoyance (similar to vibrations from a heavy truck passing at 100 feet) (Wilson, Ihrig & Associates, 2003). Monitoring data for a tunnel/pipeline project in San Francisco indicate that vibration was below the level of annoyance for most residents when vibration levels were maintained at 0.1 in/sec PPV or less (i.e., no complaints were received) (ESA, 1997).

While very low vibration levels (0.01 in/sec PPV) can cause annoyance, higher vibration levels can cause structural damage. The U.S. Bureau of Mines uses a criterion of 2.0 in/sec PPV to avoid any structural damage to buildings (Wilson, Ihrig & Associates, 2003). In general, cosmetic damage to residential buildings can occur at peak particle velocities over 0.5 in/sec, while structural damage to residential buildings can occur at peak particle velocities over 2.0 in/sec (Wilson, Ihrig & Associates, 2003).

Water Treatment Plants, Reservoirs, Pumping Plants, and Pipelines

Measurements collected during various construction activities (including pavement breaking, vibratory sheetpile driving, sheetpile driving by an excavator shovel, vibratory soil compaction, and earth excavation) at an unrelated project were found to produce vibration levels ranging between 0.03 to 0.38 in/sec PPV at 30 to 35 feet (ESA, 1997). Excavation activities associated with certain facility construction (including clearwells at treatment plants, some reservoirs, and some pipelines) could require sheetpile driving for shoring, which could generate perceptible vibration levels. Although vibration potential from sheetpile driving as well as other construction activities would depend on soil type and proximity to receptors, these measurements indicate that there are construction practices available that could minimize the potential for structural damage at the closest residential receptors. Implementation of the performance standard of 0.5 in/sec PPV, as required in Measure 3.10-3a, would preclude cosmetic or structural damage to nearby residential or other sensitive structures. However, it is possible that vibration would be perceptible and could temporarily annoy the closest residential receptors during construction of the WTTIP projects, that involve pile driving or sheetpile driving. The projects where sheetpile driving or other high-impact activities may occur include all WTP projects, the Orinda-Lafayette

Aqueduct, Moraga Reservoir, Moraga Road Pipeline, and Tice Pumping Plant. The Orinda-Lafayette Aqueduct is discussed below in more detail.

Orinda-Lafayette Aqueduct Tunnel – Alternative 2

The primary sources of vibration associated with tunnel construction would include heavy construction equipment (e.g., bulldozers, vibratory compaction equipment, impact breakers) and mining equipment (e.g., a roadheader or a tunnel boring machine), tunnel train operations, and controlled detonations. Measurements for an unrelated tunnel project indicate that a roadheader can produce vibration levels of 0.0015 to 0.0022 in/sec PPV at 100 feet, while a tunnel train (operating at an estimated 10 miles per hour) can produce vibration levels of 0.0004 to 0.0008 in/sec PPV at 100 feet (EBMUD, 2003).

The potential for vibration would depend on the excavation method, geologic conditions, and proximity to receptors. The potential for cosmetic or structural damage at overlying or nearby structures from shaft and tunnel construction would be low due to the relatively low strength of rock that is expected to be encountered and the depth of the tunnel below ground, generally in excess of 200 feet below overlying residential structures (Jacobs Associates, 2005). Implementation of the performance standard of 0.5 in/sec PPV (as required in Measure 3.10-3a) would preclude cosmetic or structural damage to overlying or nearby structures.

During tunnel construction, the potential for annoyance due to vibration would be low due to the relatively low strength of rock that is expected to be encountered and the depth of the tunnel below ground, generally in excess of 200 feet below overlying residential structures (Jacobs Associates, 2005). At 100 feet or more, it is expected that vibration levels associated with operation of tunneling equipment would remain below 0.012 in/sec PPV (the level that could cause annoyance). Since residences and school classrooms are located 500 feet or more from the tunnel entrance shaft and rock materials in this area are of relatively low strength, vibrations generated by construction of this shaft are not expected to be noticeable or cause annoyance at any nearby receptors. However, construction of the tunnel exit shaft could result in noticeable vibration, particularly during the more sensitive nighttime hours, at the adjacent residence to the west, which could be located as close as 100 feet from this shaft. If vibration complaints are received in the vicinity of the exit shaft, restriction of nighttime construction at this shaft or other operational adjustments would be employed, as required in Measure 3.10-3b.

Controlled detonations, produced by blasting techniques involving explosives, can be more noticeable to the public than mechanical excavation because of the intermittent, higher level noise and vibrations caused by blasting activities. Controlled detonation is performed by drilling holes approximately 2 inches in diameter in a specified pattern in the rock face of the tunnel excavation. The holes are packed with small amounts of explosive and primer. The explosives are detonated in one hole at a time, using a time delay between successive detonations; delay periods often range from 10 to 100 milliseconds, with the entire detonation event lasting no more than a few seconds. Detonations typically occur infrequently (once or twice per day), and the vibration produced by such detonations can be controlled by the charge per delay (the amount of explosive per delay in each hole) and delay time.

Based on review of existing geologic information, it is not anticipated that controlled detonation would be required for excavation of either the shafts or the tunnel. However, any use of controlled detonation would be subject to the performance standard of 0.5 in/sec PPV (as required in Measure 3.10-3a), which would preclude cosmetic or structural damage to overlying or nearby structures. Implementation of Measure 3.10-3b and time restrictions specified in Measure 3.10-1d (bullet 6) would also help to reduce the annoyance effects of controlled detonation, if it is employed.

Mitigation Measures

Measure 3.10-3a: To prevent cosmetic or structural damage to adjacent or nearby structures, EBMUD will incorporate into contract specifications restrictions on construction for those facilities that will or may require sheetpile driving, pile driving, or tunnel construction, whereby surface vibration will be limited to no more than 0.5 in/sec PPV, measured at the nearest residential or other sensitive structure.

Measure 3.10-3b: Contract specifications will include the following in the event that controlled detonation is required:

- Prior to controlled detonations, the contractor will be required to perform tests to determine the rock properties so that vibrations from the blast remain within the required PPV limit of 0.5 in/sec at the nearest structure. Such tests may include small test blasts in sealed borings to measure vibration attenuation (i.e., reduction). The charges used will be as small as possible to fracture the rock to be excavated. Vibration monitoring will be employed to ensure that the 0.5 in/sec PPV performance standard at the nearest structure is not exceeded.

- To the extent possible, residents in the potentially affected area will be notified in advance of controlled detonation activities, or if that is not possible, as soon as possible following the controlled detonation activity.

Operational Impacts

Impact 3.10-4: Noise increases during facility operations.

Operation of some of the WTTIP facilities would result in long-term noise increases. The primary sources of noise associated with these facilities include pumps and electrical facilities (substations, transformers, and emergency generators) at water treatment plants and pumping plants. The degree of impact would vary with each project and would depend on pump sizes, transformer sizes, proximity to sensitive receptors, and the extent of noise attenuation incorporated into the facility design. Table 3.10-8 presents the estimated maximum noise levels associated with the operation of pumps and electrical facilities at the closest sensitive receptors. Operational noise increases associated with water treatment and pumping plant facilities are described below.

TABLE 3.10-8
ESTIMATED OPERATIONAL NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project / Jurisdiction / Receptor Location	Size	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Reduction Provided by Enclosure[b]	Reduced Leq	Distance between Closest Facility and Receptor	Distance Adjustment	Adjusted Leq	Applicable Nighttime Noise Limit	Leq Exceeds Limit?	Noise Reduction with Measure 3.10-4[e]	Mitigated Leq	Mitigated Leq Exceeds Limit?
Lafayette WTP – Alternative 1 / Lafayette / Closest residential receptors are 1,500 to 2,000 feet away	Leland Pumping Plant: 350 HP per pump	3 Pumps	55	NA	55	2,000	-33	22	53	No	-20	2	No
	Bryant Pumping Plant: 1,250 HP per pump	4 Pumps	56	NA	56	2,000	-33	23	53	No	-20	3	No
	5,000 kVA	Electrical Substation	71	-10	61	1,500	-30	31	48[c]	No	NA	31	No
	500 kW	Emergency Generator	77	-25	52	1,500	-30	22	53	No	NA	22	No
Lafayette WTP – Alternative 2 / Lafayette	No new noise sources – Bryant Nos. 1 and 2 to be decommissioned												
Orinda WTP – Alternative 1 / Orinda / Closest residential receptors are 175 feet to the west	Size Not Specified	2 Pumps (Backwash Water Recycle System)	53	NA	53	175	-11	42	45[d]	No	-20	22	No
	200 kW	Emergency Generator	85	-25	60	175	-11	49	53	No	NA	49	No
Orinda WTP – Alternative 2 / Orinda / Closest residential receptors are 175 and 400 feet to the west	Los Altos Pumping Plant: 2,500 HP per pump	4 Pumps	56	NA	56	400	-18	38	45	No	-20	18	No
	7,500 kVA	Electrical Substation	73	-10	63	400	-18	45	45	No	NA	45	No
	200 kW	Emergency Generator	85	-25	60	175	-11	49	53	No	NA	49	No
Walnut Creek WTP – Alternatives 1 and 2 / Walnut Creek / Closest residential receptors are 300 feet away	Leland Pumping Plant No. 2: 150 HP per pump	3 Pumps	55	NA	55	300	-16	39	45	45	-20	19	No
Sobrante WTP Alternatives 1 and 2 / El Sobrante / Closest residential receptors are 150 feet away	No new noise sources												
Upper San Leandro WTP – Alternatives 1 and 2 / Oakland / Closest residential receptors are 200 feet away	No new noise sources												
Donald Pumping Plant / Orinda / Closest residential receptors are 100 feet away	100 HP per pump	1 Pump	50	NA	50	100	-6	44	45	No	-20	24	No
	200 kVA	Transformer	38	-10	28	100	-6	22	45	No	NA	22	No

TABLE 3.10-8 (continued)
ESTIMATED OPERATIONAL NOISE LEVELS AT THE CLOSEST SENSITIVE RECEPTORS AND CONSISTENCY WITH SIGNIFICANCE CRITERIA

Project / Jurisdiction / Receptor Location	Size	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet[a]	Reduction Provided by Enclosure[b]	Reduced Leq	Distance between Closest Facility and Receptor	Distance Adjustment	Adjusted Leq	Applicable Nighttime Noise Limit	Leq Exceeds Limit?	Noise Reduction with Measure 3.10-4[e]	Mitigated Leq	Mitigated Leq Exceeds Limit?
Fay Hill Pumping Plant / Moraga / Closest residential receptors are 1,000 feet away	125 HP per pump	1 Pump	50	NA	50	1,000	-26	24	45	No	-20	4	No
	225 kVA	Transformer	38	-10	28	1,000	-26	2	45	No	NA	2	No
Happy Valley Pumping Plant / Orinda / Closest residential receptors are 50 and 90 feet away	200 HP per pump	2 Pumps	53	NA	53	50	0	53	45	**Yes**	-20	33	No
	300 kVA	Transformer	38	-10	28	90	-5	23	45	No	NA	23	No
Sunnyside Pumping Plant / Lafayette / Closest residential receptors are 160 to 175 feet away in Orinda	100 HP per pump	1 Pump	50	NA	50	175	-11	39	53/45	No	-20	19	No
	200 kVA	Transformer	38	-10	28	160	-10	18	48[c]/ 45	No	NA	18	No
Tice Pumping Plant / Unincorporated Contra Costa County / Closest residential receptors are 120 to 140 feet away	300 HP per pump	3 Pumps	55	NA	55	140	-9	46	45	No	-20	26	No
	750 kVA	Transformer	44	-10	34	120	-8	26	45	No	NA	26	No
Withers Pumping Plant / Unincorporated Contra Costa County / Closest residential receptors are 150 feet away	100 HP per pump	3 Pumps	55	NA	55	150	-10	45	45	No	-20	25	No
	225 kVA	Transformer	38	-10	28	150	-10	18	45	No	NA	18	No

NA = not applicable or no applicable standard
HP = horsepower
kVA = kilovolt-ampere
kW = kilowatt

[a] Pump station noise levels were estimated based on noise levels measured at other enclosed pump stations and represent the maximum exterior noise level measured at 6 feet from the louvered door, generally the only opening to the enclosure. Noise levels were measured to be 20 dB lower on the sides of the enclosure where no vents or openings were located. Transformer noise levels were estimated based on National Electrical Manufacturers Association standards (NEMA, 1994). Since distance is not specified in NEMA standards, for the purpose of this analysis, levels were conservatively applied as the minimum far-field noise level at 50 feet.

[b] For pumps, no reduction for enclosure is provided since the reference noise level for pumps already includes noise reduction provided by an enclosure (see footnote a). For emergency generators at WTPs, the noise reduction provided by an enclosure assumes that the generators would be completely enclosed with appropriately designed sound attenuation. For transformers, the 10-dB noise reduction assumes that an appropriately designed sound barrier would be provided.

[c] A 5-dB penalty was added to the nighttime noise limit, as required by Section 5-205(d) of the Lafayette Noise Ordinance, to account for people's increased sensitivity to noise containing pure tones (i.e., the "hum" component of transformer noise).

[d] Title 17, Section 17.39.9 of Orinda Municipal Code specifies a maximum noise level of 45 dBA for mechanical equipment that is permanently affixed to a structure or on the ground, except for emergency backup power generators.

[e] Noise levels are 20 dB lower on the sides of the enclosure where there are no vents or openings. Therefore, locating vents away from the closest residential receptors (so that solid walls face receptors), as required in Measure 3.10-4, would reduce the above-listed reference and estimated pump noise levels by 20 dB at these receptors.

Other types of facilities proposed at treatment plants include basins, filters, and drains, which would not be major sources of noise. Noise generated by water flowing through pipes or drains would be limited to areas in the vicinity of openings or vents; since noise levels from flowing water would generally be less than ambient noise levels, these facilities would not increase noise levels beyond the facility boundaries.

Operation of WTTIP pipelines or reservoirs would not generate noise. Pipelines would be located underground and enclosed. There would be no pumping or electrical facilities at reservoirs. Therefore, no further discussion of proposed program- or project-level pipelines and reservoirs is provided.

Lafayette WTP

Alternative 1

Alternative 1 at the Lafayette WTP would involve development of new pumping facilities, a new electrical substation, and a new emergency generator. Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of these facilities. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. A 10-dB reduction was assigned to the substation since soundwalls would be constructed around it; a 25-dB reduction was assigned to emergency generators since building enclosures are proposed. The reference noise level for the pumps already includes a building enclosure. Noise would emanate from enclosure vents, so vent locations would be a factor in their effect on nearby sensitive receptors and could require additional sound attenuation.

The proposed pumping facilities (Leland and Bryant Pumping Plants) would be constructed at the west end of the WTP site. Since existing pumping facilities in the central and east ends of the site would be decommissioned, WTTIP implementation would essentially relocate pumping facilities farther away from residential receptors to the southeast (a beneficial noise impact). The proposed location for pumping facilities is away from sensitive noise receptors, with the Highway 24 embankment to the north, El Nido Ranch Road and a parking lot to the west, and Mt. Diablo Boulevard and the Lafayette Reservoir Recreational Area to the south.

A 500-kilowatt, diesel-fueled emergency generator is proposed to serve the new WTP facilities, supplementing the existing emergency generator at this facility. The new generator would be adjacent to the proposed electrical substation. Like the existing generator, the proposed generator would be used infrequently (only during power outages and for periodic testing during the day).

Table 3.10-8 indicates that estimated operational noise levels from these facilities during the nighttime hours would not exceed the Lafayette Noise Ordinance nighttime noise limits for single-family residential zones. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Alternative 2

Alternative 2 at the Lafayette WTP would decommission the Bryant Pumping Plants Nos. 1 and 2, which would result in a decrease in operational noise at this facility.

Orinda WTP

Alternative 1

Alternative 1 at the Orinda WTP would involve developing new pumping facilities as part of the backwash water recycle system and installing a new emergency generator. The reference noise level for the pump already includes a building enclosure. A 25-dB reduction was assigned to the emergency generator since a building enclosure is proposed. Noise would emanate from enclosure vents, so vent locations would be a factor in their effect on nearby sensitive receptors and could require additional sound attenuation.

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of these pumps. As shown in the table, estimated operational noise levels from these pumps during the nighttime hours would not exceed the Orinda Noise Ordinance 45-dBA noise limit for mechanical equipment. In addition, estimated noise levels would be well below ambient noise levels along Camino Pablo. Estimated noise levels would occur on the side of the building where the vent is located, while pump noise could be up to 20 dB lower on other sides of the building. Therefore, the building's vent would be located on either the north or south side of the building, not on the sides facing residential receptors to the west or east. Implementation of Measure 3.10-4 would ensure that that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

A 200-kilowatt, diesel-fueled emergency generator is proposed to serve the new WTP facilities, supplementing the existing emergency generator at this facility. The new generator would be adjacent to the proposed electrical substation. Like the existing generator, the proposed generator would be used infrequently (only during power outages and for periodic testing during the day).

Alternative 2

Alternative 2 at the Orinda WTP would involve development of a new pumping plant (Los Altos No. 2) and a new electrical substation. Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of these facilities. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. A 10-dB reduction was assigned to the substation since soundwalls would be constructed around it; a 25-dB reduction was assigned to the emergency generator since a building enclosure is proposed. Noise would emanate from enclosure vents, so the vent locations on pumps and the emergency generator would be a factor in their effect on nearby sensitive receptors.

A 200-kilowatt, diesel-fueled emergency generator is proposed to serve the new WTP facilities, supplementing the existing emergency generator at this facility. The new generator would be adjacent to the proposed electrical substation. Like the existing generator, the proposed generator would be used infrequently (only during power outages and for periodic testing during the day).

As indicated in Table 3.10-8, estimated operational noise levels from pumping and substation facilities during the nighttime hours would not exceed the Orinda Noise Ordinance 45-dBA noise limit for mechanical equipment. Noise from the emergency generator during the nighttime hours

would not exceed the Orinda Noise Ordinance nighttime noise limit for single-family residential zones. Implementation of Measure 3.10-4a would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Walnut Creek WTP – Alternative 1 or 2

This project would involve construction of the new Leland Pumping Plant No. 2 under both alternatives. Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of this pumping plant. Since this facility would be completely enclosed, noise reductions are accounted for in estimated noise levels. As indicated in Table 3.10-8, estimated operational noise levels from the proposed pumping plant during the nighttime hours would be 39 dBA (Leq). The City of Walnut Creek Noise Element requires mitigation for projects resulting in noise increases of 3 dB or more. When the estimated noise level of 39 dBA (Leq) is converted to a 24-hour CNEL noise level, the resulting noise level would be 46 dBA (CNEL). The addition of 46 dB to the ambient noise level that was measured in the vicinity of this receptor (56 dBA, CNEL)[4] would increase the ambient noise level by less than 1 dB. Therefore, operational noise associated with this pumping plant would have a less-than-significant impact on the existing noise environment. Estimated noise levels would occur on the side of the building where the vent is located, while pump noise could be up to 20 dB lower on other sides of the building. Therefore, the building's vent would be located on the west or south side of the building, not on the sides facing residential receptors to the north or east. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Sobrante WTP – Alternative 1 or 2

No new major sources of noise are proposed at this site. Therefore, operation of proposed facilities would not result in any significant noise increases.

Upper San Leandro WTP – Alternative 1 or 2

No new major sources of noise are proposed at this site. Therefore, operation of proposed facilities would not result in any significant noise increases.

Donald Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant and transformer. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. A 10-dB reduction was assigned to the transformer since soundwalls would be constructed around it. The reference noise level for the pump already includes a building enclosure. Noise would emanate from the building's vent, so the vent location would be a factor in its effect on nearby sensitive receptors.

[4] This noise measurement was taken in 1998 (prior to current construction activities) at the fenceline of the closest residential receptor to the proposed pump station.

As indicated in Table 3.10-8, estimated noise levels from operation of the proposed pump and transformer during the nighttime hours would approach but not exceed the Orinda Noise Ordinance 45-dBA nighttime noise limit for mechanical equipment. Since the estimated noise level would occur on the side of the building where the vent is located, pump noise could be up to 20 dB lower on other sides of the building. Therefore, the building's vent would be located on the south or east side of the building, not on the sides facing residential receptors to the north or west. With vents facing away from residential receptors, operational noise is not expected to increase ambient noise levels in the project vicinity. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Fay Hill Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant. This facility would be located completely underground. As indicated in the table, estimated noise levels from operation of the proposed pump during the nighttime hours are not expected to cause sleep disturbance at the closest residential receptors. The Moraga Municipal Code does not include a numerical noise limit, but limits noise from fans or equipment to a level that does not disturb the "peace, quiet and comfort of neighboring residents." Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Happy Valley Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant and transformer. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. The reference noise level for the pump already includes a building enclosure. A 10-dB reduction was assigned to the transformer since soundwalls would be constructed around it. As indicated in Table 3.10-8, noise levels just outside the plant's vent could exceed Orinda's 45-dBA noise limit by 8 dB, so the vent location would be a factor in its effect on nearby sensitive receptors. Implementation of Measure 3.10-4 would ensure that the building's vent is located away from nearby sensitive receptors. Since noise levels on the solid sides of the pumping plant enclosure (no vent openings) would be approximately 20 dB less, pumping plant noise would be reduced to below the Orinda noise limit if the vent opening is located on the south side of the building away from the closest residential receptors to the east and west. In addition, since the pumping plant would be located between the closest residential receptor and the transformer, transformer noise could be reduced to below the level listed in Table 3.10-8, depending on the design of the pumping plant enclosure. Estimated noise levels are not expected to increase ambient noise levels in the project vicinity. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Sunnyside Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant and transformer. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. The reference noise level for the pump already includes a building enclosure. Noise would emanate from the building's vent, so the vent location would be a factor in its effect on nearby sensitive receptors. A 10-dB reduction was assigned to the transformer since soundwalls would be constructed around it.

As indicated in Table 3.10-8, estimated noise levels from operation of the proposed pump and transformer during the nighttime hours would not exceed the Orinda Noise Ordinance 45-dBA noise limit for mechanical equipment or the Lafayette Noise Ordinance nighttime noise limit for single-family residential zones. In addition, estimated noise levels are not expected to increase ambient noise levels in the project vicinity. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Tice Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant and transformer. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. The reference noise level for the pump already includes a building enclosure. Noise would emanate from the building's vent, so the vent location would be a factor in its effect on nearby sensitive receptors. A 10-dB reduction was assigned to the transformer since soundwalls would be constructed around it.

As indicated in Table 3.10-8, estimated noise levels from operation of the proposed pump and transformer during the nighttime hours could approach ambient nighttime noise levels if the vent to the pump enclosure were located facing the closest residential receptor to the west, which could cause a small increase in ambient noise levels at this receptor. Contra Costa County does not specify operational noise limits for mechanical equipment, but estimated noise levels from this facility are not expected to cause sleep disturbance at the closest residential receptor. To minimize the potential for sleep disturbance, project facilities would be designed to minimize the potential for noise increases at residential receptors. Locating the pump enclosure vent so that it faces away from residential receptors to the west and north could reduce operational noise at these receptors by as much as 20 dB, to well below ambient noise levels. Locating the transformer so that it is on the east side of the pumping plant also would help to shield the closest residential receptor from noise increases or the "hum" noise that can be generated by transformers. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Withers Pumping Plant

Table 3.10-8 presents potential noise levels that could be generated at the nearest sensitive receptor by operation of the proposed pumping plant and transformer. Since these facilities would be either partially or completely enclosed, noise reductions are accounted for in estimated noise levels. The reference noise level for the pump already includes a building enclosure. Noise would emanate from the building's vent, so the vent location would be a factor in its effect on nearby sensitive receptors. A 10-dB reduction was assigned to the transformer since soundwalls would be constructed around it.

As indicated in Table 3.10-8, estimated noise levels from operation of the proposed pump and transformer during the nighttime hours could approach ambient nighttime noise levels if the vent to the pump enclosure were located facing the closest residential receptor to the south, which could cause a small increase in ambient noise levels at this receptor. Contra Costa County does not specify operational noise limits for mechanical equipment, but estimated noise levels from this facility are not expected to cause sleep disturbance at the closest residential receptor. Locating the pump enclosure vent so that it faces away from residential receptors to the southeast, east, north, and west could reduce operational noise at these receptors by as much as 20 dB, to well below ambient noise levels. Locating the transformer so that it is on the west or north side of the pumping plant would also help to shield the closest residential receptor to the southeast from noise increases or the "hum" noise that can be generated by transformers. Implementation of Measure 3.10-4 would ensure that these facilities are designed to maintain operational noise impacts at a less-than-significant level.

Mitigation Measure

Measure 3.10-4: Equipment used in WTTIP facilities will not cause ambient noise levels to exceed the nighttime noise limits specified in Table 3.10-8). Measures that could be incorporated into the design of proposed facilities to ensure that noise levels meet this criterion (as demonstrated in Table 3.10-8) include the following:

- Pumping and emergency generator facilities will be fully enclosed, and vents will be located on the building facades facing away from adjacent residential receptors, particularly at the Happy Valley Pumping Plant site where pumping plant noise must be reduced by 8 dB to meet Orinda's 45-dBA noise limit for mechanical equipment.

- Building enclosures will provide at least 40 dB of attenuation on solid walls (i.e., a 40-dB difference between interior vs. exterior noise) and a 20-dB reduction on the louvered side of the enclosure, when measured at 6 feet from the wall, directly in front of the louvers.

- Masonry sound barriers will be constructed around transformers, and substations will be of sufficient height to provide at least 10 dB or more of noise attenuation.

Tables 3.10-9 and 3.10-10 provide a summary of the applicable mitigation measures discussed above.

TABLE 3.10-9
SUMMARY OF APPLICABLE MITIGATION MEASURES – IMPACT 3.10-1

Facility	Measure 3.10-1a Noise Controls	Measure 3.10-1b Noise Ordinance Time and Noise Limits	Measure 3.10-1c Oakland Noise Limits	Measure 3.10-1d Tunnel-Related Noise Controls	Measure 3.10-1e Temporary Sound Barriers
Lafayette WTP					
Alternative 1	✓	✓	–	–	–
Alternative 2	✓	✓	–	–	–
Orinda WTP					
Alternative 1	✓	✓	–	–	–
Alternative 2	✓	✓	–	✓	✓[b]
Walnut Creek WTP					
Alternative 1 or 2	✓	✓	–	–	–
Sobrante WTP					
Alternative 1 or 2	✓	–	–	–	–
Upper San Leandro WTP					
Alternative 1 or 2	✓	–	✓	–	–
Orinda-Lafayette Aqueduct					
Alternative 2	✓	✓	–	✓	✓
Ardith Reservoir and Donald Pumping Plant	✓	✓	–	–	✓
Fay Hill Pumping Plant and Pipeline Improvements	✓	✓	–	–	✓
Fay Hill Reservoir	✓	✓[a]	–	–	✓[a]
Glen Pipeline Improvements	✓	✓	–		–
Happy Valley Pumping Plant and Pipeline	✓	✓	–	–	✓
Highland Reservoir and Pipelines	✓	✓	–	–	✓[c]
Lafayette Reclaimed Water Pipeline	✓	–	–	–	✓[c]
Leland Isolation Pipeline and Bypass Valves	✓	–	–	–	–
Moraga Reservoir	✓	✓	–	✓	✓
Moraga Road Pipeline	✓	–	–	–	–
Sunnyside Pumping Plant	✓	✓	–	–	–
Tice Pumping Plant and Pipeline	✓	–	–	–	–
Withers Pumping Plant	✓	–	–	–	–

[a] Required for this project only if future residences are constructed in the vicinity of this reservoir.
[b] Possible requirement for micro-tunnel construction
[c] Use of a temporary sound barrier is required only for pipeline segments that would be constructed at night.

✓ = Applicable Impact
– = No Impact

TABLE 3.10-10
SUMMARY OF APPLICABLE MITIGATION MEASURES – IMPACTS 3.10-3a, 3.10-3b, and 3.10-4

Facility	Measure 3.10-3a Vibration Limits	Measure 3.10-3b Controlled Detonations	Measure 3.10-4 Operational Noise Controls
Lafayette WTP			
Alternative 1	✓	–	✓
Alternative 2	✓	–	–
Orinda WTP			
Alternative 1	✓	–	✓
Alternative 2	✓	–	✓
Walnut Creek WTP			
Alternative 1 or 2	✓	–	✓
Sobrante WTP			
Alternative 1 or 2	✓	–	–
Upper San Leandro WTP			
Alternative 1 or 2	✓	–	–
Orinda-Lafayette Aqueduct			
Alternative 2	✓	✓	–
Ardith Reservoir and Donald Pumping Plant	–	–	✓
Fay Hill Pumping Plant and Pipeline Improvements	–	–	✓
Fay Hill Reservoir	–	–	–
Glen Pipeline Improvements	–	–	–
Happy Valley Pumping Plant and Pipeline	–	–	✓
Highland Reservoir and Pipelines	–	–	–
Leland Isolation Pipeline and Bypass Valves	–	–	–
Moraga Reservoir	✓	–	–
Moraga Road Pipeline	✓	–	–
New Leland Pressure Zone Reservoir and Pipeline	✓	–	–
Sunnyside Pumping Plant	–	–	✓
Tice Pumping Plant and Pipeline	✓	–	✓
Withers Pumping Plant	–	–	✓

✓ = Applicable Impact
– = No Impact

Program-Level Elements

Lafayette WTP

The closest sensitive receptors are residential uses approximately 500 feet to the south. At 500 feet, construction noise would not exceed the 70-dBA speech interference criterion, and therefore construction noise increases would be less than significant. There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

The proposed realignment of the Walter Costa Trail is not expected to generate significant noise increases during or following its construction, although the final alignment could put trail users nearer to existing roadway-generated noise.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring, if required), which could temporarily annoy the closest residential receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

The proposed program-level WTP facilities would not introduce any new major sources of operational noise. In general, treatment facilities such as basins, filters, and drains would not be major sources of noise. Noise generated by water flowing through pipes or drains would be limited to areas in the vicinity of openings or vents; since these noise levels are generally less than ambient noise levels, they would not increase ambient noise levels beyond facility boundaries.

Orinda WTP

Sensitive receptors in the vicinity of program-level WTP projects include residential uses within approximately 200 feet to the west and 300 feet to the east of proposed facilities under both alternatives. The southern boundary of Wagner Ranch Elementary School is also approximately 15 feet north of the northernmost clearwell under both alternatives. Construction noise levels could exceed the speech interference criterion, but implementation of noise controls (similar to Measure 3.10-1a) would reduce construction noise levels to below the 70-dBA speech interference criterion, except at the northernmost clearwell, which would require substantial excavation over an extended period of time. At distances of 200 to 300 feet, implementation of measures similar to Measures 3.10-1a and 3.10-1b would likely be adequate to reduce potential noise impacts to a less-than-significant level. If the school uses the playfields between the WTP

boundary and classrooms, a temporary sound barrier could also be required (similar to Measure 3.10-1e).

Under both alternatives, a micro-tunnel is proposed to extend from the north end of the facility (in the ballfields area) to the south end of the facility, connecting with the proposed clearwell, the San Pablo Pumping Plant, and the high-rate sedimentation unit. The micro-tunnel would require shafts at various locations along the micro-tunnel alignment. If the micro-tunnel requires a ventilation system or a dewatering pump system, residential receptors located 300 feet to the east and 400 feet to the west could be subject to nighttime noise associated with operation of this equipment. Implementation of noise controls similar to those specified in Measures 3.10-1a, 3.10-1d, and possibly Measure 3.10-1e, if necessary, would minimize the disturbing effects of such construction noise.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring and micro-tunnel shaft construction), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

The primary source of noise from program projects would be the two pump stations (San Pablo Pumping Plant and the low-lift pumping plant). These two facilities would be located in the center of the WTP site, east of the proposed clearwell. Since these two facilities are smaller than the proposed Los Altos facility, noise increases associated with them would not be greater than those listed in Table 3.10-8 for the Los Altos Pumping Plant. Like the Los Altos facility, estimated noise levels would likely be well below the sleep interference criterion and Orinda nighttime noise limit. Under both alternatives, combined noise from all three pump stations would likely still be below these two criteria and would not likely increase ambient noise levels.

Walnut Creek WTP

Program-level improvements would include the addition of high-rate sedimentation units and post-filtration UV disinfection in 2022. The high-rate sedimentation units and UV facilities would be located more than 300 feet from nearby residential receptors, and construction noise levels at these residences would be relatively low. Therefore, implementation of noise controls, similar to those required for the project-level elements, would maintain construction noise at a less-than-significant level.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

The primary source of operational noise from these facilities would likely be the ozonation system. Assuming this facility would be fully enclosed and vent openings are louvered and facing away from nearby residences, this facility could generate noise levels of 55 dBA (Leq) at 50 feet. When converted to CNEL, it is estimated that operation of this facility would result in an increase of 1 dB or less in the ambient noise level at the closest residential receptors. The City of Walnut Creek's Noise Element specifies a 3-dB threshold for requiring mitigation. Therefore, noise increases associated with this program-level project would be less than significant.

Leland Reservoir Replacement

Sensitive receptors include residential uses as close as 120 feet to the west and 400 feet to the east (across Leland Drive). The White Pony-Meher Elementary School is located immediately to the south, with the classroom building approximately 150 feet from the reservoir. At 120 feet, construction noise would exceed the 70-dBA speech interference criterion. Implementation of noise controls (similar to Measure 3.10-1a) would reduce construction noise levels to below the 70-dBA speech interference criterion, except for impact equipment. However, since impact-equipment-related noise would exceed the speech interference criterion by only 5 dB, it is expected that the Leq noise level could be reduced by 5 dB through such measures as limiting the duration of equipment operation during any given hour (see Measure 3.10-1a) or erecting a temporary sound barrier (see Measure 3.10-1e), thereby reducing any potential construction noise impacts to a less-than-significant level.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

There would not be any sources of noise associated with operating this reservoir.

New Leland Pressure Zone Reservoir and Pipeline

Sensitive receptors include residential uses as close as 200 feet to the north and 60 feet to the east of proposed grading limits for the reservoir. Residential uses are also located near the pipeline alignments west of Danville Boulevard. At 60 feet, construction noise would exceed the 70-dBA speech interference criterion both with and without implementation of noise controls (such as Measure 3.10-1a). With noise controls, construction noise levels would still exceed the speech interference criterion. Provision of a temporary noise barrier between the reservoir construction site and the closest residences would likely be adequate to reduce construction noise levels to a less-than-significant level. Depending on proximity of sensitive receptors to the pipeline alignment, construction noise could also exceed the 70-dBA speech interference criterion both without and with implementation of noise controls. Despite the potential exceedance of this criterion, pipeline construction would not affect any one receptor for more than about two weeks (plus a couple of additional days for paving the trench), reducing the potential for significant noise impacts. Therefore, implementation of noise controls and conformance with applicable ordinance time limits would likely maintain the potential effects of this temporary noise impact at a less-than-significant level.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction’s hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

There would be no sources of noise associated with operating this reservoir or pipeline.

St. Mary's Road/Rohrer Drive Pipeline

There are residential uses immediately adjacent to the road along some sections of the proposed pipeline alignment. St. Mary's College is adjacent to the alignment, although the campus is set back from the road. At 25 feet, construction noise would exceed the 70-dBA speech interference criterion without and with implementation of noise controls (such as Measure 3.10-1a). However, pipeline construction would not affect any one receptor for more than about two weeks, reducing the potential for significant noise impacts. Also, since residential setbacks vary from 25 to over 100 feet, noise levels at residences set back 100 feet or more would be reduced to a less-than-significant level.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (similar to the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

There would be no sources of noise associated with operating this pipeline.

San Pablo Pipeline

Most of the proposed pipeline alignment would traverse undeveloped lands adjacent to San Pablo Reservoir. However, the south end would be located adjacent to or near residential uses. Wagner Ranch Elementary School in Orinda is located east of the pipeline alignment. At 25 feet, construction noise would exceed the 70-dBA speech interference criterion without and with implementation of noise controls (such as Measure 3.10-1a). However, pipeline construction would not affect any one receptor for more than about two weeks, reducing the potential for significant noise impacts.

There are no specific truck volumes estimated for this project, but increases of up to 100 trucks per hour along truck haul routes would result in noticeable noise increases along arterial and residential streets. However, noise levels would not exceed the 70-dBA speech interference criterion, and short-term maximum noise increases could be maintained at a less-than-significant level with appropriate staging and planning of these program-level projects. Implementation of mitigation measures (such as Measures 3.10-1a and 3.10-1b) that limit truck operations (haul trucks and concrete delivery trucks) to the daytime hours, as specified under each affected jurisdiction's hourly time limits, would minimize the potential for noise impacts.

There is a potential for perceptible vibration levels to be generated during excavation activities (primarily during sheetpile driving for shoring), which could temporarily annoy the closest residential and school receptors. Implementation of a performance standard (such as the 0.5 in/sec PPV standard required in Measure 3.10-3a) would likely preclude cosmetic or structural damage to nearby structures.

There would be no sources of noise associated with operating this pipeline.

References – Noise and Vibration

East Bay Municipal Utility District (EBMUD), *Claremont Corridor Seismic Improvements Project Draft Environmental Impact Report,* SCH#203022140, prepared by Environmental Science Associates, June 2003.

Environmental Science Associates (ESA), *San Francisco Recycled Water Master Plan and Groundwater Master Plan Final EIR,* August 1997.

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, April 1995.

Jacobs Associates, *Draft Lamorinda Water System Improvements Program, Tunnel Constructability, Cost and Schedule Report*, September 30, 2005.

National Electrical Manufacturers Association (NEMA), *NEMA Standards Publication No. TR 1-1993, Transformers, Regulators and Reactors*, 1994.

Shunitzer, Claire, Planning Intern, City of Orinda Planning Department, telephone communication regarding application of the City of Orinda Noise Ordinance, January 3, 2006.

Sinnette, Christine, Senior Planner, City of Lafayette Planning Department, telephone communication regarding application of the City of Lafayette Noise Ordinance, January 4, 2006.

U.S. Environmental Protection Agency (U.S. EPA), *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (Condensed Version),* Washington D.C. (EPA/ONAC 550/9-74-004), 1974.

_____, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, December 1971.

Wilson Ihrig & Associates, Inc., *EBMUD Claremont Corridor Seismic Improvements Project: Construction Vibration Impact Analysis, Draft Technical Report,* 2003.