39TH AVENUE RESERVOIR REPLACEMENT PROJECT NOISE AND VIBRATION ASSESSMENT OAKLAND, CALIFORNIA

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Prepared for:

Nat Taylor
Lamphier-Gregory
1944 Embarcadero
Oakland, CA 94606

Prepared by:

Richard B. Rodkin, P.E.
Michael S. Thill

Illingworth & Rodkin, Inc.
505 Petaluma Boulevard South
Petaluma, CA 94952

Job No. 12-045

INTRODUCTION

This report presents the results of the noise and vibration impact assessment completed for the 39th Avenue Reservoir Replacement Project. East Bay Municipal Utility District (EBMUD) is planning on replacing the current 39th Avenue Reservoir with a smaller tank-type reservoir. A current 10 million gallon (mg) reservoir is too large for the area it serves and is proposed to be replaced with a smaller 3.5-mg reservoir. The project location is 4290 Maybelle Road in the City of Oakland; east of Interstate 580 and west of State Route 13. The 8.2-acre site lies between 39th Avenue, Maybelle Avenue, and Reinhart Drive. Noise and vibration issues associated with the project will be primarily during the demolition and construction phase.

The noise and vibration impact assessment first presents the fundamentals of noise and vibration for those who are not familiar with acoustical terminology and concepts. The report then summarizes ambient noise conditions in the project vicinity, and provides an evaluation of the potential significance of noise and vibration-related impacts that would result from the project. A list of best management construction practices is presented to reduce construction noise levels as low as feasible.

SETTING

Fundamentals of Environmental Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 1.

Most of the sounds, which we hear in the environment, do not consist of a single frequency, but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called "A" weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources, which create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01}, L_{10}, L_{50}, and L_{90}, are commonly used. They are the A-weighted noise levels equaled or exceeded during 1%, 10%, 50%, and 90% of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time.

In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes very noticeable. Further, most people sleep at night and are very sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, a descriptor, L_{dn} (day/night average sound level), was developed. The L_{dn} divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Community Noise Equivalent Level (CNEL) is another 24-hour average, which includes both an evening and nighttime weighting.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the Peak Particle Velocity (PPV) and another is the Root Mean Square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration. In this section, a PPV descriptor with units of mm/sec. or in/sec. is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce. The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related ground-borne vibration levels. Because of the impulsive nature of such activities, the use of the peak particle velocity descriptor (PPV) has been routinely used to measure and assess ground-borne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec, PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels such as people in an urban environment may tolerate a higher vibration level. Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of

vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definitions of Acoustical Terms Used in this Report

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

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

TABLE 3 Reaction of People and Damage to Buildings From Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation- and Construction-Induced Vibration Guidance Manual, California Department of Transportation, June 2004.

EXISTING NOISE ENVIRONMENT

The 39th Avenue Reservoir Replacement project is located in an area comprised primarily of residential land uses. Local traffic is the primary ambient noise source affecting area residences. A noise monitoring survey was made to quantify ambient noise levels at residential receptors in the site vicinity between Thursday, May 17, 2012 and Tuesday, May 22, 2012. The survey consisted of one long-term noise measurement and four short-term noise measurements as shown in Figure 1.

Noise measurements were made with a Larson Davis Model 820 Integrating Sound Level Meter set at "slow" response. The sound level meter was equipped with a G.R.A.S. Type 40AQ ½ - inch random incidence microphone fitted with a windscreen. All instrumentation used meets the requirements of the American National Standards Institute (ANSI) SI.4-1983 for Type 1 use. The sound level meter was calibrated prior to the noise measurements using a Larson Davis Model CAL200 acoustical calibrator. The response of the system was checked after each measurement session and was always found to be within 0.2 dBA.

Long-term noise measurement LT-1 was located in a residential cul-de-sac south of the project site at the front of #50 Gregory Place. During the daytime, hourly average noise levels typically ranged from 45 to 55 dBA L_{eq}. Because ambient noise levels resulting from distant traffic were generally low at this location, local noises had a substantial effect on the measured noise levels. For instance, the 12:00 PM hourly average noise level on Thursday, May 17, 2012 was about 10 to 15 dBA higher than typical levels because of local garbage collection activities. The day-night average noise level at this location ranged from 50 to 55 dBA L_{dn} depending on the number, timing, and level of noise generated by local events. The daily trends in noise levels at LT-1 are shown in Figures 2 through 7.

Short-term noise measurements ST-1 through ST-4 completed the noise monitoring survey. These measurements were made during the morning of Tuesday, May 22, 2012. Table 4 summarizes the results of these short-term measurements.

Figure 1: Noise Measurement Locations

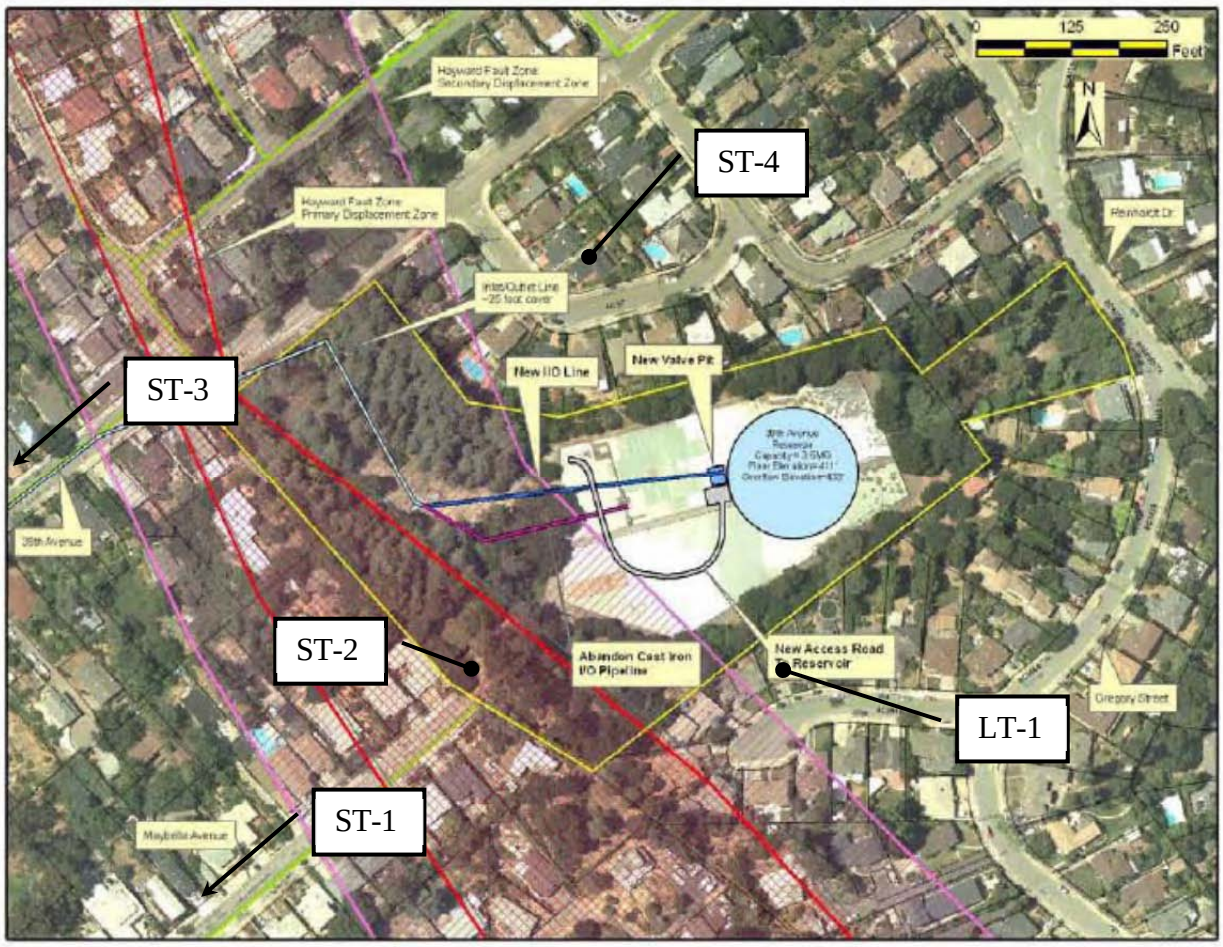


TABLE 4 Summary of Short-Term Noise Measurement Data – May 22, 2012

Location	Time (Duration)	A-Weighted Noise Levels, dBA						
		L_{eq}	L_{max}	L_{min}	L_{01}	L_{10}	L_{50}	L_{90}
ST-1: Front of #3908 Maybelle Avenue.	10:30 AM (10 min)	53	65	47	63	56	50	49
ST-2: End of Maybelle Avenue near Project Site.	10:50 AM (10 min)	52	70	47	59	54	50	48
ST-3: Front of #4089 39th Avenue.	11:10 AM (10 min)	54	67	46	64	57	49	48
ST-4: Front of #33 Selkirk Street.	11:30 AM (10 min)	48	63	42	60	49	44	42

IMPACT DISCUSSION

Topic:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
NOISE—Would the project:					
a) Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐	☐
b) Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐	☐
c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☐	☒
d) Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐	☐
e) For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?	☐	☐	☐	☐	☒
f) For a project located in the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐	☒

Impact a) ***Less than Significant Impact with Mitigation***. The project would result in short term exposure of persons to demolition and construction related noise levels in excess of applicable standards. Application of required control measures would mitigate the short-term impact to a less than significant level.

Unlike other Lead Agency under CEQA, such as cities or county governments, EBMUD does not have its own adopted thresholds or criteria for identifying significant noise impacts. And, as stated in California Government Code Section 53091 (d), "…Building ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water, wastewater, or electrical energy by a local agency." Thus, EBMUD is not bound by local ordinances of the jurisdictions in which its projects may be located. Nevertheless, it is the practice of EBMUD to work with host jurisdictions and agencies during project planning so that the evaluation of potential impacts are consistent with the local environmental protection policies to the extent practicable. In this case, and while the City of Oakland noise standards do not strictly apply to EBMUD projects, EBMUD is electing to use the City of Oakland significance criteria and noise standards[1] in evaluating potential noise and vibration impacts.

The project is located in the City of Oakland. Applicable standards established by the City of Oakland are set forth in Appendix A to this report.

Significance Criteria- Daytime Noise: The project would have a significant environmental impact if the daytime noise level received by any residential, commercial, or industrial land use which is produced by any nonscheduled, intermittent, short-term construction or demolition operation (less than ten (10) days) or by any repetitively scheduled and relatively long-term construction or

[1] City of Oakland, Oakland Municipal Code Section 17.120.

demolition operation (ten (10) days or more) were to exceed the maximum allowable receiving noise levels described in Table 5 below:

TABLE 5 Maximum Allowable Receiving Noise Level Standards, dBA

	Daily 7 a.m. to 7 p.m.	Weekends 9 a.m. to 8 p.m.
Short-Term Construction		
Residential	80	65
Commercial, Industrial	85	70
Long-Term Construction		
Residential	65	55
Commercial, Industrial	70	60

Significance Criteria – Nighttime Noise: The project would have a significant environmental impact if the nighttime noise level received by any land use and produced by any construction or demolition activity between weekday hours of seven (7) p.m. and seven (7) a.m. or between eight (8) p.m. and nine (9) a.m. on weekends and federal holidays were to exceed the applicable nighttime noise level standards outlined in this section.

Noise impacts resulting from demolition and construction depend on the noise generated by various pieces of equipment, the timing and duration of noise generating activities, and the distance between construction noise sources and noise sensitive receptors. Construction noise impacts primarily occur when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction durations last over extended periods of time. This section evaluates noise levels that would be expected from the demolition of the reservoir and the construction of a new tank at the 39th Avenue Reservoir site. Demolition activities would require the following steps and equipment:

- Draining reservoir – portable pumps – 4 weeks
- Contractor mobilization – trailer, generator, excavators – 2 weeks
- Remove roof structure – excavator, chain saw, and haul trucks – 4 weeks
- Remove lining – excavator, hoe ram, haul trucks, air compressor – 2 weeks
- Access road – dozer, material truck, backhoe – 2 weeks

Construction of the new tank at 39th Avenue Reservoir would require the following tasks, equipment, and durations:

- Temporary retaining wall – excavator, dozer, material truck – 3 weeks
- Reservoir foundation – excavator, dozer, compactor – 4 weeks
- Import fill – dozer, compactor, material trucks – 1 week
- Reservoir foundation pour – concrete truck, concrete pump – 2 days
- Reservoir walls – crane, delivery trucks, concrete trucks, concrete pump – 8 weeks
- Wall pre-stressing – pre-stressing tower, concrete truck, concrete pump – 4 weeks
- Reservoir roof – crane, delivery trucks, concrete trucks, concrete pump – 5 weeks
- Reservoir roof pour - concrete truck, concrete pump – 2 days

- Valve pit and piping – backhoe, haul trucks, concrete trucks, concrete pump – 6 weeks
- Site restoration- material trucks, bulldozer, backhoe, compactor – 2 weeks
- Landscaping – material trucks, backhoe –6 weeks
- Complete civil work – asphalt paver, scraper, roller – 2 weeks
- Demobilization – haul trucks, backhoe – 2 weeks

Impact Noise-1: Construction Noise Impacts. Typical construction equipment noise emission levels at 50 feet are shown in Table 6. Based on experience with other projects, and utilizing the data in Table 6, worst case daily average noise levels can be estimated for each phase during demolition and construction at a reference distance of 50 feet. These noise level projections are summarized in Table 7. Noise levels would exceed the applicable significance threshold of 65 dBA L_{eq} at distances typically ranging from 800 - 1,300 feet where there is line-of-sight to the construction area.

Residences are located at varying distances from the active construction areas ranging from a worst-case condition of about 50 feet along Selkirk Street and Gregory Place up to distances of several hundred feet at the end of Maybelle Avenue, along Reinhardt Drive and Gregory Street. Noise levels drop off at the rate of about 6 dBA with each doubling of distance from the activity center. Typical hourly average demolition and construction generated noise levels are about 80 dBA to 89 dBA measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). The highest maximum noise levels generated by project construction would typically range from about 90 to 93 dBA at a distance of 50 feet from the noise source. There would be variations in noise levels on a day-to-day basis depending on the specific activities occurring at the site. Noise levels generated by the construction of the project would exceed the applicable noise standards for this project and the ambient noise environment at nearby sensitive land uses and would be considered a ***significant environmental impact***.

Mitigation Measure Noise-1: Implement Noise Control Measures. The following available controls shall be included in the project to reduce construction noise levels as low as practical. The inclusion of these controls would reduce the impact from project construction to ***less-than-significant*** levels. All noise control measures applicable to the activities occurring must be implemented at the project site at all times.

Construction Related Noise Control During All Construction Activities

Days/Hours of Construction Operation *- Ongoing throughout demolition, grading, and/or construction*

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

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

b) Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities (such as concrete pouring which may require more continuous amounts of time) shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened and such construction activities shall only be allowed with the prior written authorization of the EBMUD Project Engineer.

c) Construction activity shall not occur on Saturdays, with the following possible exceptions:

   1. Prior to the building being enclosed, requests for Saturday construction for special activities (such as concrete pouring which may require more continuous amounts of time), shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened. Such construction activities shall only be allowed on Saturdays with the prior written authorization of the EBMUD Project Engineer. No extreme noise generating activities shall be allowed on Saturdays, with no exceptions.

d) No extreme noise-generating activities shall be allowed on Saturdays, with no exceptions.

e) No construction activity shall take place on Sunday or Federal holidays.

f) For clarification, construction activities include but are not limited to: truck idling, moving equipment (including trucks, elevators, etc.) or materials, deliveries, and construction meetings held on-site in a non-enclosed area.

Noise Control *- Ongoing Throughout Demolition, Grading, and/or Construction*

To reduce noise impacts due to construction, the project applicant shall require construction contractors to implement a site-specific noise reduction program which shall include the following measures:

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

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

c) Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

d) If feasible, the noisiest phases of construction (such as pile driving) shall be limited to less than 10 days at a time.

Noise Complaint Procedures *- Ongoing Throughout Demolition, Grading, and/or Construction*

Not less than thirty (30) days prior to the start of on-site demolition work, EBMUD shall establish and commence implementation of the following measures to respond to and track complaints pertaining to construction noise:

a) Provide all residents and businesses located within three hundred (300) feet of the Project site a written document describing noise complaint procedures for this project. The

document shall include the phone number of the EBMUD Project Engineer and the General Contract's Noise Complaint Coordinator and Oakland Police Department; (during regular construction hours and off-hours);

b) Post a sign on-site with permitted construction days and hours and complaint procedures and the name and phone numbers of the EBMUD Project Engineer and General Contractor Noise Complaint Coordinator to notify in the event of a problem. (during regular construction hours and off-hours);

c) The designation of an on-site Noise Complaint Coordinator and enforcement manager for the project; and

d) A preconstruction meeting shall be held with the EBMUD Project Engineer and the general contractor/on-site project manager to confirm that noise mitigation and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.

TABLE 6 Construction Equipment 50 ft Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

1 Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 7 Demolition and Construction Noise Level Projections

Activity	Noise Level at 50 Feet - dBA L_{eq}	Duration
Demolition		
Drain Reservoir	77	4 weeks
Contractor Mobilization	85	2 weeks
Remove Roof Structure	85	4 weeks
Remove Lining	93	2 weeks
Access Road	88	2 weeks
Tank Installation		
Temporary Retaining Wall	88	3 weeks
Reservoir Foundation	88	4 weeks
Import Fill	88	1 week
Reservoir Pour	88	2 days
Reservoir Walls	89	8 weeks
Wall Pre-stressing	88	4 weeks
Reservoir Roof	89	5 weeks
Valve Pit and Piping	89	6 weeks
Site Restoration	85	2 weeks
Landscaping	85	6 weeks
Complete Civil Work	85	2 weeks
Demobilization	85	2 weeks

Impact b) Less than Significant Impact. The project would not result in exposure of persons to or generation of excessive ground-borne vibration levels.

There are no local, state, or federal vibration impact criteria that are applicable to this project. The California Department of Transportation uses a vibration limit of 0.5 in/sec, PPV for buildings structurally sound and designed to modern engineering standards. A conservative vibration limit of 0.3 in/sec, PPV has been used for older residential structures found to be structurally sound. For historic buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec, PPV is often used to provide the highest level of protection. All of these limits have been used successfully, and compliance to these limits has not been known to result in appreciable structural damage. All vibration limits referred to herein apply on the ground level and take into account the response of structural elements (i.e. walls and floors) to ground-borne excitation.

Activities with the potential of generating perceptible vibration levels would include the removal of the lining using a hoe ram, the compacting of backfill, and heavy truck traffic on narrow residential streets. Pile driving is not proposed as part of the construction of the project. Table 8 summarizes typical vibration levels associated with varying pieces of construction equipment at a distance of 25 feet.

A review of the proposed equipment and the vibration level data provided in Table 8 indicates that vibration levels generated by the majority of proposed equipment would be below the 0.3 in/sec PPV criteria used to assess the potential for cosmetic damage to older residential buildings of normal conventional construction. The impact resulting from the project would be considered less-than-significant as vibration levels would not exceed the 0.3 in/sec PPV criteria established to evaluate the risk for cosmetic damage to buildings. Vibration levels generated by construction activities would be perceptible inside the residences located adjacent to the site and along the truck routes and may be cause some annoyance. However, planned construction hours are during the daytime, limiting the possibility of annoyance during typical periods of sleep or rest.

TABLE 8 Vibration Source Levels for Construction Equipment[2]

Equipment		PPV at 25 ft. (in/sec)
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

Impact c) Not applicable. The operation of the project would not result in noise that would permanently increase ambient noise levels at sensitive land uses in the site vicinity. Therefore, this significance criterion is not applicable to the proposed project.

Impact d) Less than Significant Impact with Mitigation. During demolition and construction the project would result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. Application of required control measures would mitigate the short-term impact to a less than significant level.

Noise levels at sensitive receptors in the vicinity of the reservoir would increase during the construction period. Construction period noise levels were analyzed in Impact (a). As previously discussed, implementation of Mitigation Measure Noise-1would reduce the impact from project construction to less-than-significant levels. Construction activities would only occur during the daytime hours only; no evening or nighttime work is proposed.

The project would generate truck and automobile traffic during project demolition and construction. Traffic would follow major roadways between Highway 13 and I-880 and the project vicinity, and would then use Maybelle Avenue to access the site. Sensitive receptors potentially affected by project related traffic are residences along Maybelle Avenue. The most intense truck traffic would occur on the 4 days when the reservoir walls and roof are poured, the one week when fill is imported

[2] Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

to the site, and the six weeks of landscaping near the end of the project. The highest daily traffic noise level would occur during the week when fill is imported when there would be a maximum of 60 two-way truck trips and 4 two-way worker vehicle trips per day[3]. Assuming all of the vehicles would access the site from Maybelle Avenue and 39th Avenue (via the EBMUD access road), the daily average noise level was calculated to be 58 dBA L_{dn} at 50 feet from the roadway center along steeper portions of the roadway, and 53 dBA L_{dn} at 50 feet from the roadway center near MacArthur Boulevard where the road grade is not quite as steep. Project construction trips would generate noise levels of approximately 58 to 63 dBA L_{eq} at 50 feet, approximately 5 to 11 dBA L_{eq} above ambient noise levels at receptors ST-1 and ST-2. Truck traffic noise would be clearly audible, and distinguishable from normal local traffic, but would not cause a substantial increase in daily average noise levels in the area, and would be limited to a period of about six months during the 69 week construction period.

Impact e) Not applicable. The project is not located within an airport land use plan area or within two miles of a public airport. This significance criterion is not applicable to the proposed project.

Impact f) Not applicable. The project site is not located within the vicinity of a private airstrip. This significance criterion is not applicable to the proposed project.

[3] EBMUD, Table 2.1, Construction Activities Associated With 39th Avenue Reservoir, April 2012.

APPENDIX A

Chapter 17.120

PERFORMANCE STANDARDS

Sections:

17.120.010 Title, purpose, and applicability.

The provisions of this chapter shall be known as the performance standards. The purpose of these standards is to control dangerous or objectionable environmental effects of all activities. These standards shall apply to the indicated activities in the zones and situations specified herein. (Ord. 11895 § 6, 1996: prior planning code § 7700)

17.120.020 Existing activities.

Activities existing on the effective date of the zoning regulations, or of a subsequent rezoning or other amendment thereto applying more restrictive performance standards to such activities, shall not be required to change their operations to comply with the performance standards. However, their operations shall not be so changed as to result in a greater degree of nonconformity with respect to such standards, except as otherwise authorized under Section 17.102.310 and the development agreement procedure in Chapter 17.138. (Prior planning code § 7701) For existing activities meeting the definition specified in Section 17.114.080C., an expansion greater than twenty percent (20%) of production (e.g. non-administrative) floor area is one example of a change in operations that shall be considered an increase in the degree of nonconformity.

17.120.030 Proof of compliance.

The Director of City Planning may require the applicant for a building permit or business license to submit such information with respect to proposed machinery, processes, products, or environmental effects as may be necessary to demonstrate the ability of the proposed activities to comply with applicable performance standards. Such required information may include reports to expert consultants. Any such requirement, and any determination by the Director as to sufficiency of proof, may be appealed pursuant to the administrative appeal procedure in Chapter 17.132. (Prior planning code § 7703)

17.120.040 Measurements.

When measurements are necessary, levels of dangerous or objectionable environmental effects shall be measured in accordance with accepted engineering practice. (Prior planning code § 7704)

17.120.050 Noise.

All activities shall be so operated that the noise level inherently and regularly generated by these activities across real property lines shall not exceed the applicable values indicated in subsection A, B, or

C as modified where applicable by the adjustments indicated in subsection D or E. Further noise restrictions are outlined in Section 8.18.010 of the Oakland Municipal Code.

A. Residential Zone Noise Level Standards. The noise level received by any residential zone are described in Table 17.120.01. Table 17.120.01 establishes the maximum allowable receiving noise level standards:

Table 17.120.01: MAXIMUM ALLOWABLE RECEIVING NOISE LEVEL STANDARDS, dBA – Residential and Civic

Cumulative Number of Minutes in Either the Daytime or Nighttime One Hour Time Period	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7. a.m.
20	60	45
10	65	50
5	70	55
1	75	60
0	80	65

B. Commercial Noise Level Standards. The maximum allowable noise levels received by any land use activity within any commercial zone (including the Housing and Business Mix (HBX) zone) are described in Table 17.120.02. Table 17.120.02 establishes the maximum allowable receiving noise level standards:

Table 17.120.02: MAXIMUM ALLOWABLE RECEIVING NOISE LEVEL STANDARDS, dBA

Cumulative Number of Minutes in Either the Daytime or Nighttime One Hour Time Period	Anytime
20	65
10	70
5	75
1	80
0	85

C. Manufacturing, Industrial, Agricultural and Extractive Noise Level Standards. The noise level received by any land use activity within any industrial, manufacturing or mining and quarrying zone are described in Table 17.120.03. Table 17.120.03 establishes the maximum allowable receiving noise level standards:

Table 17.120.03: MAXIMUM ALLOWABLE RECEIVING NOISE LEVEL STANDARDS, dBA

Cumulative Number of Minutes in Any One Hour Time Period	Anytime
20	70
10	75
5	80
1	85
0	90

D. In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the stated applicable noise level shall be adjusted so as to equal the ambient noise level.

E. Each of the noise level standards specified above in subsections A, B, and C shall be reduced by five dBA for a simple tone noise such as a whine, screech, or hum, noise consisting primarily of speech or music, or for recurring impulse noise such as hammering or riveting.

F. Noise Measurement Procedures. Utilizing the "A" weighing scale of the sound level meter and the "slow" meter response (use "fast" response for impulsive type sounds), the noise level shall be measured at a position or positions at any point on the receiver's property. In general, the microphone shall be located four (4) to five (5) feet above the ground; ten (10) feet or more from the nearest reflective surface, where possible. However, in those cases where another elevation is deemed appropriate, the latter shall be utilized. If the noise complaint is related to interior noise levels, interior noise measurements shall be made within the affected residential unit. The measurements shall be made at a point at least four (4) feet from the wall, ceiling or floor nearest the noise source, with windows in the normal seasonal configuration.

G. Temporary Construction or Demolition Which Exceed the Following Noise Level Standards.

1. The daytime noise level received by any residential, commercial, or industrial land use which is produced by any nonscheduled, intermittent, short-term construction or demolition operation (less than ten days) or by any repetitively scheduled and relatively long-term construction or demolition operation (ten days or more) shall not exceed the maximum allowable receiving noise level standards described in Table 17.120.04. Table 17.120.04 establishes the maximum allowable receiving noise level standards:

Table 17.120.04: MAXIMUM ALLOWABLE RECEIVING NOISE LEVEL STANDARDS, dBA

	Daily 7 a.m. to 7 p.m.	**Weekends 9 a.m. to 8 p.m.**
Short-Term Operation		
Residential	80	65
Commercial, Industrial	85	70
Long-Term Operation		
Residential	65	55
Commercial, Industrial	70	60

2. The nighttime noise level received by any land use and produced by any construction or demolition activity between weekday hours of seven (7) p.m. and seven (7) a.m. or between eight (8) p.m. and nine (9) a.m. on weekends and federal holidays shall not exceed the applicable nighttime noise level standards outlined in this section.

H. Residential Air Conditioning Units and Refrigeration Systems. The exterior noise level associated with a residential air conditioning unit or refrigeration systems shall not exceed fifty (50) dBA, with the exception that systems installed prior to the effective date of this section shall not exceed fifty-five (55) dBA.

I. Commercial Refrigeration Units. Stationary and mobile commercial refrigeration units shall not produce a noise level greater than the noise level standards set forth in this section. Between the hours of ten (10) p.m. and seven (7) a.m., a mobile refrigeration unit shall not be located within two hundred (200) feet of any residential zone boundary unless such unit is within an enclosure which reduces the noise level outside the enclosure to no more than sixty (60) dBA and reduces vibration to a level below the vibration perception threshold set forth in Section 17.120.060.

J. Commercial Exhaust Systems. Unnecessary noise caused by exhaust from ventilation units, or other air control device shall not produce a noise level greater than the noise level standards set forth in this section between the hours of ten (10) p.m. and seven (7) a.m. and shall not be located within two hundred (200) feet of any residential zone boundary unless such unit is within an enclosure which reduces

the noise level outside the enclosure to no more than sixty (60) dBA and reduces vibration to a level below the vibration perception threshold set forth in Section 17.120.060. (Ord. 11895 § 7, 1996: prior planning code § 7710)

17.120.060 Vibration.

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

17.120.070 Smoke.

All Commercial and Industrial Activities located in the S-3 zone, or in any HBX or CIX zone shall be so operated as not to emit visible smoke as dark as Ringelmann number 2 or its equivalent opacity for more than three minutes in any one-hour period, and visible smoke as dark as Ringelmann number 1 or its equivalent opacity for more than an additional seven minutes in any one-hour period. Darker or more opaque smoke is prohibited at any time. (Prior planning code § 7712)

17.120.080 Particulate matter and air contaminants.

All Commercial, Manufacturing and Industrial Activities which are located in a residential zone or the M-20, S-3, or CIX zone, or any HBX zone, or which are located in the M-30, CIX-2, IG or IO zone within four hundred (400) feet of any boundary of a residential zone, shall be so operated as not to emit particulate matter of air contaminants which are readily detectable without instruments by the average person at or beyond any lot line of the lot containing such activities. (Prior planning code § 7713)

17.120.090 Odor.

When located in the zones specified below, all Commercial, Industrial and Manufacturing Activities shall be so operated as not to emit matter causing unpleasant odors which are perceptible by the average person at the following point of determination described in Table 17.120.05. Table 17.120.05 establishes the maximum allowable receiving noise level standards.

Table 17.120.05: Points of Determination for Odor

Zone in Which Activities are Located	Point of Determination
Any residential zone, M-20, S-3, the HBX zones or CIX-1.	At or beyond any lot line of the lot containing the activities.
M-30, CIX-2, IG or IO zone if within 400 feet of any boundary of a residential zone.	At or beyond any boundary of a residential zone.

(Prior planning code § 7714)

17.120.100 Humidity, heat, cold, and glare.

When located in the zones specified below, all Commercial and Manufacturing Activities shall be so operated as not to produce humidity, heat, cold, or glare which is perceptible without instruments by the average person at the points of determination described in Table 17.120.06. Table 17.120.06 establishes the maximum allowable receiving noise level standards.

Table 17.120.06: Points of Determination for Humidity, Heat, Cold and Glare

Zone in Which Activities are Located	Point of Determination

Zone in Which Activities are Located	Point of Determination
Any residential zone, M-20, S-3, HBX zones or CIX-1.	At or beyond any lot line of the lot containing the activities.
M-30, CIX-2, IG or IO zone if within 400 feet of any boundary of a residential zone.	At or beyond any boundary of a residential zone.

(Prior planning code § 7715)

17.120.110 Electrical disturbance.

All Commercial, Industrial and Manufacturing Activities located in a residential zone or the M-20, S-3 or HBX or CIX-1 zone, or located in the CIX-2, IG or M-30 or M-40 zone and within four hundred (400) feet of any boundary of a residential zone, shall be so operated as not to cause electrical disturbance adversely affecting the operation of any equipment on any other lot. (Prior planning code § 7716)

ATTACHMENT A

TABLE 2.1
Construction Activities Associated With 39th Avenue Reservoir Replacement Project

Construction Activity	Major Equipment Concrete crushing operation with loaders and conveyors	Duration (weeks)	Material/Haul Trucks[1] (per day)	Worker Vehicles (per day)	Max One-Way Trip (per hour)
Drain Reservoir (District)	Portable Pump (1),	**4**	**1**	**5**	**5**
Contractor Mobilization	Trailer, generator, excavators	**2**	**4**	**5**	**5**
Remove Roof Structure	Excavator, Chain Saw, haul trucks, bulldozer and hoe-ram	**4**	**10**	**6**	**11**
Remove Lining	Excavator, Hoe Ram, haul trucks, air compressor, backhoe, bobcats	**2**	**2**	**5**	**6**
Access Road	Dozer, Material Truck, back-hoe	**2**	**4**	**4**	**5**
Temporary Retaining Wall	Excavator, dozer, material truck	**4**	**2**	**4**	**6**
Reservoir Foundation	Excavator dozer, compactor,	**4**	**2**	**4**	**6**
Import Fill	Dozer, compactor, material trucks	**1**	**60**	**4**	**14**
Reservoir Foundation Pour	Concrete truck, concrete pump,	**2 days**	**2**[2]	**20**	**22**
Reservoir Walls	Crane, delivery trucks, concrete trucks, concrete trucks	**8**	**2**[2]	**15**	**17**
Wall Pre-stressing	Pre-stressing tower, concrete truck, concrete pump,	**4**	**2**[2]	**8**	**10**
Reservoir Roof	Crane, delivery trucks, concrete truck, concrete pump	**5**	**2**[2]	**15**	**17**
Reservoir Roof Pour	Concrete truck, concrete pump,	**2 days**	**2**[2]	**20**	**22**
Valve Pit and Piping,	Backhoe, material trucks, concrete truck, concrete pumps	**6**	**1**[2]	**8**	**10**
Field Testing and Startup		**8**	**1**	**8**	**8**
Site Restoration	Material trucks, bulldozer, backhoe, compactor	**2**	**15**	**10**	**7**
Landscaping	Material trucks, backhoe	**6**	**1**	**10**	**11**
Complete Civil Work	Asphalt paver, scraper, roller	**2**	**2**	**2**	**1**
Demobilization	Haul trucks, backhoe	**2**	**4**	**4**	**2**
Total Construction Duration		**69**			

[1] *Truck trips are over 7 hour. Assume trucks operate 1.5 hours per round trip.*

2 Refer to Table 2.2 for additional concrete truck trips.

TABLE 2.2

Construction Equipment Associated With 39th Avenue Reservoir Replacement Project

Construction Activity	Major Equipment	Weeks	Total Equipment Hours Used	Material/Haul Trucks[1] (per day)
Drain Reservoir (District)	portable pump (1),	**4**	**120**	
Contractor Mobilization	generator, (2) excavators	**2**	**8** **1**	
Remove Roof Structure	2 Excavator(88%) chain Saw	**4**	**210** **32**	
Remove Lining	(1) Excavator(50%) hoe ram (50%) air compressor (33%) concrete crusher (66hp)3gal/hr40tph	**2**	**40** **40** **25** **70**	
Access Road	bulldozer (50%), back-hoe asphalt paver vibratory compactor	**2**	**40** **40** **40** **40**	
Reservoir Foundation	excavator bulldozer	**4**	**140** **140**	
Temporary R/Wall or layback slope	excavator bulldozer	**4**	**140** **140**	
Import Fill	bulldozer (88%), compactor (88%)	**1**	**35** **35**	
Reservoir Foundation Pour	concrete truck, concrete pump,	**2 days**	**--** **16 (total)**	**100 (total)**
Reservoir Walls	crane (75%), high-lift crane, 80hp (50%) concrete trucks, concrete pump,	**8**	**240** **160** **--** **32**	**80 (total)**
Wall Pre-stressing	Pre-stressing tower (50hp) (50%), concrete truck, concrete pump	**4**	**80** **--** **24**	**8 (total)**
Reservoir Roof	crane (75%)	**5**	**150**	

	high lift crane, 80hp (50%) concrete truck, concrete pump		**100** **16**	**100 (total)**
Reservoir Roof Pour	concrete truck, concrete pump,	**2 days**	 **16**	**100 (total)**
Valve Pit and Piping,	Backhoe, concrete truck, concrete pumps	**6**	**16** **16**	**10 (total)**
Field Testing and Startup		**8**		
Site Restoration	bulldozer, backhoe, compactor	**2**	**70** **70** **70**	
Landscaping	Backhoe (50%)	**6**	**120**	
Complete Civil Work	asphalt paver, scraper, roller bulldozer	**2**	**16** **16** **16** **32**	
Demobilization	backhoe	**2**	**16**	
Total Construction Duration		**69**		

[1] *Unless noted otherwise, refer to Table 2.1 for material and haul truck trips*

ATTACHMENT B

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Users\bruce\AppData\Roaming\Urbemis\Version9a\Projects\EBMUD 39th Reservoir.urb924

Project Name: EBMUD 39th Reservoir

Project Location: Alameda County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2019 TOTALS (tons/year unmitigated)	0.06	0.41	0.36	0.00	0.52	0.02	0.54	0.11	0.02	0.12	93.59
2020 TOTALS (tons/year unmitigated)	0.02	0.18	0.18	0.00	0.53	0.01	0.53	0.11	0.01	0.12	60.62

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2019	0.06	0.41	0.36	0.00	0.52	0.02	0.54	0.11	0.02	0.12	93.59
Building 07/08/2019-08/02/2019	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.47
Building Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.15
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02
Building 08/05/2019-08/16/2019	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.73
Building Off Road Diesel	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
Building Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Demolition 08/19/2019-09/13/2019	0.01	0.07	0.10	0.00	0.01	0.00	0.02	0.00	0.00	0.01	18.71
Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Demo Off Road Diesel	0.01	0.06	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.92

Demo On Road Diesel	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.02
Demo Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77
Demolition 09/16/2019-09/27/2019	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.59
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Off Road Diesel	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.77
Demo On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
Demo Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Fine Grading 09/30/2019-10/11/2019	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.28
Fine Grading Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Off Road Diesel	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.90
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38
Mass Grading 10/14/2019-11/08/2019	0.01	0.10	0.07	0.00	0.11	0.00	0.12	0.02	0.00	0.03	17.81
Mass Grading Dust	0.00	0.00	0.00	0.00	0.11	0.00	0.11	0.02	0.00	0.02	0.00
Mass Grading Off Road Diesel	0.01	0.09	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.69
Mass Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61
Mass Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Mass Grading 11/11/2019-12/06/2019	0.01	0.09	0.07	0.00	0.31	0.00	0.31	0.06	0.00	0.07	16.20
Mass Grading Dust	0.00	0.00	0.00	0.00	0.31	0.00	0.31	0.06	0.00	0.06	0.00
Mass Grading Off Road Diesel	0.01	0.09	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.69
Mass Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mass Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Mass Grading 12/09/2019-12/13/2019	0.01	0.06	0.03	0.00	0.08	0.00	0.08	0.02	0.00	0.02	16.34
Mass Grading Dust	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.02	0.00	0.02	0.00
Mass Grading Off Road Diesel	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.13
Mass Grading On Road Diesel	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.08
Mass Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Building 12/16/2019-12/27/2019	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93

Building Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.77
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
Building Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Building 12/30/2019-12/31/2019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
Building Off Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Building Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
2020	0.02	0.18	0.18	0.00	0.53	0.01	0.53	0.11	0.01	0.12	60.62
Building 01/01/2020-02/25/2020	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.93
Building Off Road Diesel	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.30
Building Vendor Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.58
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05
Building 02/26/2020-03/24/2020	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.47
Building Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.15
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02
Building 03/25/2020-04/28/2020	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.83
Building Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.94
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.62
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.28
Building 04/29/2020-04/30/2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
Building Off Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Building Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Building 05/04/2020-06/12/2020	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.20
Building Off Road Diesel	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.73
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.53

Building 06/15/2020-08/07/2020	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.93
Building Off Road Diesel	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.30
Building Vendor Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.58
Building Worker Trips	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05
Fine Grading 08/10/2020-08/21/2020	0.01	0.04	0.03	0.00	0.45	0.00	0.45	0.09	0.00	0.10	7.33
Fine Grading Dust	0.00	0.00	0.00	0.00	0.45	0.00	0.45	0.09	0.00	0.09	0.00
Fine Grading Off Road Diesel	0.01	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.95
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38
Fine Grading 08/24/2020-10/02/2020	0.00	0.01	0.02	0.00	0.08	0.00	0.08	0.02	0.00	0.02	2.62
Fine Grading Dust	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.02	0.00	0.02	0.00
Fine Grading Off Road Diesel	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.23
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38
Asphalt 10/05/2020-10/16/2020	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.04
Paving Off-Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.23
Paving On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
Paving Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
Building 10/19/2020-10/30/2020	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.73
Building Off Road Diesel	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58
Building Vendor Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
Building Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51

Phase Assumptions

Phase: Demolition 8/19/2019 - 9/13/2019 - Remove Roof Structure

Building Volume Total (cubic feet): 40498.5

Building Volume Daily (cubic feet): 2704.74

On Road Truck Travel (VMT): 75.13

Off-Road Equipment:

1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 2.1 hours per day
2 Excavators (168 hp) operating at a 0.88 load factor for 7 hours per day

Phase: Demolition 9/16/2019 - 9/27/2019 - Remove Lining
Building Volume Total (cubic feet): 5400
Building Volume Daily (cubic feet): 540
On Road Truck Travel (VMT): 15
Off-Road Equipment:
1 Air Compressors (106 hp) operating at a 0.33 load factor for 2.5 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 7 hours per day
1 Excavators (168 hp) operating at a 0.5 load factor for 4 hours per day
1 Other General Industrial Equipment (238 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Fine Grading 9/30/2019 - 10/11/2019 - Access Road
Total Acres Disturbed: 0.1
Maximum Daily Acreage Disturbed: 0.03
Fugitive Dust Level of Detail: Default
20 lbs per acre-day
On Road Truck Travel (VMT): 0
Off-Road Equipment:
1 Plate Compactors (8 hp) operating at a 0.43 load factor for 4 hours per day
1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 4 hours per day
1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Fine Grading 8/10/2020 - 8/21/2020 - Site Restoration
Total Acres Disturbed: 4.5
Maximum Daily Acreage Disturbed: 4.5
Fugitive Dust Level of Detail: Default
20 lbs per acre-day
On Road Truck Travel (VMT): 0
Off-Road Equipment:
1 Plate Compactors (8 hp) operating at a 0.43 load factor for 7 hours per day
1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day
1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Phase: Fine Grading 8/24/2020 - 10/2/2020 - Landscaping

Total Acres Disturbed: 4.5
Maximum Daily Acreage Disturbed: 0.5
Fugitive Dust Level of Detail: Default
10 lbs per acre-day
On Road Truck Travel (VMT): 0
Off-Road Equipment:
1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Mass Grading 10/14/2019 - 11/8/2019 - Temporary Slope Layback
Total Acres Disturbed: 0.56
Maximum Daily Acreage Disturbed: 0.56
Fugitive Dust Level of Detail: Default
20 lbs per acre-day
On Road Truck Travel (VMT): 40
Off-Road Equipment:
1 Excavators (168 hp) operating at a 0.57 load factor for 7 hours per day
1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day

Phase: Mass Grading 11/11/2019 - 12/6/2019 - Foundation Excavation
Total Acres Disturbed: 0.56
Maximum Daily Acreage Disturbed: 0.56
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 215 cubic yards/day; Offsite Cut/Fill: 0 cubic yards/day
On Road Truck Travel (VMT): 0
Off-Road Equipment:
1 Excavators (168 hp) operating at a 0.57 load factor for 7 hours per day
1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day

Phase: Mass Grading 12/9/2019 - 12/13/2019 - Import Fill
Total Acres Disturbed: 1.63
Maximum Daily Acreage Disturbed: 1.63
Fugitive Dust Level of Detail: Default
20 lbs per acre-day
On Road Truck Travel (VMT): 1200
Off-Road Equipment:
1 Plate Compactors (8 hp) operating at a 0.88 load factor for 7 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.88 load factor for 7 hours per day

Phase: Building Construction 12/16/2019 - 12/27/2019 - Foundation Rebar and Form
Off-Road Equipment:
1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

Phase: Paving 10/5/2020 - 10/16/2020 - Complete Civil Work
Acres to be Paved: 0.5
Off-Road Equipment:
1 Pavers (100 hp) operating at a 0.62 load factor for 1.6 hours per day
1 Paving Equipment (104 hp) operating at a 0.53 load factor for 1.6 hours per day
1 Rollers (95 hp) operating at a 0.56 load factor for 1.6 hours per day
1 Scrapers (313 hp) operating at a 0.72 load factor for 3.2 hours per day

Phase: Building Construction 7/8/2019 - 8/2/2019 - Drain Reservoir
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 8/5/2019 - 8/16/2019 - Contractor Mobilization
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 12/30/2019 - 12/31/2019 - Reservoir Foundation Pour
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 1/1/2020 - 2/25/2020 - Reservoir Walls
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 2/26/2020 - 3/24/2020 - Wall Pre-Stressing
Off-Road Equipment:

2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 3/25/2020 - 4/28/2020 - Reservoir Roof
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 4/29/2020 - 4/30/2020 - Reservoir Roof Pour
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 5/4/2020 - 6/12/2020 - Valve Pit and Piping
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 6/15/2020 - 8/7/2020 - Field Testing and Startup
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 10/19/2020 - 10/30/2020 - Demobilization
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

ATTACHMENT B - Combined Summer Emissions

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Users\bruce\AppData\Roaming\Urbemis\Version9a\Projects\EBMUD 39th Reservoir.urb924

Project Name: EBMUD 39th Reservoir

Project Location: Alameda County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5	PM2.5	CO2
2019 TOTALS (lbs/day unmitigated)	2.52	23.36	11.11	0.05	32.77	0.87	33.64	6.86	0.80	7.66	6,534.51
2020 TOTALS (lbs/day unmitigated)	1.17	8.43	6.19	0.00	90.00	0.37	90.38	18.80	0.34	19.14	1,466.13

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
Time Slice 7/8/2019-8/2/2019 Active Days: 20	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building 07/08/2019-08/02/2019	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building Off Road Diesel	0.12	1.17	0.62	0.00	0.00	0.04	0.04	0.00	0.04	0.04	315.00
Building Vendor Trips	0.02	0.23	0.29	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.24
Building Worker Trips	0.02	0.03	0.56	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.30
Time Slice 8/5/2019-8/16/2019 Active Days: 10	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building 08/05/2019-08/16/2019	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building Off Road Diesel	0.12	1.17	0.62	0.00	0.00	0.04	0.04	0.00	0.04	0.04	315.00
Building Vendor Trips	0.02	0.23	0.29	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.24
Building Worker Trips	0.02	0.03	0.56	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.30
Time Slice 8/19/2019-9/13/2019 Active Days: 20	1.10	6.72	9.52	0.00	1.15	0.35	1.50	0.24	0.32	0.56	1,871.33
Demolition 08/19/2019-09/13/2019	1.10	6.72	9.52	0.00	1.15	0.35	1.50	0.24	0.32	0.56	1,871.33

Fugitive Dust	0.00	0.00	0.00	0.00	1.14	0.00	1.14	0.24	0.00	0.24	0.00
Demo Off Road Diesel	1.02	5.94	8.81	0.00	0.00	0.32	0.32	0.00	0.30	0.30	1,492.12
Demo On Road Diesel	0.06	0.75	0.29	0.00	0.01	0.03	0.04	0.00	0.02	0.03	302.48
Demo Worker Trips	0.01	0.02	0.42	0.00	0.00	0.00	0.01	0.00	0.00	0.00	76.72
Time Slice 9/16/2019-9/27/2019 Active Days: 10	0.96	6.40	7.32	0.00	0.23	0.31	0.55	0.05	0.29	0.34	1,517.06
Demolition 09/16/2019-09/27/2019	0.96	6.40	7.32	0.00	0.23	0.31	0.55	0.05	0.29	0.34	1,517.06
Fugitive Dust	0.00	0.00	0.00	0.00	0.23	0.00	0.23	0.05	0.00	0.05	0.00
Demo Off Road Diesel	0.93	6.23	6.70	0.00	0.00	0.31	0.31	0.00	0.28	0.28	1,354.37
Demo On Road Diesel	0.01	0.15	0.06	0.00	0.00	0.01	0.01	0.00	0.00	0.01	60.39
Demo Worker Trips	0.02	0.03	0.56	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.30
Time Slice 9/30/2019-10/11/2019 Active Days: 10	0.69	5.11	3.75	0.00	0.60	0.21	0.82	0.13	0.20	0.32	855.78
Fine Grading 09/30/2019-10/11/2019	0.69	5.11	3.75	0.00	0.60	0.21	0.82	0.13	0.20	0.32	855.78
Fine Grading Dust	0.00	0.00	0.00	0.00	0.60	0.00	0.60	0.13	0.00	0.13	0.00
Fine Grading Off Road Diesel	0.68	5.09	3.33	0.00	0.00	0.21	0.21	0.00	0.20	0.20	779.05
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.01	0.02	0.42	0.00	0.00	0.00	0.01	0.00	0.00	0.00	76.72
Time Slice 10/14/2019-11/8/2019 Active Days: 20	1.34	9.77	7.30	0.00	11.21	0.41	11.62	2.34	0.38	2.72	1,780.79
Mass Grading 10/14/2019-11/08/2019	1.34	9.77	7.30	0.00	11.21	0.41	11.62	2.34	0.38	2.72	1,780.79
Mass Grading Dust	0.00	0.00	0.00	0.00	11.20	0.00	11.20	2.34	0.00	2.34	0.00
Mass Grading Off Road Diesel	1.30	9.36	6.86	0.00	0.00	0.40	0.40	0.00	0.36	0.36	1,568.60
Mass Grading On Road Diesel	0.03	0.40	0.16	0.00	0.01	0.01	0.02	0.00	0.01	0.01	161.04
Mass Grading Worker Trips	0.01	0.01	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.15
Time Slice 11/11/2019-12/6/2019 Active Days: 20	1.31	9.37	7.14	0.00	30.97	0.40	31.37	6.47	0.37	6.83	1,619.75
Mass Grading 11/11/2019-12/06/2019	1.31	9.37	7.14	0.00	30.97	0.40	31.37	6.47	0.37	6.83	1,619.75
Mass Grading Dust	0.00	0.00	0.00	0.00	30.97	0.00	30.97	6.47	0.00	6.47	0.00
Mass Grading Off Road Diesel	1.30	9.36	6.86	0.00	0.00	0.40	0.40	0.00	0.36	0.36	1,568.60
Mass Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mass Grading Worker Trips	0.01	0.01	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.15
Time Slice 12/9/2019-12/13/2019 Active Days: 5	**2.52**	**23.36**	**11.11**	**0.05**	32.77	**0.87**	33.64	6.86	**0.80**	7.66	**6,534.51**

Mass Grading 12/09/2019-12/13/2019	2.52	23.36	11.11	0.05	32.77	0.87	33.64	6.86	0.80	7.66	6,534.51
Mass Grading Dust	0.00	0.00	0.00	0.00	32.60	0.00	32.60	6.81	0.00	6.81	0.00
Mass Grading Off Road Diesel	1.48	11.33	6.17	0.00	0.00	0.44	0.44	0.00	0.41	0.41	1,652.15
Mass Grading On Road Diesel	1.03	12.01	4.67	0.04	0.17	0.42	0.59	0.06	0.39	0.44	4,831.21
Mass Grading Worker Trips	0.01	0.01	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.15
Time Slice 12/16/2019-12/27/2019 Active Days: 10	0.40	2.69	2.08	0.00	0.01	0.10	0.11	0.00	0.09	0.10	786.13
Building 12/16/2019-12/27/2019	0.40	2.69	2.08	0.00	0.01	0.10	0.11	0.00	0.09	0.10	786.13
Building Off Road Diesel	0.36	2.43	1.22	0.00	0.00	0.09	0.09	0.00	0.08	0.08	554.59
Building Vendor Trips	0.02	0.23	0.29	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.24
Building Worker Trips	0.02	0.03	0.56	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.30
Time Slice 12/30/2019-12/31/2019 Active Days: 2	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building 12/30/2019-12/31/2019	0.16	1.43	1.47	0.00	0.01	0.05	0.06	0.00	0.05	0.05	546.54
Building Off Road Diesel	0.12	1.17	0.62	0.00	0.00	0.04	0.04	0.00	0.04	0.04	315.00
Building Vendor Trips	0.02	0.23	0.29	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.24
Building Worker Trips	0.02	0.03	0.56	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.30
Time Slice 1/1/2020-2/25/2020 Active Days: 40	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 01/01/2020-02/25/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 2/26/2020-3/24/2020 Active Days: 20	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 02/26/2020-03/24/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 3/25/2020-4/28/2020 Active Days: 25	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 03/25/2020-04/28/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25

Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 4/29/2020-4/30/2020 Active Days: 2	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 04/29/2020-04/30/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 5/4/2020-6/12/2020 Active Days: 30	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 05/04/2020-06/12/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 6/15/2020-8/7/2020 Active Days: 40	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 06/15/2020-08/07/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 8/10/2020-8/21/2020 Active Days: 10	1.17	8.43	6.19	0.00	**90.00**	0.37	**90.38**	**18.80**	0.34	**19.14**	1,466.13
Fine Grading 08/10/2020-08/21/2020	1.17	8.43	6.19	0.00	90.00	0.37	90.38	18.80	0.34	19.14	1,466.13
Fine Grading Dust	0.00	0.00	0.00	0.00	90.00	0.00	90.00	18.80	0.00	18.80	0.00
Fine Grading Off Road Diesel	1.16	8.41	5.80	0.00	0.00	0.37	0.37	0.00	0.34	0.34	1,389.39
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.01	0.02	0.39	0.00	0.00	0.00	0.01	0.00	0.00	0.00	76.73
Time Slice 8/24/2020-10/2/2020 Active Days: 30	0.11	0.72	1.11	0.00	5.00	0.04	5.04	1.04	0.04	1.08	174.42
Fine Grading 08/24/2020-10/02/2020	0.11	0.72	1.11	0.00	5.00	0.04	5.04	1.04	0.04	1.08	174.42
Fine Grading Dust	0.00	0.00	0.00	0.00	5.00	0.00	5.00	1.04	0.00	1.04	0.00
Fine Grading Off Road Diesel	0.10	0.71	0.98	0.00	0.00	0.04	0.04	0.00	0.04	0.04	148.84
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.01	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.58
Time Slice 10/5/2020-10/16/2020 Active Days: 10	0.84	4.77	3.62	0.00	0.01	0.23	0.24	0.00	0.21	0.22	1,007.86

Asphalt 10/05/2020-10/16/2020	0.84	4.77	3.62	0.00	0.01	0.23	0.24	0.00	0.21	0.22	1,007.86
Paving Off-Gas	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.68	4.62	3.05	0.00	0.00	0.22	0.22	0.00	0.21	0.21	845.87
Paving On Road Diesel	0.01	0.13	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00	59.68
Paving Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31
Time Slice 10/19/2020-10/30/2020 Active Days: 10	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building 10/19/2020-10/30/2020	0.14	1.27	1.40	0.00	0.01	0.04	0.05	0.00	0.04	0.04	546.56
Building Off Road Diesel	0.11	1.04	0.61	0.00	0.00	0.03	0.03	0.00	0.03	0.03	315.00
Building Vendor Trips	0.02	0.21	0.27	0.00	0.00	0.01	0.01	0.00	0.01	0.01	129.25
Building Worker Trips	0.01	0.03	0.52	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.31

Phase Assumptions

Phase: Demolition 8/19/2019 - 9/13/2019 - Remove Roof Structure

Building Volume Total (cubic feet): 40498.5

Building Volume Daily (cubic feet): 2704.74

On Road Truck Travel (VMT): 75.13

Off-Road Equipment:

1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 2.1 hours per day

2 Excavators (168 hp) operating at a 0.88 load factor for 7 hours per day

Phase: Demolition 9/16/2019 - 9/27/2019 - Remove Lining

Building Volume Total (cubic feet): 5400

Building Volume Daily (cubic feet): 540

On Road Truck Travel (VMT): 15

Off-Road Equipment:

1 Air Compressors (106 hp) operating at a 0.33 load factor for 2.5 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 7 hours per day

1 Excavators (168 hp) operating at a 0.5 load factor for 4 hours per day

1 Other General Industrial Equipment (238 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Fine Grading 9/30/2019 - 10/11/2019 - Access Road

Total Acres Disturbed: 0.1

Maximum Daily Acreage Disturbed: 0.03

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Plate Compactors (8 hp) operating at a 0.43 load factor for 4 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 4 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Fine Grading 8/10/2020 - 8/21/2020 - Site Restoration

Total Acres Disturbed: 4.5

Maximum Daily Acreage Disturbed: 4.5

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Plate Compactors (8 hp) operating at a 0.43 load factor for 7 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Phase: Fine Grading 8/24/2020 - 10/2/2020 - Landscaping

Total Acres Disturbed: 4.5

Maximum Daily Acreage Disturbed: 0.5

Fugitive Dust Level of Detail: Default

10 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.5 load factor for 4 hours per day

Phase: Mass Grading 10/14/2019 - 11/8/2019 - Temporary Slope Layback

Total Acres Disturbed: 0.56

Maximum Daily Acreage Disturbed: 0.56

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 40

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 7 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day

Phase: Mass Grading 11/11/2019 - 12/6/2019 - Foundation Excavation

Total Acres Disturbed: 0.56

Maximum Daily Acreage Disturbed: 0.56

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 215 cubic yards/day; Offsite Cut/Fill: 0 cubic yards/day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 7 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 7 hours per day

Phase: Mass Grading 12/9/2019 - 12/13/2019 - Import Fill

Total Acres Disturbed: 1.63

Maximum Daily Acreage Disturbed: 1.63

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 1200

Off-Road Equipment:

1 Plate Compactors (8 hp) operating at a 0.88 load factor for 7 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.88 load factor for 7 hours per day

Phase: Building Construction 12/16/2019 - 12/27/2019 - Foundation Rebar and Form

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

Phase: Paving 10/5/2020 - 10/16/2020 - Complete Civil Work

Acres to be Paved: 0.5

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 1.6 hours per day

1 Paving Equipment (104 hp) operating at a 0.53 load factor for 1.6 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 1.6 hours per day

1 Scrapers (313 hp) operating at a 0.72 load factor for 3.2 hours per day

Phase: Building Construction 7/8/2019 - 8/2/2019 - Drain Reservoir

Off-Road Equipment:

2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day

1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 8/5/2019 - 8/16/2019 - Contractor Mobilization

Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 12/30/2019 - 12/31/2019 - Reservoir Foundation Pour
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 1/1/2020 - 2/25/2020 - Reservoir Walls
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 2/26/2020 - 3/24/2020 - Wall Pre-Stressing
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 3/25/2020 - 4/28/2020 - Reservoir Roof
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 4/29/2020 - 4/30/2020 - Reservoir Roof Pour
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 5/4/2020 - 6/12/2020 - Valve Pit and Piping
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day
1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 6/15/2020 - 8/7/2020 - Field Testing and Startup
Off-Road Equipment:
2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day

1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

Phase: Building Construction 10/19/2020 - 10/30/2020 - Demobilization

Off-Road Equipment:

2 Excavators (168 hp) operating at a 0.57 load factor for 0.1 hours per day

1 Generator Sets (549 hp) operating at a 0.74 load factor for 0.8 hours per day

ATTACHMENT C

Construction-Period Health Risk Assessment
Calculations for Diesel Particulate Matter (DPM) Cancer Risk,
DPM Non-Cancer Hazard and PM 2.5 Exposure

EBMUD 39th Avenue Reservoir Replacement Project

CANCER RISK:

1. URBEMIS Output

Specifics of construction phases were entered into URBEMIS. Default assumptions regarding construction equipment were used.

Total emissions (all years) were added together and divided by the total construction period in years (0.02 + 0.01 / 1.3 years = 0.023 average yearly short tons as the average yearly emissions rate).

2. Screen3

The average yearly emissions rate was converted to micro-grams/second/square meter (using a conversion factor of 1 short ton per year = 0.0287 g/s) then dividing by the project area (33,184 m^2). This emission rate, calculated at 1.9992E-08 g/s/m^2 was entered into Screen3 with these other parameters:

- Source type: area
- Urban dispersion coefficient
- Source release height: 3 meters
- Simple terrain – flat
- Automated distances
- Full meteorology

This resulted in a maximum 1-hour concentration of 0.4234 ug/m^3, which would occur at a distance of 149 meters. (Screen3 output is attached.)

3. Scaling to Annual

GLC = (X1-hour) (Scalar)

Where GLC is the annual average ground level concentration.

The maximum 1-hour concentration from the Screen3 output was then multiplied by the BAAQMD recommended hourly to annual Scalar of 0.1 for the following:

GLC = (0.4234 ug/m3) (0.1)

Ground Level Concentration = 0.04234 ug/m3

4. Calculate Risk

This GLC was used as the concentration in air ("C air") for calculation of inhalation dose as follows:

Inhalation Dose = (C air*DBR*A*EF*ED*1x10^{-6})/AT

DBR = daily breathing rate = 302

A = inhalation absorption rate for DPM = 1

EF = Exposure frequency = 250 days/yr (assuming 5 days a week for 50 weeks for the entire year)

ED = Exposure duration = 1.3 years (full construction period)

AT = Averaging time = 25,550 (for a 70 year cancer risk)

Inhalation Dose = (0.04234) (302) (1) (250) (1.3) (10^-6) / 25550

Inhalation Dose = 1.6265E-07

And from there calculated the Inhalation Cancer Risk:

Inhalation Cancer Potency factor (for DPM) = 1.1

Inhalation Cancer Risk per million = (Inhalation Dose)*Inhalation Cancer Potency factor*10^6

Inhalation Cancer Risk per million = (1.6265E-07)*1.1*10^6

Inhalation Cancer Risk per million (adult) = 0.179 - compared to Threshold of 10.000

Because an infant could be exposed during the construction, an age sensitivity factor of 10 is used.

Inhalation Cancer Risk * ASF = risk adjusted for age sensitivity

0.179*10 = 1.79

Inhalation Cancer Risk per million (infant) = 1.79 compared to Threshold of 10.00

PM10 is below threshold levels, even when analyzing worst case scenario.

FOR CHRONIC NON-CANCER:

Hazard Quotient = C air/REL

REL = DPM inhalation non-cancer chronic (long-term) reference exposure level = 5 ug/m^3

Hazard Quotient = 0.04234 / 5.0

Hazard Quotient = 0.008 compared to Threshold of 1.000

Chronic hazards are below threshold levels.

FOR PM2.5

The total PM2.5 emissions from URBEMIS (all years added together) were summed then divided by the total construction period in years.

Total PM2.5 emissions (all years) were added together and divided by the total construction period in years (0.02 + 0.01 / 1.3 years = 0.023 average yearly short tons as the average yearly emissions rate).

The average yearly emissions rate was converted to micro-grams/second/square meter (using a conversion factor of 1 short ton per year = 0.0287 g/s) then dividing by the project area as above. This emission rate, calculated at 1.9992E-08 $g/s/m^2$ was entered into Screen3 with the same parameters as for PM10 above and scaled to an annual average.

Annual Average PM2.5 concentration of 0.042 ug/m^3 compared to the threshold of 0.300 ug/m^3

PM2.5 is below threshold levels.

Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Thursday, May 17, 2012

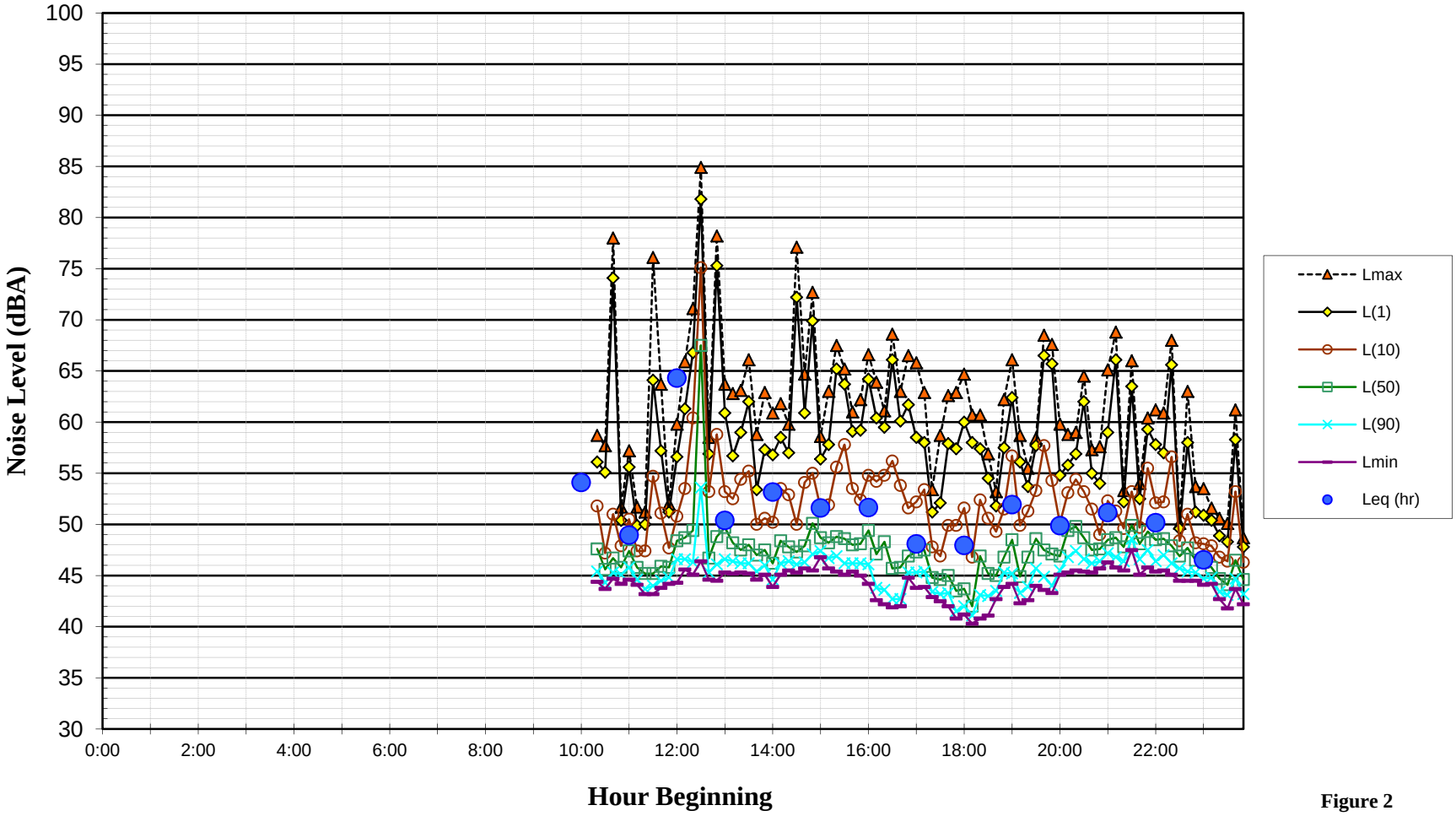
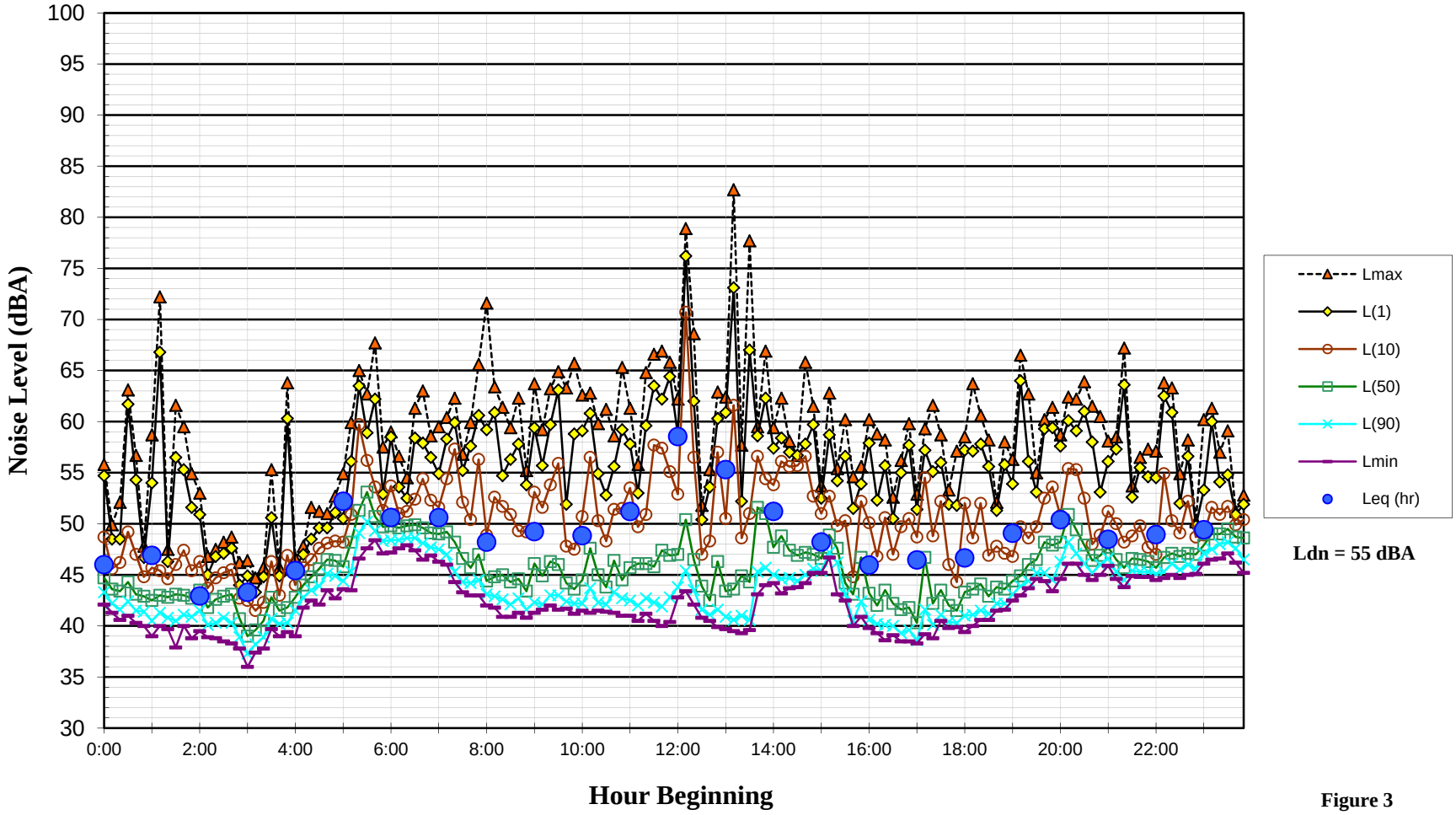


Figure 2

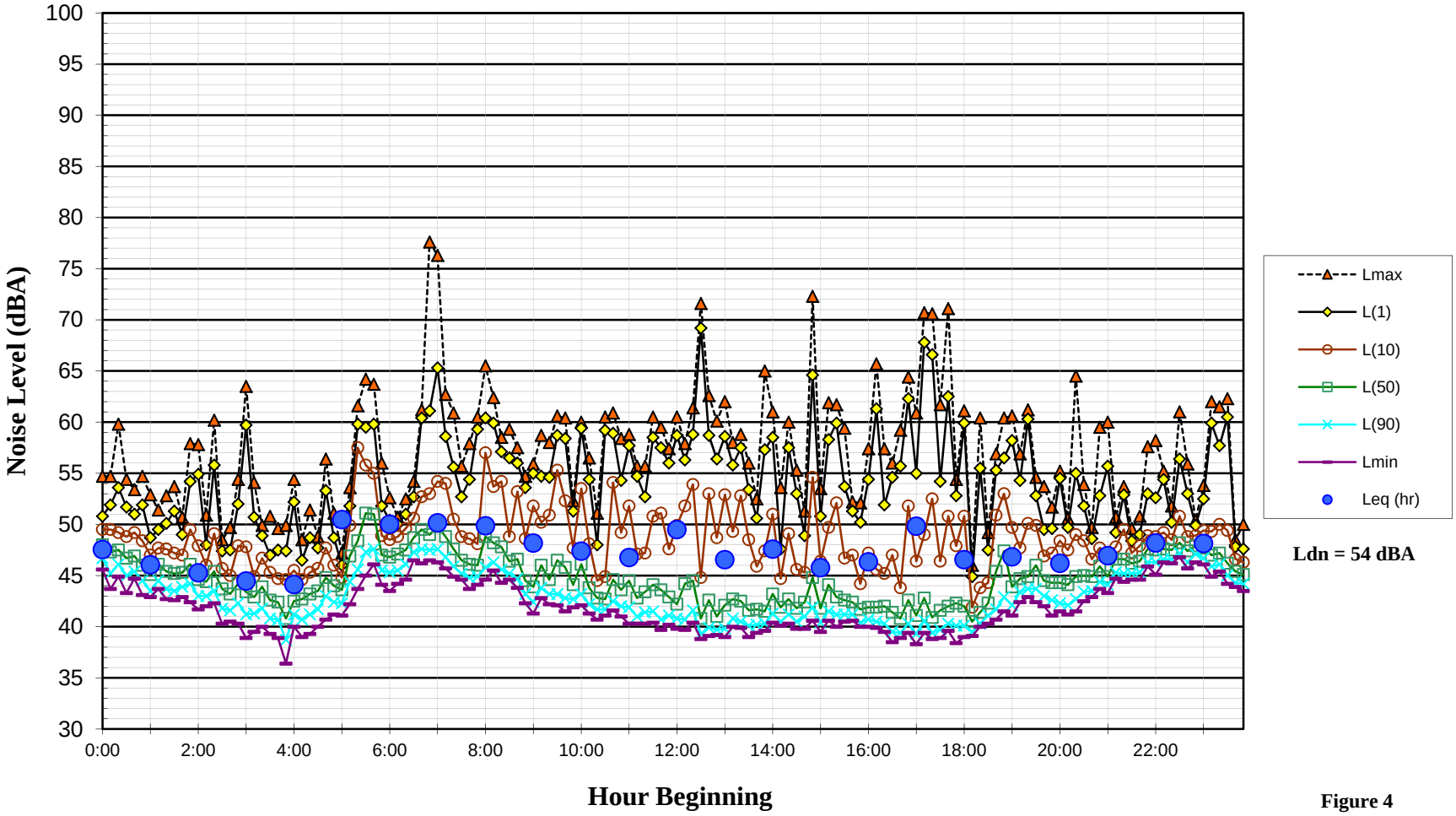
Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Friday, May 18, 2012



Ldn = 55 dBA

Figure 3

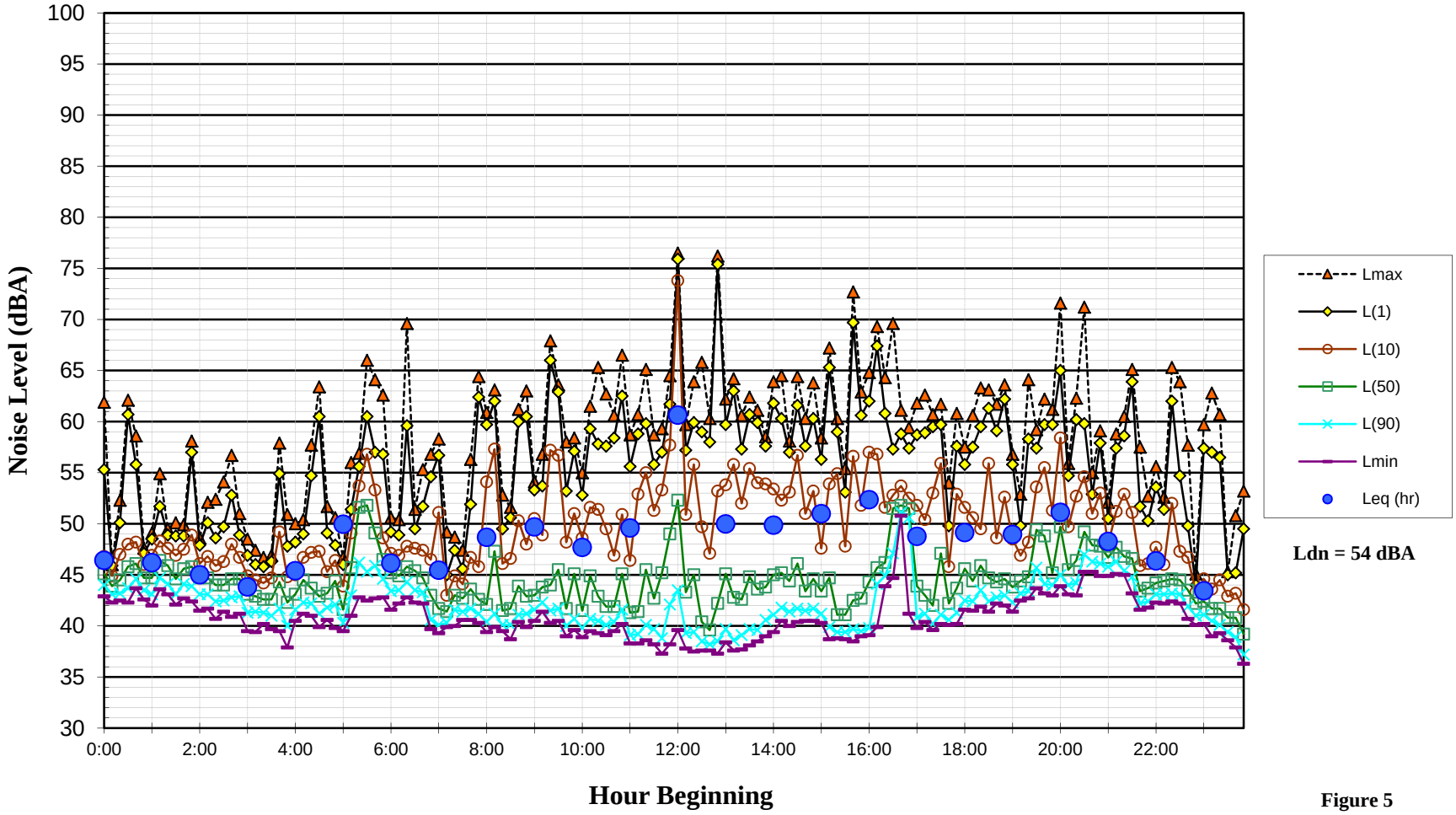
Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Saturday, May 19, 2012



Ldn = 54 dBA

Figure 4

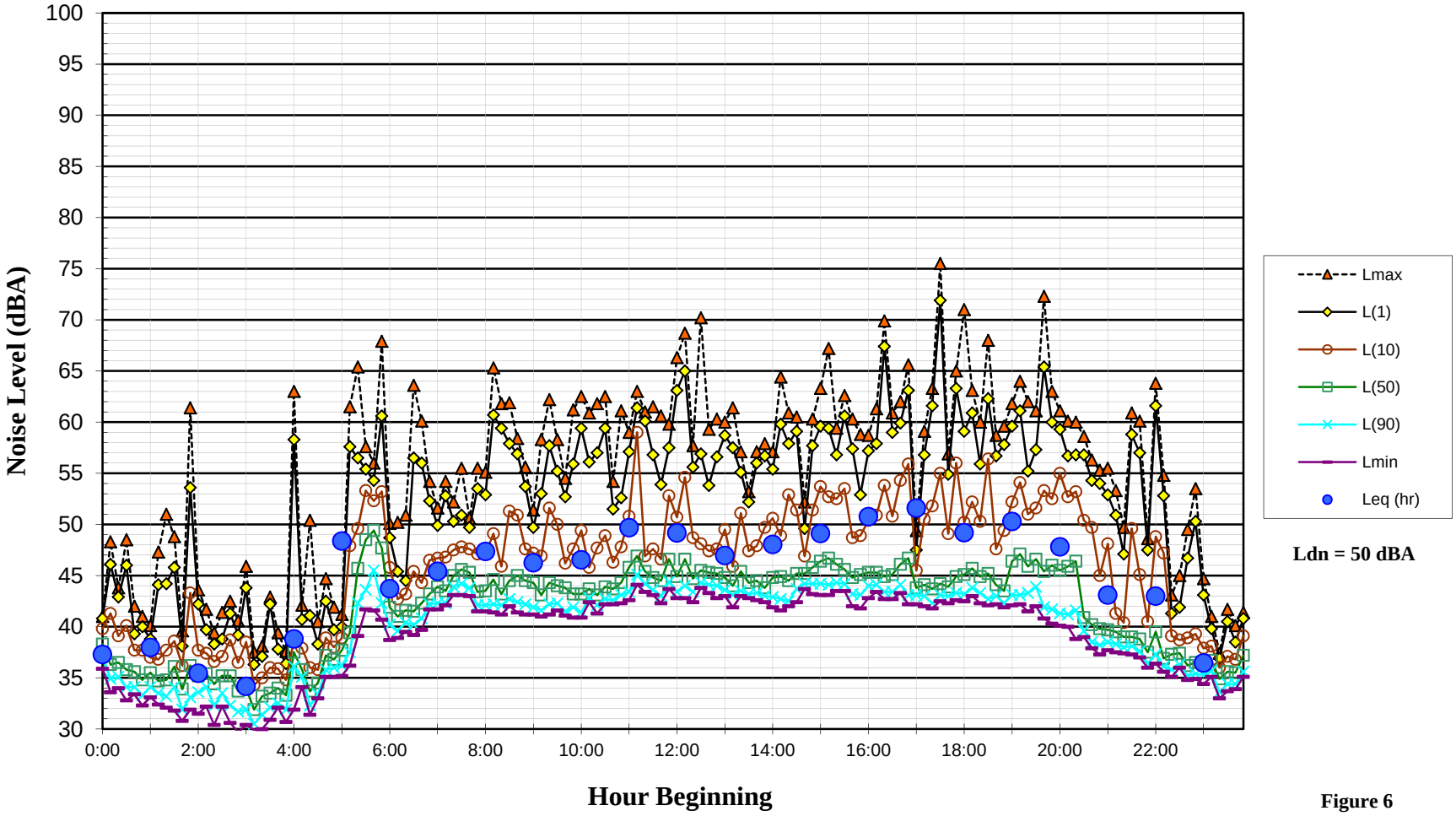
Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Sunday, May 20, 2012



Ldn = 54 dBA

Figure 5

Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Monday, May 21, 2012



Ldn = 50 dBA

Figure 6

Noise Levels at Noise Measurement Site LT-1
~ Front of #50 Gregory Place
Tuesday, May 22, 2012

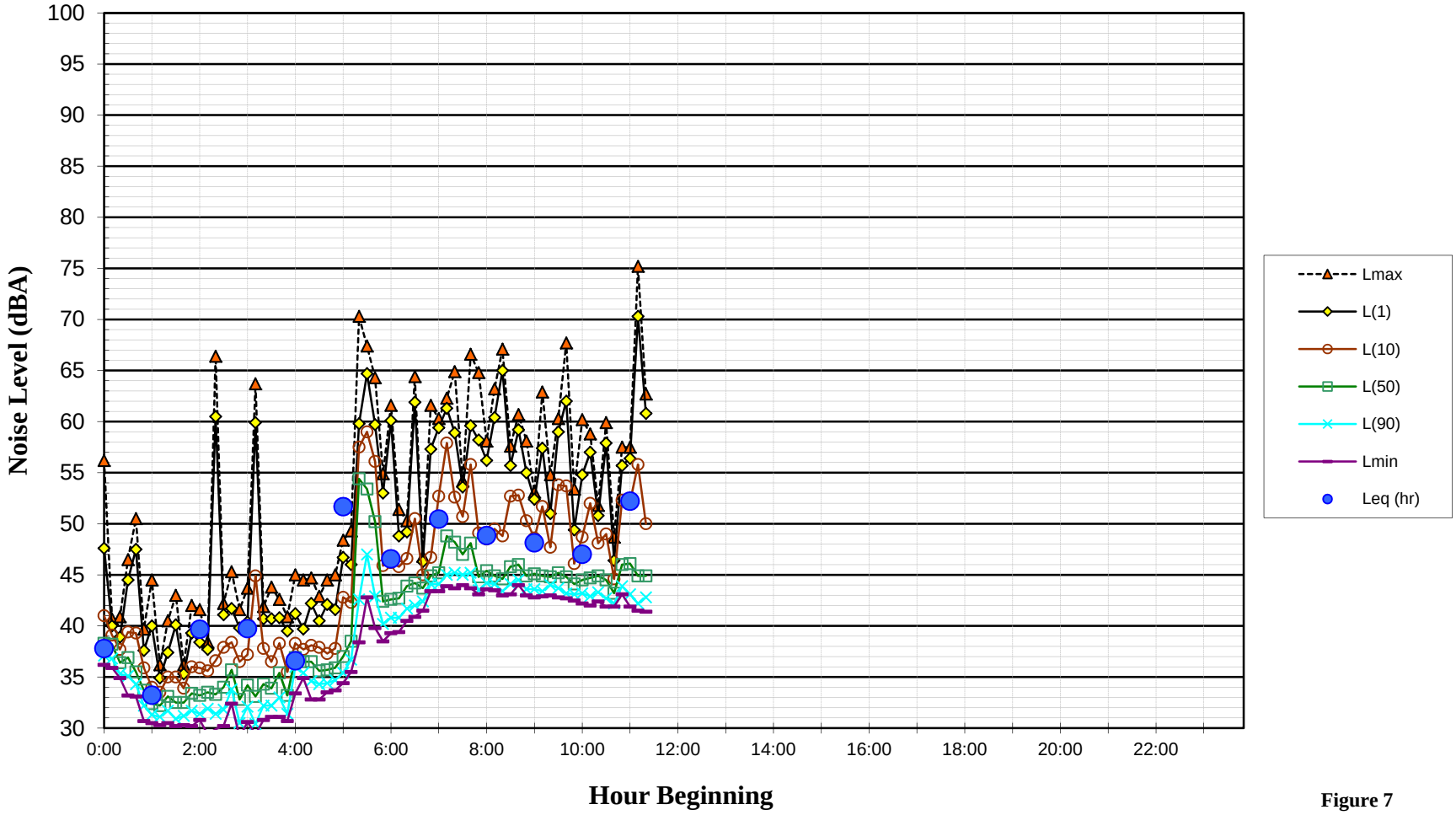


Figure 7