5.7 - NOISE

5.7.1 - Introduction

Information in this section is based upon the following documents and correspondence received on the Notice of Preparation (NOP):

- NMC Final EIR, City of Ontario, 1997. This document is incorporated by reference.
- Noise Study, ROMA Environmental, January 2005. This document is contained in Appendix F of the Technical Appendices.

The NMC Final EIR evaluated potential noise impacts, which included short-term construction-related impacts and impacts related to long-term operations. The NMC Final EIR stated that noise impacts related to construction activities were short-term in nature and, because the City did not have noise impact thresholds or regulations related to construction activities, less than significant impacts would result.

The NMC Final EIR also evaluated potential noise impacts related to the long-term operations of the build-out of the NMC. Sources of increased noise levels were related to the increased traffic that would result from development of the NMC, stationery noise sources resulting from the conversion to agricultural uses, and, depending on the location within the NMC, noise impacts related to airport operations.

This section of the DEIR evaluates the potentially significant impacts from noise that would result from implementation of the proposed project.

5.7.2 - Existing Conditions

Acoustic Fundamentals

Sound is a pressure wave transmitted through the air that is described in terms of loudness or amplitude (measured in decibels), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel (dB). Typical human hearing can detect changes in sound levels of approximately 3 dB under normal conditions. Changes of 1 to 3 dB are detectable under quiet, controlled conditions and changes of less than 1 dB are usually indiscernible. A change of 5 dB is typically noticeable to most people in an exterior environment whereas a change of 10 dB is perceived as a doubling (or halving) of the noise.

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are "felt" more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale is used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Noise

Noise is defined as unwanted sound, and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California and local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

Noise may be generated from a point source, such as a piece of construction equipment, or from a line source, such as a roadway containing moving vehicles. Because noise spreads in an ever-widening pattern, the given amount of noise striking an object, such as an eardrum, is reduced with distance from the source. This phenomenon is known as "spreading loss." The typical spreading loss for point source noise is 6 dBA per doubling of the distance from the noise source.

A line source of noise, such as vehicles proceeding down a roadway, is also subject the spreading loss phenomenon. However, the rate of reduction includes the type of terrain over which the noise passes in addition to the distance. Hard sites, such as developed areas with paving, reduce noise at a rate of 3 dBA per doubling of the distance while soft sites, such as undeveloped areas, open space, and vegetated areas reduce noise at a rate of 4.5 dBA per doubling of the distance. These represent the extremes and most areas will actually contain a combination of hard and soft elements with spreading loss noise reduction placed somewhere in between. The only way to determine the absolute amount of attenuation that an area provides is through field measurement under operating conditions with subsequent noise level measurements conducted at varying distances from a constant noise source.

Most environmental noise sources produce varying amounts of noise over time, so the measured sound levels also vary. For example, noise produced during an aircraft over flight will vary from relatively quiet background levels before the over flight to a maximum value when the aircraft passes overhead, then returning down to background levels as the aircraft leaves the observer's vicinity. Similarly, noise from traffic varies with the number and types of vehicles, speed and proximity to the observer.

Public Reaction to Noise

Because people react not only to their perception of individual noise events, but also to how many events there are, and what time of day or night they occur. Public reaction to transportation noise can be expressed as the percentage of the population which is "highly annoyed" by exposure to increasing Ldn values. The number of persons "highly annoyed" represents the upper 25-30 percent of all persons who are annoyed to some degree by the noise. Widespread complaints may be expected when the transportation noise level exceeds 65 dB Ldn and widespread threats of legal action may be expected when the transportation noise level exceeds 70 dB Ldn.

Noise Measurement Standards

Community noise is generally not a steady state and varies with time. Under conditions of non-steady state noise, some type of statistical metric is used to quantify noise exposure over a long period of time. The following standards are used to define noise levels:

- **Day/Night Noise Level (Ldn) -** The Ldn is a 24-hour, time-weighted annual average noise level, measured in decibels, with an added penalty for people's increased sensitivity to noise at night from 10 PM to 7 AM. The Environmental Protection Agency (EPA) identifies 45 Ldn indoors and 55 Ldn outdoors as the desirable maximum level of noise.
- **Equivalent Noise Level (Leq) -** The Leq is a measurement of sound energy over a specified time (usually 1 hour). Leq represents the amount of variable sound energy received by a receptor over a timed interval in a single numerical value. For example, a 1-hour Leq noise level measurement represents the average amount of acoustical energy that occurred in one hour.
- **Community Noise Equivalent Level (CNEL) -** The CNEL noise metric is based on 24 hours of measurement. CNEL also differs from Leq in that it applies a time-weighted factor designed to emphasize noise events that occur during the evening and nighttime hours (when quiet time and sleep disturbance is of particular concern). Noise occurring during the daytime period (7:00 AM to 7:00 PM) receives no penalty. Noise produced during the evening time period (7:00 PM to 10:00 PM) is penalized by 5 dBA, while nighttime noise (10:00 PM to 7:00 AM) is penalized by 10 dBA. The Ldn noise metric is similar to the CNEL metric except that the period from 7:00 PM to 10:00 PM receives no penalty. Both the CNEL and Ldn metrics yield approximately the same 24-hour value (within 1 dBA) with the CNEL being the more restrictive (i.e., higher) of the two.

Vibration

Vibration is a trembling, quivering, or oscillating motion of the earth. Like noise, vibration is transmitted in waves, but in this case through the earth or solid objects. Unlike noise, vibration is typically of a frequency that is "felt" rather than heard.

Vibration can be either natural as in the form of earthquakes, volcanic eruptions, sea waves, landslides, etc., or man-made as from explosions, the action of heavy machinery, or heavy vehicles such as trucks or trains. Both natural and man-made vibration may be continuous such as from operating machinery, or transient as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude is generally characterized in three ways: particle displacement, particle velocity, and particle acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity with respect to time and is measured in inches per second per second or millimeters per second per second. Typically, particle velocity and/or acceleration (measured in gravities) are used to describe vibration. Table 5.7-1 presents the human reaction and effect on buildings to various levels of vibration.

Table 5.7-1: Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (inches/second)	Human Reaction	Effect on Buildings
0.006 - 0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people.	Virtually no risk of “architectural” damage to normal buildings
0.20	Vibrations annoying to people in buildings.	Threshold at which there is a risk to “architectural” damage to normal dwelling - houses with plastered walls and ceilings
0.4 - 0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking by bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage
Source: Edenglen Noise Study, February 2005.		

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 Hz range and usually occur around 15 Hz. Traffic vibrations exhibit a similar range of frequencies. For example, due to their suspension systems, city buses often generate frequencies around 3 Hz at high vehicle speeds. It is more uncommon, but possible, to measure traffic frequencies above 30 Hz.

The way in which vibration is transmitted through the earth is called propagation. Propagation of earthborn vibrations is complicated and difficult to predict because of the endless variations in the soil and other sub-surface conditions through which waves travel. There are three main types of vibration: propagation, surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. Compression waves, or P-waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. Shear waves, or S-waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or "side-to-side and perpendicular to the direction of propagation."

As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level striking a given point is reduced with the distance from the energy source. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Regulatory Setting

To limit population exposure to physically and/or psychologically damaging, as well as intrusive noise levels, the federal government, the State of California, and local government have established standards and ordinances to control noise.

Federal Government

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the USEPA. Noise exposure of this type is dependent on work conditions and is addressed through a facility's Health and Safety Plan. As any site construction will be required to operate under an approved Health and Safety Plan, occupational noise is not applicable and therefore not addressed in this document.

The U.S. Department of Housing and Urban Development (HUD) has set a goal of 45 dBA Ldn as a desirable maximum interior standard for residential units developed under HUD funding. (This level is also generally accepted within the State of California.) While HUD does not specify acceptable exterior noise levels, standard construction of residential dwellings constructed under Title 24 standards typically provide in excess of 20 dBA of attenuation with the windows closed. Based on this premise, the exterior Ldn should not exceed 65 dBA.

State of California

The State Office of Noise Control has set acceptable noise limits for sensitive uses. Sensitive-type land uses, such as dwelling units and schools, are "normally acceptable" in exterior noise environments up to 65 dBA CNEL and "conditionally acceptable" in areas up to 70 dBA CNEL. A "conditionally acceptable" designation implies that new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use type is made and needed noise insulation features are incorporated in the design. By comparison, a "normally acceptable" designation indicates that standard construction can occur with no special noise reduction requirements.

Applicable interior standards for new multi-family dwellings are governed by Title 24 of the California Administrative Code. These standards require that acoustical studies be performed prior to construction in areas that exceed 60 dBA Ldn. Such studies are required to establish measures that will limit interior noise to no more than 45 dBA Ldn.

City of Ontario

The two applicable City standards that are related to noise are discussed below.

City of Ontario General Plan Noise Element Policies. The City Noise Element of the 1992 General Plan, which is directly referenced in the NMC General Plan, has identified 65 dB CNEL as the maximum acceptable noise level for noise sensitive uses such as residential and public institutions. The maximum acceptable noise level for recreational areas, livestock areas, and wildlife preserves is 70 dBA CNEL.

City of Ontario - Article 33: Section 9-1.3305. Noise. The following ordinance applies to property line noise level limits between two or more land uses and has been established to prevent the creation of noise on any particular property that may be perceived as noxious at another property.

Maximum permissible exterior sound levels by receiving land uses are:

- Noise standards for the various categories of land uses set forth in Table 5.7-2 shall, unless otherwise specified, apply to each property or portion of property in the community. Where two or more dissimilar land uses occur on a single property, the more restrictive noise standard shall apply;
- In the event of a dispute over the identification of a receiving land use, interpretation is to be made by the Zoning Administrator.
- No person shall operate or cause to be operated any source of sound or noise at any location within the city, or allow the creation of any noise on property owned, leased, occupied, or

otherwise controlled by such person, which causes the noise level to exceed the levels indicated on 5.7-2.

Table 5.7-2: Maximum Exterior Noise Levels (Property Line Standards)

Receiving Land Use Category	Noise Level (dBA)	
	10 PM-7 AM	7 AM-10 PM
Residential (except multiple family)	45	65
Multiple Family Residential and Mobile Home Parks	50	65
Commercial (All C Zones, including AP)	60	65
Light Industrial (M1, M2)	70	70
Heavy Industrial (M3)	70	70
Source: Edenglen Noise Study, February 2005.		

City of Ontario - Article 33: Section 9-1.3350. Hours of Operation. With the exception of office and security activities, any industrial production, processing, cleaning, testing, repairing, shipping or outdoor activities within 300 feet of a residential district shall be limited to the hours of 7 AM to 10 PM. The city Planner may approve additional hours when it can be found that such additional hours will not generate additional disturbance, or that mitigation measures will ensure compatibility with nearby residential areas.

Field Survey

Noise measurements were taken at the project site, on Thursday February 3, 2005 between 5 and 6 PM. Measurements were taken 10 feet from the edge of pavement of Mill Creek Avenue, Milliken Avenue, and Riverside Drive. Noise levels were 62.4 dBA $leq_{10\ min}$, 71.9 dBA $leq_{10\ min}$ and 70.4 dBA $leq_{10\ min}$ respectively. The dominant noise at these locations was vehicular traffic.

Noise measurements were taken using a Larson-Davis Laboratories Model 820 Type 1 sound level meter. Meter calibration was checked before and after use. The following parameters were used:

Filter ..... A-weighted
Response..... Slow
Time History Period ..... 5 seconds

5.7.3 - Thresholds of Significance

According to Appendix G of the State CEQA Guidelines, the proposed project is considered to have a significant noise-related impact if the proposed project would:

- 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;
- Exposure of persons to or generation of excessive groundbourne vibration or groundbourne noise levels;
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; and
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

5.7.4 - Project Impacts

Following is a discussion of the project impacts that correspond to the thresholds of significance previously identified in Section 5.7.3.

The proposed project would convert the existing agricultural uses on the project site to urban uses that would result in increased levels of noise associated with an urban environment and increased traffic generation.

Impacts Related to the Generation of Noise Levels in Excess of Standards

The project is bordered by Riverside Drive, Milliken Avenue, Mill Creek Avenue, and Chino Avenue. The Caltrans Sound32 model was utilized to estimate buildout traffic noise levels adjacent to each of these roadways. Table 5.7-3 presents distances to 65 and 70 dBA CNEL noise contours. The City of Ontario's outdoor noise level standard is 65 dBA CNEL and an interior noise level standard is 45 dBA CNEL. These standards may be exceeded if sensitive uses are developed within these noise contours.

Table 5.7-3: Potential Traffic Noise Impacts to the Project

Acoustically Significant Roadway	Classification	Buildout ADT[1]	Distance to 65 dBA CNEL Contour	Distance to 70 dBA CNEL Contour
Riverside Drive	Standard Arterial	34,000	405	150
Milliken Avenue	Major Arterial	62,000	640	256
Mill Creek Avenue	Collector	8,000	65	20
Chino Avenue	Collector	4,200	62	19

[1] Transportation Implementation Plan for the NMC, Meyer, Mohaddes Associates, Feb. 2001.
Source: Edenglen Noise Study, February 2005.

In addition to residential uses, the project proposes the development of commercial and light industrial land uses. The City will require the future developer of this the specific plan to evaluate any potential noise impacts that may be associated with any commercial or industrial land uses that may be proposed. Although particular users have not yet been identified for the commercial and commercial land uses, they will be restricted to "Community Commercial Uses" which are typically lower in intensity than larger retail and commercial areas. Typical noises that may be generated by commercial and light industrial land uses include alarm systems, truck deliveries, landscaping maintenance and interior cleaning devices and may include noise sources from light auto-repair activities or daycare centers.

Noise policies are presented in the City of Ontario General Plan Noise Element. The City of Ontario also has a Noise Ordinance. As discussed above under the previous thresholds, the project is consistent with or can be designed to be consistent with all of the City policies and ordinances.

Impacts Related to Excessive Groundborne Vibration

The proposed project would involve the construction and operation of residential dwelling units, community commercial uses, and light industrial/business park uses. Caltrans notes that excessive groundborne vibration is typically associated with such activities as pile driving or blasting, neither of which would be required during site construction. Only minimal groundborne vibrations would be created during site preparation and subsequent construction associated with project development. However, no excessive groundborne vibrations would be created by the operation of the proposed project. Therefore, project implementation would result in less than significant impacts associated with groundborne vibrations.

Impact Related to a Substantial Increase in Ambient Noise Levels

A noise source needs to be doubled to achieve a change of 3 dBA, a change which is considered to be barely audible. An audible increase is not considered to be a substantial change. Therefore, if project

traffic does not result in a doubling of existing traffic volumes on existing roadways that affected by the project, the project will not result in a substantial permanent increase in noise levels.

To verify the above findings further, existing and existing plus project traffic noise levels for the road segment most affected by project traffic was modeled to determine the project's greatest potential impact. A simple spreadsheet version and the SOUND32 computer model version of the Federal Highway Administration Noise Prediction Model (FHWA-RD-77-108) were utilized. This spreadsheet is a single roadway, single receptor, calculation of noise level for varying traffic volume, mix and speed, field of view, distance to receptor, and reflective or absorbent terrain.

Existing and existing plus project noise levels were estimated for Milliken Avenue, north of Riverside Avenue as this road segment will be most affected by project generated traffic. The proposed project will increase traffic levels on Milliken Avenue north of Riverside Drive by 58 percent during the PM peak hour. The existing peak hour volume on this road segment is 1,157. The project will increase this volume by 58 percent (674 trips) to 1,831 trips. Project generated traffic will cause a 2-decibel increase in existing noise levels at properties adjacent to Milliken Avenue north of Riverside Drive. This increase will not be significant. Therefore, the proposed project will not result in significant increases in the ambient noise level.

Impacts Related to Temporary or Periodic Increase in Noise Levels

Construction noise represents a short-term, temporary impact on ambient or existing noise levels. Noise generated by construction equipment, including trucks, graders, bulldozers concrete mixers and portable generators, can reach high levels for short periods of time. Worst case examples of construction noise at 50-feet from the noise source are shown in Table 5.7-4. Grading activities typically represent one of the highest potential sources of short tem construction related noise impacts. The most effective method of controlling construction noise is by implementing restrictions on construction hours.

Table 5.7-4: Noise Levels Generated by Typical Construction Equipment

Type of Equipment	Range of Sound Levels Measured (dBA at 50 feet)	Suggested Sound Levels for Analysis (dBA at 50 feet)
Pile Drivers, 12,000 to 18,000 ft-lb/blow	81 to 96	93
Rock Drills	83 to 99	96
Jack Hammers	75 to 85	82
Pneumatic Tools	78 to 88	85
Pumps	68 to 80	77
Dozers	85 to 90	88
Tractor	77 to 82	80
Front-End Loaders	86 to 90	88
Hydraulic Backhoe	81 to 90	86
Hydraulic Excavators	81 to 90	86
Graders	79 to 89	86
Air Compressors	76 to 86	86
Trucks	81 to 87	86
Source: Edenglen Noise Study, February 2005.		

Noise levels for equipment that might be used for the excavation and construction of the proposed specific plan are projected at a distance of 50-feet from the noise source. These noise levels decrease at a rate of 6 dBA per doubling of distance from the noise source. Therefore, at 100 feet, the noise levels will be about 6 dBA less than at 50-feet. The adjacent high school and existing homes adjacent to Riverside Drive may be impacted by construction noise.

Impacts Related to Airport Noise Levels

The project site is not located near the Ontario International Airport or the Chino Airport, and is not located within any airport comprehensive airport land use area. Therefore, no noise-related impacts related to aircraft or airport operations would result from implementation of the proposed project.

5.7.5 - Cumulative Impacts

The increased traffic volumes that would result from implementation of the proposed project in combination with other related projects would create additional noise levels that would likely require mitigation measures similar to the proposed project, or design features that require additional set-backs from roadways, or some combination of both. It is likely that development in the NMC would require participation in a fee program that makes fair share contributions to noise mitigation

programs. Cumulative impacts related to noise would be reduced below the level of significance with implementation of sound-reducing mitigation measures, design features, and fair share programs.

5.7.6 - Mitigation Measures

The Noise Section of the NMC Final EIR identified nine mitigation measures (N-1 through N-9) intended to reduce noise impacts. Mitigation Measures N-1 through N-4 required the preparation of an Acoustical Analysis Report prior to the issuance of a grading permit that would: 1) describe the cumulative effect of road noise on surrounding land uses and recommend mitigation measures, as necessary, to attenuate that noise; 2) describe in detail the interior and exterior noise levels on the project site and the specific design and mitigation features to ensure compliance with the City's noise criteria; 3) require the location and type of noise barriers to be located on the project site; and 4) identify those residential lots that may require mechanical ventilation to achieve compliance with the City's interior noise standards. Mitigation Measure N-5 required owners and occupants of residential units to be formally noticed prior to purchase or occupancy that certain interior spaces and outdoor spaces could be subject to noise levels in excess of City residential noise standards. Mitigation Measures N-6 through N-9 were related to mitigating noise impacts from short-term, construction-related activities, which included limiting and/or staging construction hours, noise-limiting equipment on construction vehicles, and determining locations for stockpiling construction supplies and staging locations for construction equipment.

Implementation of the NMC Final EIR mitigation measures and the following mitigation measures would reduce potentially significant impacts to a less than significant level.

N-1 Install an eight-foot backyard perimeter wall at the edge of the pad for project site homes that back up onto Riverside Drive and the northern half of Mill Creek Avenue.

N-2 Install double-paned windows and extra wall insulation in second story bedrooms of project site dwelling units that are adjacent to Riverside Drive and the northern portion of Mill Creek Avenue.

N-3 Prior to the issuance of a building permit, require an Acoustical Analysis Report to be submitted to the City of Ontario Planning Department that includes the following noise reduction information that adheres to the City of Ontario Noise Ordinance: a description of the interior and exterior noise levels for residential uses on the project site and specific design features and mitigation measures to document compliance with the established City of Ontario noise criteria; identification of the hours of construction in compliance with Section 9-1.3350 of the Ontario Municipal Code; a description of the location of the construction equipment and the distance between the equipment and the affected sensitive receptors; identification of temporary noise attenuation fences; a description of

the preferential location of construction equipment; and a description of the use of current noise suppression technology and equipment.

5.7.7 - Level of Significance After Mitigation

All of the mitigation measures require implementation prior to permit issuance. This eliminates the potential for construction-related activities to commence without the benefit of the recommended mitigation measures.

Mitigation Measures N-1 and N-2 would reduce the noise impacts from the increase in traffic resulting from the proposed project to proposed dwelling units located adjacent to Riverside Drive and Mill Creek Avenue.

Mitigation Measure N-3 would require the preparation of an Acoustical Analysis Report that would provide documentation that the project would comply with established City noise standards for short-term, construction-related activities on the entire project site and with interior and exterior noise levels for the residential component of the project.

With the implementation of the recommended mitigation measures, less than significant impacts related to noise impacts would result from implementation of the proposed project.