SBCN# :2011-11.01
DATE: 05/09/12
Requested by:
C. Liban

SYSTEMWIDE BASELINE
CHANGE NOTICE (SBCN)

DOCUMENT/TITLE/NUMBER/REVISION:

Metro Rail Design Criteria, Section 2, Environmental Considerations Rev 1

CHANGE IMPACT ASSESSMENT SUMMARY: (Attach written explanation of impacts identified)

SCHEDULE ISSUES?:	N	OTHER DOCUMENT REVISIONS REQUIRED?:			
ROM (RANGE):	**NO COST**	DESIGN ISSUES?:	N	COST RECOVERY POTENTIAL:	N
TIME IMPACT:	N/A	SAFETY ISSUES?:	N	OTHER CONTRACTS/PROJECTS?:	N/A
CAL DAYS	N/A	THIRD PARTY?:	N		

Related Request(s)-For-Change: **NONE**

JUSTIFICATION (including benefit or impact if not pursued):

Metro Rail Design Criteria, Section 2, Environmental Considerations Rev 1is being issued for inclusion in Contract C0988 Crenshaw/LAX Transit Corridor RFP. Formal review and approval process will follow. Any additional changes identifed will be processed in a subsequent revision, and issued through the SBCN and Addenda process.

Board adoption of new policies: Green Construction and Renewable Energy Policy.

LAWA and Port of Los Angeles staffs have been implementing clean construction requirements in their construction activities. Specifically to LAWA, they have indicated that the cost to implement these requirements in total, including the labor associated with contractor bid costs, an Independent Third Party Monitor, environmental management contractor staff, plus the cost for retrofitting the off-road construction vehicles with diesel emission control systems, is approximately 0.3% of the overall construction costs on one of their $150 million projects. In LAWA staff's opinion, the costs to do the same level of effort would conservatively be around 0.5% on a typical construction project.

PROJECTS/CONTRACTS AFFECTED: For new projects only

PROJ	CONTRACT	CN #	ACTION	STATUS	F
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TOTAL ESTIMATED CHANGE COST: (DIRECT)
TOTAL ESTIMATED CHANGE COST: (INDIRECT: POTENTIAL COST RECOVERY)
TOTAL ESTIMATED CHANGE COST: (INDIRECT+ DIRECT)

RECOMMENDATION AND APPROVAL SIGNATURES: (R = RECOMMEND, A = APPROVE)

RTG	APPROVAL	NAME/TITLE	SIGNATURE	DATE
R	DIRECTOR CONFIGURATION SYSTEMS	D. CURZON		
R	DIRECTOR PROJ. ENG. FACILITIES	A. DAVIDIAN		
R	DIRECTOR PROJ. ENG. SYSTEMS	M. RATNASINGHAM		
R	DIRECTOR QUALITY MANAGEMENT	W. MOORE		
R	EO, PROJECT ENGINEERING	S. MAYMAN		5/14/12
A	EXECUTIVE DIRECTOR PROJECT TRANSIT DELIVERY	K.N. MURTHY		
A	IMPACTED PROJECT MANAGER – N/A			

METRO RAIL DESIGN CRITERIA

SECTION 2

ENVIRONMENTAL CONSIDERATIONS

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ENVIRONMENTAL CONSIDERATIONS

2.1 INTRODUCTION

2.1.1 Objective

All Metro Rail Projects shall be designed to be for the unique environmental conditions of Los Angeles County. This section establishes criteria to minimize the level of adverse effects to the environment by Metro Rail Projects.

2.1.2 Scope

This section establishes the Environmental Criteria for all Metro Rail Projects during construction and operational phases.

2.1.3 Codes and Standards

All Metro Rail Projects shall comply with all local, state and federal codes, ordinances and regulations, and applicable Federal Transit Administration (FTA) and American Public Transit Association (APTA) guidelines. Each Metro Rail Project shall undergo an environmental review process, which, as applicable, will be documented in the Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR). The FEIS/FEIR will outline mitigation measures to be taken for each Metro Rail Project. All construction and operation mitigation measures stated in the FEIS/FEIR shall be monitored for compliance.

To the maximum extent possible, each Metro Rail Project shall also conform to the following Metro Policies:

1. Metro Environmental Policy

All Metro Rail Projects shall consider as a minimum the following strategies to demonstrate its commitment to planning and constructing our projects, operating and maintaining our facilities and vehicles, and procuring products and services consistent with State and Federal laws and regulations and in a manner that protects human health and the environment but not neglecting the efficient delivery of quality public transit services within our financial ability:

- Comply with all environmental, Federal, State, and local laws and regulations;
- Avoid environmental degradation by minimizing releases to air, water, and land;
- Prevent pollution and conserve resources by reducing waste, reusing materials, recycling, and preferentially procuring for environmentally-friendly products and materials;

- Ensure that the planning, design, construction, and operation of our facilities and services consider environmental protection and sustainable features; and

- Consider alternative energy solutions such as promoting and tapping renewable energy sources to address energy and environmental challenges.

2. Metro Demolition and Construction Debris Recycling and Reuse Policy

As it applies to this criteria, all Metro rail projects shall at a minimum:

- Give preference to recyclable and recycled products in the selection of construction materials to the maximum extent feasible during design and construction of Metro or Metro-funded capital projects. Selected materials used in the construction of all structures related to transportation projects should not adversely affect the performance, safety or the environment of the transportation system for which the material is used.

- Review all licenses and permits for landfills, recycling facilities, and similar entities that will be used for the disposal or diversion of any waste or construction and demolition debris. Metro will not use any landfill or recycling facility that does not present and maintain acceptable documentation indicating their legitimacy for disposal or diversion purposes.

3. Metro Sustainability and Energy Policy

As it applies to this criteria, all Metro rail projects shall at a minimum:

- Aggressively pursue renewable energy sources, take advantage of rebates and subsidies for energy and water conservation, wherever feasible, and implement energy conservation measures where they are feasible and fiscally prudent.

- Construct all new facilities and projects, including new transit corridor projects, using energy-efficiency and conservation strategies. For buildings or structures over 10,000 square feet, projects must be constructed to achieve Leadership in Energy and Environmental Design (LEED®) Silver certification, at minimum.

4. Metro Water Conservation and Use Policy

As it applies to this criteria, all Metro rail projects shall at a minimum:

- Develop a plan for dust suppression purposes during construction to comply with applicable environmental statutes, regulations, and guidelines. Use of potable water as a dust suppression agent should

always be secondary and should only be used if all other dust suppression technologies are not feasible or cost-effective.

- Use water conservation and efficiency guidelines outlined in applicable Leadership in Energy and Environmental Design (LEED®) reference books for all planning, procurement, design, construction, operations, and maintenance of our linear and non-linear facilities. Manuals of operation should be developed considering cost-effective and maintainable water efficiency and conservation technologies.

5. Metro Green Construction Policy

As it applies to this criteria, Metro shall require at a minimum:

- Use of on-road and off-road equipment and generators that conform to the latest air quality Federal, State, and local regulations governing these equipment. These equipment shall simultaneously conform to the requirements of Metro's Green Construction Policy. A copy of the policy can be accessed in (http://www.metro.net/projects_studies/sustainability/images/Green_Construction_Policy.pdf)

- Implement appropriate air quality Best Management Practices (BMP) outlined in the Green Construction policy to complement the use of required green equipment to ensure compliance with this policy.

Where the requirements stipulated in this document, or any referenced source, are in conflict, the more strict requirement shall govern.

Unless specifically noted otherwise herein, the latest edition of the code, regulation and standard that is applicable at the time the design is initiated shall be used. If a new edition or amendment to a code, regulation or standard is issued before the design is completed, the design shall conform to the new requirement(s) to the extent practical or required by the governmental agency enforcing the code, regulation or standard changed.

6. Metro Renewable Energy Policy

As it applies to this criteria, Metro shall require at a minimum:

- Evaluate and compare Renewable Energy technologies that are applicable, feasible, and practicable for use in the project using the following criteria:

  - Cost: Potential renewable energy applications shall be analyzed for cost competitiveness based upon the cost of constructing the project(s) or retrofitting existing facilities or equipment; their on-going short-term and long-term operation and maintenance; and their overall life-cycle expenses costs relative to the baseline cost of non-renewable energy to achieve the same functional objective. In existing facilities, energy efficiency retrofits and retro-commissioning shall be compared together

with renewable energy technology applications for combined life-cycle cost-effectiveness.

- Environmental Benefit: Renewable energy alternatives or low emissions high-efficiency energy applications, shall be analyzed for environmental benefits relative to the baseline utility electricity (or natural gas, for some solar water heat systems) based on greenhouse gas emissions that would be avoided, and as appropriate, environmental and public health and safety benefits.

- Land Use Efficiency: Renewable energy applications shall reflect efficient land use in terms of the area a renewable energy project or system occupies for each unit of power it can generate.

- Peak Shaving Benefit: The ability for renewable energy alternatives to offset peak non-renewable energy consumption shall be quantified.

- Hedging Benefit: Renewable energy alternatives shall have their ability to contribute to or enhance price and supply certainty to LACMTA quantified relative to baseline energy use.

- Local Content Use: Renewable energy applications shall utilize, where cost-effective and appropriate, equipment manufactured within Southern California.

Once a renewable energy technology is selected, the technology will be applied to capital assets and projects as follows:

- New Facilities and Transit Corridors and Projects: Selected renewable energy technology shall be considered in all new projects from the early development, design and procurement stages, where practicable and feasible. Where applicable, feasible, and practicable, the selected project level renewable energy technology shall be combined with energy efficiency technologies.

- Existing Facilities and Capital Assets: Energy efficiency retrofits and retro-commissioning shall precede renewable energy technology applications. Renewable energy technology considerations will only commence after energy use is optimized. The LACMTA recognizes that renewable energy applications may precede energy efficiency retrofits if upfront cost and life-cycle benefits of renewable energy applications significantly outweigh those of energy efficiency retrofits.

In both cases, selected renewable energy technologies shall be compared with baseline energy supply for life-cycle benefits and costs to determine whether to proceed with the renewable energy technology for the project.

Deployment of any renewable energy technology at any capital asset or project will be be to the maximum benefit of Metro and as cost-neutral as possible to the agency. Additional details are outlined in Metro's Energy Conservation and Management Plan:

(http://libraryarchives.metro.net/DB_Attachments/110930_ECMP.pdf)

Where the requirements stipulated in this document, or any referenced source, are in conflict, the more strict requirement shall govern.

Unless specifically noted otherwise herein, the latest edition of the code, regulation and standard that is applicable at the time the design is initiated shall be used. If a new edition or amendment to a code, regulation or standard is issued before the design is completed, the design shall conform to the new requirement(s) to the extent practical or required by the governmental agency enforcing the code, regulation or standard changed.

2.2 ENVIRONMENTAL CONDITIONS IN LOS ANGELES COUNTY

2.2.1 General

This subsection summarizes the criteria to be used for all Metro Rail Projects. Subsequent subsections specify the criteria in greater detail.

2.2.2 Climate

The greater Los Angeles area climate is considered to be mild in temperature and humidity, and is in a reverse wind area.

A. Ambient Temperature

Highest recorded:	112ºF (City of Los Angeles)
	119ºF (County of Los Angeles)
Yearly average:	45ºF to 84ºF (depending on the month)
Lowest recorded:	24ºF

Electrical systems shall be designed for normal operation within the ambient conditions in which the equipment is located, including failure of the mechanical ventilation equipment. Refer to MRT Design Criteria Section 9 Systems for additional criteria details.

B. Humidity

Minimum: 5%
Maximum: 100%

C. Precipitation

1. Design for protection against rainfall shall be based on 11" annual rainfall with a rate of 1" per hour. For subways, design shall be based on dripping water. Devices or equipment in subway segments shall be installed above level of walkway. (For specifics, see Subsection 2.3 for Design Criteria).

2. Equipment or components exposed to the weather shall be designed for or protected against:

- Falling rain
- Direct condensation
- Flooding
- Premature oxidation or deterioration of enclosures or components, especially due to acid rain (caused by the atmospheric pollutants). Coatings selected, whenever practical, shall be those with a proven service record in the Los Angeles basin.

D. Thunderstorm Conditions

1. Lightning protection of buildings or structures is not required since the project lies within a five-thunderstorm-days-per-year isokeraunic zone.

2. Open power supply lines and high voltage underground cables and communication lines shall be provided with properly coordinated lightning arresters.

E. Wind Velocity

Refer to MRT Design Criteria Section 5 for wind load.

2.2.3 Elevation

Equipment must be capable of operating without compromising performance at elevations in the range of sea level (datum) to 3,300 feet.

2.2.4 Floodplain

The area within which Metro plans to build the Metro Rail System has the potential for flooding by the Los Angeles River Basin, including the Sepulveda Basin, the Tujunga Wash, Santa Clara River and its associated creeks (Amargosa, Gavin Canyon, Towsley, Pico Canyon, DeWitt Canyon, Newhall, and Placerita Creeks), Ballona Creek, San Gabriel River, Rio Hondo and Arroyo Seco. Several of these drainage systems have been channelized by flood control projects. The potential Metro Rail alignments cross the Los Angeles River and several areas identified as flood hazard zones on the Flood Insurance Rate Maps of the Federal Emergency Management Agency's National Flood Insurance Program.

2.2.5 Geology

A. Soil

All pertinent soil data shall be as specified in the Geotechnical Baseline Report for the specific Metro Rail Project.

2.2.6 Air Quality

All facilities, equipment and components shall be capable of operating without detriment under ambient conditions with maximum recorded levels of pollutants. These levels can be found in the publication "California Air Quality Data" - South Coast Air Quality Management District (SCAQMD). Air pollutants produced by construction and operation of the system are subject to regulations by SCAQMD and the Air Resources Board (ARB). Criteria for “priority pollutants” are of particular concern as a group. Other extremely hazardous or hazardous air

pollutants are subject to federal, state and local regulations. Any identified air emissions from project construction or operations must be checked against air quality regulations to determine if the emission is regulated and what control measures may apply.

2.3 TRAFFIC AND TRANSPORTATION

The following are environmental mitigation criteria pertaining to traffic and transportation. For additional traffic criteria, see Section 3, Civil Criteria.

2.3.1 General Criteria

Metro, the City of Los Angeles, and the County of Los Angeles have recognized that there is a special relationship between transportation facilities and land use policies. They have initiated a cooperative planning effort that has produced an integrated policy entitled "Land Use/Transportation Policy." This policy was adopted by the Los Angeles Planning Commission and City Council in 1993. The Policy creates a framework to guide future development around transit stations and is expected to create a pedestrian oriented environment that will generate less vehicular traffic than usual.

Bus service at rail stations will be restructured to provide feeder service to Metro Rail Stations and eliminate bus/Metro Rail route duplications. Additional or revised traffic signals and TSM improvements will be implemented, as determined necessary in consultation with local jurisdictions.

2.3.2 Alignment Outside Downtown Areas

Along the alignment outside downtown areas, the following shall apply:

- All Metro Rail Heavy Rail Transit (HRT) Projects shall be grade separated.
- Streets shall be re-striped, widened and turn lanes added at various locations to improve cross traffic along major arterials when affected by Metro Rail Transit (LRT) Projects, if project land is available at these locations.
- Metro Rail Projects shall be grade-separated from main railroad lines to maintain rail operations where possible.
- Metro Rail will preempt traffic signals where possible. If not possible, then Metro will receive traffic signal priority.

The Metro Rail Projects may result in some increased traffic delay at grade crossings. To reduce this to an acceptable level, a coordinated traffic control system shall be developed between the LRT and arterial systems as a component of the LRT project.

2.3.3 Downtown Areas LRT Projects

Intersections shall be reconstructed at grade station locations to maintain through and turn lanes.

To the extent practicable vehicular traffic shall be preempted by LRT trains at intersections in the downtown area where this will help move maximum numbers of people. Park-and-ride service shall be encouraged with adequate circulation in lots, adequate feeder bus service, or parking regulations, ride share incentives, and discouragement of spillover parking by enforcement. To improve traffic, parking may be eliminated along high-traffic flow streets.

2.3.4 Haul Routes

Information on sources and amounts of fill material is not known at the time projects are planned. The amount of excavated or backfill material, which needs to be hauled to sites throughout the county, depends on the various activities taking place in the construction industry. The Construction Contractor will be responsible for hauling activities including obtaining haul route approvals from governing jurisdiction and following designated routes, especially on haul routes for contaminated materials or soil.

2.4 LAND USE AND DEVELOPMENT

Development that occurs in conjunction with the Metro Rail Projects may produce changes in land uses adjacent to stations, particularly residential neighborhoods. The primary measure of impact is the compatibility of development expected to occur in conjunction with the Metro Rail Project with the type and intensity of development permitted by local plans, and existing conditions. Land use studies should be completed for areas adjacent to rail stations. In these studies, the station's area of effect would be determined and the condition and types of use of the land would be evaluated. Potential redevelopment areas and parcels, which could be consolidated, would be identified. The studies would provide a summary of percentage of land uses existing in the station area, such as mixed use, office, or commercial, densities, and amount of land which could be redeveloped. Recommendations would be made regarding the area's development.

2.4.1 Collaboration

Collaboration is the primary method that Metro will use in development of the Metro Rail system with regard to the land use and urban design. Metro defines collaboration as the willingness of various parties to share their perspectives to identify and solve political, social, economic, engineering, architectural, and artistic challenges. This process involves free interaction among engineers, artists, architects, planners, code officials, administrators, and the public. In a successful collaboration, all participants remain open to each other, listen carefully, and challenge with sensitivity.

2.4.2 Project Goals

The basic goal of the Metro project is to provide Metro Rail users with the benefits of improved public transportation in a cost-effective, environmentally sensitive, attractive and socially responsible manner.

2.4.3 Urban Design Guidelines

A. Build safe, sustainable communities by integrating transit service into

existing or new neighborhoods and corridors.

B. Increase transit ridership by more effectively linking transit service with development.

C. Improve transit efficiency by integrating transit service and investments with infrastructure improvements and land development, and Transit Oriented Development (TOD).

D. Improve transit access for pedestrians and bicyclists by providing high quality spaces and infrastructure in collaboration with neighborhoods and local jurisdictions.

E. Conserve natural resources by developing patterns and communities that require less land for development and reduce demand for fossil fuels to meet energy needs.

F. The Metro system shall be designed, where possible and desirable, to stimulate urban development and redevelopment while avoiding drastic changes that disrupt the public commerce or social interaction. Positive changes such as street improvements shall be incorporated where there is opportunity to do so and where cost-sharing agreements can be made with the City. TOD and Joint Development of the transit right-of-way are recommended.

G. Displacement of buildings and public activity areas shall be minimized. Retail establishments shall be protected and mitigated from construction activities. Creation of physical barriers to land use functions and reduction in traffic circulation capacity shall be avoided to the extent it is practicable to do so.

H. The project shall be implemented in such a way as to maintain consistency with local community, the City and regional land use plans, insofar as possible. Exceptions shall be coordinated with the appropriate authority having jurisdiction.

I. The design shall consider the viewpoint of the user, the adjacent residential or business community, and the nearby pedestrian, motorist, or bicyclist. In this regard, the items of concern include: potential noise impacts and mitigative measures, historic preservation, visual intrusion, visual barriers, station access, continuity and transition of structures, separation of alignment, common system elements, and maintenance.

J. Historic properties whose physical and/or visual environments may be altered by the project are identified in the FEIS/FEIR as appropriate mitigation as described in the Record of Decision. During construction, standard practices shall be employed to minimize the impact on these properties. As much as possible, trucks and other equipment will be routed away from historic properties. With regard to operational impact, standard methods of physical protection and photographic record keeping may be necessary. Photographic record keeping, if required, will document the properties' environments before start up of rail operations. The California State Historic Preservation Office shall be consulted regarding the mitigation measures to be employed at each affected site.

K. The design shall minimize visual intrusion on public and private spaces. The system shall neither obscure scenic views nor exert undue shade influence on adjacent land uses. In addition, the design shall comply with the requirements presented in the FEIS/FEIR on environmental related issues.

L. Design of the Metro system shall be sensitive to the specific requirements pertinent to affected communities but consistent with the FEIS/FEIR mitigations.

M. Design quality of the Metro system shall be of the highest level and shall be context sensitive to adjacent areas but consistent with the FEIS/FEIR mitigations.

2.4.4 Transit Parkway Definitions

Guideway:

Bridges: Aerial guideway structures that include: the LRT or HRT trackway, walkways and systems facilities. Bridges may include center or side platform stations where aerial stations occur, stairs, elevators and escalators. A single or dual LRT or HRT trackway may be provided on the bridge structure. The trackway itself may include direct fixation, ballasted or embedded sections. Bridges include structures with columns, abutments, retaining walls or Mechanically Stabilized Earth (MSE) walls supporting the bridge structure. MSE walls used for the approach ramp to bridges may be landscaped or have other Transit Parkway Improvements. Bridges may also include long span bridge structures with abutments and no column or MSE wall support.

Street Restoration: Street Restoration includes all existing street conditions along the alignment of the Project to be restored or improved due to the construction of the LRT or HRT Transit Parkway. This element includes restoration and improvements to adjacent streets outside the Right-of-Way (ROW) and also includes restoration and improvement work within the ROW at crossings and other locations. Street Restoration may accompany the implementation of the following: roadway alignment and reconstruction, at-grade LRT or HRT guideway alignment, bikeway and bicycle facilities implementation, utility relocation, bridge construction and other grade separation construction, location of grade crossings and pedestrian crossing features, street connections to parking facilities, landscaping, and other transit parkway improvements. The landscape element must not interfere with the safe and efficient operation of any Metro Rail Line (including maintenance issues, such as proximity to Overhead Catenary System [OCS] for Light Rail).Station area definitions may be used to group and describe the scope of Street Restoration work.

Sound Barriers: Sound barriers are structures built as part of the Route alignment and Guideway of the Project to mitigate excessive noise. Sound barriers can be walls made of masonry, concrete, or approved equal. Sound barriers can be incorporated into Bridges as parapet walls for noise mitigation. Sound barriers can also be designed as part of landscaped berm treatments and other landscape treatments.

Station Types:

At-Grade Center Platform Station: This station type allows trains to arrive, load and unload passengers at the same platform simultaneously from two directions. This station is designed to expedite transfers between trains, if needed, and also facilitates redirecting passengers to single track operating trains from the same platform. These stations would require a larger station site area to accommodate the platform, trackway, and other station features in an existing location, compared to an at-grade side and split platforms station.

At-Grade Side Platform Station: This station type allows trains to arrive, load and unload passengers only from one side of the platform. A minimum of two platforms are required at a station location to accommodate train service in opposite directions using a double track alignment. There are two types of side platform stations: At-grade side opposing and at-grade side and split platform. At-grade side opposing stations would allow trains to arrive,

load and unload from opposite directions simultaneously, directly opposite each other. At-grade side and split platform stations allow for trains to arrive at platforms located typically on either side of a crossing. Side and split platforms would allow for vehicles to make a left turn at a crossing. An at-grade side opposing platform station may require a wider ROW to accommodate two platforms without changing the trackway alignment to accommodate the station. An at-grade side and split platform station requires the least ROW width to accommodate two platforms; however, it will require a longer station site area to accommodate a duplicate of all station features on both platforms.

Aerial Center Platform Station: This station type has platform features similar to an at-grade center platform station however; this station type is located on a bridge or aerial structure.

Standard Canopy Design: A standard canopy design concept will be featured as part of the proposed Project. The concept involves a systematic, uniform canopy design concept, featuring a few canopy concepts. Each canopy would feature weather protection to meet design criteria requirements with minimum maintenance and access from platform. One or more of these canopy concepts would be developed during Final Design.

Clean Mobility Center (CMC): Is a flexible and integrated multi-modal facility offering high quality amenities and transportation connections to and from activity centers anchored with a transit hub or station. The purpose of the CMC is to act as a gateway for arriving, transferring or departing customers by providing a menu of environmentally sustainable mobility options such as walking, bicycling, transit and car sharing, so that customers can reach their ultimate destination in a safe, easy, comfortable and predictable manner. A CMC is part of a transit hub or station area as they provide a symbiotic relationship to transit oriented land uses and serve to promote a more sustainable transportation system. A CMC can be provided as part of a Gateway Station Program and will include as a minimum:

- Illuminated information kiosks for local and regional trips, kiosks may be smart card activated. Include bicycle map and road rules for bicycling.
- Countdown pedestrian signals and enhanced crosswalk paving
- A drinking fountain
- Two restrooms/changing rooms with smart card electronic access
- Office/attendant space for bicycle and car sharing facilities
- Bicycle facilities for 48 bike racks in a self-enclosed room with restricted access, and 16 bicycles lockers with 24/7 access
- Bike rental, workshop and repair space
- Compressed air station for inflating bicycle tires
- 8 dedicated car sharing parking spaces for 5 car share and 3 car share parking stalls with electric vehicle charging

If a CMC is assigned to a Gateway Station, all bicycle facilities provided at the station will be part of the CMC.

Transit and Car Sharing Facilities: If provided, shall be consistent with existing industry accepted best practices for such infrastructures.

Transit Center: Transit Centers are bus transit facilities located at LRT or HRT stations. Transit Center facilities allow for the transfer of passengers from bus transit to another mode, facilitating circulation flow for bus vehicles and organize passenger movements in a comfortable, convenient manner. Transit Centers also provide information on transfers to LRT or HRT and to other buses using the Transit Center and the destination adjacent or

surrounding the station area, where the Transit Center is located. There are two types of Transit Centers: On-street or Off-street Transit Centers.

On-Street Transit Center: Serves a high level of bus activity including Metro Rapid, Metro Local, City, or Other Service Provider and community-based operations.

- On-street customer service is primarily on-street bus service layover facilities.
- Accessed by bus transfer, drop-off, walking and bicycle
- May include shared park-and-ride opportunities in some locations, and maybe taxi waiting areas
- May be located adjacent to transit-oriented retail and or mixed-use development
- Customer services and amenities may include: service identity, signage, service maps timetables, lighting, seating and phones, neighborhood area maps/information, Ticket vending machines, real-time service information, "Next Bus" display VMS, bicycle racks (part of Gateway and Neighborhood Station, CMC), sidewalk intersection paving improvements for pedestrian and American Disabilities Act (ADA) access and safety.

Off-Street Transit Center: Serves Metro Rail and/or the interface of two Metro Rapid lines along with Metro, Local, Municipal Operator, Other Service Provider and community based services; along with limited and express services where appropriate:

- May include a combination of on- and off-street customer service and bus service/layover, may include some operational support facilities;
- Accessed by full range of modes, rail, bus transfer, auto, drop-off, walking and bicycle;
- May include shared or transit-only park-and-ride facilities, taxi waiting zones, located adjacent to transit-oriented retail and or mixed-use development, may be integrated with on-site development.

Customer service and amenities may include:

- Service identity, signage, canopy, service maps/timetables, and a neighborhood area map/information;
- Ticket vending machines, lighting, seating, phones and bicycle racks and lockers;
- Sidewalk/intersection paving improvements, access and pedestrian safety features;
- Communication system, VMS to provide real-time travel, or delay information, CCTV cameras, security speaker telephones in case of an emergency, signage and graphics;
- Landscaping, Public Art and Other Transit Parkway Improvements.

Station Program Guidelines:
Two concepts may be used to express station program guidelines: Gateway Stations and Neighborhood Stations. Bicycle and Pedestrian Linkages should also be considered**.**

Gateway Stations: Are both origin and destinations in themselves and will be designed to balance both local and regional transit ridership. A Gateway Station serves as a landmark of entry or symbolic passage into a district or destination. It is characterized by being on main routes of destination or commerce with anticipated high boarding and transfers to connecting transit services. Most patrons will arrive at the Gateway Station to access a major educational, cultural, or institutional destination. Gateway Stations may also have a larger area for pedestrians and streetscape linkages within a station site and vicinity area. Gateway Stations would be visible to and from a major destination. Gateway Stations may present opportunities for use of air rights over the station and guideway for Transit Oriented Development. Any such development should be compatible with the surrounding community and station.

Neighborhood Stations: Are smaller scaled station types designed to bring transit patrons to and from their homes within the station vicinity. Neighborhood Stations are located in smaller neighborhoods along the alignment. Most patrons are anticipated to walk, bicycle or take a bus directly from their homes or apartments to a Neighborhood Station. Neighborhood serving uses may be located next to these stations. The architecture of the Neighborhood Station would be reduced in scale and would not appear as dramatic as that of a Gateway Station. Neighborhood Stations have a smaller station vicinity of streetscape features. As rail systems move from the central metropolitan core, it should be recognized that in order to attract larger numbers of patrons than in the immediate vicinity of the stations, adequate parking should be provided. CCTV coverage of parking lots should be included in the design.

Bicycle Linkages: Bicycle use can provide the short distance connection between origins and destinations. Bicycle linkages integrate on-street bicycle infrastructure with the transit. Improvements should include station design and bicycle parking. Examples of bicycle linkages are wide curb lanes, bicycle lanes or bicycle paths, directional signage, lighting, security, signal and crosswalk treatments.

Pedestrian Linkages: Pedestrian Linkages integrate the landscaping, public art and other transit parkway improvements together with station program guidelines to develop linkages from the station to the surrounding area within two station area zones: the station site area and station vicinity. Pedestrian linkages include streetscape improvements to station site areas across from the station platforms. These linkages may typically include and not be limited to street trees, information way-finding, kiosks, benches, lighting, sidewalk treatments and enhanced crosswalks. Typically include improvements to the sidewalk and street across and adjacent to the ROW. Pedestrian linkages may include additional ROW and opportunities for future enhancements at surrounding parcels or in the station influence area.

Station Area Definitions:

The Station Site: Is the land area centered on the station, extending approximately 200 to 300 feet from each station, and lying within the Metro owned ROW or on-street within a local jurisdiction. The Station Site may include additional ROW, to include parking or to reach a major cross-street, or it may include adjacent property which Metro is considering acquiring. The Station Site area would contain the best level of streetscape and station amenities. Station entrances would occur within this zone. Station entrances would be located away from direct visual access to residential areas. Station entrances would open onto arterial or local streets, using pedestrian medians and sidewalks as pedestrian linkages and buffers from the station entrance to the Station Site area. Station entrances for aerial stations located on bridges would be located away from direct visual access to residential areas. Drop-off areas would be located within this zone. It would be located near station entrances away from adjacent residential areas. The driveways to all parking facilities located within this zone will not face residential areas.

Station Vicinity: Is defined as adjacent land area which has a direct physical relationship with the station site. Typically, this adjacent area will extend perpendicular from the station site roughly one block, approximately 300 to 600 feet. The area of extension may reach out further at major cross-streets, and less where a wall or other barrier limits adjacent physical relationships. The key physical relationships are: 1) land use of adjacent buildings and property, 2) visual relationships with respect to massing, building height, shading, and sight

lines both for existing buildings and the station structure itself, and 3) circulation relationships with respect to paths for pedestrians, transit users, intermodal, bicyclists, and motorists. The Station Vicinity area would contain a less intensive level of streetscape amenities than the Station Site area. Station entrances would be located away from direct visual access to residential areas. Drop-off areas would be located near station entrances away from adjacent residential areas. Driveways to all Parking Facilities located within this zone may not face residential areas. Parking Facilities located within this zone will provide proper screening from adjacent uses.

Station Influence Area: Is defined as the land area within approximately a one-quarter mile radius from the station whose street pattern, land use, demographics, topography, transit service, and other factors may directly or indirectly influence the design of the station area.

2.5 LAND ACQUISITION AND DISPLACEMENT

Displacement deals with the removal of existing land uses for project right-of-way (ROW) requirements. The ROW is the composite of total requirements of all interests and uses or real property needed to construct, maintain, protect, and operate the transit system, including tunnels and land on either side of the tracks for street-level or aerial sections. Metro will either acquire the land or obtain easements from the owners. Parcels and easements selected for acquisition should be those that are the least expensive for the project, and most sensitive to Risk of Upset to the EIR/EIS. Parcels and easements should not have contaminated structures, soil or groundwater to remediate.

During construction and operation of Metro Rail, Metro would need to make different types of real property acquisitions. Full and partial acquisition of parcels would be necessary for ROW requirements, for stations and for equipment storage. Easements, which are interests in land owned by another that entitles its holder to a specific limited use, would be necessary for both construction and the underground alignment. Temporary construction easements would be necessary for construction sites and underground easements would be required for the alignment to pass under private property. Construction of the Metro Rail Projects would directly displace residents, homes, businesses, social services and public facilities. Indirect displacement because of development induced by the Metro Rail Project may also occur.

2.6 SAFETY AND SECURITY

Safety refers to the prevention of accidents to passengers and the general public resulting from such things as fires, faulty equipment, improper boarding and accidents between trains and automobiles or pedestrians. The safety record of rail rapid transit (measured in deaths per millions of passenger miles) is better than any other form of urban transportation. To ensure that the operation of the Metro Rail System will either equal or exceed the safety systems currently in operation, safety planning has been a primary focus of preliminary architectural design and site planning work.

All designs for Rail Transit Systems shall comply with 49 CFR Part 659 System Safety and Security. Metro has formulated policies and a system safety program plan as part of the Criteria: Safety, Fire/Life Safety, Security and Systems Assurance is basic to the program are safety procedures, training programs, accident reporting procedures, system hazard tests and fire/life safety requirements drawn from applicable local, state and federal codes. Specific guidelines cover safety features for stations, communications, passenger vehicles, automatic train control, electrification, central control, ways and structures, and personnel.

Security refers to the prevention of acts defined as unlawful, criminal or intended to bring harm to another or damage property. In a broader sense, it also means freedom from threats or uncertainty about the likelihood of such acts. Crime and anti-social behavior is a potential problem in any public environment because there is often uncertainty about who is responsible for supervising the space and how undesirable acts can be controlled.

By careful, systematic design and planning, experience in recently constructed rapid transit systems suggests that rail rapid transit facilities not only can make an improvement over what transit patron security has been, but can also help reduce crime risks in surrounding neighborhoods as well by creating new public space that is often frequented and informally surveyed. Careful planning and the presence of properly placed CCTV camera coverage, availability of E-Tel phones and the presence of Metro and transit law enforcement staff discourage criminal activity. It has been documented that public transit, while a reflection of the neighborhood that it travels through, is in fact safer than the surrounding area. Proper design can influence the perception of the transit public that the system is safe to use.

All at-grade LRT track way located on right-of-way with pedestrian access should have picket-type fencing, a minimum of 4' in height, which discourages ease of climbing. The fencing should be located in the middle of the two sets of tracks to discourage persons from crossing the ROW other than at designated crossings. The location of the fencing should allow for adequate clearance (minimum of 30") on either side, if an emergency walkway is present.

2.7 AESTHETICS/URBAN DESIGN

2.7.1 Guideways

Aerial guideway sections should be designed to be slim, not bulky, and visually attractive. As part of final design activities, guideway materials and surface textures shall be selected in accordance with generally accepted architectural principles in collaboration with project stakeholders, to achieve an effective integration between the guideway and its surrounding environment. Landscaping shall also be used, as appropriate, to achieve this integration.

2.7.2 Visual Clutter

When alignments are aerial or at-grade, the existing and proposed overhead power lines could result in visual clutter, in the context of the surrounding environment. In order to minimize this, such overhead lines shall be consolidated where feasible. Design should consider least interference from these elements consistent with safe and efficient Rail System Operations.

With specific regard to the visual treatment of aboveground traction power substations (TPSS), the following criteria shall apply. Landscaping shall be used to screen the TPSS from sensitive adjacent land uses, such as residential areas and, if possible, from the guideway. Lighting and security equipment shall be located so as not to be visible from adjacent sensitive land uses. The substations shall be designed to be architecturally compatible with their surroundings and blend into the urban or natural environment. A wall shall be constructed around the TPSS in sensitive areas, when necessary. Local ordinances for screening shall be followed. Where possible, every effort should

be made to integrate a TPSS into a larger structure in the central business districts.

2.7.3 Light and Glare

Lights used for construction and for operational lighting can illuminate adjacent properties in undesirable ways. Designs will follow the principle of keeping direct and reflected illumination or glare from the project from striking adjacent properties, where feasible. Design should consider least interference from these elements consistent with safe and efficient Rail System Operations.

Station plazas, parking lots, yard area and guideway lighting fixtures and standards shall incorporate directional shielding where needed, to avoid the intrusion of unwanted light and glare into adjacent sensitive land uses, such as residential.

2.7.4 Shade and Shadow

Aerial structures and other aboveground facilities can block views generated by existing vantage points and cast shade or shadows on adjacent land uses. Designs should consider adjusting building masses and placing them on parcel so that shade and shadow are minimized on adjacent parcels and viewscapes are not blocked. Design should consider least interference from these elements consistent with safe and efficient Rail System Operations.

2.8 NOISE AND VIBRATION

2.8.1 General Information

This section is intended to provide performance requirements for all noise and vibration control problems relating to the operation of the Light and Heavy Rail Transit system. The basic goals of this performance specification are to:

A. Provide transit system patrons with an acoustically comfortable environment by maintaining noise and vibration levels in vehicles along the way and in stations within acceptable limits.

B. Minimize the adverse impact of system operation and construction on the community by controlling transmission of noise and vibration to adjacent properties.

C. Provide reasonable and feasible noise and vibration control consistent with economic constraints.

D. Design a rail transit system that controls airborne noise from transit train operations, transit ancillary areas and facilities such as yard operations, vent and fan shafts of the ventilation system, electrical substations, and emergency service buildings. The design should also provide for any required control of ground-borne noise and vibration from the transit vehicle operations.

E. Provide a satisfactory and comfortable acoustical environment for patrons in station areas using sound-absorbing materials on under-platform areas, platform level walls and ceilings, and the ceilings and walls of concourse areas for control of noise and

reverberation in the station. Overall control of station noise also requires inclusion of maximum noise limits in equipment specifications.

2.8.2 Criteria for Wayside Noise

A. General

The objective of the noise analysis is to determine a wayside community noise impact criterion to provide a basis to determine whether noise mitigation measures will be required to avoid significant impact to the project community. The wayside noise criteria are related to the type of activities normally taking place within a building or the community as a whole. The noise criteria are also related to the existing levels of ambient noise in the community as measured at 50 feet from the noise source (i.e. rail facilities), per FTA criteria. For example, rail vehicle noise would be more objectionable in a quiet residential area at night than in a busy commercial area during the day.

The existing ambient noise levels in the community within 50 feet of the planned noise source, usually at rail facilities, including busway and ancillary, should be measured at representative locations within each of the affected community areas over a continuous 24-hour period for residential areas and over a 13-hour period for commercial or institutional areas where there is only daytime occupancy. The 24-hour measurement data is used to determine the day/night (L_{dn}) noise level. The projected change in the ambient L_{dn} with the transit system in operation will determine the extent of the noise impact and the potential need for noise mitigation. Measurements should include both mid-block and block end locations in the vicinity of sensitive receptors.

The FTA Guidelines define three levels of noise assessment: *Screening, General and Detailed*. A *Detailed Analysis* is required for the engineering phase of a transit project. The Mitigation Monitoring and Reporting Plan (MMRP) will provide the required noise mitigation measures applicable to the project. These are derived from the General Noise Assessment completed during the Environmental Impact Report and Environmental Impact Statement. Typically, one of the mitigation measures would require a detailed noise impact assessment be performed prior to the beginning of construction.

A *Detailed Analysis* requires specific information of the Project's operational parameters and the transit vehicle noise emission characteristics. Specific information of the existing wayside, ambient noise environment, and the sensitivity of all buildings and land uses along the alignment which would be adversely affected are required. Once this information is available, a *Detailed Analysis* of the noise impacts can be performed.

For operational noise impacts, a *Detailed Analysis* determines the projected change in ambient noise due to the operation of the transit system along a new alignment following the methodology specified in the FTA Guidelines. The projected changes in ambient noise due to transit operations are compared with the criteria contained in the FTA Guidelines for fixed-guideways.

B. Airborne Noise from Rail Operations

The FTA “noise impact criteria are defined by two curves which allow increasing project noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone.” The two curves from the FTA Guidelines (Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006) are replicated herein in Figures 2-1 and 2-2. The two curves define three degrees of impact: *No Impact*, *Impact,* and *Severe Impact*. The three degrees of noise impact can also be presented in terms of the noise level increase as specified in the FTA Guidelines, and replicated herein in Figure 2-2 (ibid., Table 3-2, page 3-5).

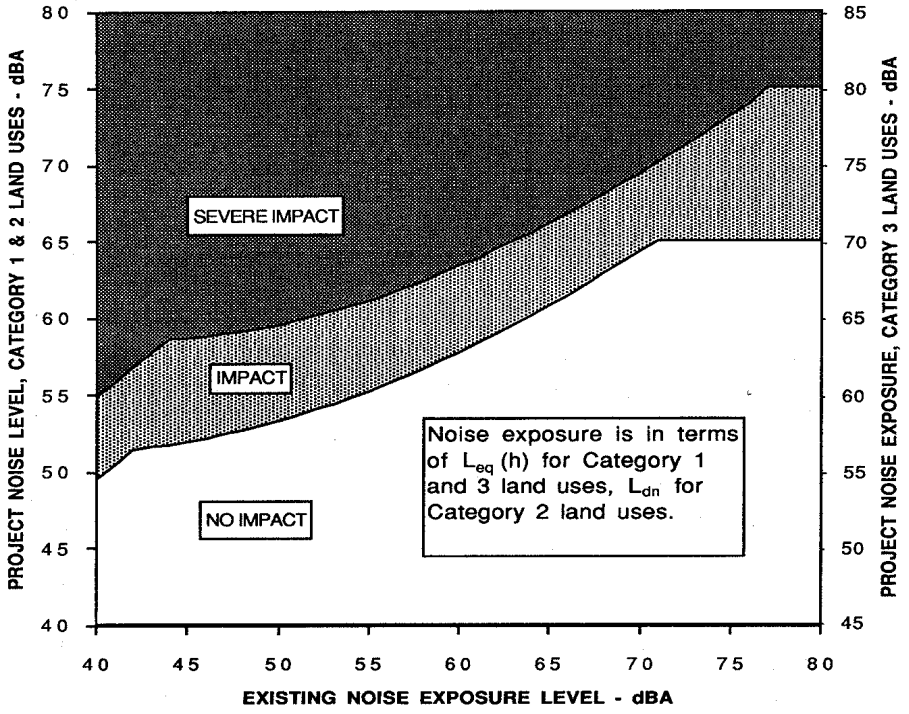
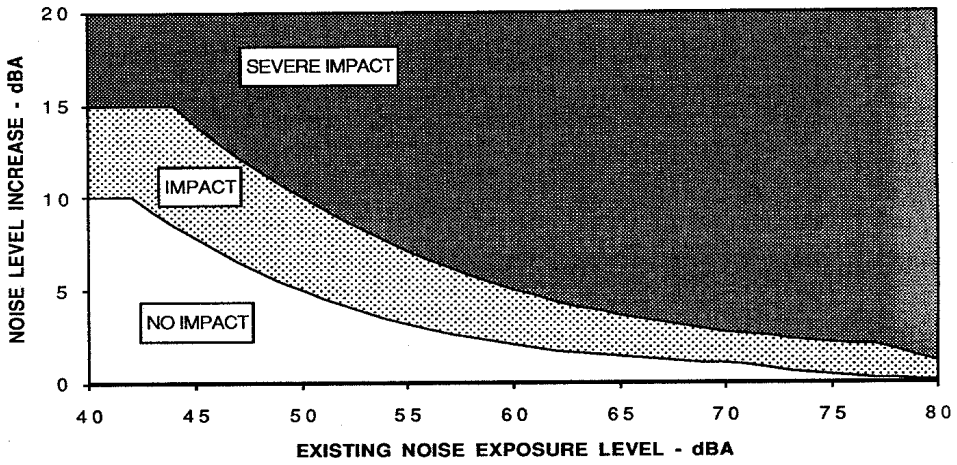


Figure 2-1 Noise Impacts Criteria for Transit Projects



Noise exposure is in terms of L_{eq} (h) for Category 1 land uses, L_{dn} for Category 2 land uses.

Figure 2-2 Increase in Cumulative Noise Levels Allowed by Criteria (Land Use Cat. 1 & 2)

The existing ambient noise environment and the Project noise are characterized by noise metrics which are based on noise exposure over a specific period of time. For residences and other buildings where people normally sleep, the noise metric is the day-night level or L_{dn}. The L_{dn} is a 24 hour noise level average with nighttime noise levels penalized by adding 10 decibels to the ambient noise level between the hours of 10 p.m. and 7 a.m. For other land uses, the hourly average noise level $L_{eq}(h)$ is the noise metric to be used. The $L_{eq}(h)$ to be used is for the noisiest hour of transit-related activity during hours of noise sensitivity.

The FTA Guidelines specify which noise metric to use for different land use categories. This is specified in the FTA Guidelines (ibid.), and replicated in Table 2-1 herein (ibid., Table 3-2, page 3-5). All noise impact assessment is to be performed with respect to outdoor areas where there are noise sensitive land uses.

Table 2-1 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	**Description of Land Use Category**
1	Outdoor L_{eq} (h)*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance
3	Outdoor L_{eq} (h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks and recreational facilities are also included.
* L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.		

The noise impact criteria for transit operations are summarized in Table 2-2 for the different land use categories. The first column shows the existing noise exposure, and the remaining columns show how much additional noise exposure from the transit project is necessary to cause either a moderate or severe impact. The future noise exposure would be the combination of the existing noise exposure and the

additional noise exposure caused by the transit project. As the existing noise exposure increases, the amount of allowable increase in the noise exposure created by the project decreases. Future project noise levels that exceed the “severe impact” criteria will require noise mitigation.

At those land uses or noise sensitive sites, not considered during the environmental review process, where existing ambient noise levels have not been measured, performance requirements for a single train passby may be used. Table 2-3 presents performance requirements for single passby maximum noise levels for airborne noise from transit trains for typical community areas, and Table 2-4 for specific types of buildings. These criteria are generally applicable at the nearside of the nearest dwelling or occupied building under consideration or at 50 ft. from the track centerline, whichever is closer.

TABLE 2-2
WAYSIDE NOISE IMPACT CRITERIA

Existing Noise Exposure L_{eq} or L_{dn} [1]	Project Noise Exposure Impact Thresholds, Ldn. or L_{eq} [1] (all noise levels in dBA)	
	Category 1 or 2 Sites	**Category 3 Sites**
	Impact	Impact
<43	Amb.+15	Amb.+20
43-44	<58	<63
45	<58	<63
46-47	<59	<64
48	<59	<64
49-50	<59	<64
51	<60	<65
52-53	<60	<65
54	<61	<66
55	<61	<66
56	<62	<67
57-58	<62	<67
59-60	<63	<68
61-62	<64	<69
63	<65	<70
64	<65	<70
65	<66	<71
66	<67	<72
67	<67	<72
68	<68	<73
69	<69	<74
70	<69	<74
71	<70	<75
72-73	<71	<76
74	<72	<77
75	<73	<78
76-77	<74	<79
>77	<75	<80

[1] L_{dn} is used for land uses where nighttime sensitivity is a factor; Daytime L_{eq} is used for land use involving only daytime activities.

Category Definitions:
Category 1: Buildings or parks where quiet is an essential element of their purpose.
Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals and hotels where nighttime sensitivity is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches, parks, certain historical sites and recreational facilities.
Source: Transit Noise and Vibration Impact Assessment, FTA, April 1995.

TABLE 2-3
CRITERIA FOR MAXIMUM AIRBORNE NOISE FROM TRAIN OPERATIONS

	Maximum Passby Noise Level (dBA)		
Community Area	Single Family Dwellings	Multi-Family	Commercial Buildings
Low Density Residential	70	75	80
Average Residential	75	75	80
High Density Residential	75	80	85
Commercial	80	80	85
Industrial/Highway	80	80	85

For some types of buildings or occupancies, maximum noise level limits should be applied regardless of the community area. The design should reflect careful consideration of noise control when the transit line is near auditoriums, TV recording studios, schools, day care centers, theaters, amphitheaters, and churches. Table 2-4 lists performance requirements for maximum airborne noise from "train" operations near specific types of buildings.

TABLE 2-4
CRITERIA FOR MAXIMUM AIRBORNE NOISE FROM "TRAIN" OPERATIONS NEAR SPECIFIC TYPES OF BUILDINGS

Building or Occupancy Type	Maximum Passby Noise Level (dBA)
Amphitheaters	65
"Quiet" Outdoor Recreation Areas	70
Concert Halls, Radio and TV Studios	70
Churches, Theaters, Schools, Hospitals, Museums, Libraries	75

2.8.3 Noise Mitigation Measures

Metro requires that feasible and practical noise reduction measures be considered to mitigate a severe noise impact at a sensitive area or land use. Feasible noise reduction measures that may be considered to mitigate an above-ground LRT or HRT noise impact are the installation of noise barriers within or outside the transit right-of-way.

Metro requires that outdoor living areas be mitigated a minimum of 5 dBA or more for the noise barriers to be considered to be acoustically effective. Noise barriers providing less than 5 dBA reduction will not be considered a reasonable mitigation measure.

Additional guidelines to be considered in evaluating the feasibility of a noise barrier as a mitigating measure are:

- The number of dwelling units benefited should be large enough such that the barrier cost per receptor makes the barrier reasonable;
- The structural design of the barrier should be feasible;
- The acceptance of a noise barrier and its aesthetic impacts will reflect the opinion of impacted residents and neighboring groups.

At locations where the use of noise barriers is not considered feasible or cost effective, sound insulation of indoor living areas will be considered for payment by Metro. Sound insulation measures will consist of improving the sound attenuation of the exterior wall construction of sleeping and living spaces to achieve an interior noise level criteria of L_{dn} = 45 dBA through any or all of the following measures: replacement windows, adding storm windows to existing windows, adding insulation to the exterior walls, and caulking and gasketing existing doors and windows. These measures are effective if the sleeping and living spaces have an air-conditioning or forced-air ventilation system, which allows occupants to keep doors and windows closed. If such a system does not exist, then the sound insulation measures provided would include such a system for the sleeping and living spaces affected.

2.8.4 Ground-Borne Noise and Vibration Criteria

A. General

Ground-borne noise and vibration are exactly the same phenomena, up to the point of perception at the dwelling. Ground-borne vibration describes waves in the ground, which can be measured using vibration pickups mounted on side-walks, foundations, basement walls, or stakes in the ground and which can be perceived as mechanical motion. Ground-borne noise describes sound generated when the same waves in the ground reach room surfaces in the buildings, causing them to vibrate and radiate sound waves into the room.

B. Ground-Borne Noise from Train Operations

Table 2-5 presents the criteria for maximum ground-borne noise due to transit train operations for different category of land uses. As with airborne noise, there are some types of buildings for which specific performance requirement should be applied, regardless of area category. Table 2-6 presents performance requirements for generally acceptable levels of transient ground-borne noise levels in occupied spaces of various types of buildings and rooms. This table is intended to be a general guide.

C. Ground-Borne Vibration from Train Operations

Table 2-5 presents the criteria for maximum ground vibration for different category of land uses. The criteria apply to measurements of vertical vibration of floor surfaces within the buildings.

As with ground-borne noise, there are some types of buildings for which specific performance requirement for ground-borne vibration should be applied, regardless of area category. Table 2-6 presents performance requirements for ground-borne vibration levels in occupied spaces of various types of buildings and rooms. This table is intended to be a general guide. Any other structures would be evaluated on a site-specific basis.

Ground-borne vibration meeting the performance requirements listed in Tables 2-5 and 2-6 will not be imperceptible in all cases; however, the level will be sufficiently

low such that no significant intrusion or annoyance should occur. In most cases, there will be vibration from street traffic, other occupants of a building, or other sources that will create intrusion that is equal to or greater in level than the vibration from the transit trains.

Table 2-5
Maximum Ground-Borne Noise and Vibration Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re: 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re: 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65VdB[3]	65VdB[3]	[4]	[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:
[1] "Frequent Events" is defined as more than 70 vibration events per day.
[2] "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
[3] This criterion is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC system and stiffened floors.
[4] Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: FTA Guidance Manual for Transit Noise and Vibration Impact Assessment, 2006.

(End Table 2-5)

Table 2-6
Maximum Ground-Borne Noise and Vibration Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re: 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re: 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Concert Halls, TV Recording Studios, Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditorium	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Notes:
[1] "Frequent Events" is defined as more than 70 vibration events per day.
[2] "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.

Source: FTA Guidance Manual for Transit Noise and Vibration Impact Assessment, 2006.

2.8.5 Noise and Reverberation Time Control in Stations

A. Purpose

The purpose is to define criteria which will result in a desirable acoustical environment in and around stations throughout the Metro Rail System. The following objectives apply to transit stations:

- Control and reduction of noise from transit vehicle operations;
- Maximize the speech intelligibility from Public Address (PA) system announcements;
- Control of noise generated by patrons and/or exterior sources;
- Control of noise from station air handling equipment, vertical circulation equipment and any other station mechanical equipment;
- Control noise levels to permit emergency communications.

Table 2-7 summarizes the criteria for reverberation time and acoustic treatment of the various enclosed or partially enclosed areas of stations.

TABLE 2-7

SUMMARY OF STATION ACOUSTIC PERFORMANCE REQUIREMENTS (Applicable to enclosed or partially enclosed station or public areas)

	Maximum Reverberation Time at 500 Hz	Maximum Mechanical Equipment Noise[1]	Underplatform Sound Treatment (Coefficient of Sound Absorption)
Areas Exposed to Street Traffic	1.2 to 1.4 seconds	N/A	N/A
Concourse/Mezzanine Areas	1.2 seconds	55 dBA	N/A
Train Rooms	1.5 seconds	55 dBA	0.6 at 250 Hz 0.75 at 500 Hz
[1] APTA Noise and Vibration Guidelines, 1979			

The noise levels inside stations are dependent on the design of the transit cars and station mechanical equipment and on the acoustic treatment in stations. The criteria and designs for the acoustic treatment take into account the general architectural characteristics expected and the noise to be radiated by the transit cars and other noise sources. Table 2-8 defines the noise limits for trains entering and leaving the station and air handling equipment.

For at-grade or aerial stations, the goal is to achieve a noise level of L_{eq}= 75 dBA or lower at the station platform from any exterior noise sources. The existing ambient noise levels at individual station locations should be measured during the noisiest traffic periods as part of the EIR/EIS process to determine if the one-hour peak noise level is higher than an L_{eq}= 75 dBA. Noise levels higher than 75 dBA from nearby freeways or street traffic are of concern because of the potential interference with speech intelligibility of public address announcements, speech communication between riders, and phone communications. Achieving the goal of 75 dBA at the station platform through feasible and reasonable mitigation measures will depend on the existing noise level and the extent to which it exceeds 75 dBA. At those locations that exceed the 75 dBA goal, an analysis should be prepared to determine the feasibility of controlling these levels at the station platform using such measures as: (1) noise barriers between the platform and roadway; (2) pedestrian shelters for outdoor waiting areas; (3) sound absorptive treatment of the underside of station canopies or bridge structures spanning the station platform; and (4) relocation of station platform or entrance locations.

If achieving the goal of 75 dBA or lower at the station platform is not found to be feasible or reasonable, then alternate safety measures will be required to ensure that, under emergency conditions, public address announcements are communicated to and understood by all riders and emergency phone communication is possible from the station platform area. These measures would include the use of communication equipment designed for operation in a high noise level environment such as variable message sign (VMS) boards, emergency flashers and warning signals, and special phone equipment with amplified hand sets or acoustical enclosures.

TABLE 2-8
MAXIMUM NOISE LEVELS IN STATIONS

Noise Location	L_{max}, (dBA)
On platform, trains entering and leaving - ballast and tie track	75-80
On platform, trains entering and leaving - concrete track bed	80-85
On platform, trains stationary	78
On platform or other public areas, noise from any ancillary mechanical or vertical circulation equipment, including tunnel ventilation system and/or under-platform exhaust operating at any normal condition	55
On platform or other public areas with tunnel or station ventilation system operating in emergency status	70
In station attendant's booths or offices due to ventilation system and booth equipment	50

Note: Noise on platform to be measured at center of Platform

2.8.6 Noise Control in Stations

A. Ancillary Areas

Spaces for noisy ancillary equipment shall be located away from public spaces. Noisy ancillary spaces opening directly to public spaces shall have sound-rated or double-entrance doors. Acoustical treatment for each area listed below depends on location, type of noise, and occupancy. The areas to be considered are as follows:

- Fan rooms
- Pump rooms
- Mechanical equipment rooms

Fan rooms, Pump rooms, and Mechanical equipment rooms housing fans, pumps, and other equipment which generate high sound levels shall have a ceiling sound absorption treatment with a minimum NRC of 0.65.

B. Vertical Circulation Equipment

For all normal operating conditions for escalators and elevators located in public areas, the source noise level at 3 feet from the equipment shall not exceed 55 dBA for steady-state noise, and transient noise shall not exceed 60 dBA as measured using the fast meter response.

Escalators. Noise produced by escalators operating individually in either direction under no load and maximum load in the station environment shall not exceed 55 dBA 5 feet above the tread at the entrance combs at both ends of the escalator.

Elevators. Steady-state noise produced by elevators or associated equipment shall not exceed 55 dBA in public spaces 3 feet or more from the elevator or associated equipment or within the elevator cab at any location 5 feet above the floor and 1 or more feet from any wall. Transient noise produced by elevators or associated equipment, not including entrance door operations, shall not exceed 60 dBA (using the fast meter response) in public spaces 3 feet or more from the elevator or associated equipment or within the elevator cab at any location 5 feet above the floor and 1 or more feet from any wall. Transient noise produced by the operation of the elevator door shall not exceed 65 dBA (using the fast meter response) 3 feet or more from the elevator door inside or outside the elevator cab.

C. Ventilating Equipment

Fan and Equipment Rooms. Spaces for fans and other potentially noisy equipment shall be separated from public areas insofar as possible. If direct access into such rooms from public areas cannot be avoided, sound-rated doors necessary to achieve the noise levels specified in Table 2-9 shall be provided. Sound transmission through other openings shall be controlled by appropriate means such as acoustically lined ducts or shafts. Where acoustical absorption treatment is necessary in order to reduce the noise transmitted into the public areas of the station through shafts or from fan rooms, the treatment shall have minimum sound absorption coefficients of 0.6 at 250 Hz and 0.8 at 500 Hz.

Fan Equipment. Fans shall have certified sound power levels measured in accordance with the AMCA test code (Ref. 2). The fan sound power levels shall not exceed those shown on the drawings or listed in the fan procurement documents.

Vibration Isolation. Because of the nature of station and other transit facility structures, it may not be necessary to provide neoprene or spring-type vibration isolators for fans and other equipment in the same manner as is provided in office or other general purpose buildings. Station structures are of heavy concrete construction and the fans and related equipment are generally separated from public areas. However, as a minimum, simple neoprene support pads are required between the concrete mounting surface and the machine or device.

Except as noted below, in substation structures and in any separate mechanical equipment or plant structures, vibration isolation consisting only of standard neoprene or rubber pads shall be provided between the mounting feet or bracket and the support surface for the following items:

- Fans,
- Pumps,
- Emergency generators,
- Elevator motors, motor generators, d.c. power converters and hydraulic power units,
- Electrical equipment containing reactors or choppers (excluding traction power transformers and rectifiers).

Except for hydraulic elevator power units, flexible connectors should be provided in pipes and ducts only as necessary to prevent stress or load concentration or to provide for alignment tolerance. Each hydraulic elevator power unit output line shall have a muffler in the line and two flexible connectors located at right angles to each other and separated by at least 4 feet of line. The connectors can be located on each side or the same side of the muffler, but they should be close to the hydraulic power unit.

In any location where fans are placed in a room that is located directly above a public area, spring isolators shall be provided for support of the fan, and flexible connectors shall be used for connections of the fan to duct work. The static deflection for such spring isolators should be appropriate for intended application. Rubber pads of 1/2-inch thickness should be provided between the spring foot and the support surface. In all cases where anchor bolts pass through the rubber support pads, a neoprene sleeve and washer shall be used to separate the anchor bolt shank and head (or nut) from the machine support foot or bracket.

2.8.7 Airborne Noise from Transit Ancillary Facilities

A. Introduction

There are sources of community noise from a transit system other than train operations. The two basic types of airborne noise from ancillary facilities are transient and continuous. For example, transient noise occurs during train passbys, and is transmitted from vent shaft openings. Power substations and fan noise may be characterized as continuous ancillary equipment noise. These noises can be obtrusive, due to their tonal and continuous nature. The appropriate noise level design criterion depends on the activities of occupants as well as the background noise in the area. The acceptable levels of transient and continuous noises are different. Transient noises are acceptable at higher levels than continuous noises, particularly continuous noises containing pure tones.

The ambient noise level of the area in which the ancillary equipment is located should be measured to determine the performance requirements for ancillary facilities. Existing ambient noise levels should be measured for the hours of the day when the maximum noise impact is expected, such as nighttime hours for residential areas. The ancillary facilities will be designed to achieve operating noise levels based on Section 2.8.2, Criteria for Wayside Noise, and Table 2-2, Wayside Noise Impact Criteria to avoid any “severe impact”. When existing ambient noise levels are not available, the design goals presented in Table 2-9 for typical community areas should be used.

TABLE 2-9
PERFORMANCE REQUIREMENTS FOR NOISE FROM TRANSIT SYSTEM ANCILLARY FACILITIES

	Maximum Noise Level. dBA	
Community Area	Transient	Continuous
Low Density Residential	50	40
Average Residential	55	45
High Density Residential	60	50
Commercial	65	55
Industrial/Highway	75	65

The criteria in Table 2-9 shall be applied at a distance of 50 feet from the shaft outlet or other ancillary facility or shall be applied at the setback line of the nearest building or occupied area, whichever is closer.

As stated previously, transient noise design goals apply to short time duration events such as train passby noise transmitted from vent shaft openings. Continuous noise design goals apply to noises such as fans, cooling towers or other long-duration noises except electrical transformer hum. The design goals for transformer noise, or other sources with tonal components, should be 5 dBA less than the ambient noise levels or 5 dBA less than the levels in Table 2-9.

B. Fan and Vent Shafts

For fan and vent shafts with surface gratings or openings, the noise shall be limited in accordance with the criteria for exterior noise from ancillary facilities. Vent shaft noise reductions shall be achieved by absorption treatment in the shafts applied to the walls and ceilings. Fan shaft noise reduction shall be achieved by use of standard duct attenuators and absorption treatment applied to the fan room and shaft walls and ceilings, with the combination to achieve the total attenuation required. Where absorption treatment is necessary, the treatment shall have a minimum sound absorption coefficient of 0.6 at 250 Hz and 0.8 at 500 Hz.

C. Substations

The cumulative substation noise, due to all sources, shall be limited to 5 dBA less than the ambient noise levels, or 5 dBA less than the levels listed for continuous noise in Table 2-9. Reduction of noise from these sources shall be achieved by barriers, enclosures, sound absorption materials and sound attenuators - as applicable to the individual facility or unit design.

D. Emergency Power Generation Equipment

Emergency power generator equipment noise shall be noise tested following installation during the time of day when existing ambient noise is at its maximum level. Periodic equipment testing shall be limited to a maximum period of ten (10) minutes once a week or less. Per design criteria, the emergency power generator

equipment shall be limited to no more than 10 dBA sound level above the ambient noise levels or 10 dBA more than the levels listed for continuous noise in Table 2-9 at a distance of 50 feet from the generator or at the nearest building or occupied area, whichever is closer. Reduction of noise from these sources shall be achieved by barriers, enclosures, sound absorption materials and mufflers - as applicable to the individual facility or unit design.

E. Shop Equipment Noise

To avoid excessive noise exposure for employees and to comply with existing and proposed standards and requirements of the Occupational Safety and Health Administration, shop equipment noise shall not exceed 85 dBA at operator stations and shall not exceed 90 dBA at any point 3 ft from the equipment.

2.8.8 Vibration Isolation of Transit Structures

A. Scope

Vibration isolation shall be provided at any point where an underground structure, aerial structure column, aerial structure girder or other structure is in direct contact with, supported on, or supporting a building structure, or at any point where an underground structure, station structure or other transit structure is in very close proximity or directly against a building structure or building foundation element.

B. General Considerations

Vibration isolation in the form of a resilient element shall be provided between the transit structure elements and building structure elements to prevent direct transmission of noise and vibration to buildings.

C. Isolation Elements

For underground transit structures near or at buildings, the resilient element between the two structures shall consist of intervening soil of at least 2 feet thickness or depth, or shall be an elastomer pad between the underground structure and building. The elastomer pad shall be a 1-inch or 2-inch thick closed-cell expanded neoprene, selected to give proper support of hydraulic or structural loads with deflection of the elastomer pad not exceeding 10 percent to 20 percent of pad thickness.

For aerial structure columns or girders, the transit structures should be separately founded from buildings, and resilient bearing pads or elastomer separation elements provided between the transit structures and the building. There shall be no rigid connection between the building elements and the transit structure elements.

2.9 AIR QUALITY

The Metro Rail Projects are located within the South Coast Air Basin. It is an area of high air pollution potential, particularly from June through September. The poor ventilation afforded by the generally light winds and shallow vertical mix of air in the area frequently

keep emissions from being diluted. Added to this is the plentiful sunshine, whose energy converts emissions of the priority pollutants into ozone, photochemical aerosol and other secondary products. The project must comply with air quality regulations, such as the state and federal Clean Air Act and Amendments, and those of the South Coast Air Quality Management District. Refer to current federal, state and local regulation.

2.10 ENERGY

Energy is needed for the construction of rail guideways and for the construction and operation of fleet and rail vehicles. Energy requirements for a project's rail components: propulsion, maintenance, and station operation, would be supplied by the Los Angeles Department of Water and Power, Pasadena Water and Power, and the Southern California Edison Company. The required amount of energy needed will differ based on design alternative selected. Environmental documents for each project will analyze the specific energy requirements of design alternatives and the mitigation measures that may be appropriate. The following are environmental/sustainable energy elements that should be considered for incorporation into a project. All are pursuant to AB118: Alternative and Renewable Fuel and Vehicle Technology Program, AB 32: California Global Warming Solutions Act of 2006, and SB375: Redesigning Communities to Reduce Greenhouse Gases, and their amendments.

2.10.1 Project Planning and Design

To the maximum extent feasible:

- Prepare and implement a comprehensive resource management plan for the integrated consideration of energy resources with the goal of identifying, evaluating, and optimizing its use for the project.
- Incorporate sustainable design measures to maximize the project's efficient use of energy.

2.10.2 Energy Efficient Fixtures and Equipment

To the maximum extent feasible:

- Design the HVAC, lighting, and other systems to maximize energy performance.
- Utilize energy-efficient and automated controls for air conditioners and lighting to reduce electricity consumption and associated emissions.
- Generators should be the most efficient with least emissions possible using AQMD regulations and Metro Sustainability and Energy Policy as guidelines.

2.10.3 Energy Efficient Building Features and Design

To the maximum extent feasible, incorporate the following elements into a project or building's design and construction:

- Where practical and consistent with standard and reasonable building practices, install special sun-light filtering window coatings or double-paned windows to reduce thermal gain.

- Utilize light-colored roofing materials or “cool-roof” technology to reduce heat gain and air conditioning electrical loads.

- Where practical from design and operational standpoints, provide shade trees next to habitable structures to reduce building heating and cooling needs.

- Wherever possible, orient structures with their long sides along an east-west axis. This minimizes glare and heat gain (especially along the west façade), maximizes shading control along the south facade, and takes the best advantage of sunlight for natural illumination, as may be required.

2.10.4 Green or Renewable Energy

To the maximum extent feasible, design and specify the use of on-site non-polluting renewable technologies (such as solar, geothermal, wind, biomass and biogas) and/or the purchase of green or renewable energy from an accredited utility program or equivalent to contribute to the total energy requirements of the project.

2.10.5 Metering and Sub-Metering

To the maximum extent feasible, incorporate meters and sub-meters for power functions within the project. The meters will be used to measure a project’s energy usage and sub-meters will measure the various components that make up the entire project.

2.10.6 Energy Conservation

To the maximum extent feasible, conservation features and operating procedures shall be incorporated into the operating systems and subsystems as part of the final design activities to reduce energy consumption. Install an Energy Management System, where applicable.

2.11 SURFACE AND SUBSURFACE CONDITIONS AND HAZARDOUS MATERIALS

2.11.1 Construction and Operation in Subsurface Gaseous Areas

A. Subway Tunnels and Stations

In sections of cut-and-cover stations and tunnels where the ground is classified as "gassy" or “potentially gassy" by Cal/OSHA, hydrocarbon resistant membrane shall be applied in conjunction with cast-in-place concrete, or the tunnel may be lined with a bolted, gasketed liner system that has been tested to verify its resistance to dangerous gas intrusion. Metro

has conducted extensive research and investigation to determine the appropriate selection of lining materials and gas-proofing membranes.

During revenue operations, prevent buildup of methane, hydrogen sulfide, and other toxic or flammable gases vapors to hazardous or obnoxious levels by the following system features:

1. Natural ventilation, ventilation created by train movements, and by providing blast/relief shafts at the ends of stations.

2. A ventilation system of fans and controls that can exhaust gases and bring in fresh air when required.

3. A gas sensing system, supplemented by the use of hand-held gas detectors that will detect changes in the level of gas present. If gas readings increase over a period of time at a given sensor location, the source of the gas infiltration will be located and sealed. System ventilation will be computer controlled, so that if the human operators do not respond to a gas alert within a short time, the computer will initiate ventilation automatically.

   Cross Reference: For additional information see Mechanical Criteria.

B. Caissons, Piles and Piers

Caissons, piles and piers may need to be constructed in gaseous areas. Design in such areas shall include compliance with all federal, state and local jurisdiction codes and regulations, especially worker safety requirements. Specific requirements for construction shall be detailed in the construction contract documents.

2.11.2 Hydrology and Water Quality

A. Storm Water Control

Develop a Construction Storm Water Control Plan for all aboveground fixed facilities. Design shall consider applicable Standard Urban Stormwater Mitigation Plan (SUSMP) guidelines for permanent management of Stormwater.

B. Siltation and Runoff

The addition of new fixed impervious surfaces into the existing urban environment will increase the potential for water runoff. This potential extends to both the construction and operation phases of the project. Catch basins, curbing, culverts, gutters, pumping stations, and storm drain shall be constructed, as necessary, for the permanent control of water runoff during the operation phase of the project, regulations from state and local regulatory agencies shall be followed. Control of sediments, runoff discharge and dewatering fluid discharge including turbidity, pH etc. during construction, shall be required in the Contract Documents.

For additional information see Civil Criteria.

C. Dewatering

The principal engineering problems encountered in tunnels or deep surface excavations are often related to the presence of groundwater. Large volumes of groundwater entering an excavation can seriously disrupt operations, and the presence of interstitial water significantly reduces soil strength, sometimes causing such soils to flow as a viscous fluid.

Geotechnical investigation may indicate that shallow groundwater is present. Relatively shallow groundwater also appears to be present in the non-tar-impregnated sands of the San Pedro Formation in the central portion of the Wilshire Corridor segment. Shallow perched groundwater is believed to exist within the alluvium throughout much of the various project alignments; it may also exist in isolated pockets, or lenses, of granular soils.

To avoid the engineering and environment problems associated with excavating or tunneling in soils below the perched or permanent water table, it will be necessary to remove water (dewatering) from these materials before and possibly during construction. This is generally done by advancing slotted pipes into the saturated soils and then pumping or allowing water to flow from the pipes, thus lowering the water table locally. Alternatively, groundwater may be removed by pumping from shallow ditches or sumps within an excavation.

When any dewatering activities occur, they will be limited to the immediate excavation area by utilizing a variety of methods such as compressed air, chemical grouting, freezing, slurry shields or earth pressure balance where local geologic or other constraints dictate, thus avoiding potential ground subsidence or differential settlement of adjacent structures. Moreover, by confining groundwater control activities to the immediate area of excavation, the Metro Rail Project will avoid potential adverse impacts on urban flora (trees, shrubs, etc.) caused by a lowered water table. Dewatering during construction may require discharge of water through National Pollutant Discharge Elimination System (NPDES) and/or Industrial Wastewater Permits.

D. Water Contamination

Effluent from any dewatering activity may be contaminated according to criteria limits set by federal, state (Regional Water Quality Control Board) or local regulatory agencies and require treatment prior to discharge to sanitary sewer or storm drain system. Permits for treatment and discharge of effluent waters will be required. Treatment system for contaminated water may need to be completed as part of project design. Recycling at a fixed facility is preferred, if more cost effective.

2.11.3 Hazardous Materials

A. Hazardous Materials would include asbestos, lead containing materials, polychlorinated biphenyl (PCB) containing light ballasts or electrical transformers, and other related hazardous waste and hazardous materials.

Designers should anticipate that any building demolition activity may encounter asbestos contaminated material (ACM) or lead-based paint (LBP). All demolition involving asbestos or lead-based paint removal shall be in accordance with all governmental regulations. Soil contamination, that is different from the surrounding area, may exist at a specific site that is the target of demolition.

B. Other Hazardous Waste and Hazardous Materials

All handling and disposal of hazardous waste and hazardous materials shall be in accordance with all governmental regulations and shall depend on the hazardous or toxic nature of the material as specified in an environmental assessment report, on a case by case basis.

2.12 BIOLOGICAL

2.12.1 Flora

A. Natural Landscape

Most rail projects are located in urban areas. No truly riparian habitats are in the project area, although urban runoff and drainage modifications have contributed to the development of a few riparian habitats, as well as a few wetland habitats. Biological studies should be completed for natural areas in the vicinity of rail projects, which could be adversely affected by the rail project. In areas where impacts are identified, biological surveys should be done to assess the impacts. Mitigation measures should be recommended to minimize adverse impacts in addition to those specified in the adopted Final Environmental Impact Statement/ Final Environmental Impact Report (FEIS/FEIR).

B. Ornamental Landscape

As a result of implementing the Metro Rail Projects, it will be necessary to remove some landscaped areas and street trees. In order to mitigate these losses, the following criteria shall apply:

- Where existing vegetation must be removed, new landscaping shall be planted where possible and appropriate, the placement and types of which shall be as specified in an established landscaping plan.

- The selected landscape material shall be drought tolerant and California native, if possible.

- The landscape plan shall be designed to allow plants to attain their ultimate height and spread, and to minimize maintenance requirements.

- The landscaping plan shall include a master plant list, which shall call for new vegetation that is designed to conform with the surrounding environment and enhance its visual appeal.

- The landscaping plan shall extend to the system right-of-way, station, parking and public areas, and other areas of fixed system facilities.

- A program shall be developed, as part of the overall operating procedures for the Metro Rail System, which shall provide for the regular maintenance of landscaping owned by Metro.

The design of landscaping shall be prepared as part of the rail facilities' detailed engineering and included in facilities contract documents. In station areas, landscaping may match the theme of the station adopted by the designer.

2.12.2 Fauna

All projects are located in urban areas and would cause minimal disturbance to animal habitats. Some of the projects would traverse more natural areas. Wildlife along the Metro Rail route is what one would expect throughout the Los Angeles basin; species naturally adapted to rugged scrub, lands, along with a mixture of urban-adapted species. Because there are few open and grassy habitats, raptors are not particularly common. Any of the anticipated project area's extent of riparian habitats is very limited and it is not expected to represent significant habitat for declining bird species. Additional biological studies may need to be completed for natural areas in the vicinity of rail projects, which could be adversely affected by the rail project. Adverse impacts should be assessed and mitigation measures recommended to minimize adverse impacts, as necessary, in addition to those in the adopted Final Environmental Impact Statement/ Final Environmental Impact Report (FEIS/FEIR)

2.13 ELECTROMAGNETISM

The operation of the project could result in interference with radio and television broadcasting due to the emission of radio frequency signals and electromagnetic fields for subway, at-grade and aerial systems. The potential for such disruption should be studied and the project designed to minimize this possible land use incompatibility.

2.14 CULTURAL RESOURCES

2.14.1 Historic Properties

Metro's service area includes many historic sites and buildings that could be adversely affected during construction and operation of projects. If the project is federally funded, compliance with Section 106 of the National Historic Preservation Act is required. If federal funds are not used, the project should

comply with the requirements of "The State of California Office of Historic Preservation". The area of project effect should be defined, historical properties identified, and the properties eligibility for the National Register of Historic Places determined. The project's effect should be identified, and agreements made with state or federal agencies, as necessary. Metro will cooperate with the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, and the Federal Transit Administration (FTA).

2.14.2 Parks

Section 4(f) of the Department of Transportation Act of 1966 declares a national policy that special effort be made to preserve the natural beauty of the countryside, public park and recreation lands, wildlife and water fowl refuges, and historic sites. Section 4(f) permits the Secretary of Transportation to approve a project that requires the use of publicly-owned land from a park, recreation area, or wildlife refuge, or any land from a historic site of national, state or local significance (protected resources) only if there is no feasible and prudent alternative to the use of such land and all possible planning has been undertaken to minimize harm to the 4(f) lands resulting from such use. All federally funded projects must be examined for impacts on protected resources. Section 4(f) process should be undertaken in cooperation with the federal lead agency.

2.14.3 Archaeology

Archeological resources could conceivably be discovered during almost any earthmoving activity. The alignment areas shall be studied, archaeological resources identified, and treatment plans prepared. Construction shall be monitored when warranted, and treatment plans activated during excavation.

2.14.4 Paleontology

The paleontological resources of an area are largely a function of the kinds of sedimentary deposits found there. Marine and terrestrial fossils can be found in many sedimentary deposits throughout the Metro service area. Project environmental studies should identify the areas of effect and the rock strata in those areas, identity the likelihood of encountering fossils along the alignments, prepare treatment plans for dealing with fossils found, and monitor the area during construction (except during tunneling). The alignment areas shall be studied, paleontology resources identified, and treatment plans prepared. However, construction shall be monitored when warranted, and treatment plans activated during excavation. Treatment plans should be activated when fossils are encountered. Metro shall cooperate with SHPO and FTA.

2.15 CLIMATE CHANGE AND ADAPTATION

Metro has been a leader in pursuing a variety of sustainability strategies to maximize transportation efficiency, access, safety, and performance while minimizing energy use, consumption, pollution, and the generation of waste. These efforts support environmental stewardship and can result in long-term cost savings for Metro while maintaining our environmental and sustainability leadership in the transportation industry. Sustainability strategies will also become increasingly important to comply with regulatory processes related to AB 32, SB 375, and related regulations under the

California Environmental Quality Act, the Federal surface transportation re-authorization process, and potential Federal climate change legislation.

In Section 2.1.3, we have identified specific policies that will allow our agency to reduce our carbon footprint by ensuring that we mitigate the effects of climate change in the way we design and construct our projects. Unlike climate change mitigation which allows for changes to be implemented after the rail system is completed, climate change adaptation allows for the consideration of design and construction changes considering the effects of climate upfront. As it applies to this criteria, Metro shall require at a minimum the applicable climate adaptation strategies outlined in the document Adapting Transit to Climate Change Impacts, FTA, 2011.

REFERENCES

1. "Guidelines for Design of Rapid Transit Facilities", Report by American Public Transit Association (APTA), 1981.

2. Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating, ANSI/AMCA 210-07, August 17, 2007

3. "Standard for Fixed Guideway Transit Systems", National Fire Protection Association (NFPA), NFPA 130, 2010 Edition.

4. “Transit Noise and Vibration Impact Assessment” FTA-VA-90-1003-06 May 2006 or newer version

5. “Adapting Transit to Climate Change Impacts”, Federal Transit Administration, 2011.

END OF SECTION