4.4 Vibration

Ground-borne vibration impacts associated with the proposed project were investigated. In this section, projected ground-borne vibration levels related to operation of the maglev system are discussed. Vibrations caused by construction work (e.g., earth-moving equipment, drilling, and blasting) are addressed in Section 4.21, Construction Impacts, of this DEIS.

4.4.1 Methodology

Vibration impacts were studied using methods described in the FRA guidance manual (FRA, 1998) and a preceding FTA report (FTA, 1995). A recent report (FRA, 2001) on vibration characteristics of the Transrapid TR08 maglev vehicle, which operates at a testing facility in Elmsland, Germany, was used to estimate vibrations attendant to future operation of the maglev vehicles planned for western Pennsylvania.

The vibration impact assessment included field tests along the proposed alternative alignments to accurately measure baseline vibrations caused by vehicular traffic on existing infrastructure. Vibrations caused by traffic on interstate highways, operating rail lines, and local access streets were measured to provide a basis for comparison with possible vibrations predicted for operation of the maglev system. The level of impact assessed for areas of the proposed maglev alignments takes into consideration the current levels of existing vibration exposure, the predicted vibration levels for future maglev operation, and acceptable vibration level criteria provided in the FRA manual. Permissible vibration levels for the project are shown on Figure 4.4.1-1.

Category 1 Vibration sensitive structures	**65** VdB = Ground velocity in decibels referring to 0.000001 inch/sec[1]
Category 2 Residences, buildings where people normally sleep	**72** VdB = Ground velocity in decibels referring to 0.000001 inch/sec[2]
Category 3 Institutional, primary daytime usage	**75** VdB = Ground velocity in decibels referring to 0.000001 inch/sec[2]

[1] Same VdB value for infrequent events, < 70 per day
[2] **8** VdB units higher permitted for infrequent events, < 70 per day

The Pennsylvania High-speed Maglev Project

Permissible Vibration Levels

Figure 4.4.1-1

4.4.2 Impact Analysis

Existing levels of vibration exposure were studied at 186 receptor locations distributed along the proposed alternative alignments. Locations of these vibration test sites are found in the PTSF. Vibration measurements for alternative alignments located within Sections A and B were taken during the period of April 2 to April 11, 2002. For alternative alignments within Section C, vibration measurements were taken between May 13 and May 18, 2002.

Baseline vibration measurements were conducted for a time period of 15 minutes at most locations. At certain sites (due to a shallow depth to bedrock, unstable soil characteristics, or sensitive adjacent land uses), longer duration tests were conducted; these ranged from

15 minutes to about one-hour long. For maglev vehicles, vibrations are caused by reactive forces at each point where large magnetic fields are imposed to levitate the vehicle. Rapid propulsion of the maglev vehicle past magnet supports produces force pulses that propagate into the local environment as ground-borne vibration.

No-Build Alternative

The No-Build Alternative would not result in any immediate impacts from vibration upon sensitive receptors. However, without a viable high-speed transportation alternative, the traffic volume of single-occupancy vehicles could increase. Thus, the No-Build Alternative could result in increased vibration impacts due to increased transportation infrastructure needed to meet future demand.

Build Alternatives

Because of the physical properties of vibration, the entire project length was analyzed as a whole, rather than examining Section A, B, and C impacts separately. Three receptor categories were analyzed.

Vibration-Sensitive Structures (Category 1)

Only one possible Category 1 structure was identified, the Carnegie Robotics Lab located on 43rd Street in Pittsburgh. Baseline vibration measurements were taken adjacent to this building on April 12, 2002. The Carnegie Robotics Lab is located along an active railroad spur in a commercial district on the south shore of the Allegheny River. Maximum root mean square (RMS) vibrations exceeded 78 VdB, more than 13 dB greater than the limit for a “vibration sensitive” facility. It was determined on the basis of the existing vibration exposure that the robotics lab is not a Category 1 facility, as it appears to function within a relatively high vibration environment. This facility is viewed as a typical commercial site and would not be impacted by the proposed maglev operation for reasons given below for Category 3 structures.

Residential Structures (Category 2)

As noted in the FRA guidelines, the acceptable vibration level threshold for inhabited residences is 72 VdB. Predicted vibration in excess of the 72 VdB level in the range of 0 to 5 dB suggests only 50 percent likelihood that a vibration impact would actually exist. However, projected vibrations of 5 dB or greater, above the 72 VdB limit, would likely produce an adverse vibration impact warranting mitigation. Based upon the anticipated construction limits, no impacts to Category 2 structures would occur within the acceptable vibration level threshold. At a vehicle speed of 240 kph (150 mph), an adverse vibration impact would result only within 3 meters (10 feet) of the centerline. At a higher speed of 322 kph (200 mph), the impact distance would increase to about 15 meters (50 feet) from the centerline. At high speeds near 402 kph (250 mph), adverse impacts from vibration to residential structures would likely be at distances within about 30 meters (100 feet) from the maglev centerline. At this time, based upon the potential vibration impact area, no existing residences would be affected by vibration.

Commercial Properties (Category 3)

Vibration impacts to typical commercial properties are not expected during operations of the proposed high-speed maglev system. Commercial (or institutional) properties with primary daytime usage have a higher vibration limit of 75 VdB. In addition, there is a greater reduction of vibration of 10 VdB transmitted to the interior of the more massive commercial structures relative to adjacent ground surface. For these combined reasons, vibration impacts to commercial properties are likely only at distances of about 8 meters (25 feet) or closer from the maglev centerline and operating at the highest speed of 402 kph (250 mph). At this time, based upon the potential vibration impact area, no existing commercial buildings would be affected by vibration.

4.4.3 Summary

Vibration impacts are projected to be minimal based upon an evaluation of the structures (residential and commercial) in the immediate vicinity of the maglev guideway. A detailed vibration assessment is included within the PTSF.

4.4.4 Mitigation

Mitigation would be based upon potential impacts to residential and commercial structures that may remain within the distances of the impact range defined above. Mitigation could include property acquisition or financial compensation.

4.5 Potentially Contaminated Areas and Waste Disposal Sites

4.5.1 Methodology

A Phase I Environmental Site Assessment (ESA) was performed in August 2002 throughout the study area following guidelines in PENNDOT Publication 281, *Waste Site Evaluation Procedures Handbook, Volume I* (June 1999). The Phase I ESA is the first step in a process to establish "all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial area customary practice" as defined in the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). This assessment also served to identify waste materials that would be handled in accordance with the PADEP waste management regulations, and as required by the Occupational Safety and Health Administration (OSHA), to identify health and safety hazards that could be encountered during construction. Other sources of information utilized for the Phase I ESA included a regulatory database search, contacts with knowledgeable individuals and environmental regulators, and a review of historic aerial photographs and Sanborn Fire Insurance Maps.

A 60-meter (200-foot) corridor was used as the study area for each alternative alignment. Information about past and present land use, regulated substances, hazardous waste materials, and waste disposal areas within the project area was acquired from various sources to complete a comprehensive search of the area. During the field reconnaissance phase, numerous features suggesting potentially contaminated waste areas were identified. Sources of potential contamination in these areas included, but were not limited to: underground storage tanks (USTs), aboveground storage tanks (ASTs), fuel islands, storage handling and disposal of hazardous substances, drums, waste disposal areas, wells, streams, stained soils or pave-