21. Electric and Magnetic Fields

21.1. Chapter Overview

21.1.1. Introduction

The following section analyzes the Build Alternatives in terms of their potential to contribute to the generation of electric and magnetic fields (EMF) that could result in potential health concerns for the study area population.

Human exposure to EMFs is constant resulting from the activity of the sun and Earth's naturally occurring magnetic field, which continuously exposes all persons to low levels of EMFs averaging about 500 milliGauss (mG). EMFs also envelop any electrical device that carries an electrical charge or current, and are produced by electrically powered devices, including cellular telephones, indoor lighting systems and household appliances. Appliances such as refrigerators, televisions, radios, microwaves and clocks can generate EMFs between 10,000 to 100,000 mG within close proximity.

Field strengths decline with distance from an EMF-producing object. Electric-field strength decreases rapidly with distance and is easily shielded or blocked by manmade objects and natural features. Magnetic fields, on the other hand, maintain their strength over greater distances and are not easily shielded. For this reason, most research into the possible health effects of EMFs concentrate on magnetic fields.

21.1.2. Summary of Findings

Neither Build Alternative is anticipated to exceed suggested acceptable International Commission on Non-Ionizing Radiation Protection (ICNIRP) and American Conference of Governmental Industrial Hygienists (ACGIH) exposure thresholds within rail vehicles or at wayside and platform locations. As such, it can be reasonably concluded that EMF exposure levels from the proposed project will pose no additional health risk for Northern Branch passenger rail users or study area residents living in the vicinity of the rail right-of-way.

21.2. Methodology

The methodology for this assessment involved a review of EMF exposure thresholds and standards as well as recent relevant studies associated with EMF exposure. An assessment for potential exposure to EMF as it applies to the Northern Branch corridor was prepared based on a review of the data described below.

21.2.1. Exposure Standards

Currently, the U.S. National Institute of Environmental Health Services EMF Research and Public Information Dissemination Program and the World Health Organization (WHO) International EMF Project agree that no convincing laboratory or epidemiological evidence exists to prove a causal link between EMF exposure and cancer incidence. Both agencies note that, of the numerous studies of a possible dose-effect relationship for EMF exposure undertaken thus far, all have proven inconclusive.

However, EMF exposure guidelines have been developed by several professional organizations in order to guard against hemodynamic and cardiovascular effects that high EMF exposure may induce, as well as to ensure that electrical fields generated within a human body moving through a static electromagnetic field do not rise above naturally occurring levels. Standards for short-term and continuous exposure vary. In 1987, the WHO suggested a maximum short-term level of static-field EMF exposure of 20,000,000

mG. Between 1994 and 2001, the ICNIRP suggested a series of maximum exposure levels depending on whether the exposure is continual or occupational (eight hours of exposure), and whether the magnetic field is static or time-varying. Table 21-1, below, summarizes the guidelines.

Table 21-1: Occupational and Continual EMF Exposure Guidelines

Agency	Hz	Exposure	Exposure Type
ICNIRP	50 to 60 Hz	5000 mG 1000 mG	8-hour occupational exposure Public continual exposure

21.2.2. Relevant Recent Studies

In 2008, NJ TRANSIT submitted an EIS for the Access to the Region's Core (ARC) project, which was intended to expand and extend one-seat ride service into Manhattan via two new trans-Hudson tunnels. The EMF study conducted for ARC sought to determine whether the expansion of electric service and an increase in electric-powered transit would result in EMF exposure in exceedance of the guidelines put forth by ICNIRP and ACGIH. The analysis was approached as a worst-case study, examining the EMF generated by Amtrak's Acela Express passenger train, fully occupied, accelerated from a total stop along the North East Corridor (NEC). The conditions selected for the train presented a scenario under which the locomotive would require the greatest draw of electricity from the overhead catenary.

The study determined that the peak magnetic field generated by the Acela during acceleration, as measured on the platform, was 436 mG. The average field measured on the platform generated by a moving train was significantly less, about 179 mG. Both magnetic fields were well below the most conservative of the exposure guidelines. The study did indicate that when two electric trains pass each other, the magnetic field can increase to as much as 1102 mG; however, this field exists only momentarily. The study determined that the brief increase in exposure was not significant.

Although the project did not proceed due to funding issues, the ARC study stands as a worst-case scenario as the Acela trains emit the highest EMFs of any rail vehicle in New Jersey. Additionally, the Hudson-Bergen Light Rail (HBLR) vehicles are powered by direct current (DC) power, which is at a lower frequency than the electric current used to power the Acela. This means that the maximum magnetic field generated by the HBLR vehicles will be less than the field generated by the Acela train. As a consequence HBLR electric rail service will be within safe parameters since the Acela EMF levels are typically below the exposure threshold of 436 mG.

21.3. Environmental Review

The following section describes the environmental review for EMF within the Northern Branch corridor. Existing conditions, potential impacts, and mitigation methods are described at the project corridor level as potential EMF concerns were uniform across municipalities.

21.3.1. Existing Conditions

The existing Northern Branch rail alignment is not electrified and currently serves only diesel-powered freight trains. Consequently, aside from lighting, there are no electric or magnetic fields directly associated with the rail line as it exists today. The surrounding communities are served by overhead electric distribution lines providing power to the existing residential, commercial, and industrial uses in the study area.

21.3.2. Potential Impacts and Mitigation

3.18.1.1 No Build Alternative

Under the No Build Alternative, diesel-powered freight service would continue to operate on the Northern Branch right-of-way. No additional service would be initiated, and EMF-generating improvements, such as catenary, would not be installed. As a result, the No Build Alternative would not result in the generation of new or an increase in existing EMF in the study area.

21.3.2.1. Light Rail to Tenafly (Preferred Alternative) and Light Rail to Englewood Route 4

Both Light Rail to Tenafly (Preferred Alternative) and Light Rail to Englewood Route 4 are essentially identical in their potential impacts and mitigation. Consequently, the discussion below applies to both alternatives.

Impacts – Under each alternative, catenary will be installed along the length of the existing Northern Branch alignment and light rail electrical substations will be located at approximately one-mile intervals along the alignment. In terms of EMF generation, the light rail vehicle is significantly lighter and less powerful than the Acela locomotive described above in Section 21.2.2. – Recent Relevant Studies. Consequently, it can be expected to generate magnetic fields weaker than the Acela's 436 mG field (which is well within acceptable limits per Table 21-1), and the light rail fields will diminish in proportion to the distance from the vehicle. As a result, the strength of the magnetic fields within residences near the right-of-way will not exceed continual exposure public health guidelines. The electrical substations are stationary sources of EMF but the substation building is designed to act as a shield, reducing any potential EMF exposure.

Right-of-way improvements under both Light Rail to Tenafly (Preferred Alternative) and Light Rail to Englewood Route 4 will require the relocation of an existing high voltage underground transmission line owned by PSE&G. The transmission line is located along the west side of the right-of-way from just north of Route 46 in Palisades Park to just south of Fort Lee Road in Leonia, a distance of about three miles. The transmission line is an oil-static line presently located in a concrete conduit accessed by manholes. The transmission line will be moved about 50 feet west of its current location and installed in a new concrete underground conduit. The exact location of the new conduit is at the discretion of the power line owner, PSE&G, who is also responsible for securing permits and developing construction and mitigation plans should the relocation disrupt community facilities or circulation. The conduit will shield the surrounding environment from any EMF produced by the transmission line. As a result, the relocation of the transmission line will not result in an increased exposure to EMF in the study area.

Project impacts north of Tenafly will be confined to changes to the freight service, with freight trains operating at night under Light Rail to Tenafly (Preferred Alternative) and Light Rail to Englewood Route 4. As passenger service will not extend past the proposed Tenafly North Station, areas north of Tenafly will not receive electrification under either of the Build Alternatives. Consequently, there will be no increase in EMF exposure in areas north of Tenafly in either of the Build Alternatives.

Mitigation – No significant EMF impacts are foreseen, and no mitigation is warranted.

21.4. Summary of Potential Environmental Effects

Although no dose-effect cancer risk from EMF exposure has been proven, exposure standards have been developed by professional organizations for other health purposes. Data on EMF exposure levels for the

closest comparable catenary powered transit system to have undergone detailed EMF exposure analysis indicate electric and magnetic field strengths below suggested exposure levels, both within rail vehicles and at wayside and platform locations. Therefore, it can be reasonably concluded that EMF exposure levels from the proposed project will pose no additional health risk for Northern Branch passenger rail users or study area residents living proximate to the rail alignment. The relocated oil-static electric transmission line will be placed in a concrete conduit as a matter of standard procedure, and as a result, adjacent uses will be shielded from the EMF produced by the line.