APPENDIX G

POWER THE SOUTH BAY PROJECT

ELECTRIC AND MAGNETIC FIELDS MANAGEMENT PLAN

POWER THE SOUTH BAY PROJECT
ELECTRIC AND MAGNETIC FIELDS MANAGEMENT PLAN

1. PROJECT OVERVIEW

The Power the South Bay Project (Project) was approved by the California Independent System Operator (CAISO) to ensure the reliability of the CAISO-controlled grid. This would be accomplished through the construction of two new high-voltage direct current (HVDC) terminals, a new HVDC transmission line connecting the terminals, and two new alternating current (AC) transmission lines connecting the terminals to the existing electrical grid. The Project is being developed by LS Power Grid California, LLC (LSPGC), a regulated public utility in California, established to develop, own, and operate transmission projects.

Project Summary

The Project is located in the Cities of Fremont, Milpitas, San José, and Santa Clara, California as shown in **Appendix 1,** *Project Map*. The Project includes the following key elements:

- Two new HVDC terminals:
  - The new Albrae terminal interconnected to the existing Pacific Gas and Electric Company (PG&E) Newark substation; and
  - The new Baylands terminal interconnected to the existing Silicon Valley Power (SVP) Northern Receiving Station (NRS) substation.
- One approximately 8.6-mile Albrae to Baylands 320 kV direct current (DC) overhead and underground transmission line connecting the Albrae terminal to the Baylands terminal;
- One approximately 0.4-mile Newark to Albrae 230 kV AC overhead and underground transmission line connecting the Albrae terminal to the existing PG&E Newark substation;
- One approximately 3.5-mile Baylands to NRS 230 kV AC overhead and underground transmission line connecting the Baylands terminal to the existing SVP NRS substation

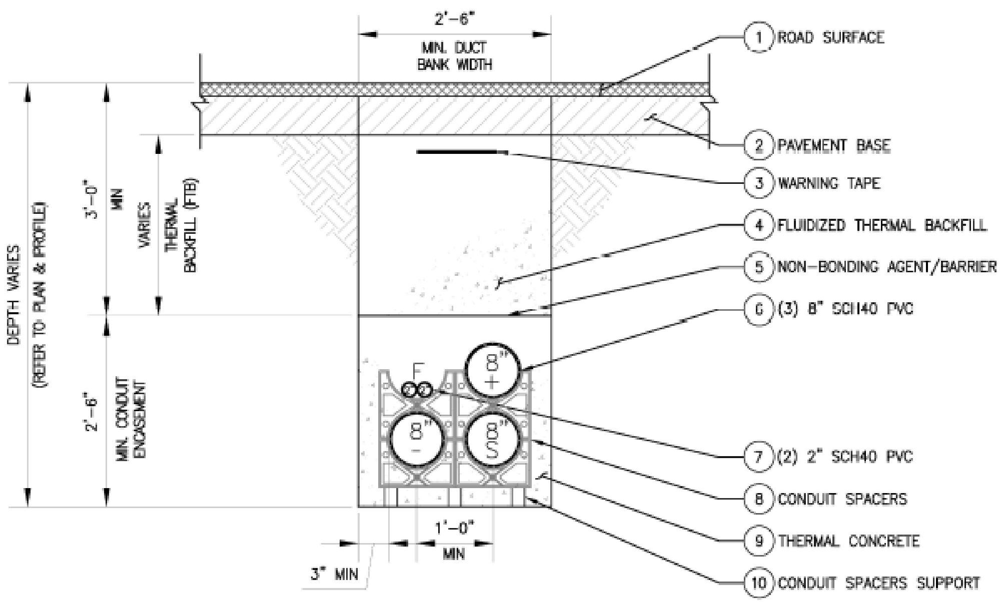
Project Segments

In this Field Management Plan, the Project is divided into six transmission line segments which represent each of the typical right-of-way cross sections, and the two HVDC terminals (i.e., substations). The segment locations are depicted in **Appendix 1** and described below.

Segment A

The underground portions of the proposed Albrae to Baylands 320 kV DC transmission line (Segment A) are located within the Cities of Fremont, Milpitas, and San José, and consist of a total of approximately 6.7 miles comprising two separate sections. These two sections of Segment A have the same geometry and ampacity, and therefore, would create the same magnitude of electromagnetic fields. Segment A is proposed to be located predominantly within existing public rights-of-way (ROWs). One section of Segment A would extend from the proposed Albrae terminal along the following roads: Weber Road, Boyce Road, Cushing Parkway, Fremont Boulevard, and McCarthy Boulevard and end at a new transition structure near on a Santa Clara Valley Water District (SCVWD) easement near the San José Santa Clara Regional Wastewater Facility (RWF) south of McCarthy Boulevard. The other section of Segment A would begin at a new transition structure on RWF property near Los Esteros Road and follow within Los Esteros Road into the proposed Baylands Terminal. The locations of the Segment A sections are shown in **Appendix 1**. Surrounding land uses consist of commercial, industrial (light and heavy), undeveloped land, and the RWF. There are no schools, hospitals, or licensed daycare facilities identified within 87.5 feet[1] of this segment. **Figure 1,** *Segment A Typical Cross Section***,** depicts the proposed typical cross section for Segment A's underground 320 kV DC transmission line. Segment A is a DC transmission line which produces a static magnetic field different from the more typical dynamic magnetic fields produced by AC transmission lines.

Figure 1 – Segment A Typical Cross Section

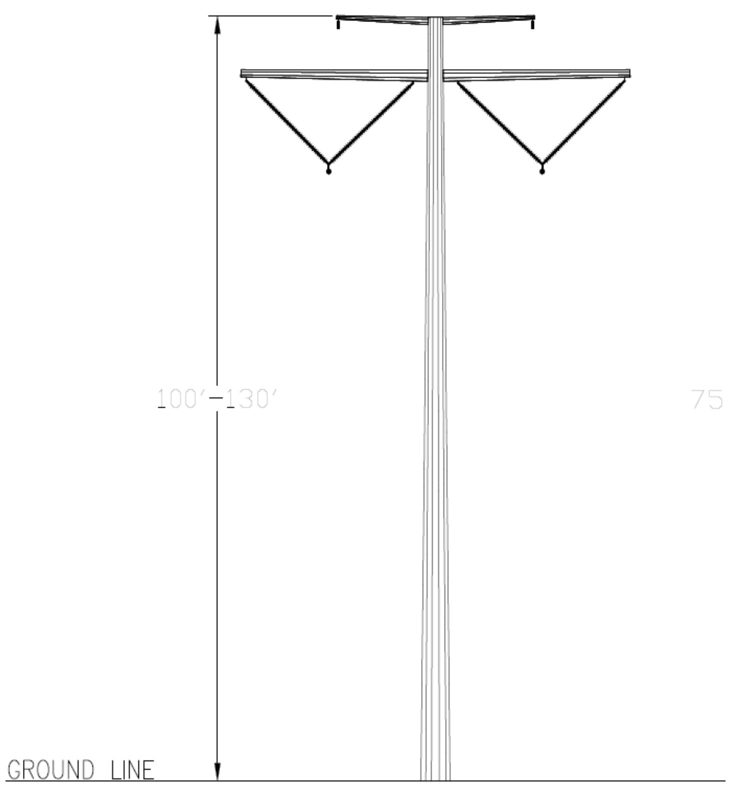


[1] 87.5 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to underground Electric Power Lines Rated 50 kV and Above for 500-550 kV [AC] lines.

Segment B

The overhead portion of the proposed Albrae to Baylands 320 kV DC transmission line (Segment B) is located within the cities of Milpitas, and San José on SCVWD and RWF owned property. Segment B would traverse approximately 1.9 miles from near McCarthy Boulevard to near Los Esteros Road. The location of Segment B is shown in **Appendix 1**. Surrounding land uses consist of entirely undeveloped land and the RWF. There are no schools, hospitals, or licensed daycare facilities identified within 350 feet[2] of this segment. **Figure 2,** *Segment B Typical Cross Section***,** depicts the proposed typical cross sections for Segment B's overhead 320 kV DC structures. Segment B is a DC transmission line which produces a static magnetic field different from the more typical dynamic magnetic fields produced by AC transmission lines.

Figure 2 – Segment B Typical Cross Section



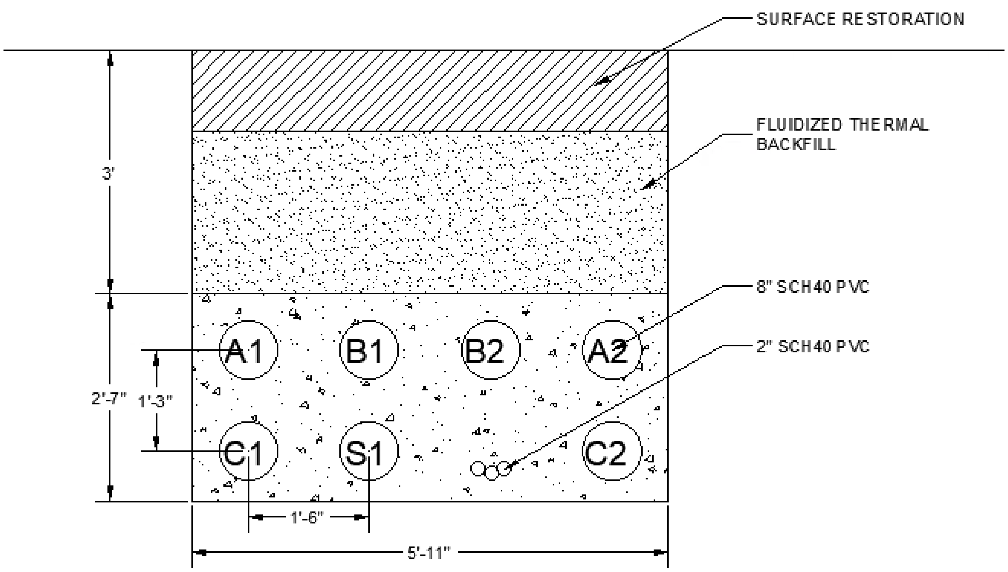
ELEVATION
V–STRING TANGENT
(WITH EMBEDDED FOUNDATION)

[2] 350 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to overhead Electric Power Lines Rated 50 kV and Above for 500-550 kV [AC] lines.

Segment C

The underground portion of the proposed Newark to Albrae 230 kV transmission line (Segment C) would be approximately 0.2 miles in the City of Fremont. Segment C would be located underground in Weber Road, beginning at the proposed Albrae terminal and extending to the point where the line transitions above ground within the exterior fence on the Newark substation property to the east of Weber Road. The location of Segment C is shown in **Appendix 1.** Surrounding land uses are industrial along with the proposed Albrae terminal and the Newark substation. There are no schools, hospitals, or licensed daycare facilities identified within 37.5 feet[3] of this segment. **Figure 3**, *Segment C Typical Cross Section*, depicts the proposed typical cross sections for Segment C's underground 230 kV AC duct bank.

Figure 3 – Segment C Typical Cross Section



[3] 37.5 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to underground Electric Power Lines Rated 50 kV and Above for 220-230 kV lines.

Segment D

The overhead portion of the proposed Newark to Albrae 230 kV transmission line (Segment D) would be approximately 0.2 miles, entirely on PG&E's Newark substation property in the City of Fremont. Segment D will be constructed in areas that prohibit public access, and therefore mitigation measures for Segment D have not been evaluated in this report. The location of Segment D is shown in **Appendix 1**. Surrounding land uses are industrial along with the proposed Albrae terminal and the Newark substation. There are no schools, hospitals, or licensed daycare facilities identified within 150 feet[4] of this segment. Due to the fact that the entirety of Segment D is proposed to be located on PG&E Property modeling was not performed and therefore a typical cross section is not included.

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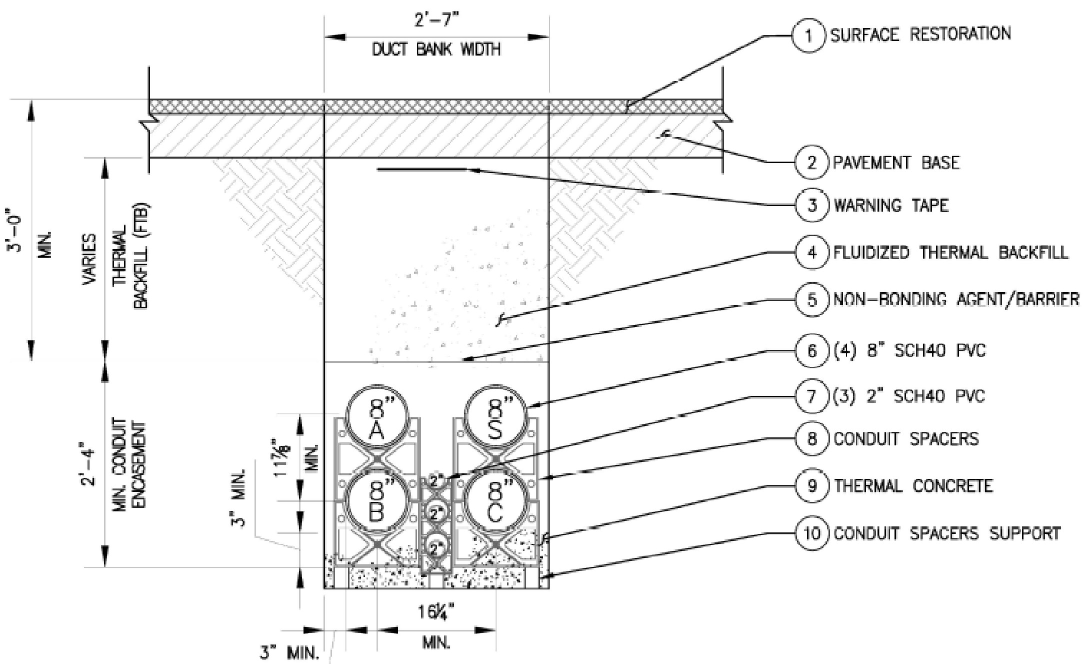
[4] 150 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to overhead Electric Power Lines Rated 50 kV and Above for 220-230 kV lines.

Segment E

The underground portions of the proposed Baylands to NRS 230 kV transmission line (Segment E) are located within the cities of San José and Santa Clara. Segment E would be approximately 3.3 miles in total, located on both private and public property including within existing roadways including Los Esteros Road, Disk Drive, Nortech Parkway, Gold Street, and Lafayette Street. Segment E consists of two sections – one from the Baylands terminal to just east of the Guadalupe River and the other from just west of the Guadalupe River to the NRS substation. These two sections of Segment E have the same geometry and ampacity, and therefore, would create the same magnitude of electromagnetic fields. The locations of the Segment E sections are shown in **Appendix 1**. Surrounding land uses consist of commercial, industrial (light and heavy), residential, undeveloped land, and the RWF. There are no schools, hospitals, or licensed daycare facilities identified within 37.5 feet[5] of this route. The closest school is Kathryn Hughes Elementary School, approximately 375 feet away from the proposed route. **Figure 5**, *Segment E Typical Cross Section*, depicts the proposed typical cross section for Segment E's underground 230 kV AC transmission line.

Figure 5 – Segment E Typical Cross Section



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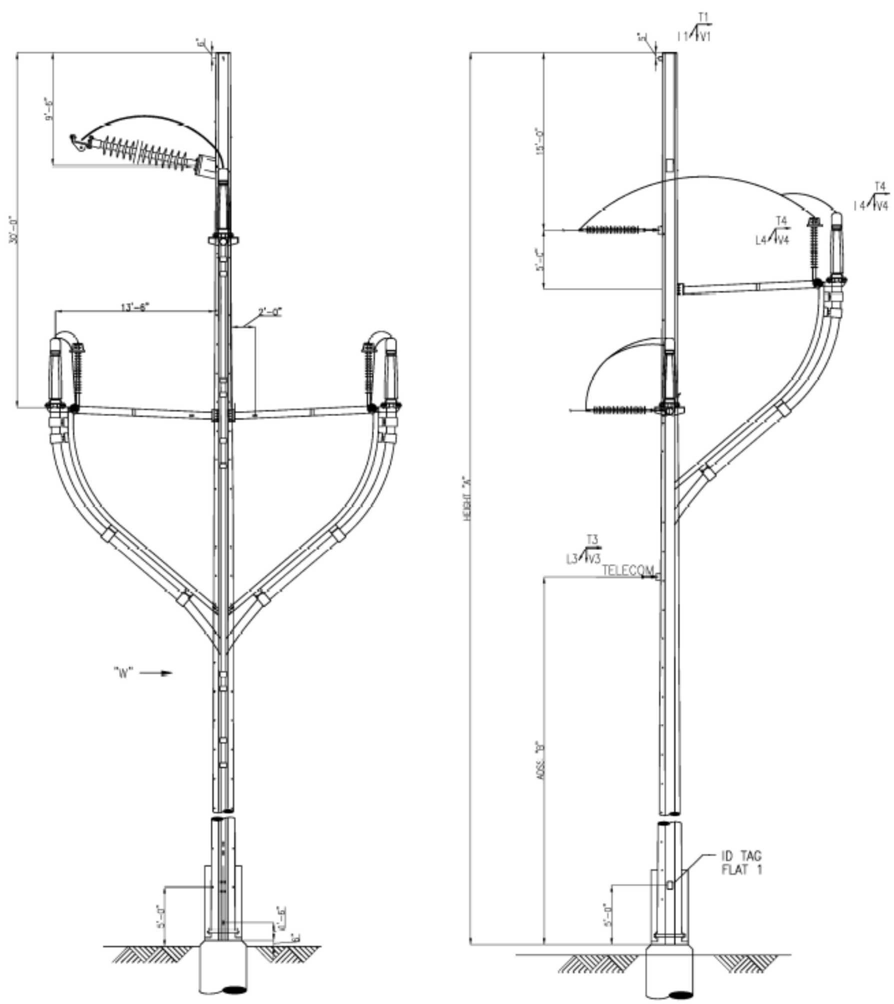
5 37.5 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to underground Electric Power Lines Rated 50 kV and Above for 220-230 kV lines.

Segment F

The overhead portion of the proposed Baylands to NRS 230 kV transmission line (Segment F) is located within the city of San José and would consist of a 0.2 miles of a single span overhead transmission crossing of the Guadalupe River. The location of Segment F is shown in **Appendix 1**. Surrounding land uses consist of recreational, commercial, and undeveloped land with the nearest residence being over 530 feet away. There are no schools, hospitals, or licensed daycare facilities identified within 150 feet[6] of this segment. **Figure 6**, *Segment F Typical Cross Section*, depicts the proposed typical cross section for Segment F's overhead 230 kV AC structures.

Figure 6 – Segment F Typical Cross Section



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[6] 150 feet is the setback for schools recommended in the California Department of Education's (CDE) Criteria for Siting New Schools Adjacent to aboveground Electric Power Lines Rated 50 kV and Above for 220-230 kV lines.

Albrae Terminal

The proposed Albrae terminal site is approximately 6.1 acres and is located approximately 0.8 miles west of Interstate I-880 and approximately 0.2 miles northeast of the existing PG&E Newark substation (see Figure 3-4, Project Route Map). The proposed Albrae terminal site is located in the City of Fremont. Surrounding land uses consist of industrial facilities to the north, an electric utilities distribution center to the east, and a car repair, storage, and auction lot to the south and west.

Baylands Terminal

The proposed Baylands terminal site is approximately 9.2 acres and is located approximately 0.5 miles north of State Route 237, approximately 1.8 miles west of I-880, and approximately 1.8 miles northeast of the existing SVP NRS substation. The site is located within the City of San José adjacent to the RWF. Surrounding land uses consist of a recycling center to the north, RWF to the east, and undeveloped land to the south and west.

2. MAGNETIC FIELD MANAGEMENT DESIGN GUIDELINES

The Project requires permitting under General Order 131-D; therefore this detailed Field Management Plan (FMP) will be developed. LSPGC will apply guidelines to the design of electrical facilities of the Project in accordance with CPUC Decisions 93-11-013 and 06-01-042. The applicable design guidelines mandated by the CPUC are:

A) No-cost and low-cost magnetic field reduction measures will be considered on new and upgraded projects.

B) Low-cost measures, in aggregate, will:

   a. Cost less than 4% of the total project cost.

   b. Achieve a 15% or greater magnetic field reduction at the utility ROW.

C) The Commission [CPUC] has exclusive jurisdiction over issues related to EMF exposure from regulated utility facilities.

D) Parties generally agree on the following group prioritization for land use categories in determining how mitigation costs will be applied:

   1. Schools, hospitals, and licensed day care
   2. Residential
   3. Commercial/industrial
   4. Recreational
   5. Agricultural
   6. Undeveloped land

E) Low-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools or hospitals located on these lands.

F) Although equal mitigation for an entire class is a desirable goal, the Commission will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit.

G) The following magnetic field reduction methods may be considered for new and upgraded electrical facilities:

   1. Increasing the distance from electrical facilities by:
      - Increasing structure height or trench depth.
      - Locating power lines closer to the centerline of the corridor.
   2. Reducing conductor (phase) spacing.
   3. Phasing circuits to reduce magnetic fields.

H) Non-routine mitigation measures, or other mitigation measures that are based on numeric values of EMF exposure, will not be considered.

I) The guidelines "should not compromise safety, reliability, or the requirements of [CPUC] General Orders (GO) 95 and 128."

J) Without exception, design and construction of electric power system facilities must comply with all applicable federal and state regulations, applicable safety codes, and each electric utility's construction standards.

The CPUC has asserted that there is no significant scientifically verifiable relationship between EMF exposure and negative health consequences and that state and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate.

Consistent with the CPUC's EMF policy, this Field Management Plan deals solely with magnetic fields. Also, minimizing the magnetic field strength is only one of many factors to consider in planning and designing a transmission system. EMF reduction must be balanced with many other concerns such as safety, environmental concerns, reliability, insulation and electrical clearance requirements, aesthetics, cost, operations, and maintenance.

3. TRANSMISSION LINE FIELD MANAGEMENT PLAN

In accordance with CPUC Decision 06-01-042, 2-dimensional magnetic field modeling is used to compare differences between alternative EMF mitigation measures. Magnetic field levels were calculated in CYMCAP[7] for underground segments and PLS-CAD[8] for overhead segments at 3 feet above the ground at various distances from the centerline. To determine the effectiveness of the potential mitigation measures, calculated values for each potential mitigation measure were compared to the level calculated without the potential mitigation measure. For Segments A, C, E, and F the effectiveness of mitigation measures was calculated at 3 feet above the ground at the centerline of the right of way because these segments allow for public access to the center of the right of way, either within public road rights of way or in the case of Segment F, a recreational trail crossing beneath the transmission line. Feasibility and incremental cost were then considered for each potential mitigation measure. Potential mitigation measures are summarized in **Table 1** below.

Table 1 - Reduction Measures Adopted or Rejected

Project Segment	Location (Street, Area)	Adjacent Land Use	Reduction Measure Considered	Measure Adopted? (Yes/No)	Estimated Cost to Adopt
		Per §2-D	Per § 2-G		
A, C, & E	See Appendix	Residential Commercial Industrial Recreational Undeveloped	Underground Installation	Yes	>4%
	The CPUC has previously stated in D.06-01-042 that, "placing a transmission line underground should normally provide sufficient mitigation." The incremental cost for placing these segments underground is significantly greater than the 4% threshold for low-cost mitigation measures. However, the suburban and urban nature of the adjacent land uses led to the decision in this case to propose all of Segments A, C, and E to be underground, thereby providing significant magnetic field level mitigation compared to a similar overhead transmission line.				
A	See Appendix	Commercial Industrial Recreational Undeveloped	Increase Trench Depth	No	N/A
	The proposed minimum trench depth is 3 feet to the top of the duct bank. Increasing trench depth for Segment A was rejected due to the incremental cost of the additional trenching. To achieve a 15% reduction in magnetic field strength at the centerline of the utility ROW would necessitate an increase in trench depth of at least 1.5 feet. This increase in trench depth is estimated to increase Segment A transmission line construction costs by approximately 13%. Trenching to a greater depth would also extend construction time and increase construction-related traffic and disruption to local neighborhoods.				

[7] CYMCAP version 8.2 rev. 3 developed by Cyme International (c) 1990-2023

[8] PLS-CADD version 19.0 developed by Power Line Systems © 2021 Calculations based on the EPRI Red Book methods

Project Segment	Location (Street, Area)	Adjacent Land Use	Reduction Measure Considered	Measure Adopted? (Yes/No)	Estimated Cost to Adopt
	Further, because of the crowded utility environment below city streets, the duct bank may be up to approximately ten feet below the road surface in limited areas to avoid existing utilities. This will have a secondary benefit of decreasing magnetic field strength at the surface in these areas.				
B	See Appendix	Commercial Industrial Undeveloped	Increase Structure Height	No	N/A
	Segment B is located within the San José/Santa Clara Regional Wastewater Facility, which excludes public access. The undeveloped land use along Segment B does not warrant low-cost mitigation measures and is not evaluated further herein.				
C	See Appendix	Commercial Industrial	Increase Trench Depth	No	N/A
	This line segment is located between two substations, mostly underground in a gated PG&E-owned road, which excludes public access. Increasing the trench depth would have negligible effects for any sensitive receptors.				
E	See Appendix	Residential Commercial Industrial Undeveloped	Increase Trench Depth	No	N/A
	The proposed minimum trench depth is 3 feet to the top of the duct bank. Increasing trench depth for Segment E was rejected due to the incremental cost of the additional trenching. Furthermore, to achieve a 15% reduction in magnetic field strength at the centerline of the utility ROW would necessitate an increase in trench depth of at least 9 inches. This increase in trench depth is estimated to increase transmission line construction costs by approximately 7%. Trenching to a greater depth would also extend construction time and increase construction-related traffic and disruption to local neighborhoods. Further, because of the crowded utility environment below city streets, the duct bank may be up to approximately ten feet below the road surface in limited areas to avoid existing utilities. This will have a secondary benefit of decreasing magnetic field strength at the surface in these areas.				
F	See Appendix	Commercial Industrial Recreational Undeveloped	Increase Structure Height	Yes	>4%
	The design of the Segment F transmission span has been raised above the minimum electrical clearance requirement to meet maintenance requirements imposed by the Santa Clara Valley Water District. This height increase achieves an approximate 35% reduction in magnetic field strength..				
A, C, & E	See Appendix	Residential Commercial Industrial Recreational Undeveloped	Locate transmission line closer to the center of the right of way where possible	Yes	No cost
	All segments of transmission line will be located close to the center of the public				

<table>
<tr><th>Project Segment</th><th>Location (Street, Area)</th><th>Adjacent Land Use</th><th>Reduction Measure Considered</th><th>Measure Adopted? (Yes/No)</th><th>Estimated Cost to Adopt</th></tr>
<tr><td></td><td colspan="5">right of way when possible. Because of the crowded nature of the city streets, especially along Segments A and E, the duct bank will be located to minimize substantial relocation of existing utilities. In many cases location near the center of the right of way will not be possible due to clearance requirements with existing utilities.</td></tr>
<tr><td rowspan="2">B & F</td><td>See Appendix</td><td>Commercial
Industrial
Recreational
Undeveloped</td><td>Locate transmission line closer to the center of the right of way where possible</td><td>Yes</td><td>No cost</td></tr>
<tr><td colspan="5">Segments B and F would be located at or near the center of the designated right of way.</td></tr>
<tr><td rowspan="2">A & B</td><td>See Appendix</td><td>Commercial
Industrial
Recreational
Undeveloped</td><td>Reduce Conductor Spacing</td><td>No</td><td>N/A</td></tr>
<tr><td colspan="5">As a DC line, Segments A & B are not phased like a conventional AC line and therefore, reducing the conductor spacing does not materially reduce magnetic field values.</td></tr>
<tr><td rowspan="2">C, & E</td><td>See Appendix</td><td>Residential
Commercial
Industrial
Recreational
Undeveloped</td><td>Reduce Conductor Spacing</td><td>Yes</td><td>No cost</td></tr>
<tr><td colspan="5">The spacing between conductors inside the duct bank has been minimized to optimize for EMF levels as well as duct bank size efficiency. Further spacing reduction is not practical due to mutual heating, which would limit the cable capacity to below the CAISO requirements.</td></tr>
<tr><td rowspan="2">F</td><td>See Appendix</td><td>Commercial
Industrial
Recreational
Undeveloped</td><td>Reduce Conductor Spacing</td><td>Yes</td><td>No cost</td></tr>
<tr><td colspan="5">Based upon the preliminary design, the Segment F structure’s conductors have been designed in a delta configuration which reduces magnetic field strengths compared to a horizontal and vertical conductor configuration.</td></tr>
<tr><td rowspan="2">A, B, E, & F</td><td>See Appendix</td><td>Residential
Commercial
Industrial
Recreational
Undeveloped</td><td>Phasing circuits to reduce magnetic fields</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="5">The DC Segments A & B do not have conventional AC phasing that would materially benefit from adjusting phasing to reduce magnetic fields. Segments E and F consist of only a single AC circuit each, meaning that there are no phase configurations that would reduce field strength through partial cancellation.</td></tr>
</table>

<table>
<tr><th>Project Segment</th><th>Location (Street, Area)</th><th>Adjacent Land Use</th><th>Reduction Measure Considered</th><th>Measure Adopted? (Yes/No)</th><th>Estimated Cost to Adopt</th></tr>
<tr><td rowspan="2">C</td><td>See Appendix</td><td>Residential
Commercial
Industrial
Recreational
Undeveloped</td><td>Phasing circuits to reduce magnetic fields</td><td>Yes</td><td>No Cost</td></tr>
<tr><td colspan="5">Segment C is a single AC circuit proposed to have two conductors per phase, allowing for phasing optimization to reduce magnetic fields.</td></tr>
</table>

Magnetic Field Reduction Measures Considered

Segment A

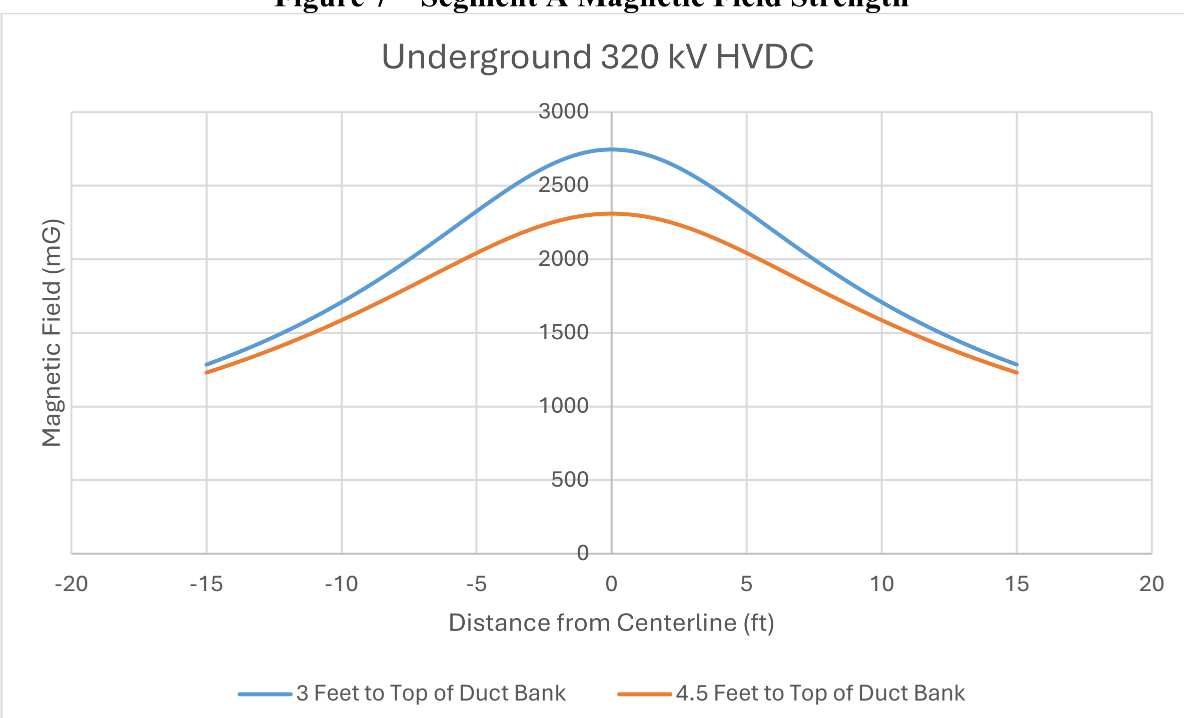
Segment A would be located underground, almost exclusively within existing public roadways. The CPUC has previously stated in D.06-01-042 that, "placing a transmission line underground should normally provide sufficient mitigation"; the incremental cost for placing this segment underground is significantly greater than the 4% threshold for low-cost mitigation measures. However, the suburban and urban nature of the adjacent land uses led to the decision in this case to propose all of Segment A to be underground, thereby providing significant magnetic field level mitigation compared to a similar overhead transmission line.

Notwithstanding this, LSPGC evaluated the following no-cost and low-cost mitigation measures to further reduce magnetic field strength:

Increasing Trench Depth

The standard minimum trench depth for the Power the South Bay project is 3 feet below expected post construction grade. Increasing trench depth was considered as a potential mitigation measure for Segment A. **Figure 7,** *Segment A Magnetic Field Strength* provides the magnetic field strength values for Segment A at varying distances from the duct bank centerline for a receptor 3 feet above ground level.

Figure 7 – Segment A Magnetic Field Strength[9]



[9] See Appendix 2 Table 4 for the tabular data used to produce this figure

The minimum trench depth increase required to decrease the magnetic field level by 15% for Segment A is 18 inches (1.5 feet). This increase in trench depth is estimated to increase Segment A construction costs by approximately 13%. Additionally, Segment A is located almost entirely within city and county streets where any magnetic field exposure would be temporary. Trenching to a greater depth would also extend construction time and could increase construction-related traffic and disrupt local businesses. For these reasons, LSPGC does not propose increasing trench depth within Segment A as a low-cost measure for reducing magnetic fields.

Notwithstanding this, in street sections with a large number of existing utilities, limited portions of the Segment A trench are expected to be installed lower than the minimum 3 feet to meet utility clearance requirements which would further reduce magnetic fields.

Locating Power Lines Closer to the Centerline of the Corridor

The Segment A transmission line will be located close to the center of the right of way when possible. Because of the crowded utility environment under city streets, the duct bank may need to be closer to the edge of the right of way to avoid conflicts with or substantial relocations of existing utilities. LSPGC will locate transmission lines close to the centerline of the ROW to the extent practicable while also considering other design constraints.

LSPGC will work with the relevant parties to ensure each segment is centered in the existing roadway to the extent practicable while maintaining required existing utility clearances.

Reducing Conductor (Phase) Spacing

As a DC line, Segment A is not phased like a conventional AC line and therefore, reducing the conductor spacing does not materially reduce magnetic field values. Thus, this measure is not applicable to Segment A.

Phasing Circuits to Reduce Magnetic Fields

As a DC line, Segment A is not phased like a conventional AC line. Additionally, Segment A is a single circuit transmission line. Therefore, phasing circuits to reduce magnetic fields is not an effective reduction measure.

Segment B

Segment B would be located wholly within the RWF and SCVWD property both of which prohibit public access. Segment B would be located across undeveloped land with no permanently occupied residences, schools, or hospitals. Moreover, there are no high priority land use categories in the vicinity of Segment B. The CPUC has previously stated in D.06-01-042 that, "low-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools, or hospitals located on these lands." For this reason, low-cost mitigation measures for Segment B would not be required.

Notwithstanding this, LSPGC evaluated the following no-cost mitigation measures to reduce magnetic field strength:

Locating Power Lines Closer to the Centerline of the Corridor

Segment B will be located at or near the center of its corridor.

Reducing Conductor (Phase) Spacing

As a DC line, Segment B is not phased like a conventional AC line and therefore, reducing the conductor spacing does not materially reduce magnetic field values. Thus, this measure is not applicable to Segment B.

Phasing Circuits to Reduce Magnetic Fields

As a DC line, Segment B is not phased like a conventional AC line. Additionally, Segment B is a single circuit transmission line. Therefore, phasing circuits to reduce magnetic fields is not an effective reduction measure.

Segment C

Segment C would be located within the private Weber Road and the PG&E owned Newark substation property which prohibits public access. There are no high priority land use categories or sensitive receptors in the vicinity of Segment C. For this reason, low-cost mitigation measures for Segment C would not be required. Regardless, LSPGC evaluated the following no-cost mitigation measures to reduce magnetic field strength:

Locating Power Lines Closer to the Centerline of the Corridor

The Segment C transmission line will be located close to the center of the right of way when possible. Because of potential utility conflicts, the duct bank may need to be closer to the edge of the right of way to avoid conflicts with or substantial relocations of existing utilities. LSPGC will locate transmission lines close to the centerline of the ROW to the extent practicable while also considering other design constraints.

Reducing Conductor (Phase) Spacing

The spacing between conductors inside the duct bank for Segment C has been minimized to optimize for EMF levels as well as duct bank size efficiency. Further spacing reduction is not practical due to mutual heating, which limits the cable capacity to below the CAISO requirements. Therefore, LSPGC has already optimized conductor phase spacing for the underground portion of Segment C.

Phasing Circuits to Reduce Magnetic Fields

While Segment C is a single circuit, it is proposed to have two conductors per phase which allows for phasing optimization to reduce magnetic fields. LSPGC will phase the sub-conductors to reduce magnetic fields to the extent practical considering project constraints.

Segment D

Segment D would be located within PG&E's Newark substation property, entirely in areas that prohibit public access. Therefore, mitigation measures for Segment D have not been evaluated in this report.

Segment E

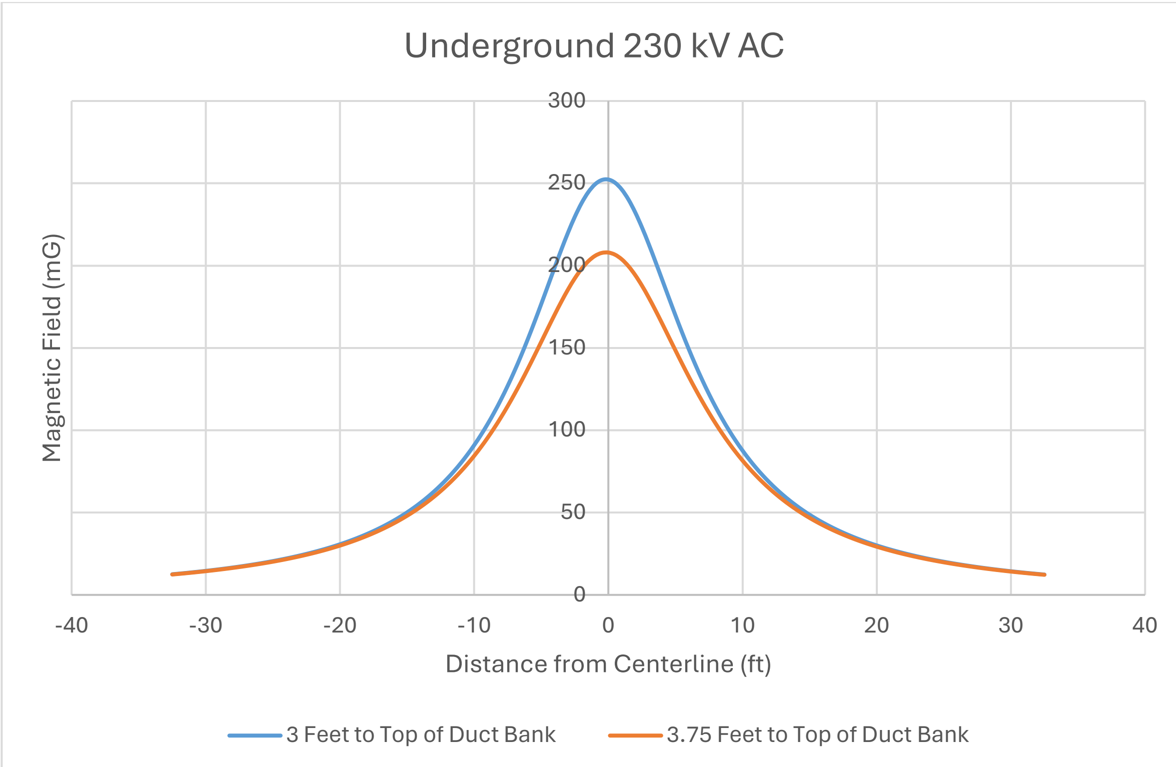
Segment E would be located underground, almost exclusively within existing public roadways. The CPUC has previously stated in D.06-01-042 that, "placing a transmission line underground should normally provide sufficient mitigation." The incremental cost for placing this segment underground is significantly greater than the 4% threshold for low-cost mitigation measures. However, the suburban and urban nature of the adjacent land uses led to the decision in this case to propose all of Segment E to be underground, thereby providing significant magnetic field level mitigation compared to a similar overhead transmission line.

Notwithstanding, LSPGC evaluated the following no-cost and low-cost mitigation measures to further reduce magnetic field strength:

Increasing Trench Depth

The standard minimum trench depth for the Power the South Bay is 3 feet below expected post construction grade. Increasing trench depth was considered as a potential mitigation measure for Segment E. **Figure 9,** *Segment E Magnetic Field Strength* provides the magnetic field strength values for Segment E at varying distances from the duct bank centerline for a receptor 3 feet above ground level.

Figure 9 – Segment E Magnetic Field Strength[10]



The minimum trench depth increase required to decrease the magnetic field level by 15% for Segment E is 9 inches (0.75 feet). This increase in trench depth is estimated to increase the Segment E construction costs by approximately 7%. Trenching to a greater depth would extend construction time and could increase construction-related traffic and disruption to local neighborhoods. For these reasons, LSPGC does not propose increasing trench depth within Segment E as a low-cost measure for reducing magnetic fields.

Locating Power Lines Closer to the Centerline of the Corridor

The Segment E transmission line will be located close to the center of the right of way when possible. Because of the crowded utility environment under streets, the duct bank may need to be closer to the edge of the right of way to avoid conflicts with or substantial relocations of existing utilities. LSPGC will locate transmission lines close to the centerline of the ROW to the extent practicable while also considering other design constraints. LSPGC will work with the relevant parties to ensure each segment is centered in the existing roadway to the extent practicable while maintaining required existing utility clearances.

Reducing Conductor (Phase) Spacing

The spacing between conductors inside the duct bank for Segment E has been minimized to optimize for EMF levels as well as duct bank size efficiency. Further spacing reduction is not

[10] See Appendix 2 Table 5 for the tabular data used to produce this figure

practical due to mutual heating, which limits the cable capacity to below the CAISO requirements. Therefore, LSPGC has already optimized conductor phase spacing for Segment E.

Phasing Circuits to Reduce Magnetic Fields

Segment E is a single circuit transmission line. Therefore, phasing circuits to reduce magnetic fields is not an effective reduction measure.

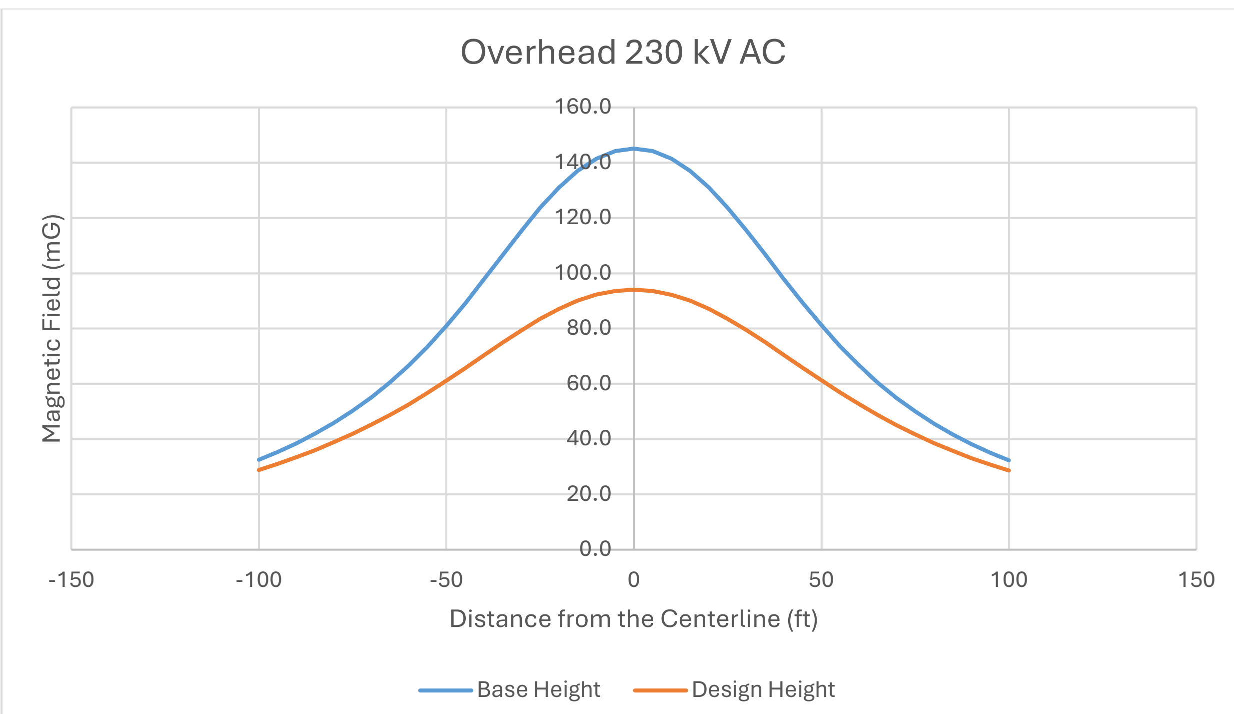
Segment F

Segment F is a single overhead span over the Guadalupe River. There are no high priority land use categories in the vicinity of Segment F. For this reason, low-cost mitigation measures for Segment F would not be required. Regardless, LSPGC evaluated the following no-cost and low-cost mitigation measures to reduce magnetic field strength:

Increasing Structure Height

Segment F structure heights have been raised above the minimum clearance requirement to meet maintenance requirements imposed by the Santa Clara Valley Water District. The design height of the structures has been raised to 116.5 feet from the base minimum structure height of 103.5 feet. This change reduces the magnetic field at the centerline 3 feet above the ground by approximately 35%. **Figure 10,** *Segment F Magnetic Field Strength* provides the magnetic field strength values for Segment F at varying distances from the centerline for a receptor 3 feet above ground level.

Figure 10 - Segment F Magnetic Field Strength[11]



[11] See Appendix 2 Table 6 for the tabular data used to produce this figure

Locating Power Lines Closer to the Centerline of the Corridor

Segment F will be located at or near the center of its corridor.

Reducing Conductor (Phase) Spacing

The structures for Segment F have been designed with a delta conductor configuration which reduces magnetic field impacts when compared to horizontal and vertical conductor configurations. Therefore, LSPGC has already optimized conductor phase spacing for Segment F.

Phasing Circuits to Reduce Magnetic Fields

Segment F is a single circuit transmission line. Therefore, phasing circuits to reduce magnetic fields is not an effective reduction measure.

4. SUBSTATION FIELD MANAGEMENT PLAN

Generally, magnetic field values along the substation perimeter are low compared to the substation interior because of the distance to the energized equipment. Normally, the highest values of magnetic fields around the perimeter of a substation are caused by overhead power lines and underground duct banks entering and leaving the substation, and not by substation equipment. The lines entering and leaving the substations are included in the scope of the transmission line FMP. Magnetic field reduction measures considered for the Albrae and Baylands terminals as part of the Project are summarized in the table below.

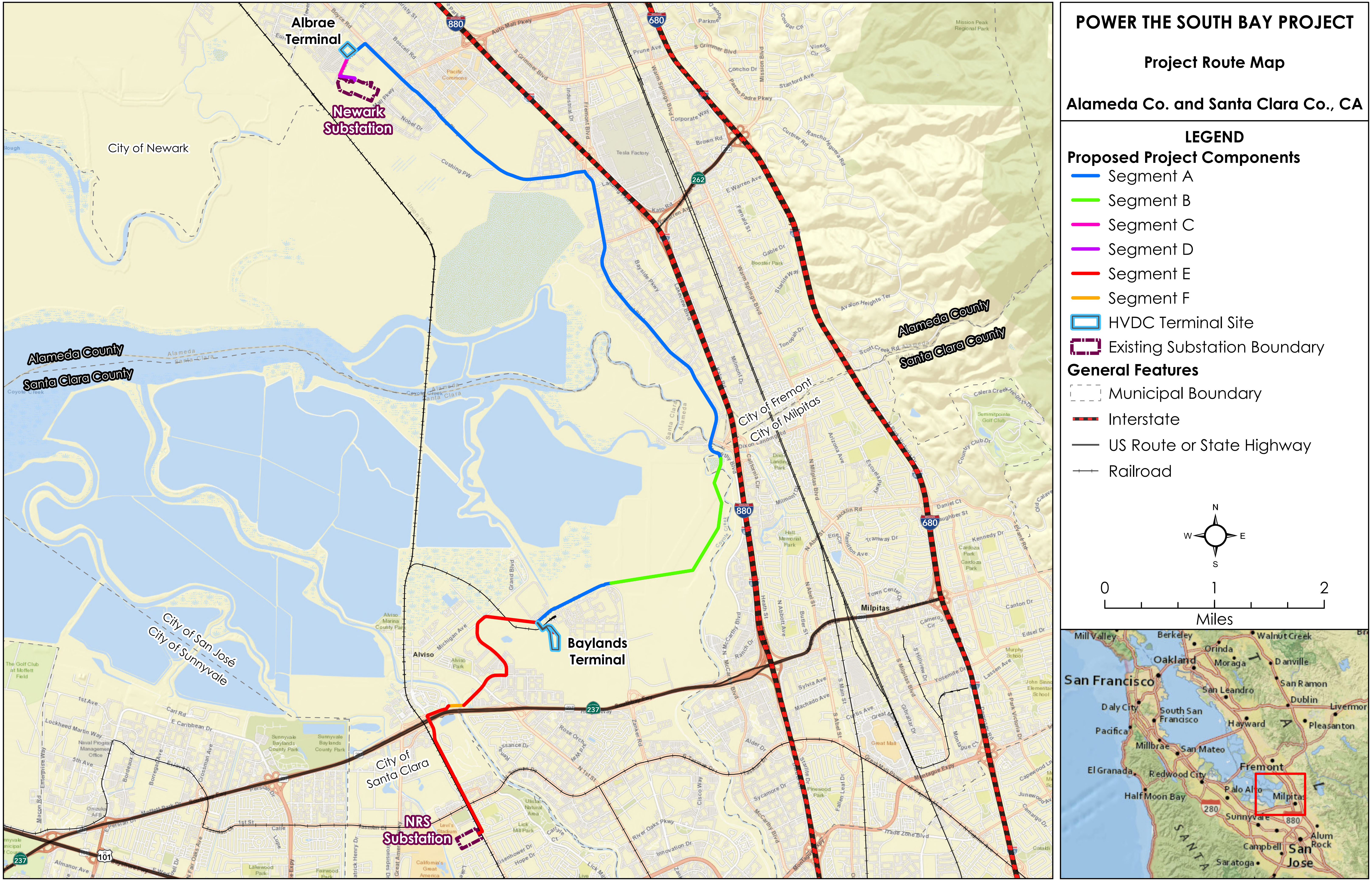
Table 2 - Albrae Terminal - Substation Checklist

No- Cost and Low -Cost Magnetic Field Reduction Measures Evaluated for the Albrae Terminal	Measures Adopted? (Yes/No)	Reason(s) if not Adopted
Keep high- current devices, transformers, capacitors, and reactors away from the substation property lines.	Yes	
For underground duct banks, the minimum distance should be 12 feet from the adjacent property lines or as close to 12 feet as practical.	Yes	
Locate new substations close to existing power lines to the extent practical.	Yes	LSPGC consulted with PG&E concerning the potential for siting the Albrae terminal on PG&E property adjacent to the existing Newark substation. PG&E determined that they would not be able to accommodate the request given the existing and planned uses for the property. The proposed Albrae terminal is located close to existing power lines and the Newark substation to the extent practical.
Increase the substation property boundary to the extent practical.	Yes	

Table 3 - Baylands Terminal - Substation Checklist

No -Cost and Low -Cost Magnetic Field Reduction Measures Evaluated for the Baylands Terminal	Measures Adopted? (Yes/No)	Reason(s) if not Adopted
Keep high -current devices, transformers, capacitors, and reactors away from the substation property lines.	Yes	
For underground duct banks, the minimum distance should be 12 feet from the adjacent property lines or as close to 12 feet as practical.	Yes	
Locate new substations close to existing power lines to the extent practical.	Yes	
Increase the substation property boundary to the extent practical.	Yes	

Appendix 1 – Project Route Map


POWER THE SOUTH BAY PROJECT
Project Route Map
Alameda Co. and Santa Clara Co., CA
LEGEND
Proposed Project Components
Segment A
Segment B
Segment C
Segment D
Segment E
Segment F
HVDC Terminal Site
Existing Substation Boundary
General Features
Municipal Boundary
Interstate
US Route or State Highway
Railroad
N
W
E
S
0
1
2
Miles
Albrae Terminal
Newark Substation
City of Newark
Alameda County
Santa Clara County
City of Fremont
City of Milpitas
Baylands Terminal
City of San José
City of Sunnyvale
City of Santa Clara
NRS Substation
Alviso
Milpitas
880
680
262
237
101
San Francisco
Oakland
Berkeley
Mill Valley
Walnut Creek
Orinda
Moraga
Danville
San Leandro
San Ramon
Dublin
Livermore
Daly City
South San Francisco
Hayward
Pleasanton
Pacifica
Millbrae
San Mateo
Fremont
El Granada
Redwood City
Palo Alto
Milpitas
Half Moon Bay
Sunnyvale
Campbell
San Jose
Alum Rock
Saratoga

Appendix 2 – Magnetic Field Value Tables from Figures 7 Through 10

Table 4 – Segment A - 320 kV HVDC Underground Transmission Line

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	4.5 Feet to Top of Duct Bank	Percent Reduction
-15	1284.3254	1229.842	4.24%
-14.5	1318.6271	1259.855	4.46%
-14	1354.5161	1291.039	4.69%
-13.5	1392.0752	1323.431	4.93%
-13	1431.3883	1357.067	5.19%
-12.5	1472.5392	1391.975	5.47%
-12	1515.61	1428.179	5.77%
-11.5	1560.6792	1465.694	6.09%
-11	1607.8184	1504.523	6.42%
-10.5	1657.0891	1544.656	6.78%
-10	1708.5376	1586.066	7.17%
-9.5	1762.1896	1628.702	7.58%
-9	1818.0424	1672.49	8.01%
-8.5	1876.0567	1717.322	8.46%
-8	1936.1453	1763.056	8.94%
-7.5	1998.1608	1809.504	9.44%
-7	2061.8816	1856.432	9.96%
-6.5	2126.9959	1903.552	10.51%
-6	2193.0853	1950.515	11.06%
-5.5	2259.6094	1996.913	11.63%
-5	2325.8959	2042.278	12.19%
-4.5	2391.115	2086.072	12.76%
-4	2454.3046	2127.714	13.31%
-3.5	2514.3639	2166.581	13.83%
-3	2570.0832	2202.024	14.32%
-2.5	2620.1864	2233.395	14.76%
-2	2663.391	2260.069	15.14%
-1.5	2698.482	2281.48	15.45%
-1	2724.3952	2297.145	15.68%
-0.5	2740.2981	2306.699	15.82%
0	2745.6599	2309.909	15.87%
0.5	2740.2981	2306.699	15.82%
1	2724.3952	2297.145	15.68%
1.5	2698.482	2281.48	15.45%

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	4.5 Feet to Top of Duct Bank	Percent Reduction
2	2663.391	2260.069	15.14%
2.5	2620.1864	2233.395	14.76%
3	2570.0832	2202.024	14.32%
3.5	2514.3639	2166.581	13.83%
4	2454.3046	2127.714	13.31%
4.5	2391.115	2086.072	12.76%
5	2325.8959	2042.278	12.19%
5.5	2259.6094	1996.913	11.63%
6	2193.0853	1950.515	11.06%
6.5	2126.9959	1903.552	10.51%
7	2061.8816	1856.432	9.96%
7.5	1998.1608	1809.504	9.44%
8	1936.1453	1763.056	8.94%
8.5	1876.0567	1717.322	8.46%
9	1818.0424	1672.49	8.01%
9.5	1762.1896	1628.702	7.58%
10	1708.5376	1586.066	7.17%
10.5	1657.0891	1544.656	6.78%
11	1607.8184	1504.523	6.42%
11.5	1560.6792	1465.694	6.09%
12	1515.61	1428.179	5.77%
12.5	1472.5392	1391.975	5.47%
13	1431.3883	1357.067	5.19%
13.5	1392.0752	1323.431	4.93%
14	1354.5161	1291.039	4.69%
14.5	1318.6271	1259.855	4.46%
15	1284.3254	1229.842	4.24%

Table 5 – Segment E - 230 kV AC Underground Transmission Line

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	3.75 Feet to Top of Duct Bank	Percent Reduction
-32.5	12.5299	12.3987	1.05%
-32	12.9059	12.7668	1.08%
-31.5	13.2988	13.1511	1.11%
-31	13.7095	13.5526	1.14%
-30.5	14.1391	13.9723	1.18%
-30	14.5889	14.4114	1.22%
-29.5	15.06	14.8709	1.26%
-29	15.5538	15.3522	1.30%
-28.5	16.0717	15.8565	1.34%
-28	16.6153	16.3854	1.38%
-27.5	17.1862	16.9404	1.43%
-27	17.7864	17.5232	1.48%
-26.5	18.4177	18.1357	1.53%
-26	19.0823	18.7797	1.59%
-25.5	19.7824	19.4575	1.64%
-25	20.5207	20.1712	1.70%
-24.5	21.2998	20.9235	1.77%
-24	22.1226	21.717	1.83%
-23.5	22.9924	22.5546	1.90%
-23	23.9127	23.4396	1.98%
-22.5	24.8874	24.3753	2.06%
-22	25.9205	25.3655	2.14%
-21.5	27.0167	26.4143	2.23%
-21	28.1809	27.5261	2.32%
-20.5	29.4186	28.7058	2.42%
-20	30.7359	29.9586	2.53%
-19.5	32.1392	31.2903	2.64%
-19	33.6358	32.7072	2.76%
-18.5	35.2337	34.216	2.89%
-18	36.9415	35.8244	3.02%
-17.5	38.7688	37.5403	3.17%
-17	40.7262	39.3727	3.32%
-16.5	42.8254	41.3313	3.49%
-16	45.079	43.4266	3.67%
-15.5	47.5013	45.6701	3.86%
-15	50.1077	48.0742	4.06%

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	3.75 Feet to Top of Duct Bank	Percent Reduction
-14.5	52.9154	50.6528	4.28%
-14	55.9428	53.4199	4.51%
-13.5	59.2105	56.3916	4.76%
-13	62.7408	59.5847	5.03%
-12.5	66.5582	63.017	5.32%
-12	70.6889	66.7074	5.63%
-11.5	75.1613	70.6758	5.97%
-11	80.0055	74.9422	6.33%
-10.5	85.2533	79.5273	6.72%
-10	90.9374	84.4508	7.13%
-9.5	97.0911	89.7316	7.58%
-9	103.7468	95.3861	8.06%
-8.5	110.9345	101.427	8.57%
-8	118.6796	107.8612	9.12%
-7.5	126.9998	114.6879	9.69%
-7	135.901	121.8954	10.31%
-6.5	145.3726	129.458	10.95%
-6	155.3811	137.3322	11.62%
-5.5	165.863	145.4527	12.31%
-5	176.717	153.7288	13.01%
-4.5	187.7976	162.0419	13.71%
-4	198.9057	170.2416	14.41%
-3.5	209.7906	178.15	15.08%
-3	220.1499	185.5638	15.71%
-2.5	229.6407	192.2628	16.28%
-2	237.8989	198.0223	16.76%
-1.5	244.5678	202.6293	17.15%
-1	249.3319	205.9	17.42%
-0.5	251.952	207.6975	17.56%
0	252.2943	207.9456	17.58%
0.5	250.3471	206.6366	17.46%
1	246.2213	203.8319	17.22%
1.5	240.1353	199.6549	16.86%
2	232.3869	194.278	16.40%
2.5	223.3205	187.9057	15.86%
3	213.2929	180.7577	15.25%
3.5	202.6462	173.0525	14.60%
4	191.6869	164.9948	13.92%
4.5	180.6749	156.7673	13.23%

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	3.75 Feet to Top of Duct Bank	Percent Reduction
5	169.8189	148.5252	12.54%
5.5	159.2768	140.3942	11.86%
6	149.1637	132.4738	11.19%
6.5	139.554	124.836	10.55%
7	130.4914	117.5315	9.93%
7.5	121.9953	110.592	9.35%
8	114.0666	104.0345	8.79%
8.5	106.6932	97.8644	8.27%
9	99.8537	92.078	7.79%
9.5	93.5212	86.6656	7.33%
10	87.6653	81.6128	6.90%
10.5	82.2542	76.9024	6.51%
11	77.2558	72.5154	6.14%
11.5	72.6387	68.4322	5.79%
12	68.3728	64.6328	5.47%
12.5	64.4296	61.0978	5.17%
13	60.7824	57.8083	4.89%
13.5	57.4065	54.7462	4.63%
14	54.279	51.8946	4.39%
14.5	51.3789	49.2374	4.17%
15	48.6871	46.7598	3.96%
15.5	46.1858	44.4479	3.76%
16	43.8593	42.2891	3.58%
16.5	41.693	40.2715	3.41%
17	39.6735	38.3843	3.25%
17.5	37.7889	36.6174	3.10%
18	36.0281	34.9617	2.96%
18.5	34.3813	33.4089	2.83%
19	32.8394	31.9511	2.70%
19.5	31.3941	30.5813	2.59%
20	30.038	29.293	2.48%
20.5	28.7642	28.0804	2.38%
21	27.5665	26.9378	2.28%
21.5	26.4392	25.8604	2.19%
22	25.3772	24.8435	2.10%
22.5	24.3757	23.8828	2.02%
23	23.4303	22.9746	1.94%
23.5	22.5371	22.1152	1.87%
24	21.6925	21.3014	1.80%

	Magnetic Field Level 3 Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	3 Feet to Top of Duct Bank	3.75 Feet to Top of Duct Bank	Percent Reduction
24.5	20.8931	20.53	1.74%
25	20.1358	19.7983	1.68%
25.5	19.4178	19.1038	1.62%
26	18.7366	18.4441	1.56%
26.5	18.0897	17.8169	1.51%
27	17.4749	17.2202	1.46%
27.5	16.8902	16.6521	1.41%
28	16.3337	16.111	1.36%
28.5	15.8037	15.5951	1.32%
29	15.2985	15.1029	1.28%
29.5	14.8166	14.6331	1.24%
30	14.3567	14.1844	1.20%
30.5	13.9175	13.7555	1.16%
31	13.4978	13.3453	1.13%
31.5	13.0964	12.9528	1.10%
32	12.7124	12.5771	1.06%
32.5	12.3447	12.2171	1.03%

Table 6 – Segment F - 230 kV AC Overhead Transmission Line

	Magnetic Field Level Three Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	Base Height (103.5 feet)	Design Height (116.5 feet)	Percent Reduction
-100	32.5	28.8	11.30%
-95	35.3	31.0	12.16%
-90	38.5	33.4	13.10%
-85	42.0	36.1	14.15%
-80	45.9	38.9	15.32%
-75	50.3	41.9	16.60%
-70	55.2	45.2	17.98%
-65	60.6	48.8	19.47%
-60	66.7	52.6	21.07%
-55	73.4	56.7	22.77%
-50	81.0	61.1	24.51%
-45	89.1	65.7	26.28%
-40	97.7	70.3	28.03%
-35	106.6	75.0	29.68%
-30	115.4	79.4	31.18%
-25	123.7	83.5	32.47%
-20	131.0	87.1	33.51%
-15	137.1	90.1	34.28%
-10	141.5	92.3	34.79%
-5	144.2	93.6	35.09%
0	145.1	94.1	35.18%
5	144.2	93.6	35.08%
10	141.5	92.3	34.79%
15	137.0	90.1	34.28%
20	131.0	87.1	33.51%
25	123.7	83.6	32.48%
30	115.5	79.5	31.19%
35	106.8	75.1	29.69%
40	97.9	70.5	28.04%
45	89.3	65.8	26.29%
50	81.2	61.3	24.52%
55	73.6	56.8	22.77%
60	66.7	52.6	21.09%
65	60.5	48.7	19.50%
70	54.9	45.0	18.01%
75	50.0	41.7	16.64%

	Magnetic Field Level Three Feet Above Ground (milliGauss)		
Distance from Centerline (feet)	Base Height (103.5 feet)	Design Height (116.5 feet)	Percent Reduction
80	45.6	38.6	15.38%
85	41.7	35.7	14.23%
90	38.2	33.1	13.19%
95	35.1	30.8	12.23%
100	32.3	28.6	11.37%