FINAL TRANSMISSION EMF MANAGEMENT PLAN

JEFFERSON-MARTIN 230 KV TRANSMISSION PROJECT

January 6, 2005

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I. GENERAL DESCRIPTION OF PROPOSED PROJECT

Project Name: Jefferson-Martin 230 kV Transmission Project

Project Lead: Alain Billot (Project Manager)

Scope of Work:

The Jefferson-Martin 230 kV Transmission Project is needed to meet the projected electric demand in the Cities of Burlingame, Millbrae, San Bruno, South San Francisco, Brisbane, Colma, Daly City, Hillsborough and San Francisco (the north of San Mateo County). The Project starts from PG&E's Jefferson Substation in San Mateo County and terminates at PG&E's Martin Substation in the City of Brisbane.

The approved project route:

Beginning at the Jefferson substation, the project shall be constructed along a hybrid route commencing with Route Option 1B in the southernmost segment; with PG&E authorized to determine which of five identified options for crossing Crystal Springs Dam to utilize based on the timing of project construction and the preferences of the SFPUC, the County of San Mateo, and the U.S. Fish and Wildlife Service; and transitioning to an overhead configuration at a new transition structure sited at the location of existing tower 11/70;

From the new transition structure, the transmission line shall be constructed as proposed in PG&E's Proposed Project until the line transitions underground at a new Glenview Drive transition tower located on a roadway divider between Glenview Drive and Skyline Boulevard west of an existing water tank, on land owned by Caltrans;

From the new Glenview Drive transition tower, the line shall be constructed in an underground configuration along Glenview Drive to its intersection with San Bruno Avenue where it shall travel east down San Bruno Avenue; and

From San Bruno Avenue, the line shall be constructed consistent with PG&E's proposed underground route in the northern segment, modified to include Route Option 4B rather than Route Option 4A, to the Martin substation.

Base Cost of Transmission Line Proposed Project:

The estimated total cost of the Proposed Project (without the EMF mitigation benchmark budget) is approximately $199,026,923.[1] Four percent of this estimated total cost is $7,961,077.

[1] The estimated total cost of the project may change based on final engineering and other factors.

II. BACKGROUND: CPUC DECISION 93-11-013 AND EMF POLICY

On January 15, 1991, the CPUC initiated an investigation to consider its role in mitigating the health effects, if any, of electric and magnetic fields from utility facilities and power lines. A working group of interested parties, called the California EMF Consensus Group, was created by the CPUC to advise it on this issue. It consisted of 17 stakeholders representing citizens groups, consumer groups, environmental groups, state agencies, unions, and utilities. The Consensus Group's fact-finding process was open to the public, and its report incorporated concerns expressed by the public. Its recommendations were filed with the Commission in March 1992.

Based on the work of the Consensus Group, written testimony, and evidentiary hearings, the CPUC issued its decision (93-11-013) on November 2, 1993, to address public concern about possible EMF health effects from electric utility facilities.

In response to a situation of scientific uncertainty and public concern, the decision specifically requires PG&E to consider "no-cost" and "low-cost" measures, where feasible, to reduce exposure from new or upgraded utility facilities. It directs that no-cost mitigation measures be undertaken, and that low-cost options, when they meet certain guidelines for field reduction and cost, be adopted through the project certification process. PG&E was directed to develop, submit and follow EMF guidelines to implement the CPUC decision. PG&E has done so. Four percent of total project budgeted cost is the benchmark in implementing EMF mitigation, and mitigation measures should achieve incremental magnetic field reductions of at least 15%.

III. ELECTRIC AND MAGNETIC FIELDS (EMF)

EMF is a term used to describe electric and magnetic fields that are created by electric voltage (electric field) and electric current (magnetic field). Power frequency EMF is a natural consequence of electrical circuits, and can be either directly measured using the appropriate measuring instruments or calculated using appropriate information.

Electric fields are present whenever voltage exists on a wire, and are not dependent on current. The magnitude of the electric field is primarily a function of the configuration and operating voltage of the line and decreases with the distance from the source (line). The electric field can be shielded (i.e., the strength can be reduced) by any conducting surface, such as trees, fences, walls, buildings, and most types of structures. The strength of an electric field is measured in volts per meter (V/m) or kilovolts per meter (kV/m).

Magnetic fields are present whenever current flows in a conductor, and are not dependent on the voltage of the conductor. The strength of these fields also decreases with distance from the source. However, unlike electric fields, most common materials have little shielding effect on magnetic fields.

The magnetic field strength is a function of both the current on the conductor and the design of the system. Magnetic fields are measured in units called Gauss. However, for the low levels normally encountered near electric utility facilities, the field strength is

expressed in a much smaller unit, the milliGauss (mG), which is one thousandth of a Gauss.

Power frequency EMF are present wherever electricity is used. This includes not only utility transmission lines, distribution lines, and substations, but also the building wiring in homes, offices, and schools, and in the appliances and machinery used in these locations. Magnetic field intensities from these sources can range from below 1 mG to above 1,000 mG (1 Gauss).

Magnetic field strengths diminish with distance. Fields from compact sources (i.e., those containing coils such as small appliances and transformers) drop off with distance "r" from the source by a factor of $1/r^3$. For three-phase power lines with balanced currents, the magnetic field strength drops off at a rate of $1/r^2$. Fields from unbalanced currents, which flow in paths such as neutral or ground conductors, fall off inversely proportional to the distance from the source, 1/r. Conductor spacing and configuration also affect the rate at which the magnetic field strength decreases, as well as the presence of other sources of electricity. The magnetic field levels of PG&E's power lines will vary with customer demand.

Magnetic field strengths for typical overhead transmission power line loads at the edge of rights-of-way are approximately 10 to 90 mG.

The Jefferson-Martin 230 kV Transmission Project CPUC Final Decision (D 04-08-046) includes the following requirements for the EMF management plan as described in Section VI.C:

Triangular Configuration

"We require that PG&E use a triangular configuration to reduce EMF levels as a no-cost mitigation measure unless there are obstacles or other impediments that would preclude such a configuration." D.04-08-046 at 103.

Strategic Line Placement

"To the extent allowed by the location of existing underground utilities, PG&E may be able to choose line placement within the right of way in a manner that would reduce EMF exposure within buildings along the way. We instruct PG&E to undertake such strategic line placement along the entire route to the extent it can be accommodated at no or minimal cost. By "minimal" cost, we mean typical trenching and duct bank construction costs that may be incurred because the route may not be as direct as otherwise possible if strategic placement were not undertaken. As a general matter, we do not expect PG&E to undertake more extensive steps such as moving existing underground utilities in order to reduce EMF levels through strategic placement. PG&E should use its judgment, however, regarding the extent to which such additional strategic line placement could be undertaken as a low-cost measure." D.04-08-046 at 103-04.

Thirty-four feet from the edge of residential and commercial buildings

"PG&E commits, however to locate the line at least 34 feet from the edge of residential and commercial buildings along the BART right of way to the extent "safe, feasible, and cost-effective" as part of its EMF mitigation measures. We adopt this additional strategic line placement requirement, not just along the BART right of way but any place along the route where it is feasible to place the line at least 34 feet from residential living units or other buildings where people are expected to spend significant amounts of time. PG&E should undertake strategic line placement, including placement of the line at least 34 feet from buildings where feasible, even if the reduction in EMF is less than 15%." D.04-08-046 at 104.

Total Depth

"In an effort to make the most effective use of EMF mitigation funds, we will not require PG&E to lower the trench below a total depth of 11 feet due to EMF mitigation requirements." D.04-08-046 at 103.

Lowering the trench an additional five-feet

"we require that PG&E lower the trench by 5 feet in all residential areas where this would lower magnetic fields by at least 15%. The low-cost EMF mitigation measure that provides deeper undergrounding near schools and other high priority customers applies in addition to the requirements regarding strategic line placement, i.e., there may be locations where the line's alignment would be moved and it would be placed deeper underground. The determination of whether lowering the trench an additional 5 feet would reduce magnetic fields by at least 15% should be based on a comparison to field levels after strategic line placement." D.04-08-046 at 105-06.

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IV. NO COST FIELD REDUCTIONS TO BE IMPLEMENTED

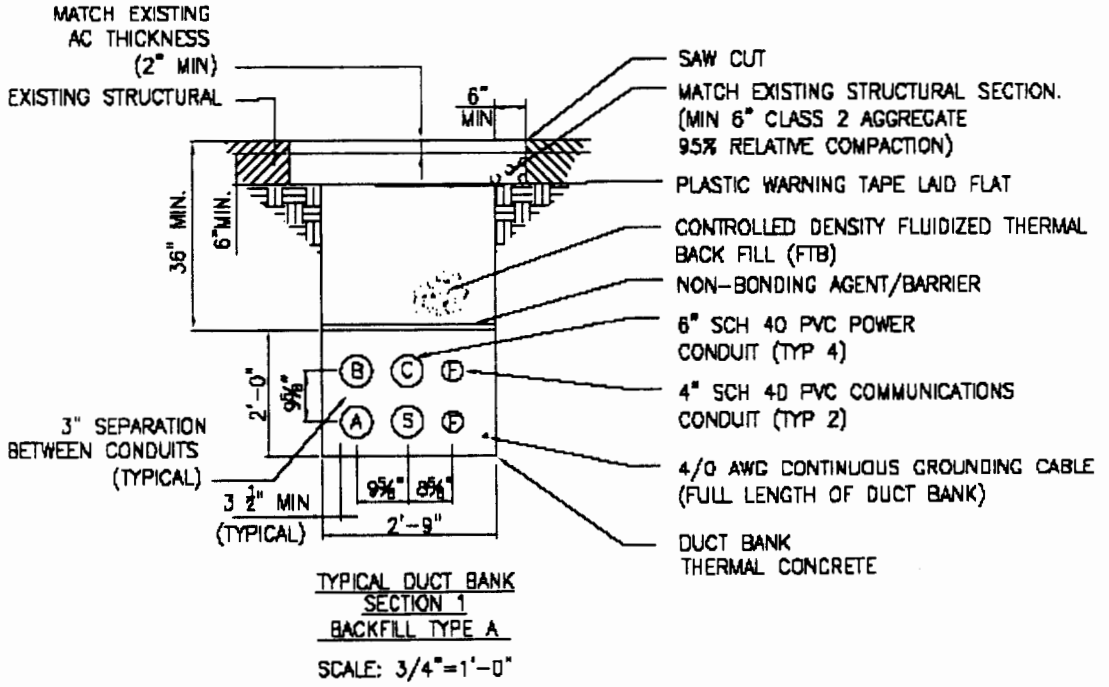
Location of magnetic field calculations: The magnetic field is calculated three feet above the ground at the edge of the right of way. The magnetic field strength depends upon the location along the line at which it is calculated.

Base Case Load Flow:

Jefferson-Martin 230 kV: The projected 2006 normal summer medium load current (all lines in service) used for the base case calculation of the magnetic field is 459 Amps, flowing from Jefferson substation to Martin substation.

The load currents are assumed to be balanced at 120 electrical degrees separation between the three phases. The loads can vary during the 24 hour day and /or throughout the year.

Typical Duct Bank Configuration Figure 1.



Triangular Configuration

The typical configuration for this project will be a triangular placement of the three cables in a 2 X 2 duct bank. See Figure 1.

Strategic Line Placement

The trench will be placed within the right of way to reduce magnetic field exposure to buildings along the entire route, except where the location of existing underground utilities prevent strategic line placement.

Thirty-four feet from the edge of residential and commercial buildings

After the strategic line placement, the duct bank locations within the right of way closer than thirty-four feet from residential and commercial buildings were evaluated for feasible methods to relocate the trench further away. The following Plan and Profile drawings show the route locations where the duct bank could not be located at least thirty-four feet from residential and commercial buildings where people are expected to spend significant amounts of time:

P&P Drawing: 394103-394104, from station 897+00 to 905+00: In this location, the middle of the road is occupied by a sanitary sewer line. In order to maintain access to these utilities for future repair or maintenance, the transmission line must be placed on one side or the other of these existing utilities. PG&E opted to site the line on the south side of the road, staying as close as possible to an existing sanitary sewer line without building over it.

P&P Drawing: 394115, from station 996+00 to 999+00 : The congestion in Orange Avenue, specifically the utilities crossing perpendicular to and above the BART tunnel, prevent PG&E's new duct bank from crossing the Orange Avenue utilities and the BART tunnel in the same location. This situation forces PG&E to cross Orange Avenue either left or right of the BART tunnel. On the right (north) side of the tunnel, there are multiple residential lots within 34 feet of the tunnel's edge, which would in turn force the PG&E duct bank to be very near these residences. There is also an emergency exit staircase from the BART tunnel on the northeast side of Orange Avenue and a gas line parallel to the tunnel that block reasonable alignment options on this north side. On the south side, by contrast, there is an asphalt parking area and a relatively open corridor on the southwest side of Orange Avenue, but there is a building (Boys and Girls Club) west of Orange Avenue and south of the BART tunnel within 34 feet of the proposed transmission line alignment. The utilities on Orange Avenue are also located both shallow and deep, meaning that an open-cut installation would be difficult and require long road closures. To avoid this, PG&E proposes to use a "jack and bore" to cross Orange Avenue west of the BART tunnel. Since the Boys and Girls Club is so close to the BART tunnel, we do not have reasonable access to install the bore pit adjacent to Orange Avenue, so the pit must be located farther away from Orange Avenue in an area where there is room.

P&P Drawing: 394135, from station 1186+00 to 1190+00: In this location, the middle of the road is occupied by existing utilities (a sanitary sewer line and underground telecommunications). In order to maintain access to these utilities for future repair or maintenance, the transmission line must be placed on one side or the other of these existing utilities. The west side of the road becomes blocked at the end of Villa Street

(approximately Station 1192+00), so PG&E opted to site the line on the east side of the road, staying as close as possible to an existing sanitary sewer line without building over it.

P&P Drawing: 394136, from station 1198+75 to 1200+25: The corner of Hillside Boulevard and Market Street is very congested. Identifying an alignment that does not require overly tight radius bends and extensive relocating of existing utilities forces the transmission line alignment to the west side of Hillside Boulevard, where we approach the edge of easement and buildings. While XLPE cable can bend "tightly" on a limited basis, each bend between pulling and splice boxes increases the sidewall pressures on the cable and duct system, which, in this case, would increase pulling tensions beyond acceptable levels. PG&E would need to relocate approximately 300 feet of either water lines (and associated valves), underground telecommunications, and/or gas lines) in order to keep the transmission line at least 34 feet from any building at this location.

P&P Drawing: 394137, from station 1204+00 to 1211+00: For this location, the recommended alignment is near the middle of the road, as far from existing buildings as possible without encroaching on the existing storm line which is located in the middle of the road. Due to the relatively narrow easement and the fact that buildings are built up to this easement line, the line approaches within 34 feet of some buildings along this alignment. It is not possible to place the transmission line any closer to the center of the road and still maintain access to the existing utility for maintenance and repair.

It was not feasible to locate the duct bank at least thirty-four feet from the residential and commercial buildings in the above-listed areas because of existing underground utilities.

V. PRIORITY AREAS WHERE LOW COST MEASURES ARE TO BE APPLIED

Surrounding Uses by Priority Category:

Pursuant to PG&E's EMF Transmission Line Guidelines, the mitigation of magnetic fields will be applied to the transmission lines in the following priority:

1. School or Daycare
2. Residential
3. Commercial/Industrial
4. Recreational
5. Agricultural, Rural
6. Undeveloped Land (Zoned for Residential)
7. Undeveloped Land (Zone for Commercial/Industrial)
8. Unpopulated, Forested, Government Owned Land

Along the CPUC-approved route, between Jefferson substation and Martin substation, there are seven schools. Listed below are the schools and their locations:

Nueva School 6565 Skyline Boulevard Hillsborough, CA 94010	South San Francisco High School 400 B St S. San Francisco, CA 94080	Los Cerritos Elementary School 210 W Orange Ave S. San Francisco, CA 94080
El Camino High School 1320 Mission Rd S. San Francisco, CA 94080	Colma Elementary School 444 E Market St Daly City, CA 94014	Pollicita Middle School 550 E Market St Daly City, CA 94014
John F Kennedy Elementary School 785 Price St Daly City, CA 94014		

Listed below are the high priority groups including school, day care, and residential land uses along the proposed route where low cost mitigation (lowering the trench depth by five feet where it achieves at least 15% lower magnetic fields at buildings, starting with the typical duct bank configuration shown in Figure 2) was considered:

Skyline Blvd.
From Hayne Rd. to Trousdale Dr. P&P Drawings: 394074 - 394089

Glenview Dr.
From San Bruno Tap to San Bruno Ave. P&P Drawings: 394093 - 394094

San Bruno Ave.
From Glenview Ave. to Huntington Ave. P&P Drawings: 394094 - 394104

Huntington Ave.
From San Bruno Ave. to Sneath Lane. P&P Drawings: 394105 - 394109

BART ROW
From S. Spruce Ave. to Chestnut Ave. P&P Drawings: 394112 - 394117
From Grand Ave. to Sequoia Ave. P&P Drawings: 394119 - 394120
From BART Access Rd. to Lawndale Blvd. P&P Drawing: 394121

Lawndale Ave.
From Mission Rd. to Hillside Blvd. P&P Drawings: 394122 - 394125

Hillside Blvd.
From Hoffman St. to East Market Ave. P&P Drawings: 394134 – 394136

East Market Ave.
From Hillside Blvd. to Price St. P&P Drawings: 394137 - 394138

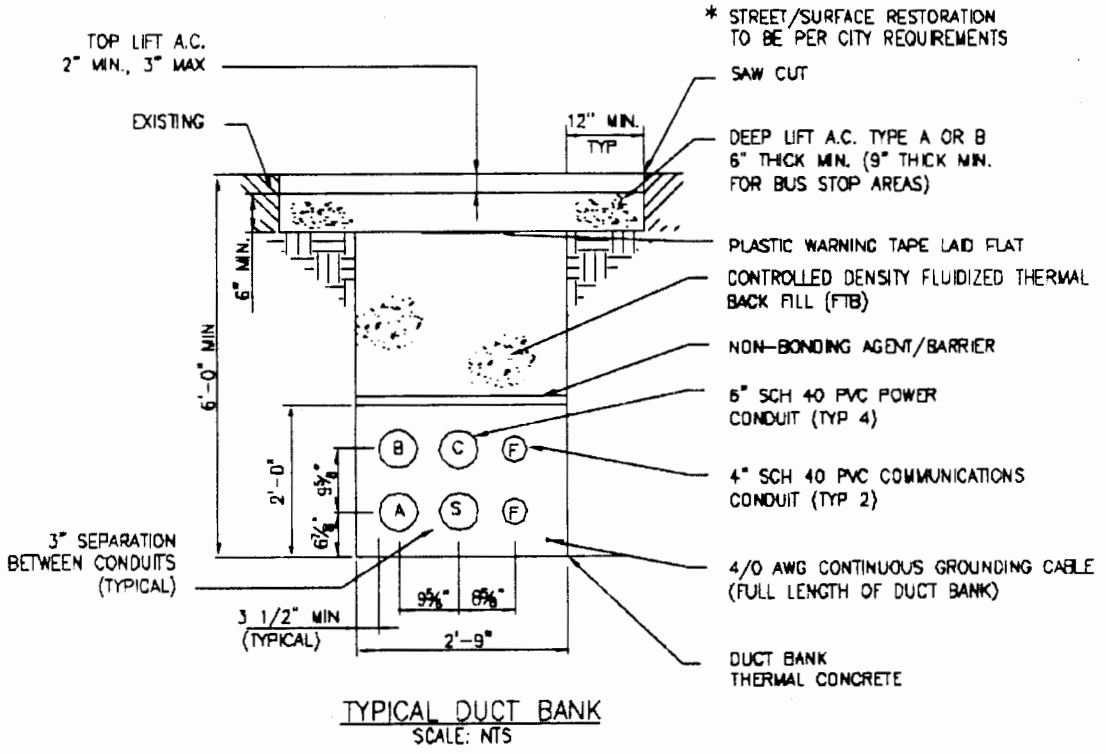
Guadalupe Canyon Parkway
From Price St. to JFK School P&P Drawing: 394139

VI. LOW COST MAGNETIC FIELD REDUCTION OPTIONS

Mitigate Near Schools and Residential Areas:

Achieve lower magnetic fields at the edge of the right-of-way[2] by moving the conductor further from the edge of the right of way near high priority groups including school, day care, and residential land uses along the proposed route by lowering the depth of the duct bank five feet deeper than otherwise required "where this would lower magnetic fields by at least 15 %." D.04-08-046 at 105. Not to exceed a maximum trench depth of eleven feet. D.04-08-046 at 103.

Typical Duct Bank Configuration (Base Case) Figure 2.



TYPICAL DUCT BANK
SCALE: NTS

Base Case Field Level at the Centerline: 46.3 mG
Base Case Field Level at 34 feet away: 2.4 mG
(See Table 1 and Graph 1)

[2] The distance to the edge of right of way varies depending on, among other factors, whether the portion of the line in question is within existing franchise areas or whether private right of way easements must be obtained. For those portions of the CPUC-approved route that are located within city or county roads, the edge of right of way is the edge of the existing franchise area. For those portions of the route outside of franchise areas, PG&E must obtain private easements, the widths of which are determined based on construction, safety, and engineering requirements.

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The table below shows magnetic field levels at the edge of ROW and percent reduction for a five-foot deeper trench:

Location	P&P Drawing	Base Case (mG)	5' Lower (mG)	Reduction in Magnetic Field @ edge of ROW
Skyline Blvd	394074	3.7	3.3	11.6 %
"	"	2.4	2.2	7.9 %
Skyline Blvd	394075	2.6	2.4	8.2 %
"	"	2.3	2.1	7.4 %
Skyline Blvd	394076	2.7	2.5	8.9 %
"	"	0.8	0.8	2.5 %
Skyline Blvd	394077	1.9	1.8	5.9 %
"	"	2.6	2.4	8.2 %
Skyline Blvd	394078	2.4	2.2	7.9 %
"	"	2.7	2.5	8.9 %
Skyline Blvd	394079	2.7	2.5	8.9 %
Skyline Blvd	394080	2.4	2.2	7.9 %
"	"	2.7	2.5	8.9 %
Skyline Blvd	394081	2.6	2.4	8.2 %
Skyline Blvd	394082	2.9	2.6	9.4 %
Skyline Blvd	394083	4.6	4.0	14.1%
"	"	8.4	6.4	**22.9 %**
Skyline Blvd	394084	5.8	4.8	**17.1 %**
"	"	4.3	3.7	13.1 %
Skyline Blvd	394085	2.7	2.5	8.9 %
"	"	2.4	2.2	7.9 %
Skyline Blvd	394086	2.1	1.9	6.8 %
"	"	4.3	3.7	13.1 %
Skyline Blvd	394087	4.6	4.0	14.1%
"	"	2.6	2.4	8.2 %
Skyline Blvd	394088	2.2	2.0	7.4%
"	"	0.6	0.5	1.8 %
Skyline Blvd	394089	0.4	0.4	0.0 %
Glenview Dr.	394093	4.3	3.7	13.1 %
San Bruno Ave.	394094	4.6	4.0	14.1%
San Bruno Ave.	394095	2.7	2.5	8.9 %
"	"	3.1	2.8	9.8 %
San Bruno Ave.	394096	4.0	3.5	12.5 %
"	"	4.6	4.0	14.1%
San Bruno Ave.	394097	4.3	3.7	13.1 %
"	"	2.7	2.5	8.9 %
San Bruno Ave.	394098	0.9	0.9	2.2 %
San Bruno Ave.	394099	0.8	0.8	2.5 %
"	"	1.0	1.0	2.9 %
San Bruno Ave.	394100	2.0	1.8	6.6 %
"	"	3.1	2.8	9.8 %

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Location	P&P Drawing	Base Case (mG)	5' Lower (mG)	Reduction in Magnetic Field @ edge of ROW
San Bruno Ave.	394101	1.1	1.1	3.6 %
"	"	2.2	2.0	7.4%
San Bruno Ave.	394102	2.6	2.4	8.2 %
"	"	3.1	2.8	9.8 %
San Bruno Ave.	394103	1.8	1.7	5.6 %
"	"	4.0	3.5	12.5 %
San Bruno Ave.	394104	1.6	1.5	5.0 %
"	"	4.3	3.7	13.1 %
Huntington Ave.	394105	0.9	0.8	2.3 %
"	"	2.6	2.4	8.2 %
Huntington Ave.	394106	0.5	0.4	1.2 %
"	"	0.7	0.6	1.4 %
Huntington Ave.	394107	0.4	0.4	0.0 %
"	"	0.8	0.7	2.6 %
Huntington Ave.	394108	1.3	1.2	3.2 %
"	"	1.5	1.4	5.4 %
"	394109	1.5	1.4	5.4%
Bart ROW	394112	14.2	9.4	**33.5 %**
Bart ROW	394113	14.2	9.4	**33.5 %**
Bart ROW	394114	14.2	9.4	**33.5 %**
Bart ROW	394115	20.3	11.8	**41.9 %**
Bart ROW	394116	14.2	9.4	**33.5 %**
Bart ROW	394117	14.2	9.4	**33.5 %**
Bart ROW	394119	14.2	9.4	**33.5 %**
"	"	14.2	9.4	**33.5 %**
Bart ROW	394120	14.2	9.4	**33.5 %**
"	"	14.2	9.4	**33.5 %**
Mission Rd.	394121	14.2	9.4	**33.5 %**
Lawndale Blvd	394122	0.8	0.8	2.5 %
Lawndale Blvd	394123	1.3	1.2	4.6 %
"	"	1.5	1.4	5.4%
Lawndale Blvd	394124	1.6	1.5	5.0 %
"	"	1.8	1.7	5.6 %
Lawndale Blvd	394125	2.0	1.8	6.6 %
Hillside Blvd	394134	2.6	2.4	8.2 %
Hillside Blvd	394135	2.0	1.8	6.6 %
"	"	4.6	4.0	14.1 %
Hillside Blvd	394136	2.0	1.8	6.6 %
"	"	6.9	5.6	**19.9 %**
East Market St.	394137	2.0	1.8	6.6 %
"	"	3.1	2.8	9.8 %
East Market St.	394138	2.2	2.0	7.4 %
"	"	3.1	2.8	9.8 %
East Market St.	394139	0.8	0.7	2.6 %
Guadalupe Canyon	394139	0.6	0.6	1.6 %

Note 1: Two calculations were done for drawings where the duct bank varied in the horizontal distance from the edge of the right-of-way adjacent to a high priority group land use. The magnetic fields at the closest and furthest distances were calculated and shown in the table. One calculation was done where the horizontal distance was consistent.

Note 2: The "BART ROW" portion of the project is not within existing franchise areas and therefore requires the acquisition of private right-of-way easements by PG&E. These easements will be twenty-five feet wide, based on construction, safety, and engineering requirements. Thus, the edge of the PG&E easement in the "BART ROW" portion of the project will be twelve feet from the line where possible. Even though, in many cases, the PG&E easement will be within a larger overall BART or CCSF easement area, PG&E conservatively measured the effectiveness of low cost mitigation measures based on the shorter distance to the edge of the PG&E right of way.

The shaded cells in the table above identify the locations along the route where a 15 % or greater reduction at the edge of right-of-way would occur for five foot lowering of the base case trench depth. To achieve at least a 15 % reduction, the line must be closer than twenty-four feet to the edge of right-of-way adjacent to a high priority group land use. Listed below are the locations where lowering the duct bank by five-feet will achieve at least a 15 % reduction of the magnetic field at the edge of right-of-way:

Skyline Blvd. - P&P Drawings: 394083 - 394084
Proposed five-foot lower trench: from station 540+00 to 550+00

BART ROW - P&P Drawings: 394112 - 394117
Proposed five-foot lower trench: from station 970+00 to 1018+00

BART ROW - P&P Drawing: 394119 - 394120
Proposed five-foot lower trench: from station 1037+00 to 1050+00

BART ROW - P&P Drawing: 394121 - 394122
Proposed five-foot lower trench: from station 1057+00 to 1067+00

Hillside Blvd. P&P Drawing: 394136
Proposed five-foot lower trench: from station 1199+00 to 1200+40

The locations where lowering the duct bank by five-feet is proposed will have limited exceptions, identified below, for manhole locations, two sanitary sewer line locations, and when near one area occupied by adjacent BART structures/foundations. Vaults (manholes) should not be placed lower because it would interfere with safe ingress/egress. Instead, in areas where the five-foot lower trench is proposed and a vault is called for, the duct bank will rise up to the vault depth and then exit to return to the proposed lower trench depth.

The utility crossings of concern involve sanitary sewer lines that are constructed to exact slopes; undermining them to install the PG&E duct bank below them will likely require additional restoration/replacing of sections of sanitary sewer lines, and increases the probability of damage to the sanitary system. Where the five-foot lower trench is proposed near adjacent BART structures/foundations the added depth would have the potential of undermining the existing foundation by disturbing the soil around the foundation. To address these concerns, PG&E proposes exceptions for the proposed lowering of the duct bank by five-feet in the three locations listed below:

Station 1001+00 to 1002+75: The proposed trench is within a fenced BART ventilation building area, adjacent to BART structures and foundations. Going five-feet deeper would potentially disturb the soils surrounding the existing foundations and undermine them.

Station 1005+35: The proposed trench crosses a sanitary sewer line located at about eight-feet deep. PG&E proposes to rise up from the lower trench depth to go over the sanitary sewer line and then return to the lower depth.

Station 1046+00 to 1048+00: There is a manhole and three sanitary sewer crossings nearby. It is not reasonable to make the vertical curves sharp enough to dive below the sanitary sewers near the manhole, and it is not recommended to install the duct bank below the sanitary sewer as mentioned above.

The estimated cost to install a five-foot lower trench that achieves at least a 15 % magnetic filed reduction for the underground transmission line near high priority group land uses is $1,950,000.

VII. CONCLUSION: FIELD REDUCTION MEASURES SELECTED

The Jefferson-Martin 230 kV Transmission Project field management plan proposes to apply the following no cost and low magnetic field mitigation:

Triangular Configuration

The typical configuration for this project will be a triangular placement of the three cables in a 2 X 2 duct bank. See Figure 1.

Strategic Line Placement

The trench will be placed within the right of way to reduce magnetic field exposure to buildings along the entire route, except where the location of existing underground utilities prevent strategic line placement.

Thirty-four feet from the edge of residential and commercial buildings

After the strategic line placement, the duct bank locations within the right of way closer than thirty-four feet from residential and commercial buildings "or other buildings where people are expected to spend significant amounts of time" were evaluated for feasible methods to relocate the trench further away. The following Plan and Profile drawings show the route locations where the duct bank could not be located at least thirty-four feet from residential and commercial buildings or other buildings where people are expected to spend significant amounts of time:

P&P Drawing: 394103-394104, from station 897+00 to 905+00

P&P Drawing: 394115, from station 996+00 to 999+00

P&P Drawing: 394135, from station 1186+00 to 1190+00

P&P Drawing: 394136, from station 1198+75 to 1200+25

P&P Drawing: 394137, from station 1204+00 to 1211+00

Lowering the trench an additional five-feet

The following locations along the proposed route will have the depth of the duct bank lowered five-feet except for manhole locations, two sanitary sewer line locations, and when near one area occupied by adjacent BART structures/foundations. Not to exceed a maximum trench depth of eleven feet.

Skyline Blvd. - P&P Drawings: 394083 - 394084
Proposed five-foot lower trench: from station 540+00 to 550+00

BART ROW - P&P Drawings: 394112 - 394117
Proposed five-foot lower trench: from station 970+00 to 1018+00

BART ROW - P&P Drawing: 394119 - 394120
Proposed five-foot lower trench: from station 1037+00 to 1050+00

BART ROW - P&P Drawing: 394121 - 394122
Proposed five-foot lower trench: from station 1057+00 to 1067+00

Hillside Blvd. P&P Drawing: 394136
Proposed five-foot lower trench: from station 1199+00 to 1200+40

The estimated cost to install a five-foot lower trench that achieves at least a 15 % magnetic filed reduction for the underground transmission line near high priority group land uses is $1,950,000.

Total Low Cost Mitigation

Total estimated cost of magnetic field mitigation for this project is $1,950,000.

Plan and Profile Drawings:

394074	394094	394112	394130
394075	394095	394113	394131
394076	394096	394114	394132
394077	394097	394115	394133
394078	394098	394116	394134
394079	394099	394117	394135
394080	394100	394118	394136
394081	394101	394119	394137
394082	394102	394120	394138
394083	394103	394121	394139
394084	394104	394122	394140
394085	394105	394123	394156
394086	394106	394124	394157
394087	394107	394125	394158
394088	394108	394126	394159
394089	394109	394127	394160
394090	394110	394128	394161
394093	394111	394129	

FINAL TRANSMISSION EMF MANAGEMENT PLAN
JEFFERSON-MARTIN 230 KV TRANSMISSION PROJECT
230 kV Underground Transmission Line (6 Foot Trench Depth)

TABLE 1

	Magnetic Field Level Three Feet Above Ground (milliGauss)		
Distance from Center line (feet)	Base Case	Lower Conductors 5 Feet	Percent Reduction
-50	1.2	1.1	3.5%
-49	1.2	1.2	4.2%
-48	1.3	1.2	4.8%
-47	1.3	1.2	4.6%
-46	1.4	1.3	4.4%
-45	1.4	1.3	5.0%
-44	1.5	1.4	5.4%
-43	1.5	1.5	5.2%
-42	1.6	1.5	5.0%
-41	1.7	1.6	5.3%
-40	1.8	1.7	5.6%
-39	1.9	1.8	5.9%
-38	2.0	1.8	6.6%
-37	2.1	1.9	6.8%
-36	2.2	2.0	7.4%
-35	2.3	2.1	7.4%
-34	2.4	2.2	7.9%
-33	2.6	2.4	8.2%
-32	2.7	2.5	8.9%
-31	2.9	2.6	9.4%
-30	3.1	2.8	9.8%
-29	3.3	2.9	10.4%
-28	3.5	3.1	10.9%
-27	3.7	3.3	11.6%
-26	4.0	3.5	12.5%
-25	4.3	3.7	13.1%
-24	4.6	4.0	14.1%
-23	5.0	4.2	15.1%
-22	5.4	4.5	16.0%
-21	5.8	4.8	17.1%
-20	6.4	5.2	18.6%
-19	6.9	5.6	19.9%
-18	7.6	6.0	21.3%
-17	8.4	6.4	22.9%
-16	9.2	6.9	24.7%
-15	10.2	7.5	26.7%
-14	11.3	8.1	28.7%
-13	12.7	8.7	31.1%
-12	14.2	9.4	33.5%
-11	15.9	10.2	36.2%
-10	18.0	11.0	39.0%

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230 kV Underground Transmission Line (6 Foot Trench Depth)

TABLE 1

	Magnetic Field Level Three Feet Above Ground (milliGauss)		
Distance from Center line (feet)	Base Case	Lower Conductors 5 Feet	Percent Reduction
-9	20.3	11.8	41.9%
-8	23.0	12.7	45.0%
-7	26.0	13.5	48.1%
-6	29.4	14.4	51.1%
-5	33.1	15.2	54.0%
-4	36.8	15.9	56.7%
-3	40.4	16.6	58.9%
-2	43.4	17.1	60.7%
-1	45.5	17.4	61.8%
0	46.3	17.5	62.2%
1	45.6	17.4	61.9%
2	43.7	17.1	60.9%
3	40.7	16.6	59.2%
4	37.2	16.0	57.0%
5	33.4	15.3	54.3%
6	29.7	14.4	51.4%
7	26.3	13.6	48.3%
8	23.2	12.7	45.2%
9	20.4	11.8	42.1%
10	18.1	11.0	39.1%
11	16.0	10.2	36.3%
12	14.2	9.5	33.6%
13	12.7	8.8	31.1%
14	11.4	8.1	28.8%
15	10.2	7.5	26.7%
16	9.2	7.0	24.8%
17	8.4	6.5	22.9%
18	7.6	6.0	21.4%
19	7.0	5.6	19.9%
20	6.4	5.2	18.5%
21	5.9	4.8	17.3%
22	5.4	4.5	16.1%
23	5.0	4.2	15.1%
24	4.6	4.0	14.1%
25	4.3	3.7	13.3%
26	4.0	3.5	12.5%
27	3.7	3.3	11.6%
28	3.5	3.1	10.9%
29	3.3	2.9	10.4%
30	3.1	2.8	9.8%
31	2.9	2.6	9.4%

FINAL TRANSMISSION EMF MANAGEMENT PLAN
JEFFERSON-MARTIN 230 KV TRANSMISSION PROJECT
230 kV Underground Transmission Line (6 Foot Trench Depth)

TABLE 1

	Magnetic Field Level Three Feet Above Ground (milliGauss)		
Distance from Center line (feet)	Base Case	Lower Conductors 5 Feet	Percent Reduction
32	2.7	2.5	8.9%
33	2.6	2.4	8.2%
34	2.4	2.2	7.9%
35	2.3	2.1	7.4%
36	2.2	2.0	7.4%
37	2.1	1.9	6.8%
38	2.0	1.8	6.6%
39	1.9	1.8	5.9%
40	1.8	1.7	5.6%
41	1.7	1.6	5.3%
42	1.6	1.5	5.0%
43	1.5	1.5	5.2%
44	1.5	1.4	5.4%
45	1.4	1.4	4.3%
46	1.4	1.3	4.4%
47	1.3	1.2	4.6%
48	1.3	1.2	4.8%
49	1.2	1.2	4.2%
50	1.2	1.1	3.5%

Graph 1

FINAL TRANSMISSION EMF MANAGEMENT PLAN
JEFFERSON-MARTIN 230 KV TRANSMISSION PROJECT
230 kV Underground Transmission Line (6 Foot Trench Depth)