INTRODUCTION

San Diego Gas & Electric Company (SDG&E) filed a Proponent's Environmental Assessment (PEA) as part of its application for a Certificate of Public Convenience and Necessity (CPCN) for the Sycamore to Penasquitos 230kV Transmission Line Project (Proposed Project) to the California Public Utilities Commission (CPUC) in April, 2014. Subsequent to filing the PEA and publication of the Draft Environmental Impact Report (EIR) by the CPUC, minor project engineering and design refinements (Minor Design Refinements) were made to SDG&E's Proposed Project. Additionally, SDG&E has performed a preliminary review of the alternatives analyzed in the DEIR and has included suggested refinements to those alternatives primarily for feasibility reasons. These changes were the result of ongoing engineering, updated construction planning/sequencing, and new design specifications.

OVERVIEW

These minor changes are described in more detail under the *Minor Design Refinements* section of this attachment and are summarized below for Proposed Project and each DEIR alternative.

Although the precise design, including number of new structures to be installed or existing structures to be modified may be further refined during final engineering, the Minor Design Refinements noted thus far include revisions to the Proposed Project, DEIR Alternative 3 (or 3/4 Combination), and DEIR Alternative 5. The Minor Design Refinements are summarized below.

Proposed Project Refinements

- Refined civil engineering and work pad design.
    - Structures have undergone refined civil design.
- Sycamore Canyon Substation
    - Revise 230kV Bay Connection Design.

Alternative 3 (and 3/4 Combination) Refinements

- Replacement of existing 138kV wood H-frame with new steel deadend H-frame approximately 10 feet south.
- Cable Pole Refinement (Structure P19a)
    - Cable Pole P19a is proposed to be shifted one span length (450 feet) southeast, near Structure P19.
- Cable Pole Refinement (Structure P43)
    - Cable Pole P43 is proposed to be shifted northeast (500 feet).
- All applicable civil design changes noted for the Proposed Project would apply to Alternative 3 as well. Specifically, this would include changes at structures P1 through P18.

Alternative 5 Refinements

- Replacement of existing 138kV wood H-frame with new steel deadend H-frame approximately 10 feet south.

- Additional I-15 Crossing Options
  - Option 1 (preferred): Underground within existing Bridge over the I-15.
  - Option 2: Span I-15 solely via two cable poles.
- Cable Pole Refinement (Structure CC MM CP)
  - Cable Pole CC MM CP is proposed to be shifted north (125 feet).
- Potential installation of ADSS (communication cable) in an underbuild position instead of installing OPGW along the top of existing structures.
- All applicable civil design changes noted for the Proposed Project would apply to Alternative 5 as well. Specifically this would include changes at structures P1 through P4.

MINOR DESIGN REFINEMENTS

Minor Proposed Project Refinements are described in detail below for each segment of the Proposed Project Alignment.

<u>Proposed Project</u>

As outlined above, Minor Design Refinements have been made to the Proposed Project, including the Sycamore Canyon Substation minor upgrades, and the civil design (grading) and permanent work pad design for the overhead structures on Segments A, B, and D. These minor refinements are further described below.

<u>Civil Engineering and Grading for Work Pads</u>

The initial grading plan designs (and associated permanent and temporary work areas) were completed prior to acquiring more detailed site specific survey and before making additional field visits. Once the survey work was performed, a more complete package of the existing topographic conditions was developed. This allowed for the most efficient design for access to the new facilities. In addition, the draft grading plans have gone through technical review which has allowed for all parties (engineering, construction, maintenance, etc.) to comment on the layouts. These comments have been incorporated the updated designs described herein. The updated designs include minor refinements to previously identified access (spur roads), work pads, and retaining wall configurations. Exhibit 1 contains the updated designs as part of an Updated Detailed Route Map for the Proposed Project and Exhibit 2 contains a map depicting the specific changes compared to the DEIR-level design. The refined design described herein has resulted in a reduction in impacts to natural habitat of approximately 1 acre. As noted above, the civil design revisions would also apply to the Alternative 3, 4, 3/ 4 combniation, and 5 routes where these alternatives share structures within the Proposed Project design.

<u>Sycamore Canyon Substation</u>

At the Sycamore Canyon Substation, the original Proposed Project design included the two Suncrest Substation 230kV transmission lines (TL23054 and 23055) being relocated to Bay 22 and the new SX-PQ 230kV line being connected to Bay 21. Upon further review, this design would result in an unacceptable reliability risk because the failure of the 22T circuit breaker would trip both of the Suncrest Substation 230kV transmission lines. Therefore, SDG&E has refined the Sycamore Canyon Substation design element of the Proposed Project to include the relocation of the Bank 70 230kV conductors to Bay 22, and moving the TL23055 connection to Bay 23. In addition, ongoing design review determined that the equipment in Bay 22 (two circuit breakers and six disconnects) needs to be upgraded to 3000 amps, consistent with the other bays in the Sycamore Canyon Substation. As with the original design for substation upgrades at the Sycamore Canyon Substation included within the DEIR, all work would occur within the substation fenceline with similar equipment as included within the DEIR. Exhibit 3 (CONFIDENTIAL) contains a substation diagram depicting the Sycamore Canyon Substation Minor Design Revision. Because all of the Alternatives retained for consideration in the DEIR would terminate at the Sycamore Canyon Substation in a similar manner as the Proposed Project, the design revisions described above would be applicable to all of the alternatives.

Peñasquitos Substation

To date, no refinements to the Peñasquitos Substation design have been identified.

DEIR Alternative 3 (Mercy Road)

Cable Pole Shift for Structure P19a

SDG&E suggests that the cable pole structure P19a be shifted one span east -southeast (approximately 450 feet) to improve constructability and transmission line design. Existing structure R21 would be replaced by a new steel deadend H-frame structure (P20A) located approximately 10 feet south of the existing structure location. Exhibit 4 contains a figure of the proposed design revision at cable pole structure P19a and Exhibit 5 contains detailed structure information (such as height).

Cable Pole Shift for Structure P43

SDG&E suggests that the cable pole structure P43a be shifted approximately 500 feet northeast in order to reduce the amount of civil work, and the overall number of structures in the Penasquitos Junction. The relocated P43a structure would replace an existing 138kV steel H-frame structure. Exhibit 6 contains a figure of the proposed design revision at cable pole structure P43a and Exhibit 5 contains detailed structure information (such as height).

DEIR Alternative 5 (Pomerado to Miramar North)

Addition of Structure P06a

Existing structure R6 (tangent, wood H-frame) would need to be replaced by a new steel deadend H-frame structure. The replacement structures are required because the existing structure cannot support the tension created from the installation of the Cable Pole at location P05. Exhibit 7 contains a figure of the proposed design revision at cable pole structure P06a and Exhibit 5 contains detailed structure information (such as height).

I-15 Crossing Options

During additional review, design, and research into Caltrans practices, SDG&E has identified two potential revisions for the I-15 crossing that could result in less impacts and are considered more feasible due to the likelihood of timely approval from Caltrans. These options are described below and depicted in Exhibit 8:

Option 1: Underground through existing bridge. Upon further research into the Pomerado Bridge crossing the I-15, it was determined that the bridge contains vacant cells that may be utilized for utility crossings. The utilization of the vacant cells will need to be assessed for structural adequacy and will ultimately need to be approved by Caltrans. Although it is not typical for Caltrans to allow 230kV crossings through their bridges, a recent project by a neighboring utility had success in obtaining approval for the installation of 230kV. Given the newly identified potential for installation of the new SX-PQ 230kV line within the existing bridge structure, SDG&E considers this design as the preferred option for crossing the I-15 under Alternative 5. SDG&E suggests this crossing option be included within the Final EIR as the preferred I-15 crossing for Alternative 5. The underground crossing through the bridge would result in less impacts to biological and visual resources than the current design within the DEIR.

Option 2: Two cable pole structure crossing. After conducting additional preliminary engineering review of the potential overhead crossing of the I-15 freeway at Pomerado Road using publicly available LiDAR data, SDG&E has determined that the crossing is possible without the utilization of interset structures. SDG&E considers this design option preferable to the DEIR design as it results in two less new structures and could potentially result in no new structures within Caltrans ROW. By avoiding the placement of new structures within Caltrans ROW, the likelihood of obtaining timely Caltrans approval is increased. Exhibit 5 contains detailed structure information (such as height).

Cable Pole Shift for Structure CC MM CP

SDG&E suggests that the cable pole structure CC MM CP be shifted approximately 125 feet north in order to account for continuing changes in the area due to roadway construction. Exhibit 9 contains a graphical depiction of the proposed design revision at cable pole structure CC MM CP.

ADSS Underbuild Option

As part of SDG&E's review of the potential DEIR Alternative 5, SDG&E notes that the structural adequacy of the existing 230kV structures between Carol Canyon Road and the Penasquitos Substation needs to be further analyzed to confirm the existing structures can support the proposed new SX-PQ transmission line. The existing double circuit structures are designed to support bundled 1033.5 KCMIL ACSR "Ortolan" conductor on both circuits which is larger than the proposed bundled 900 KCMIL ACSS for the new Transmission Line from Sycamore Substation to Peñasquitos Substation. However, these structures were designed to carry an overhead shield wire much smaller than the proposed optical ground wire (OPGW) required for communication between the two Substations. These structures and foundations were originally designed in 1974. One option SDG&E is considering to address this concern is to install ADSS communication cable as an underbuild and leave the overhead shield wire as is. This would ensure that the structures would not be subject to increased loads from the OPGW level, but the required communication would still be provided by the ADSS underbuild. SDG&E is currently working on gathering detailed loading information to assess adequacy of the structures for the increased loads and ground clearance information to ensure the feasibility of installing the ADSS as underbuild. In order to complete the final assessment of the structure adequacy, field investigation may be required amongst other measures to confirm the feasibility of reusing the existing structures and foundations with proposed loads.

DEIR Alternative 4

Alternative 4 (partial 69kV underground) would have the same civil and grading revisions on Segment A as described above for the Proposed Project alignment.

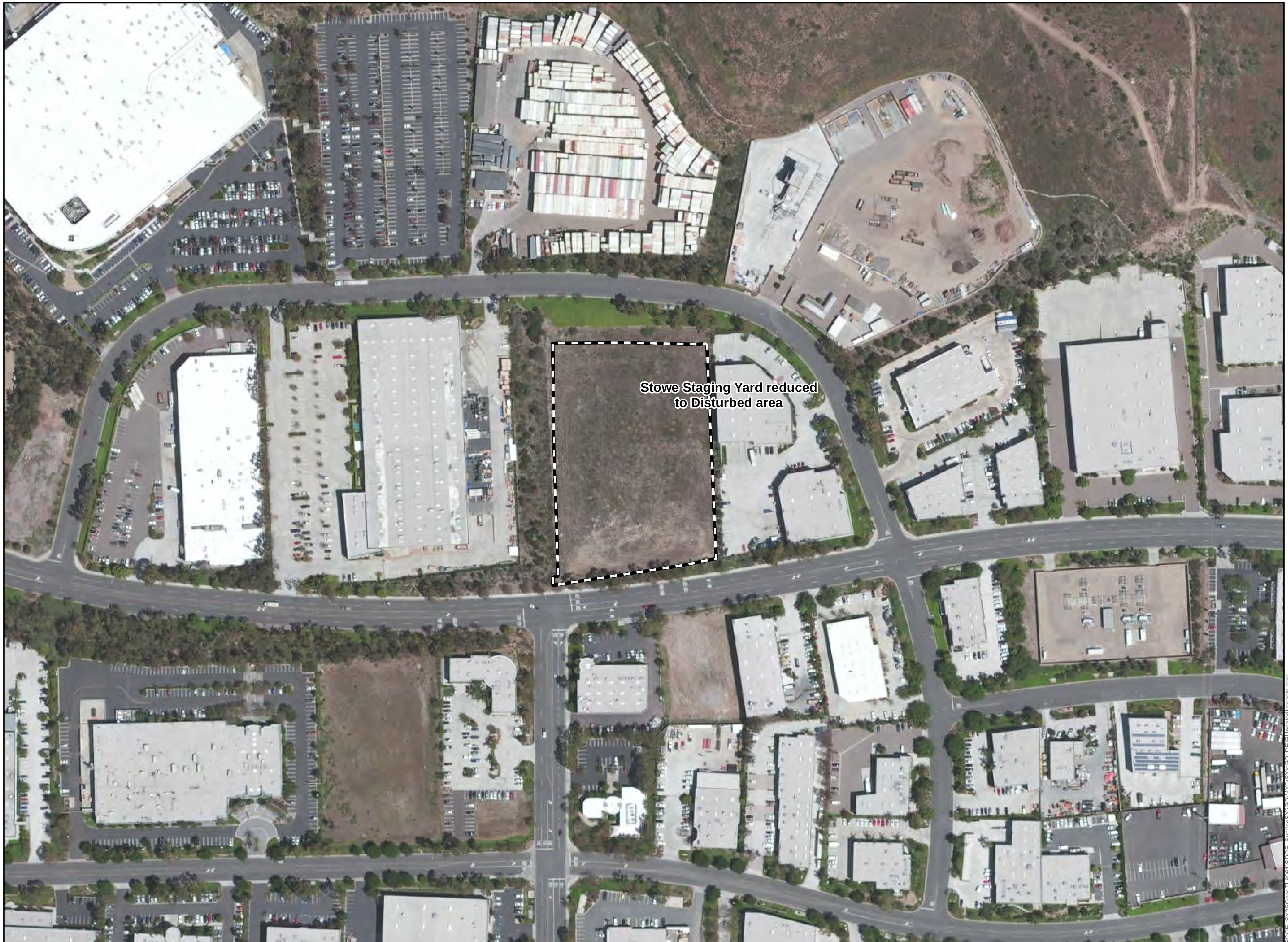
OTHER ENGINEERING AND REFINMENT DOCUMENTS

SDG&E is also providing the following as part of detailed comments on the DEIR.

- As referenced in the Comment No. 12, Exhibit 10 contains a figure depicting SDG&E comments on DEIR Alternative 1 (cable pole south of Carmel Valley Road).
- As referenced in Comment No. 15, Exhibit 11 includes a figure of potential properties for staging yards along the Alternative 5 alignment.
- As referenced in Comment Nos. 236, 237, and 238, Exhibit 12 contains the Completed Geotechnical Study prepared for the Proposed Project.

EXHIBIT 1

Updated Proposed Project Route Map



Sycamore to Peñasquitos 230kV Transmission Line Project

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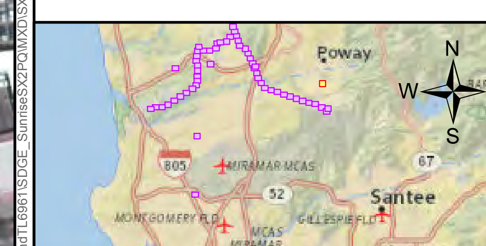

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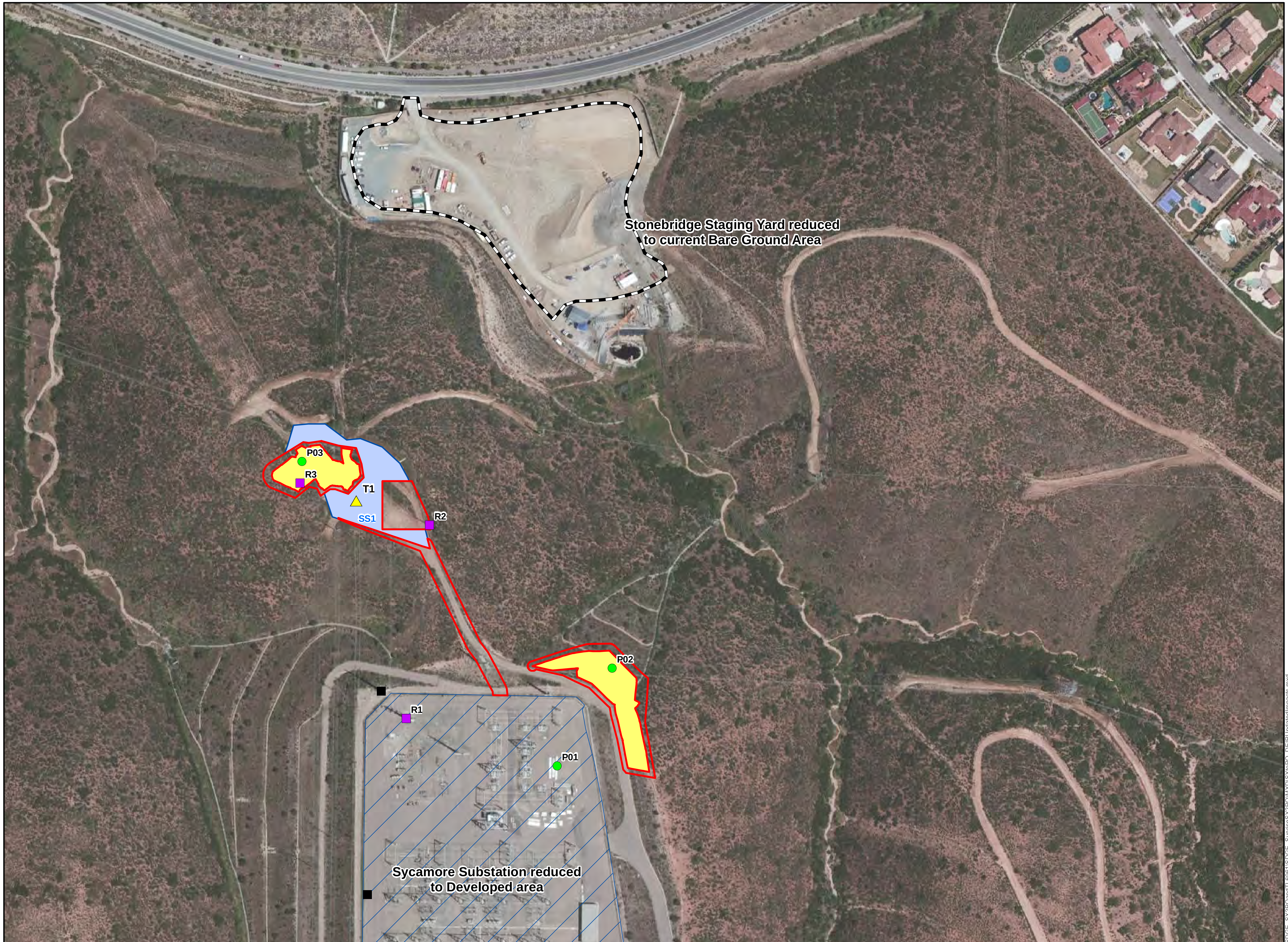

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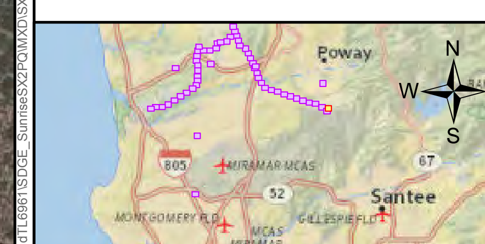

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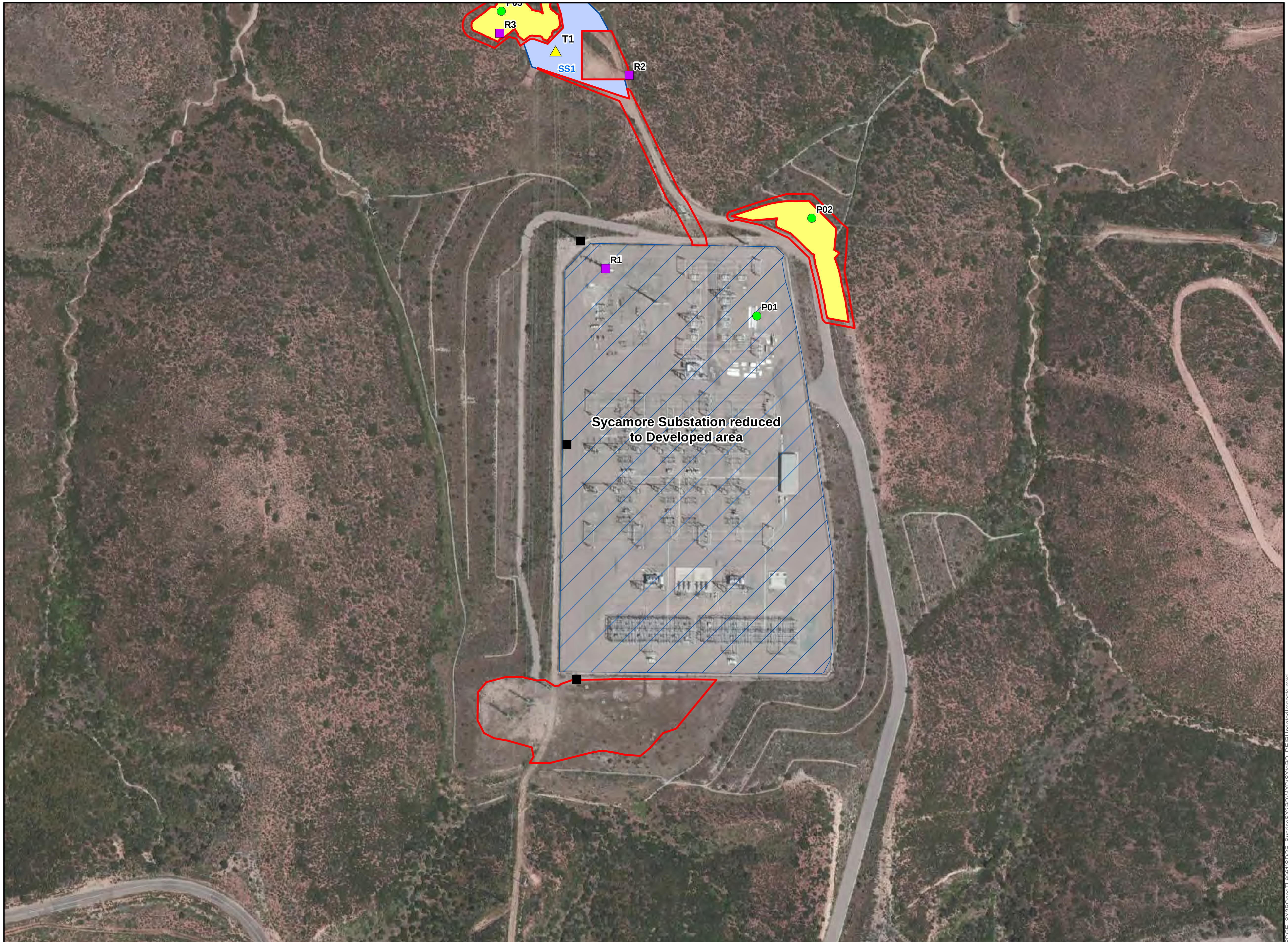

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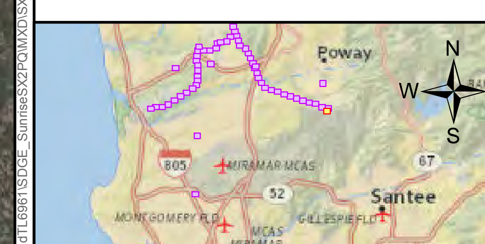

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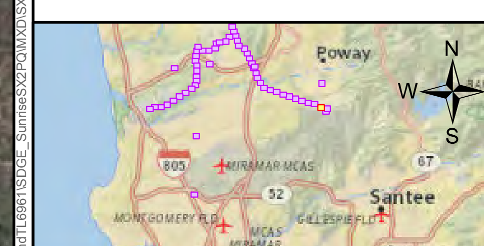

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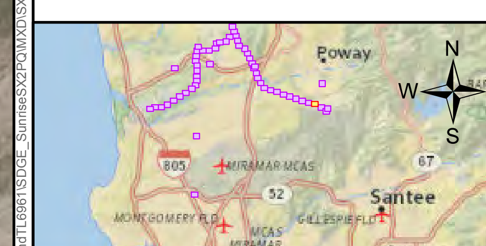

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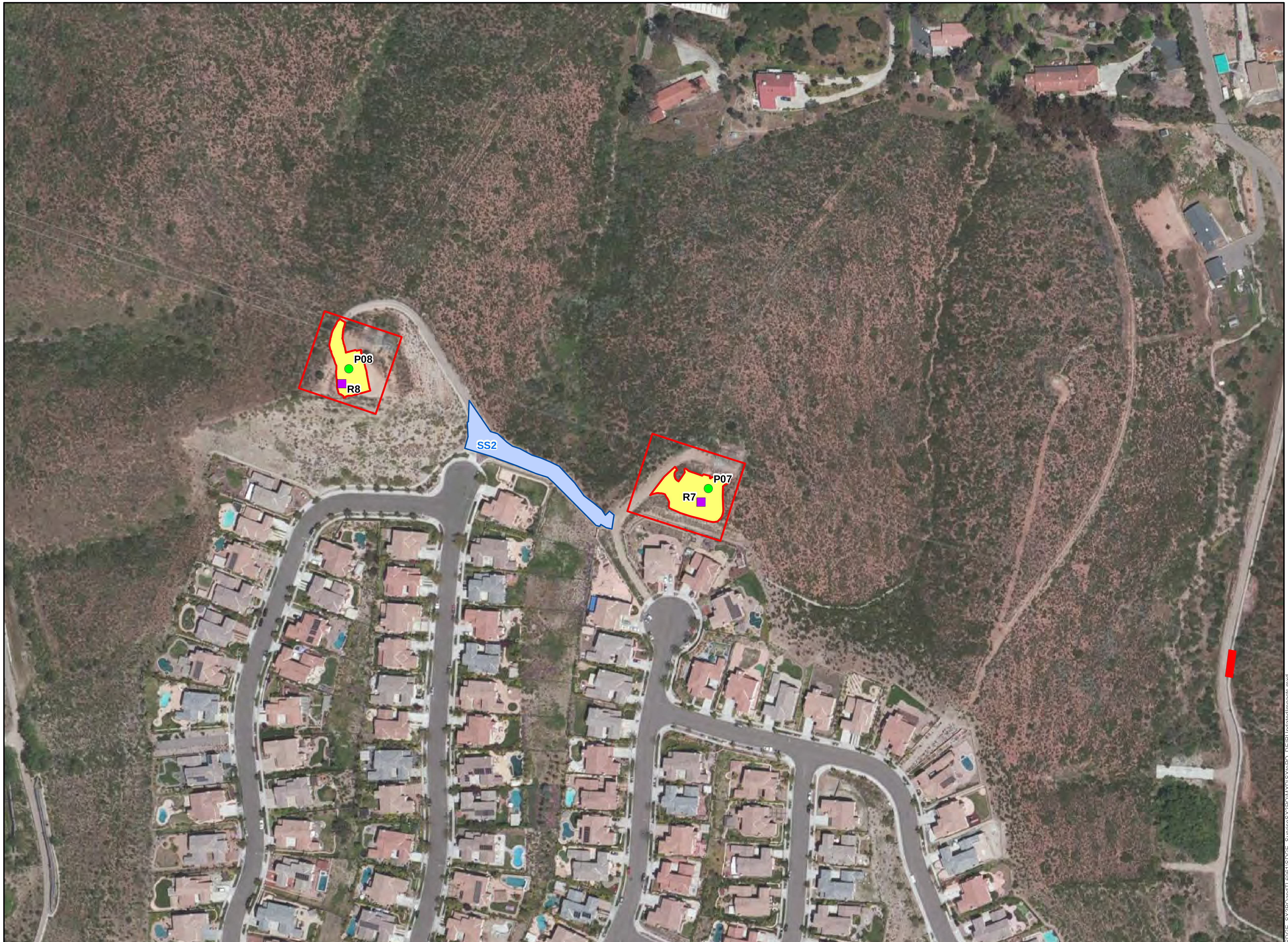

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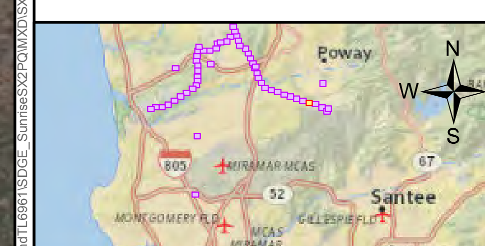

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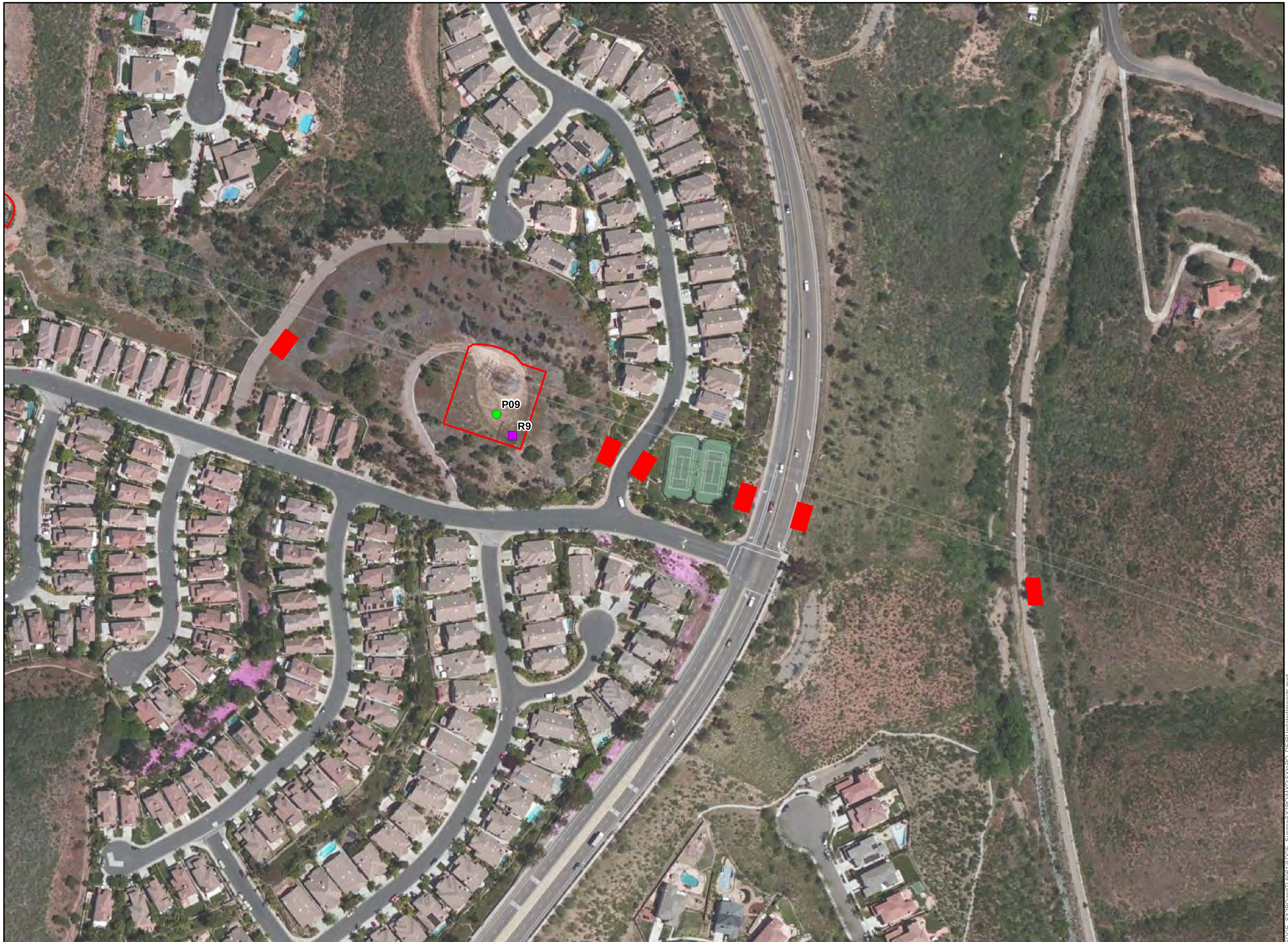

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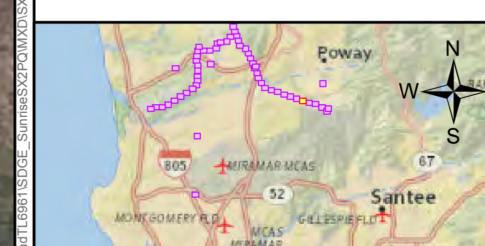

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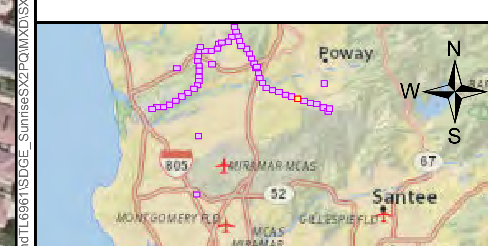

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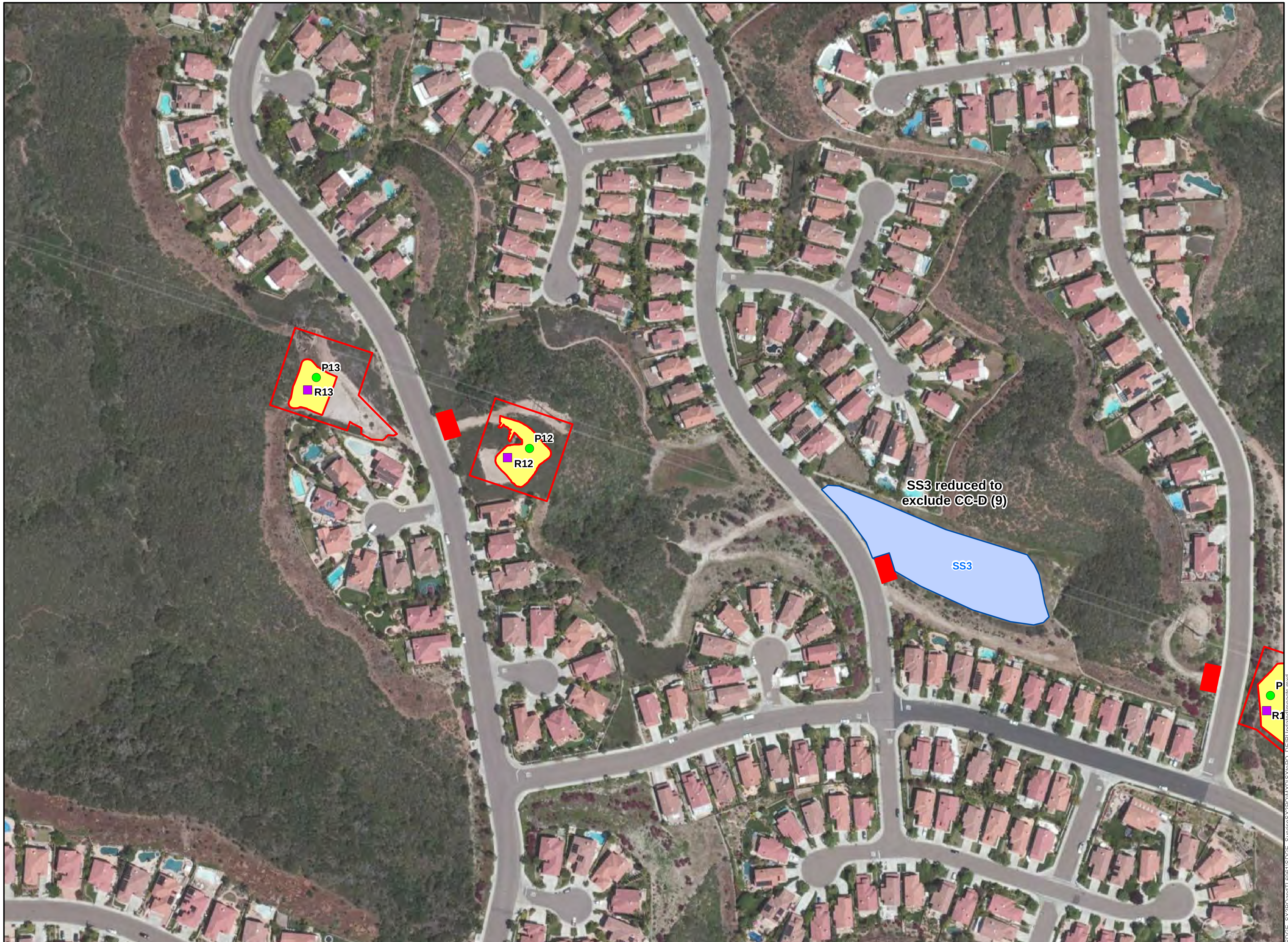

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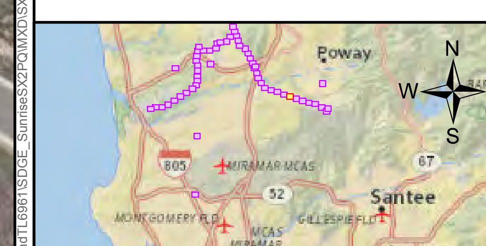

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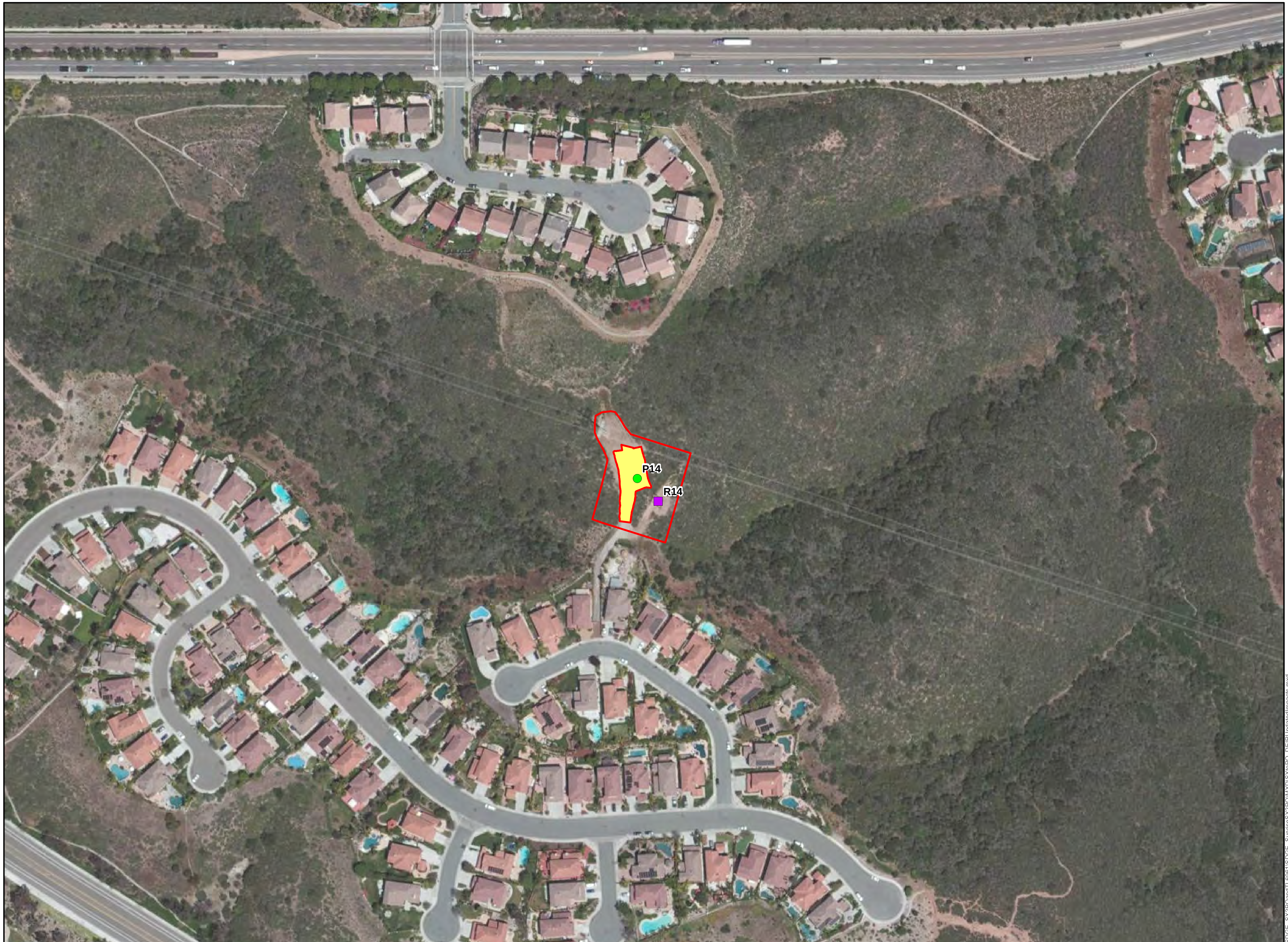

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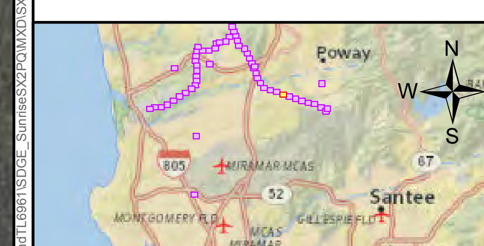

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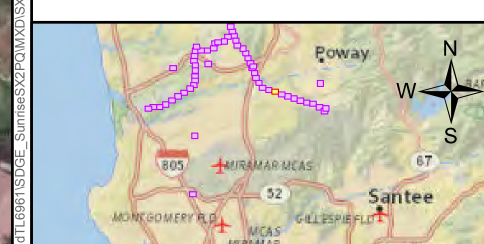

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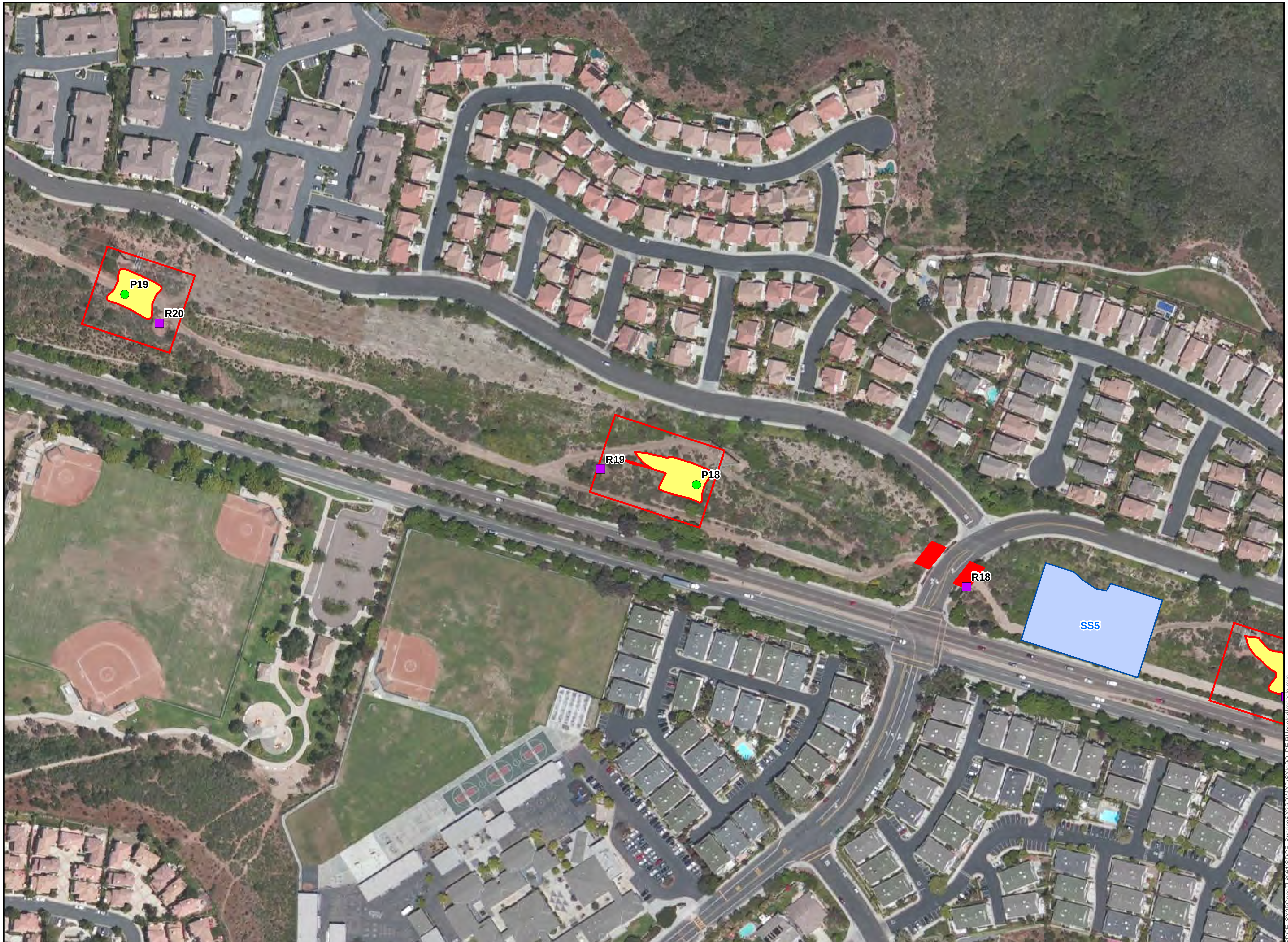

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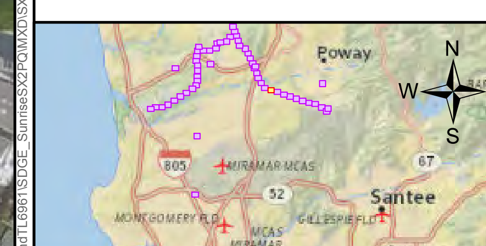

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Sycamore to Peñasquitos 230kV Transmission Line Project

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- Proposed Pole
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- Permanent Impact
- Guard Structures
- Staging Yard
- Substations

11/16/2015

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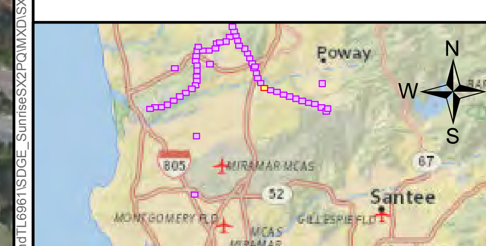

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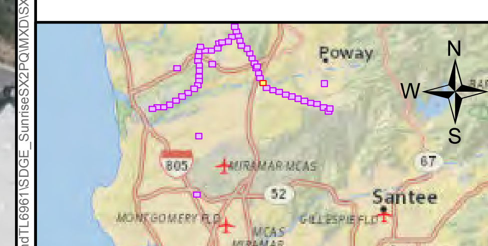

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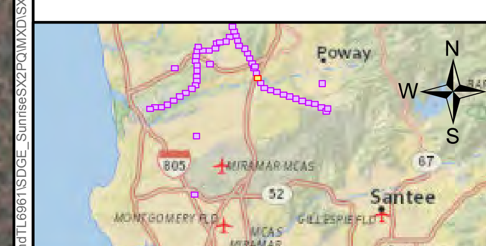

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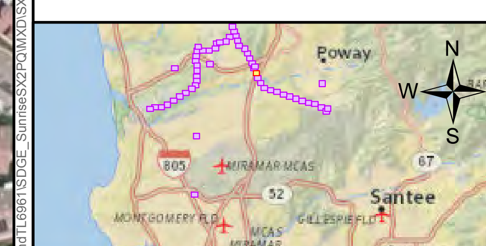

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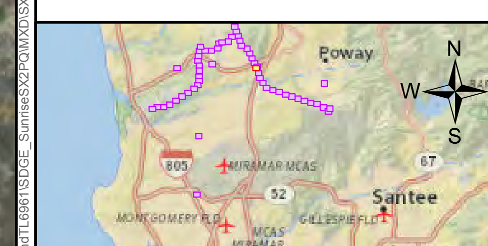

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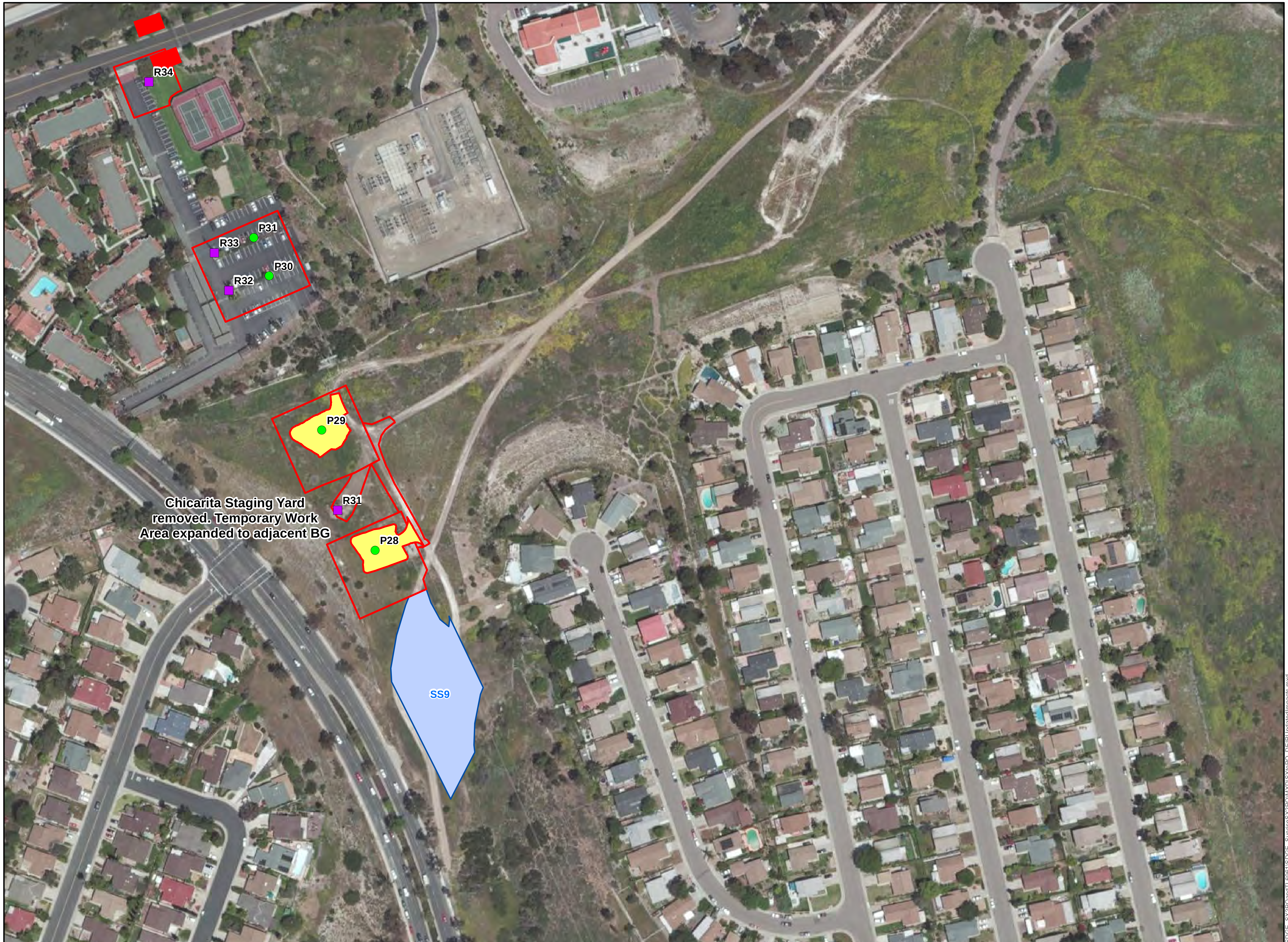

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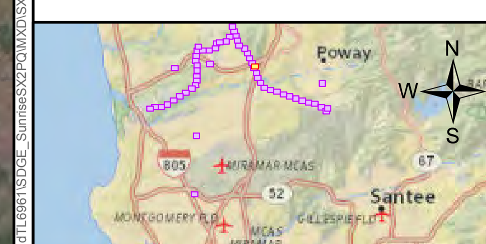

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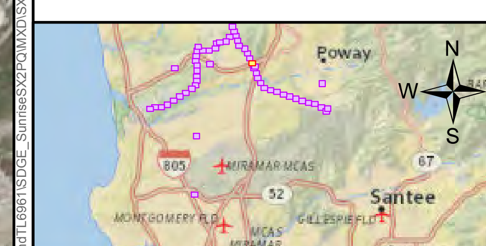

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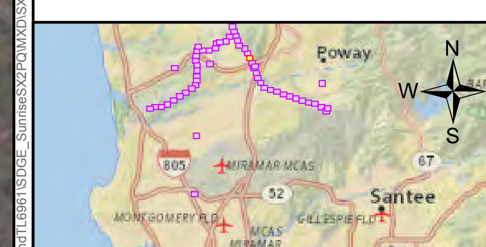

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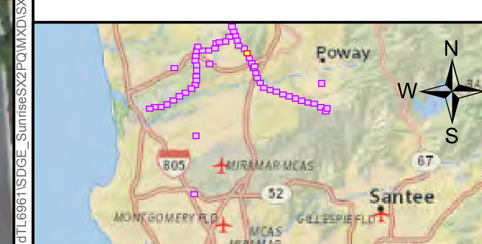

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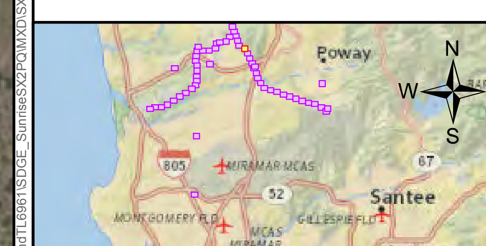

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A Sempra Energy utility

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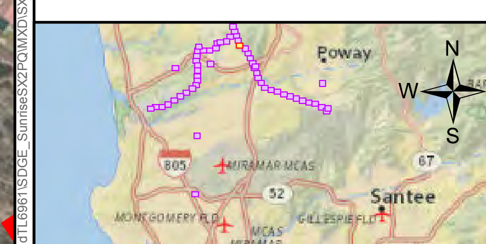

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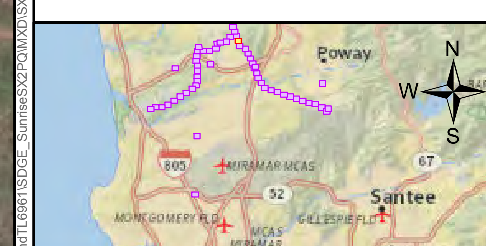

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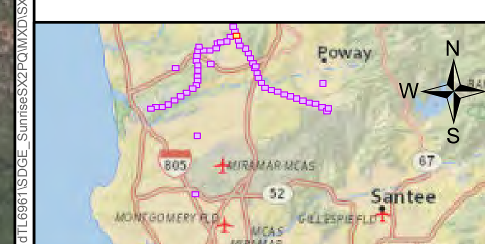

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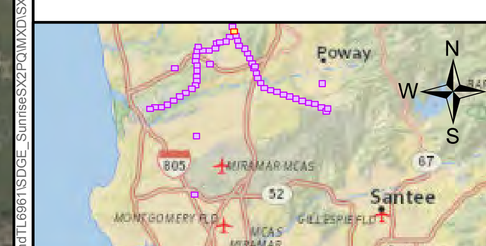

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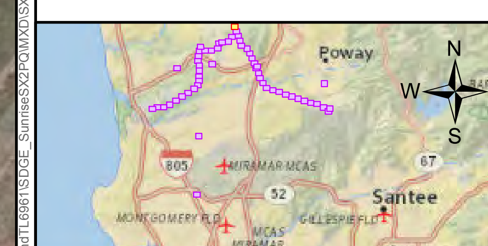

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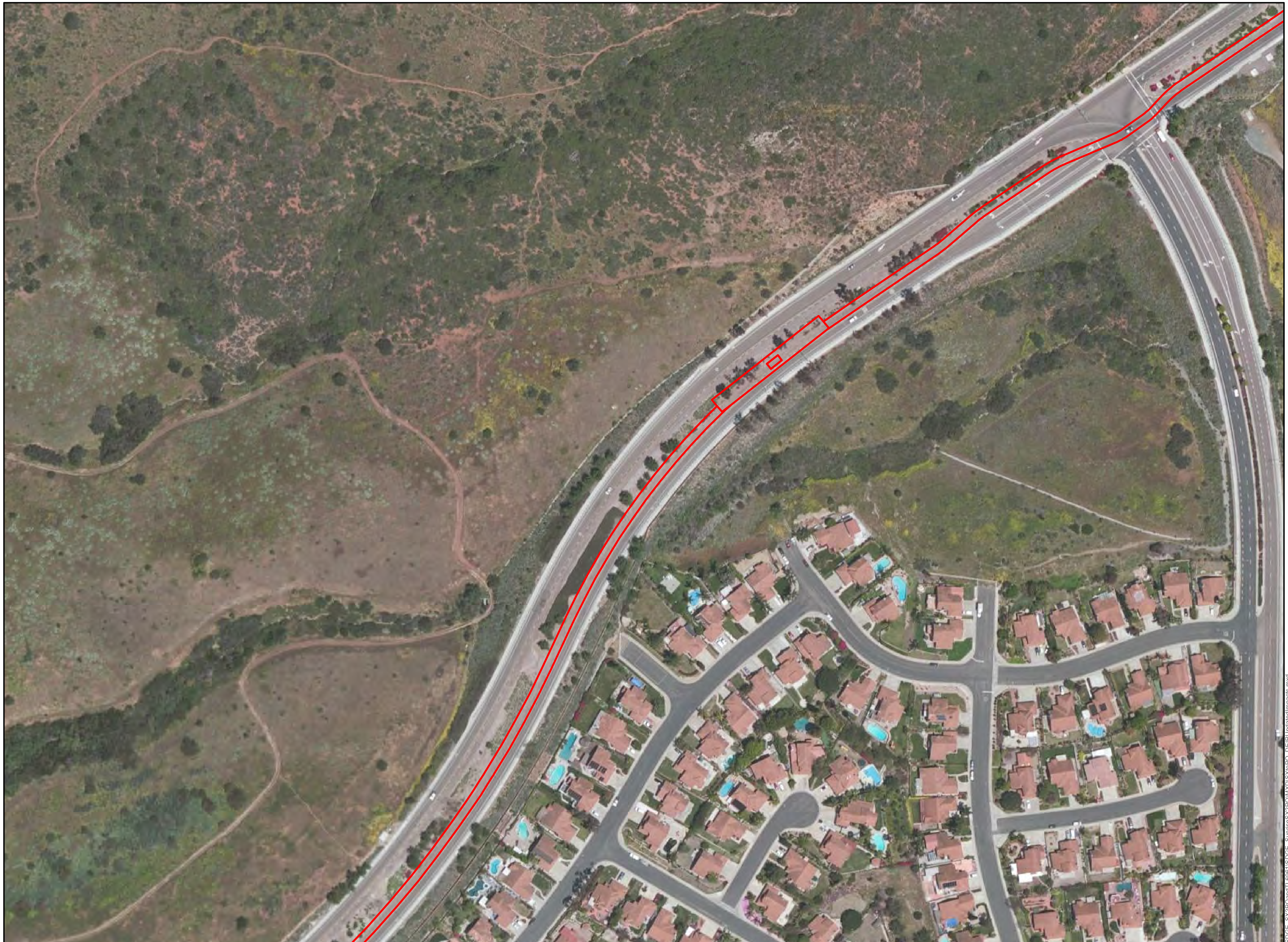

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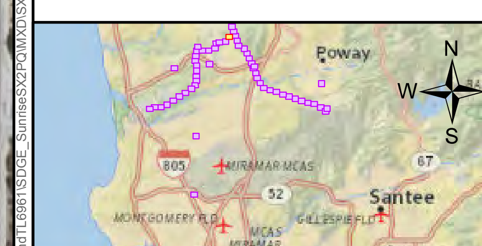

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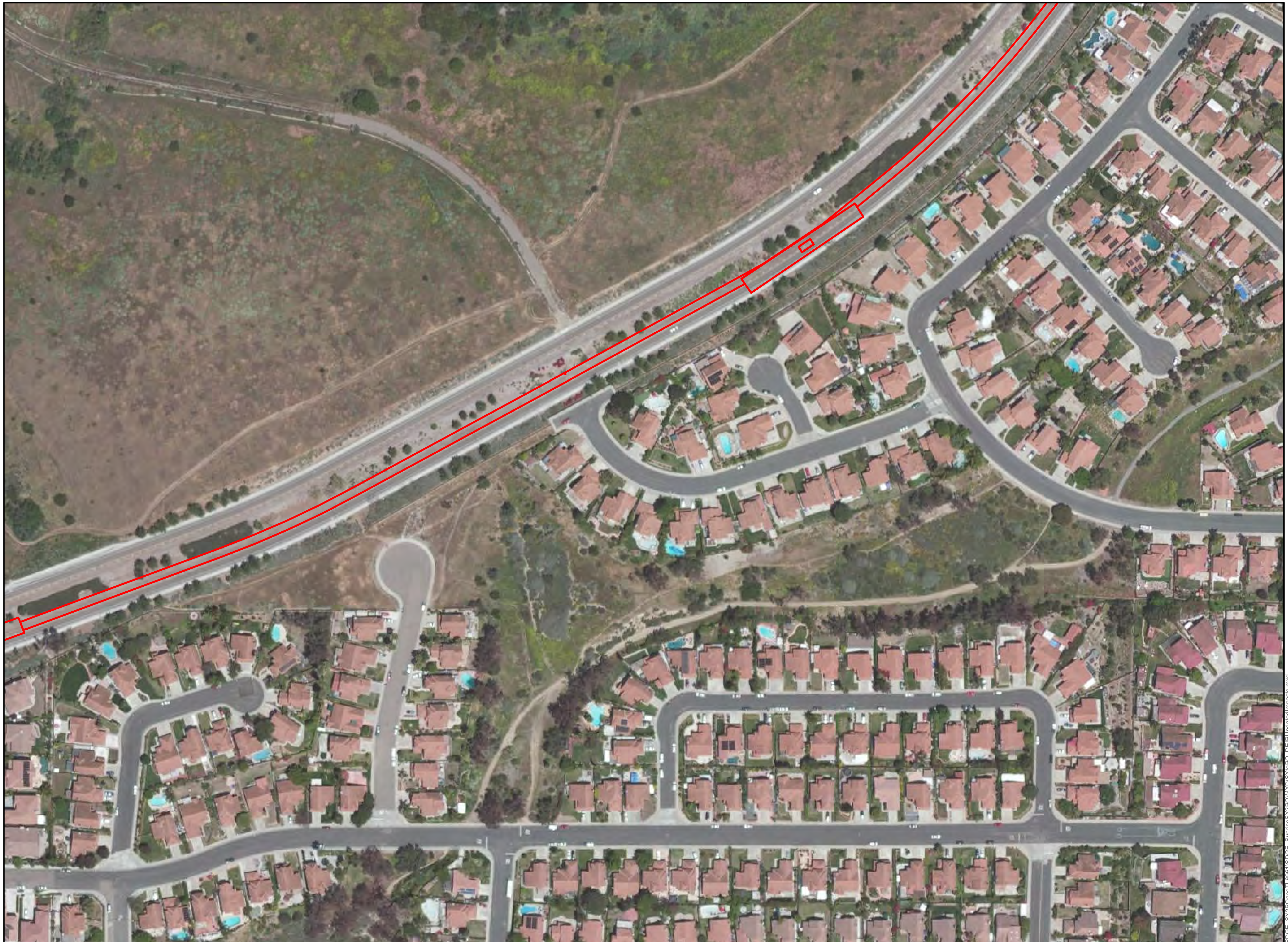

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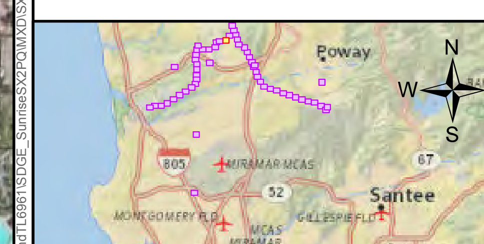

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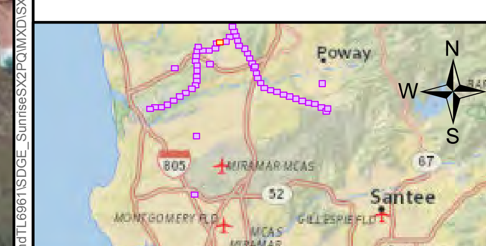

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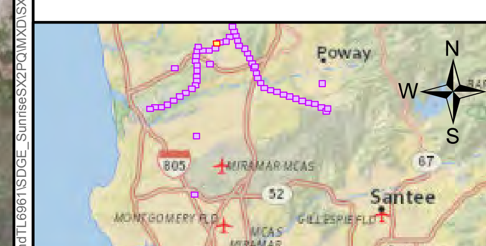

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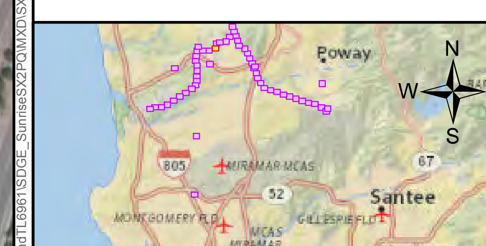

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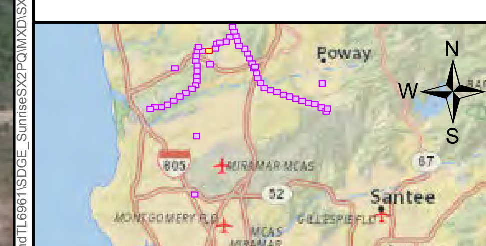

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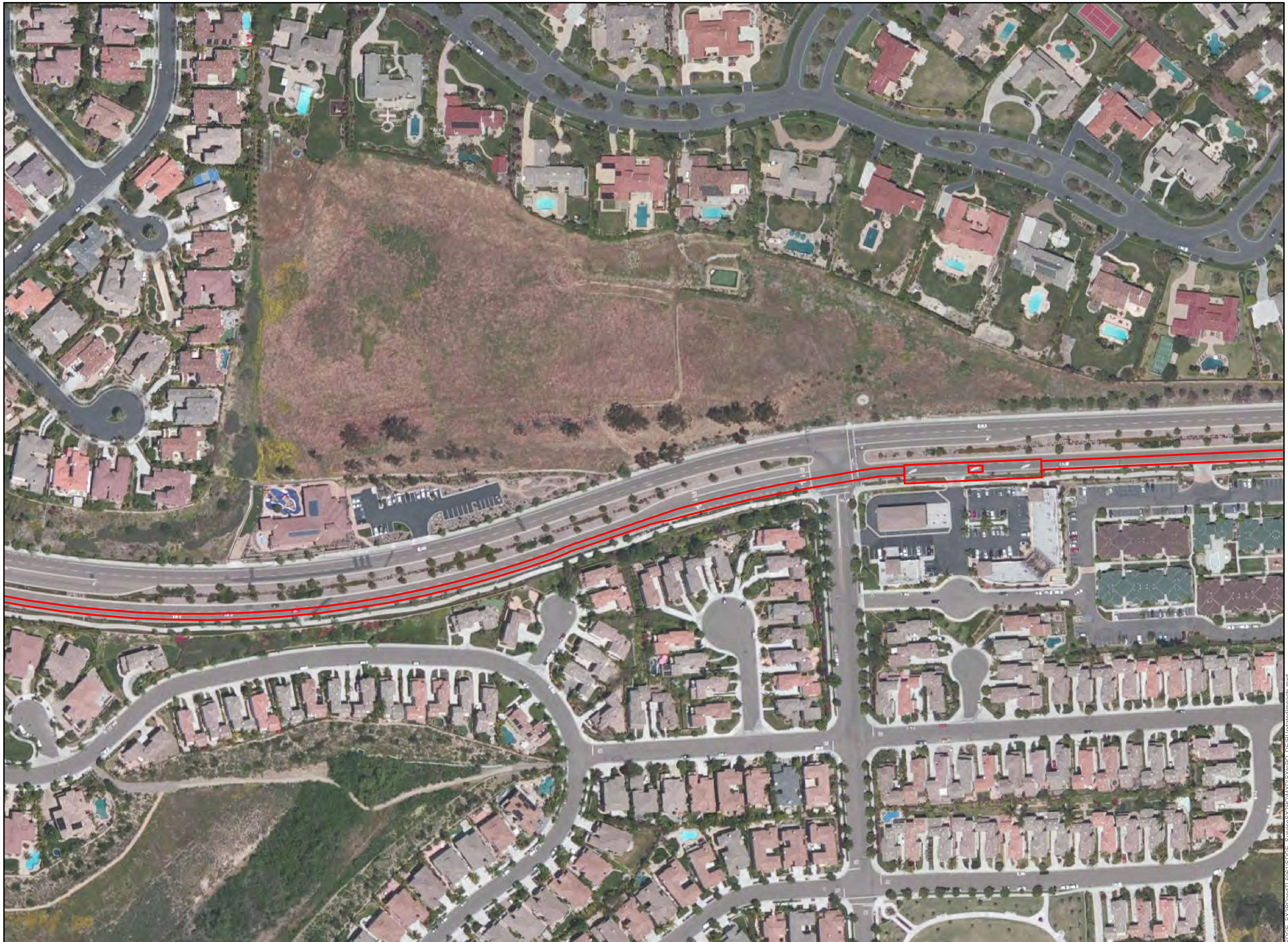

Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 1 - Updated Proposed Project Route Map

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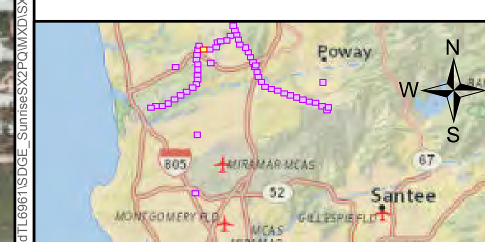

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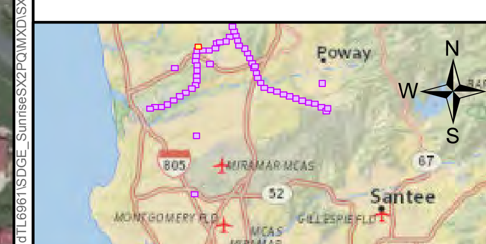

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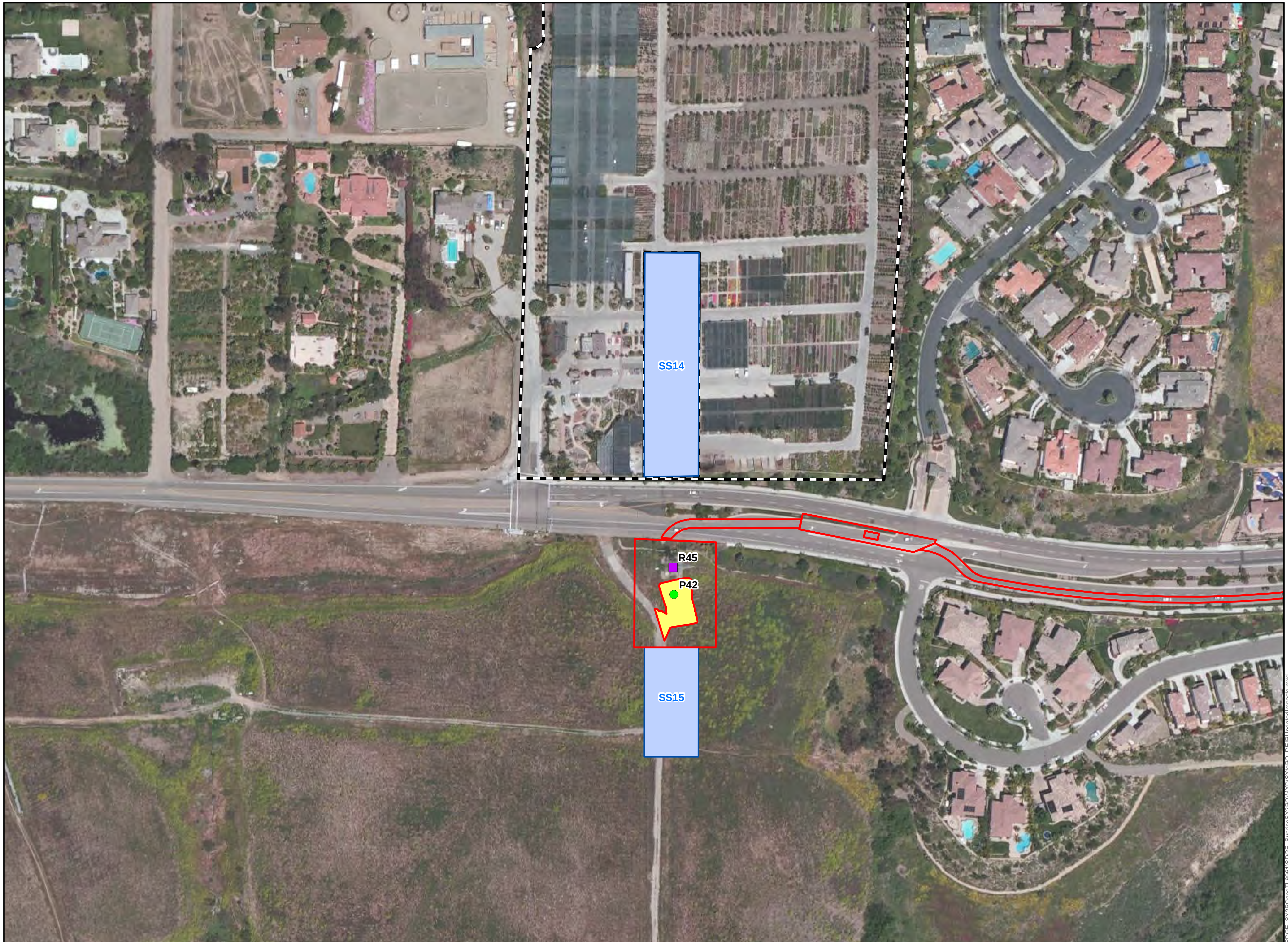

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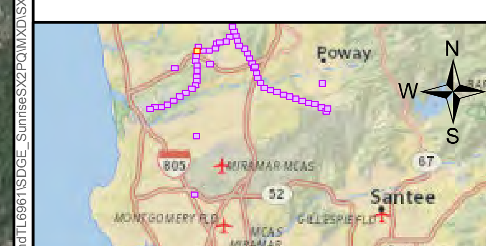

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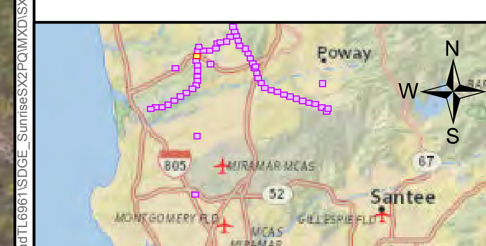

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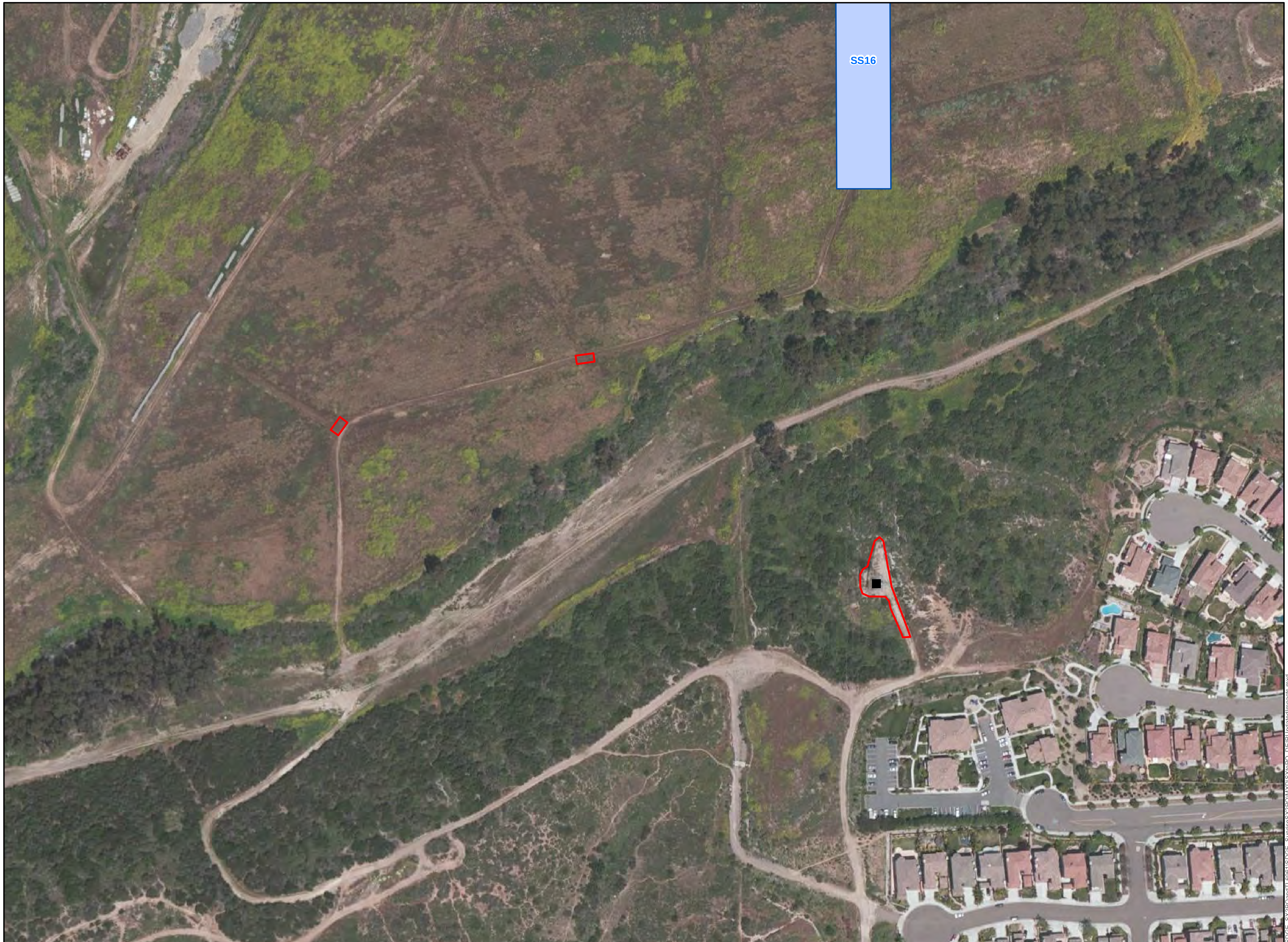

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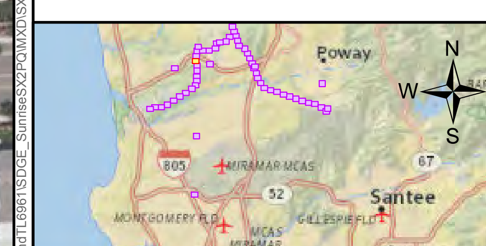

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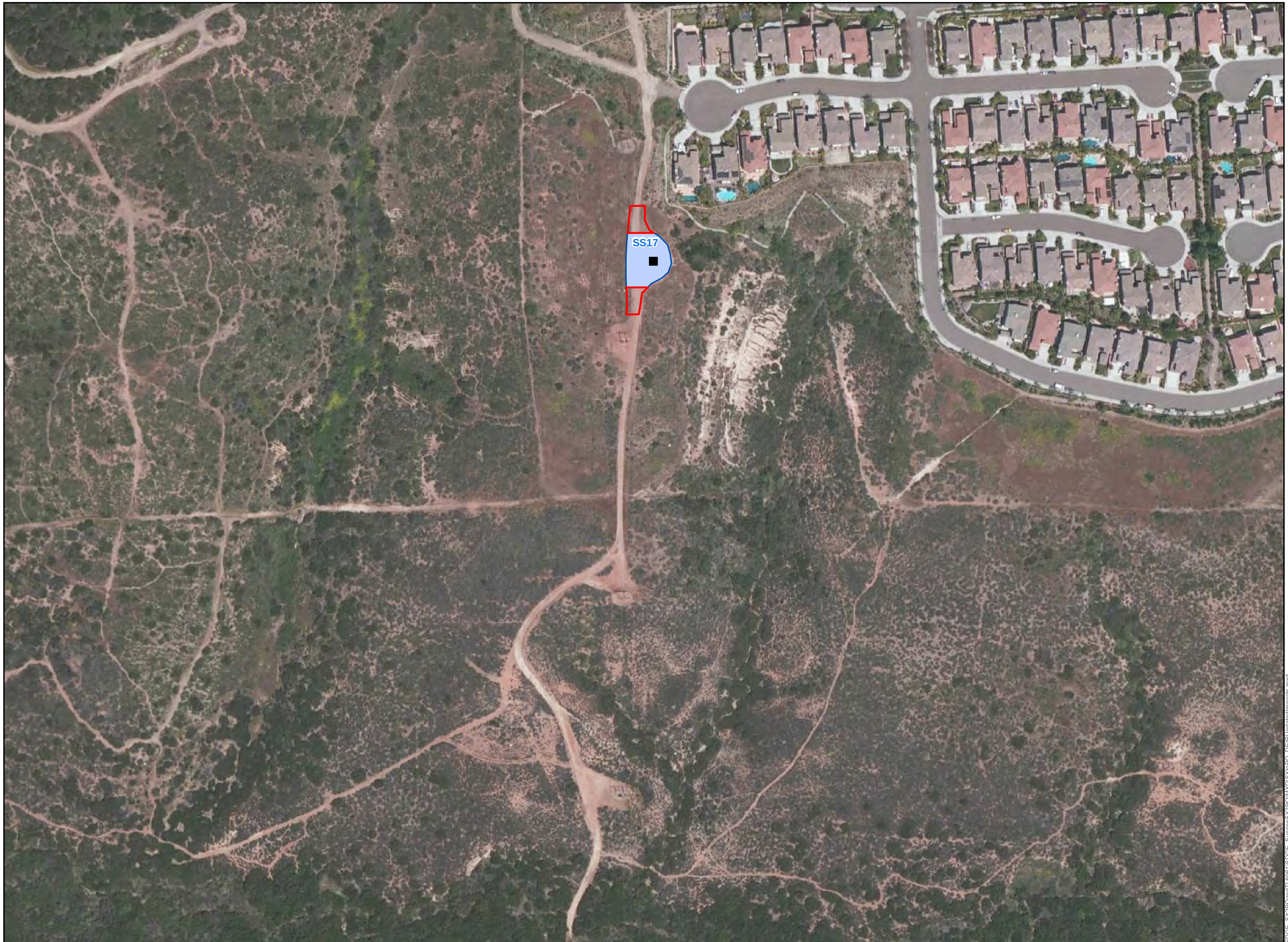

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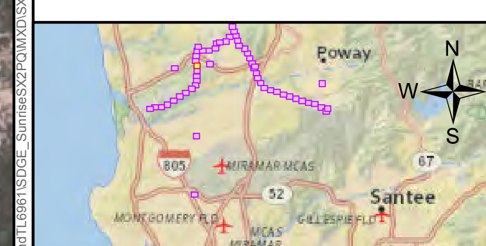

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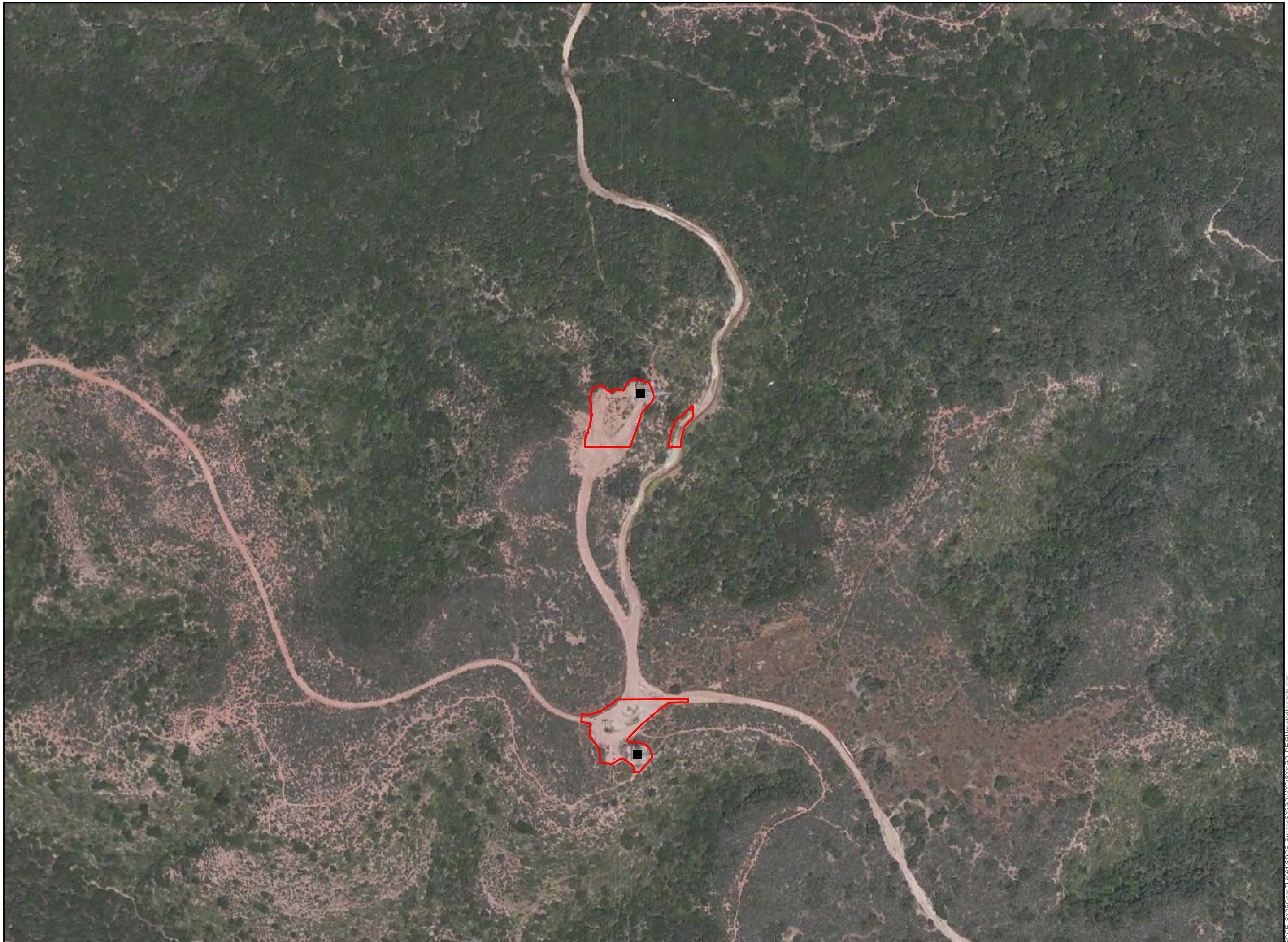

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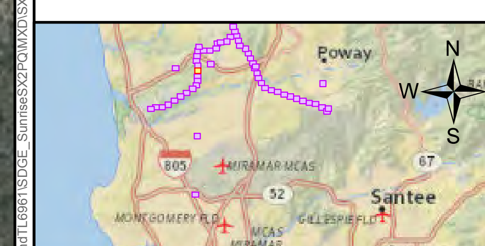

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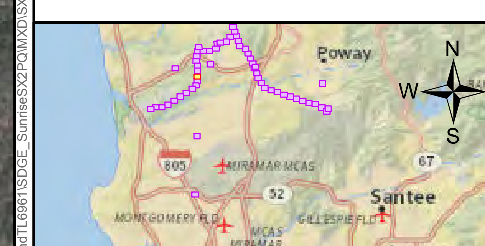

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Sycamore to Peñasquitos 230kV Transmission Line Project

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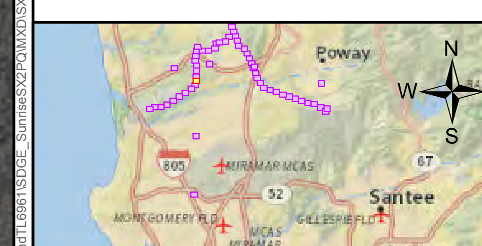

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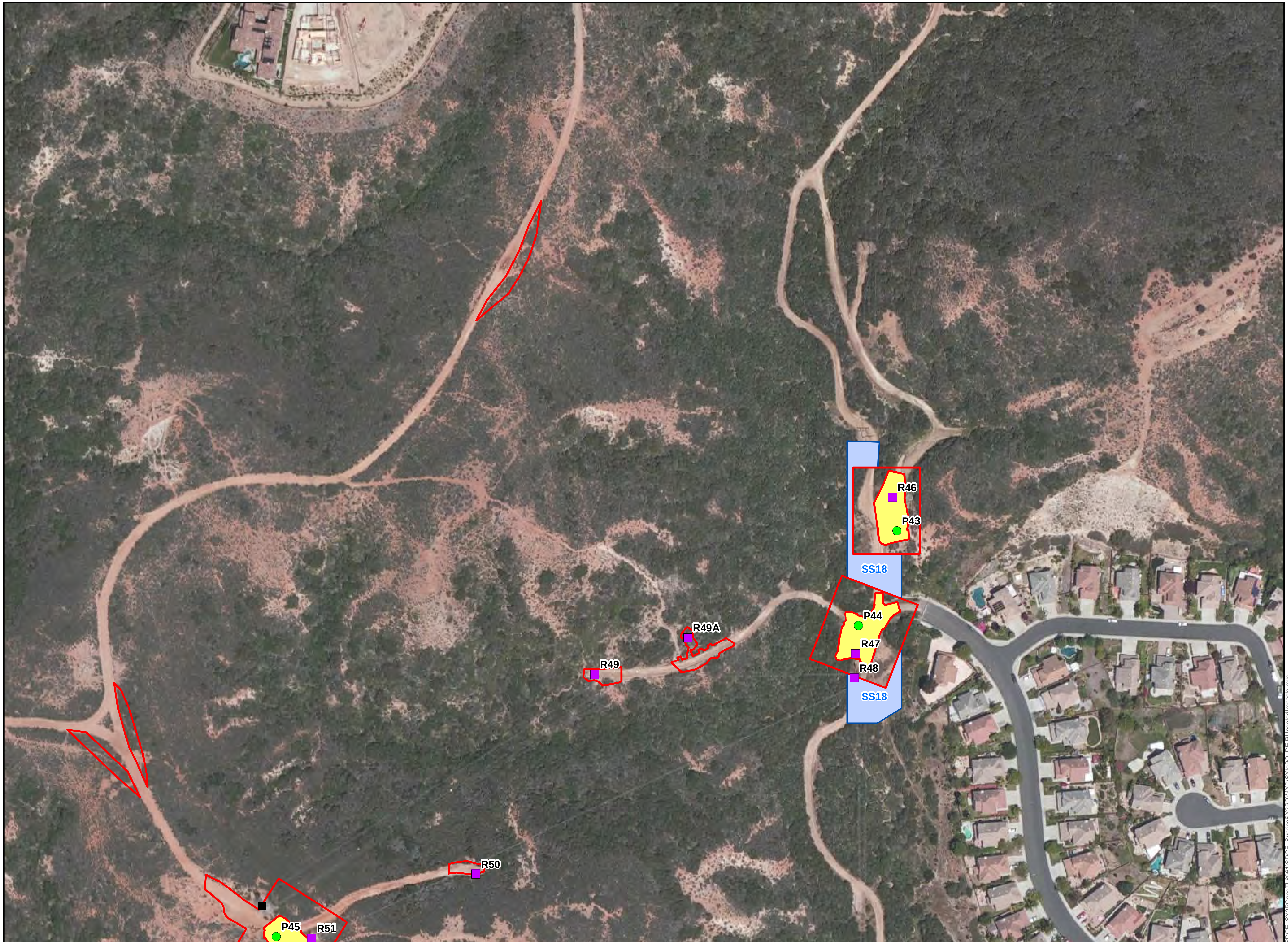

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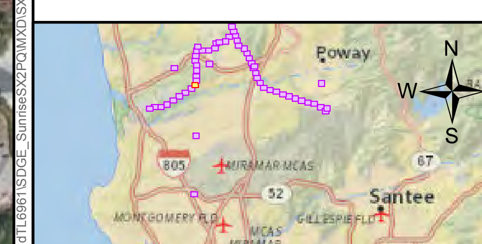

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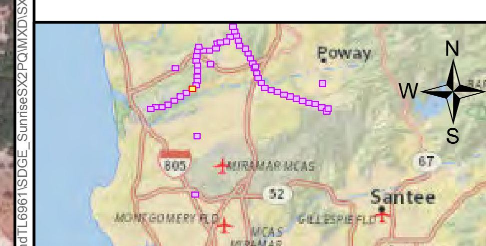

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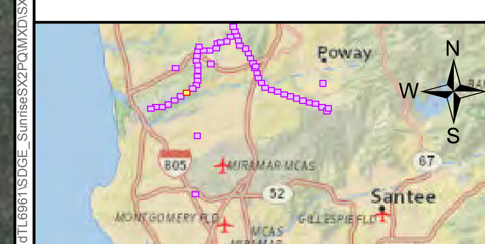

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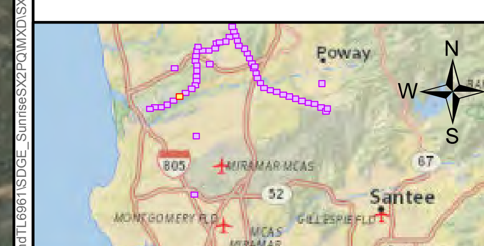

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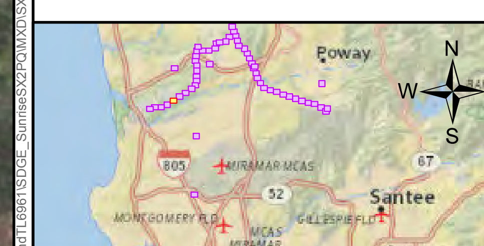

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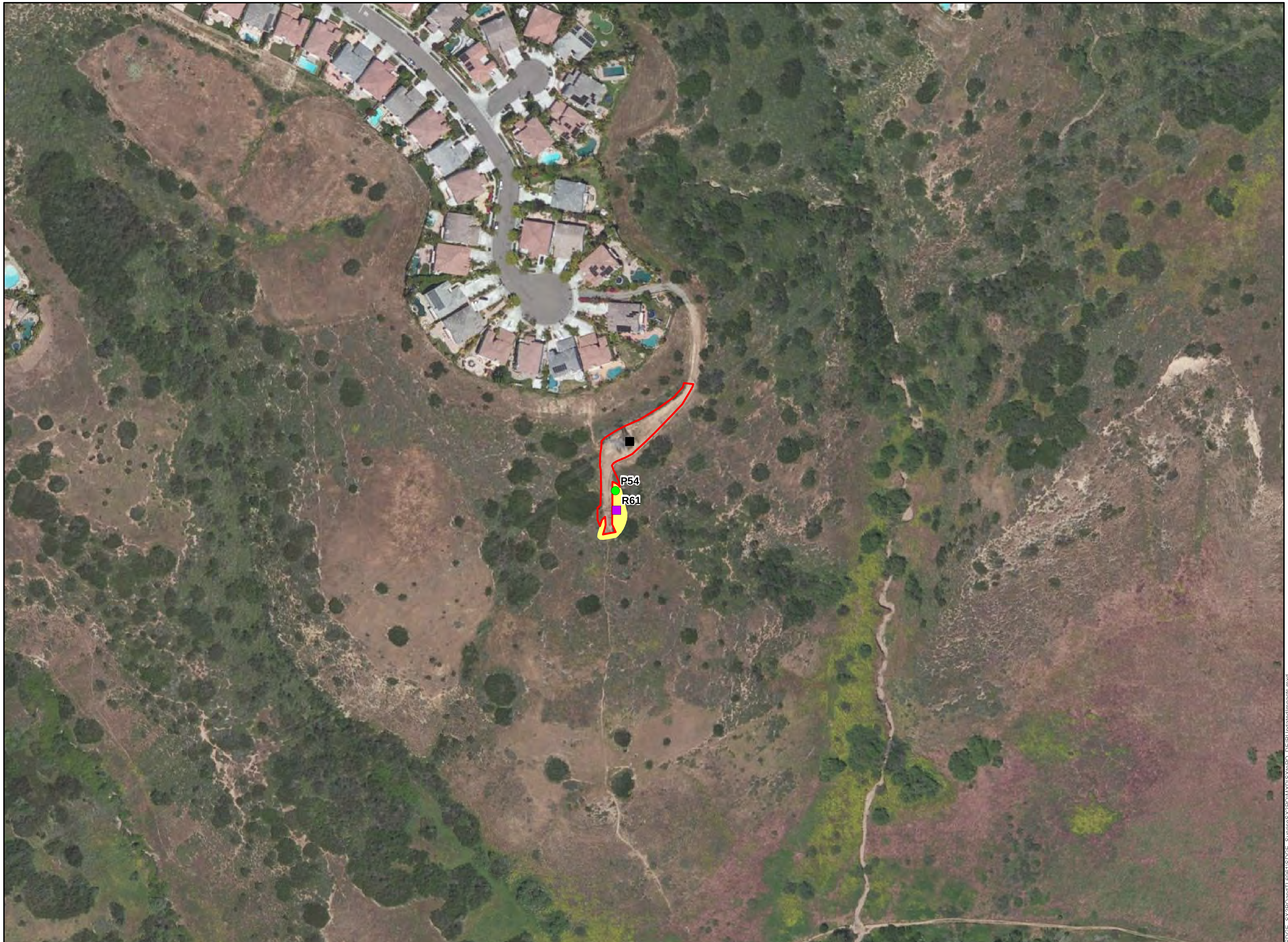

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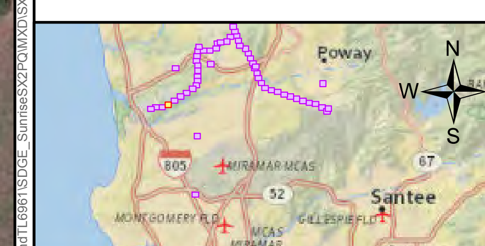

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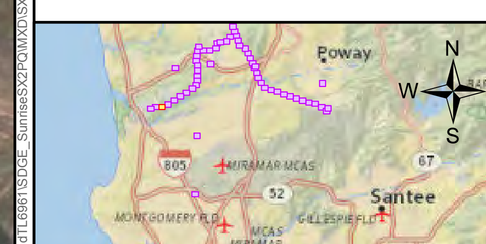

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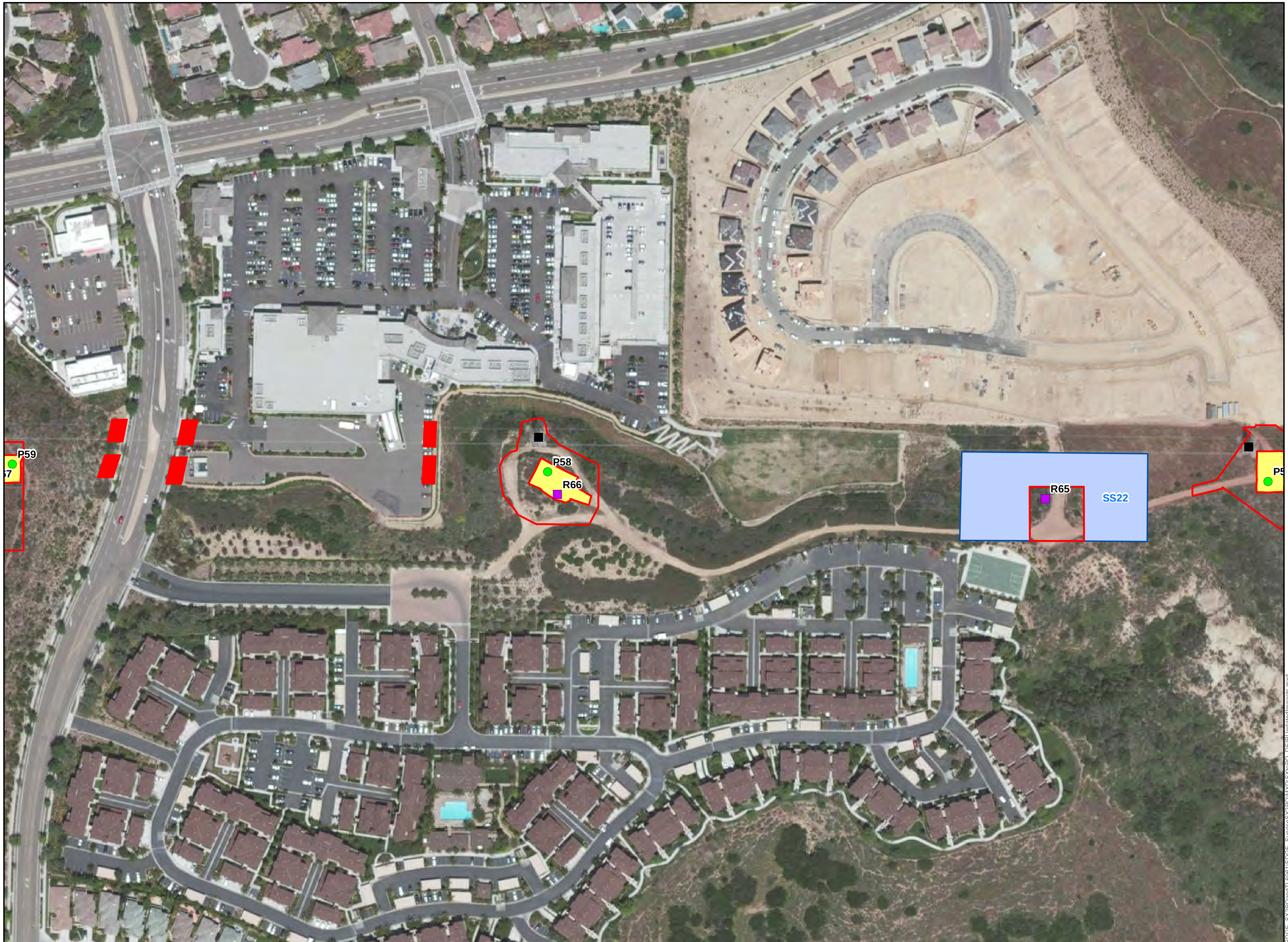

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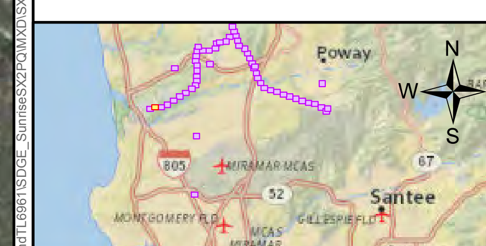

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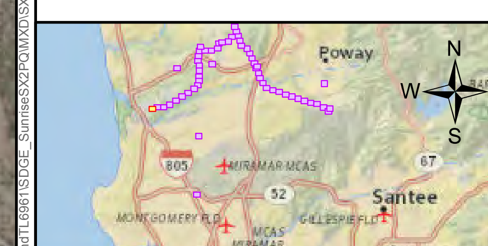

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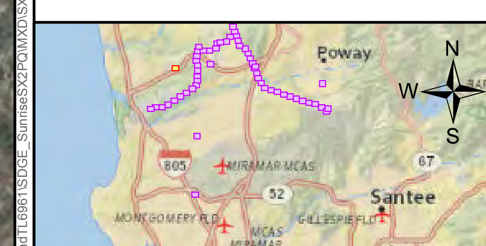

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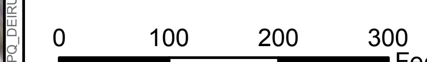
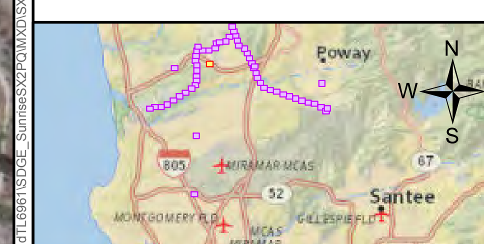
- Removed Pole
- Existing Pole
- Topped Pole
- Temporary Work Area
- Stringing Site
- Permanent Impact
- Guard Structures
- Staging Yard
- Substations

11/16/2015





Sources: SDG&E, 2015; TRC, 2015; Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Sycamore to Peñasquitos 230kV Transmission Line Project

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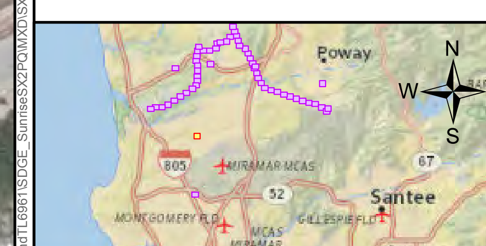
- Substations

SDGE A Sempra Energy utility

TRC

11/16/2015

0 100 200 300 Feet



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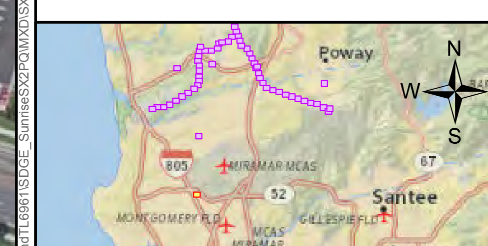

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Sycamore to Peñasquitos 230kV Transmission Line Project

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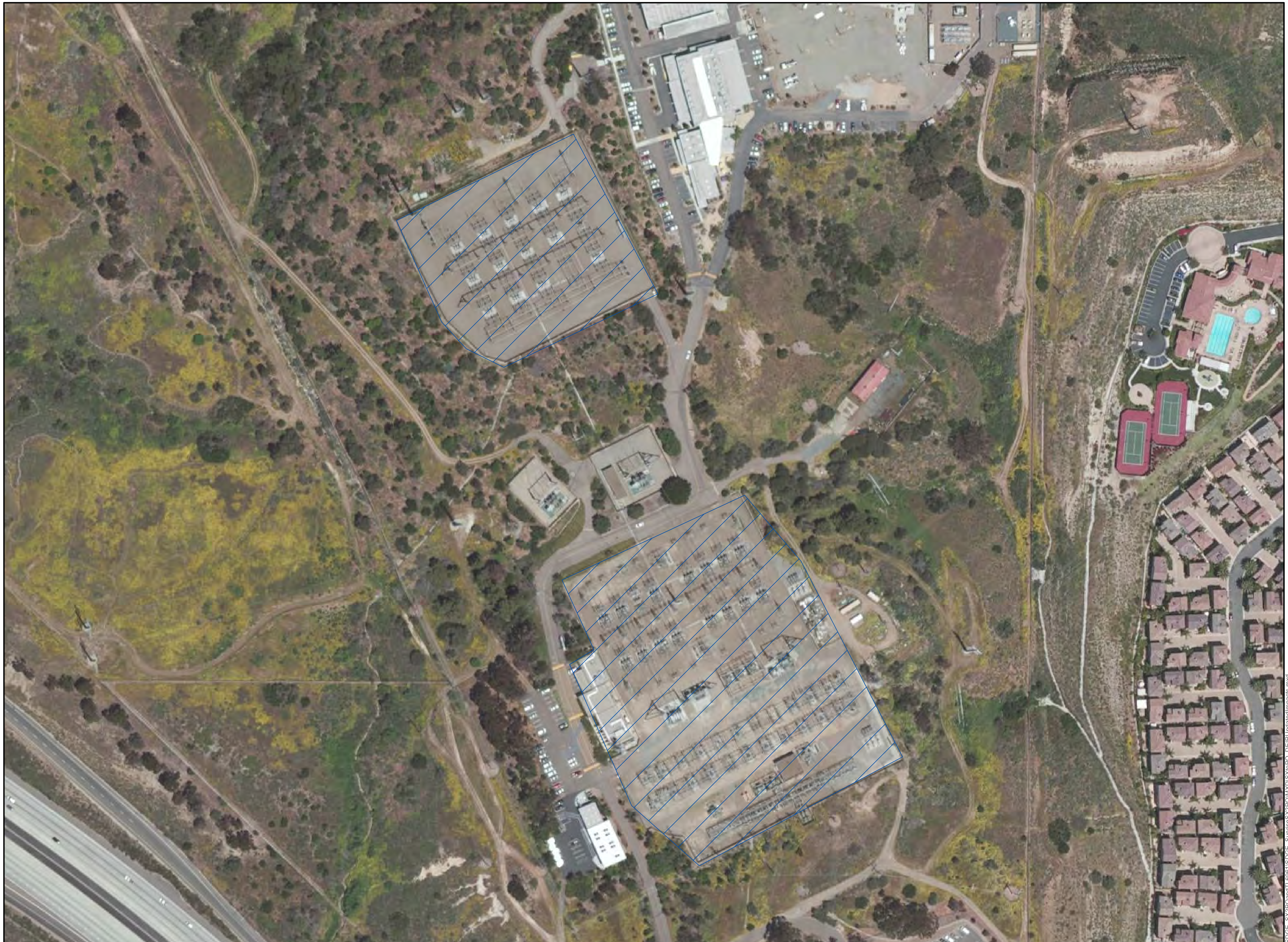

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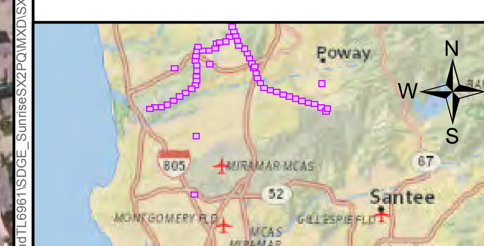

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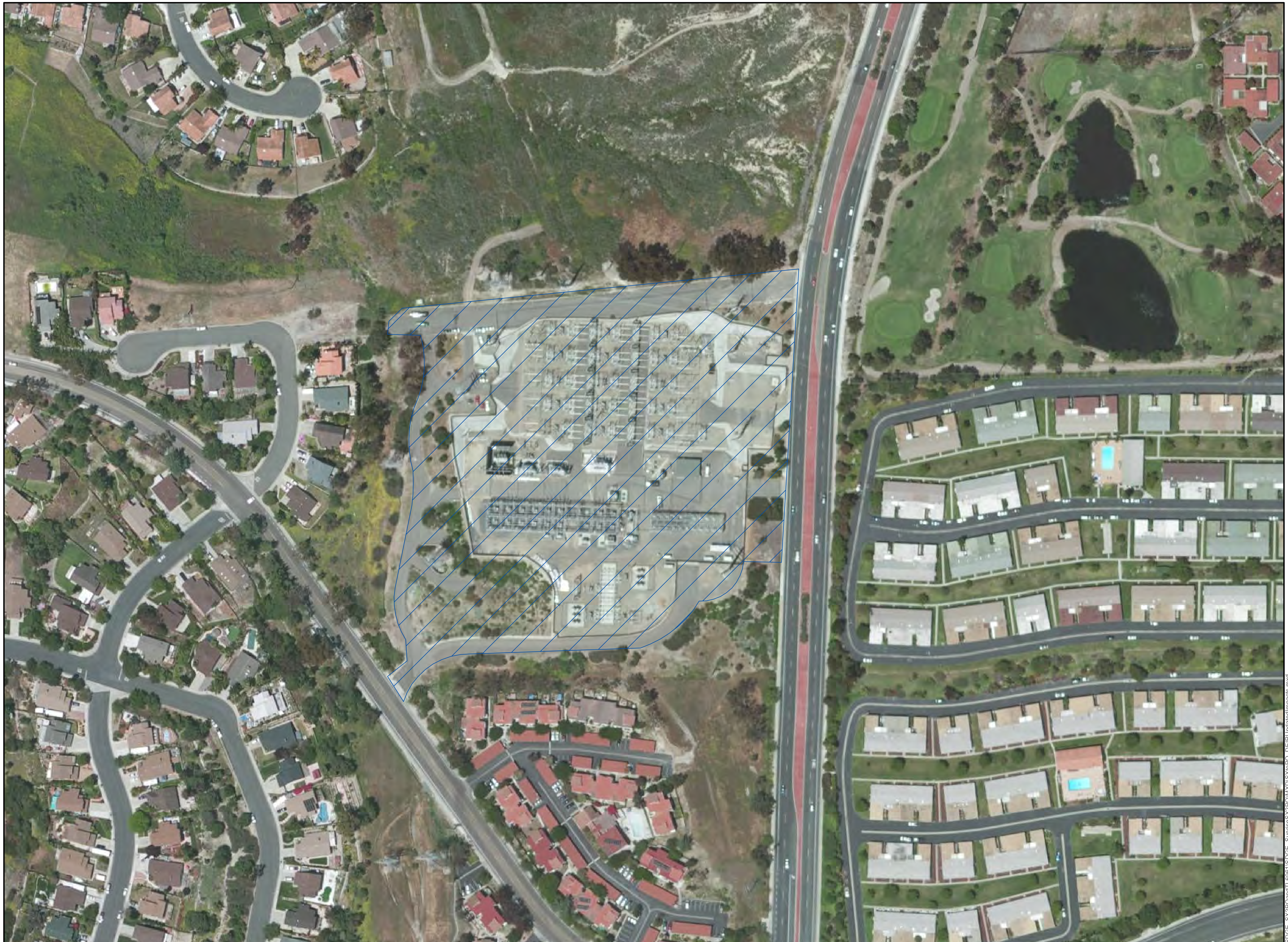

Sycamore to Peñasquitos 230kV Transmission Line Project

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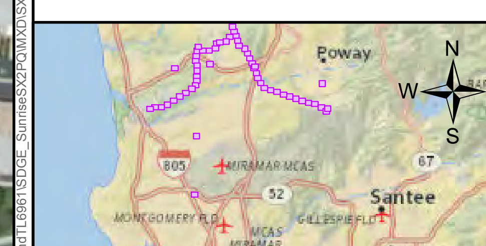

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Sycamore to Peñasquitos 230kV Transmission Line Project

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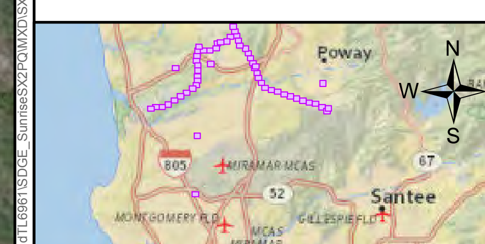
SDGE A Sempra Energy utility

TRC

11/16/2015

0 100 200 300 Feet



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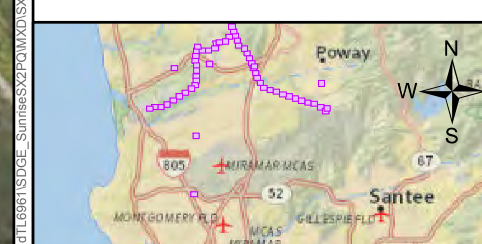

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EXHIBIT 2

Civil Design Updates Comparison

Sycamore to Penasquitos 230kV Transmission Line Project

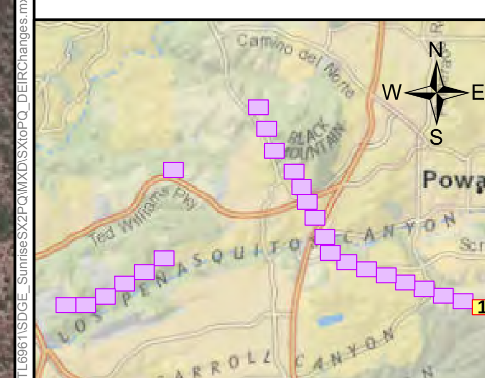
Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

SDGE A Sempra Energy utility

TRC

0 200 400 Feet



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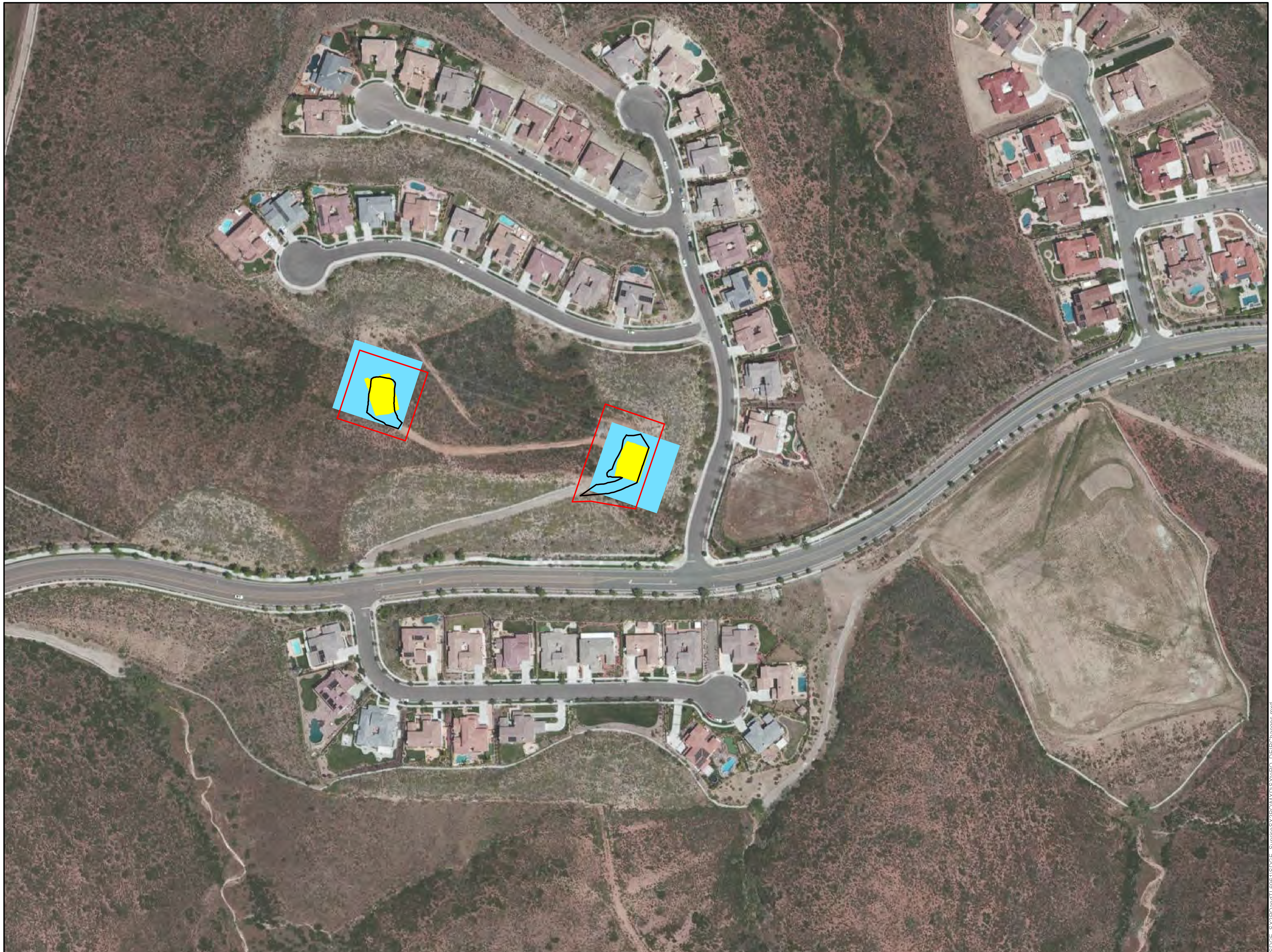
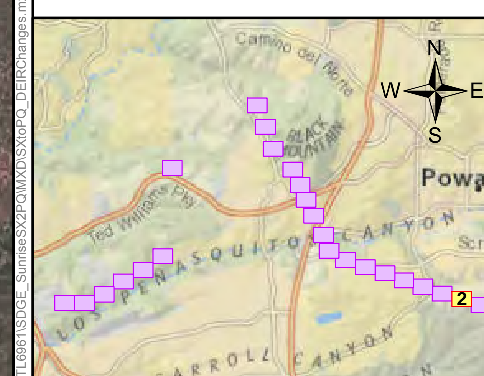


Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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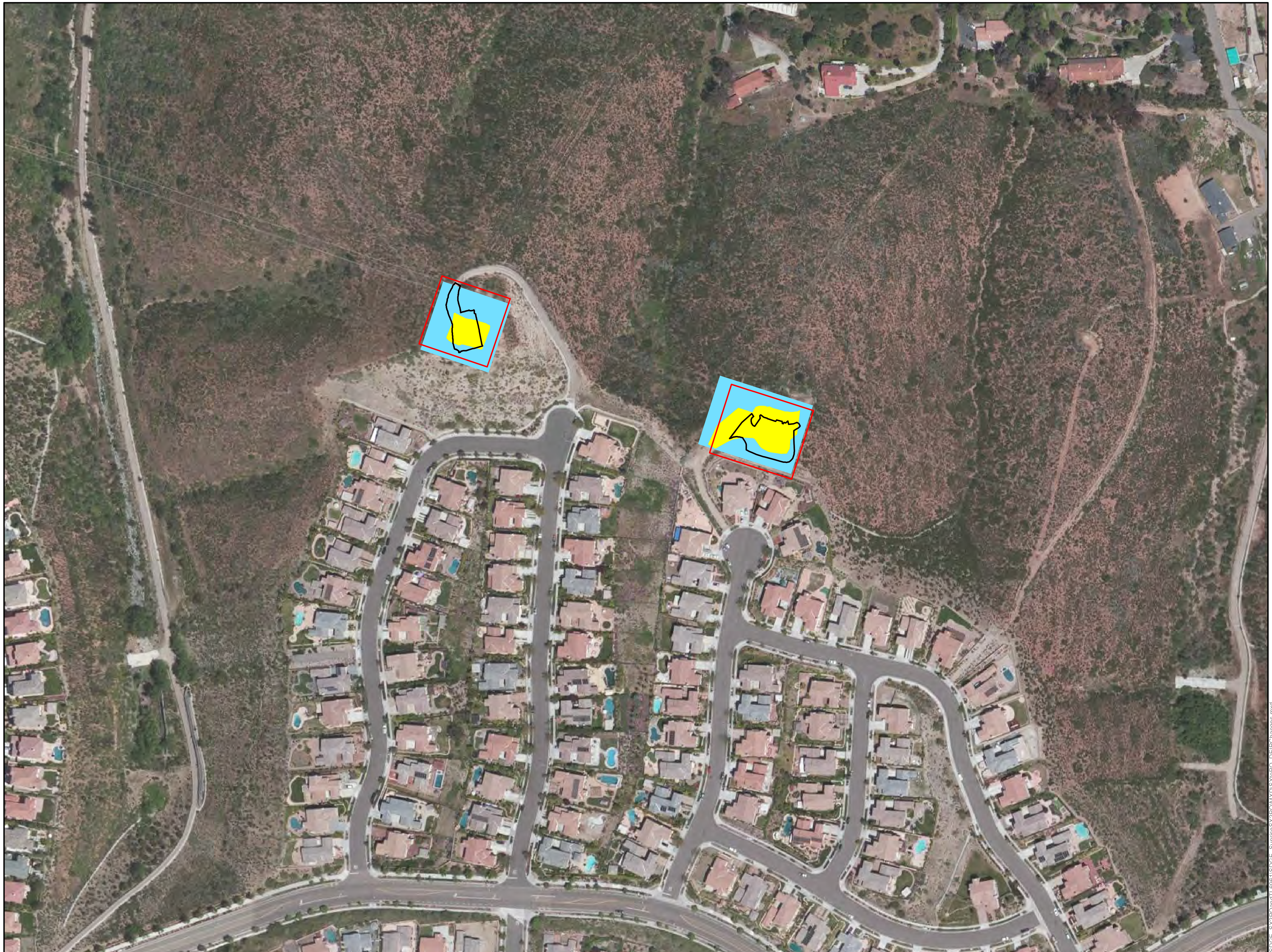
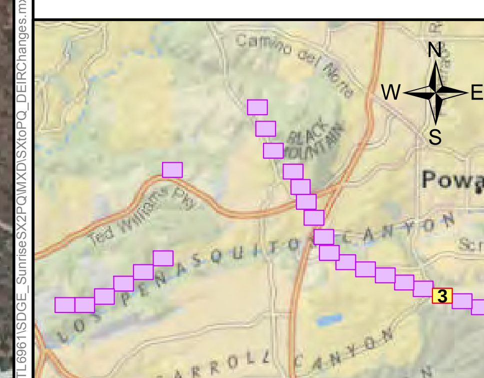


Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

Revised Permanent Impact
Revised Temporary Work Area
Old Permanent Impact
Old Temporary Work Area

0 200 400
Feet



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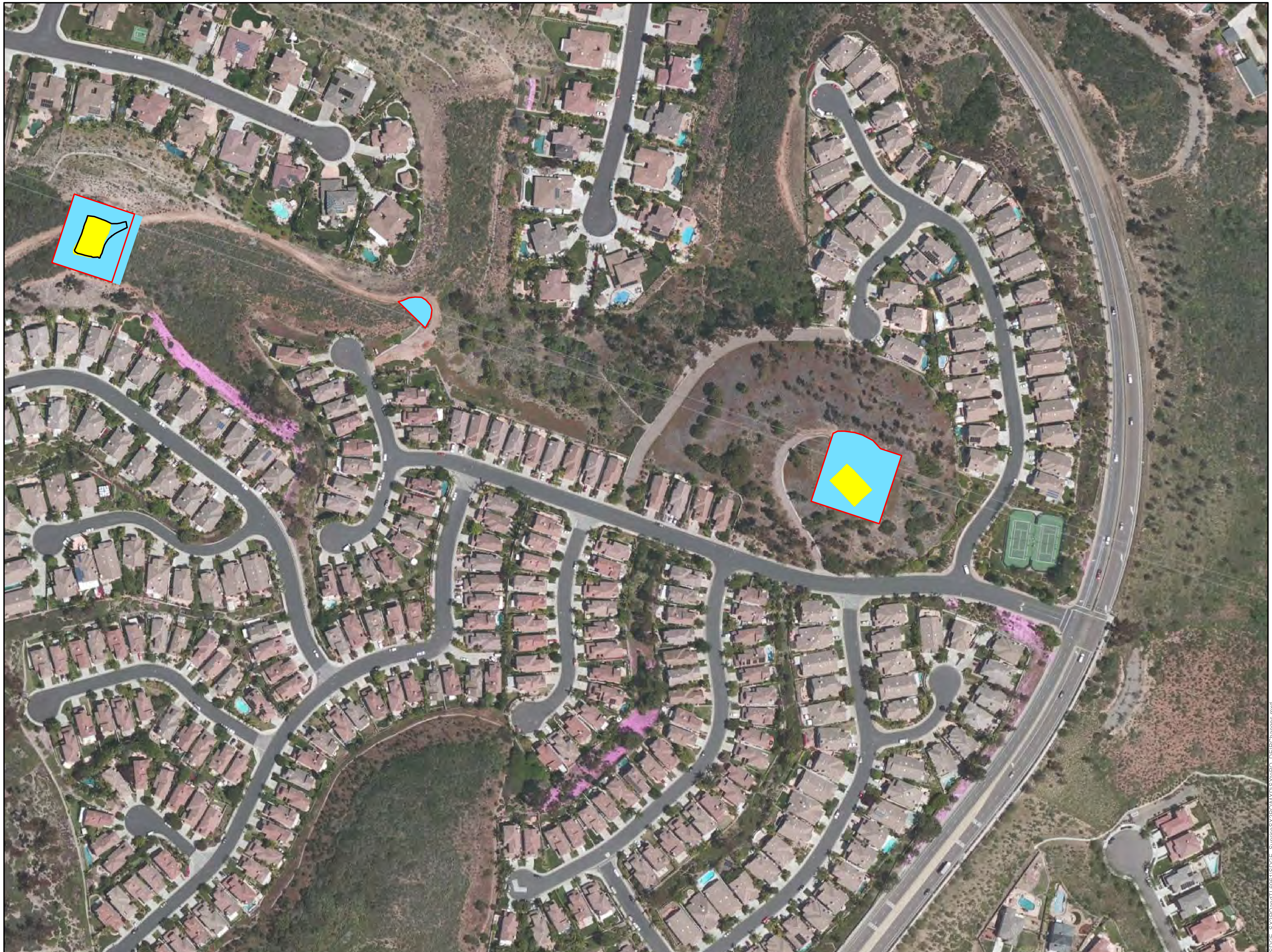
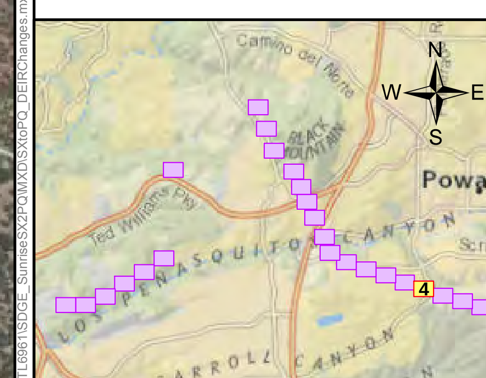
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates



Revised Permanent Impact
Revised Temporary Work Area
Old Permanent Impact
Old Temporary Work Area

0 200 400 Feet



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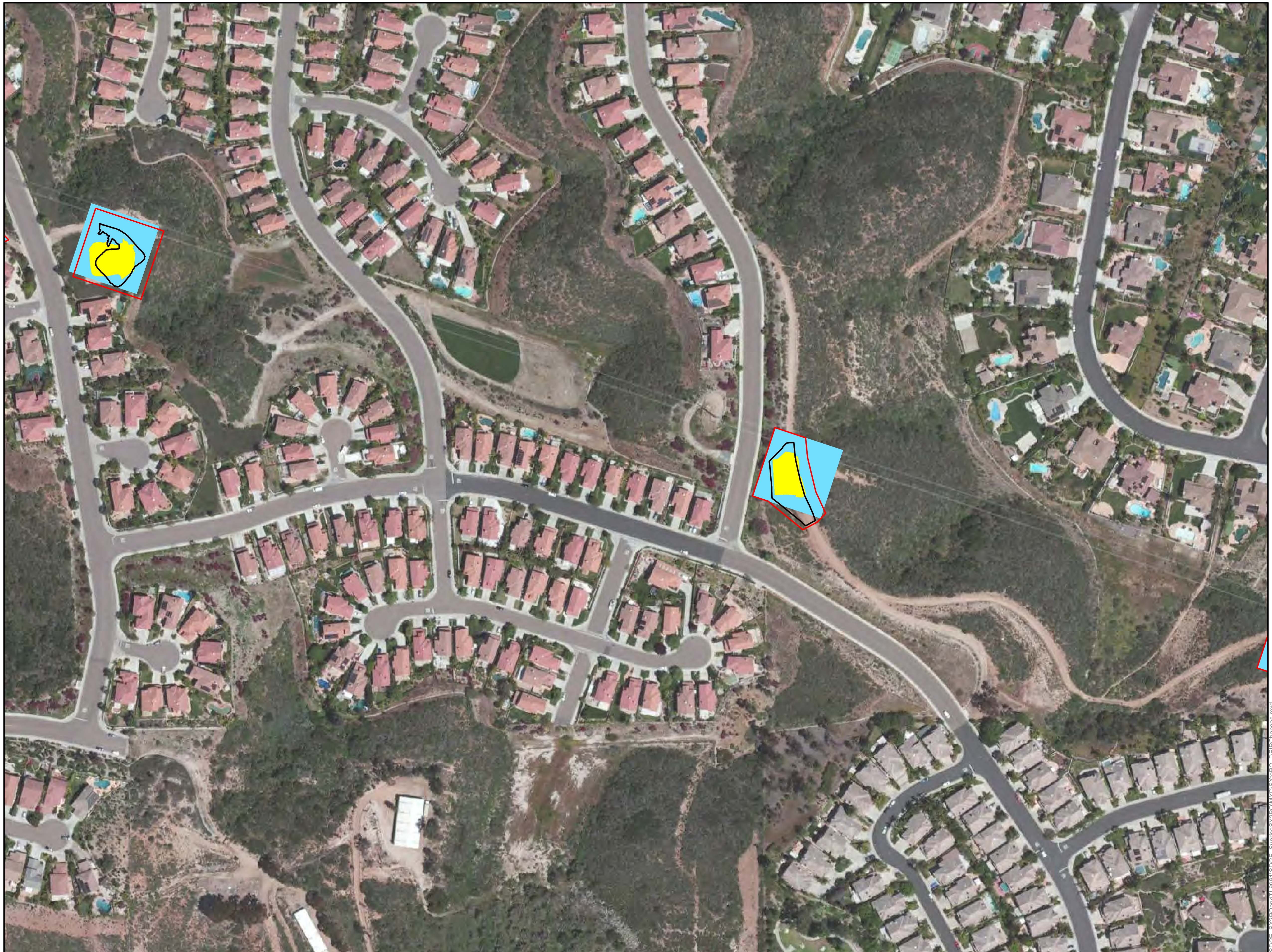
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates



Revised Permanent Impact

Revised Temporary Work Area

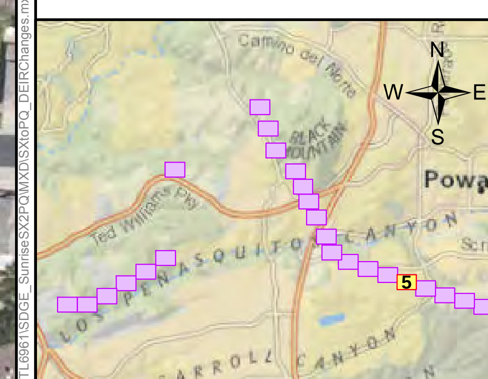
Old Permanent Impact

Old Temporary Work Area

SDGE A Sempra Energy utility

TRC

0 200 400 Feet



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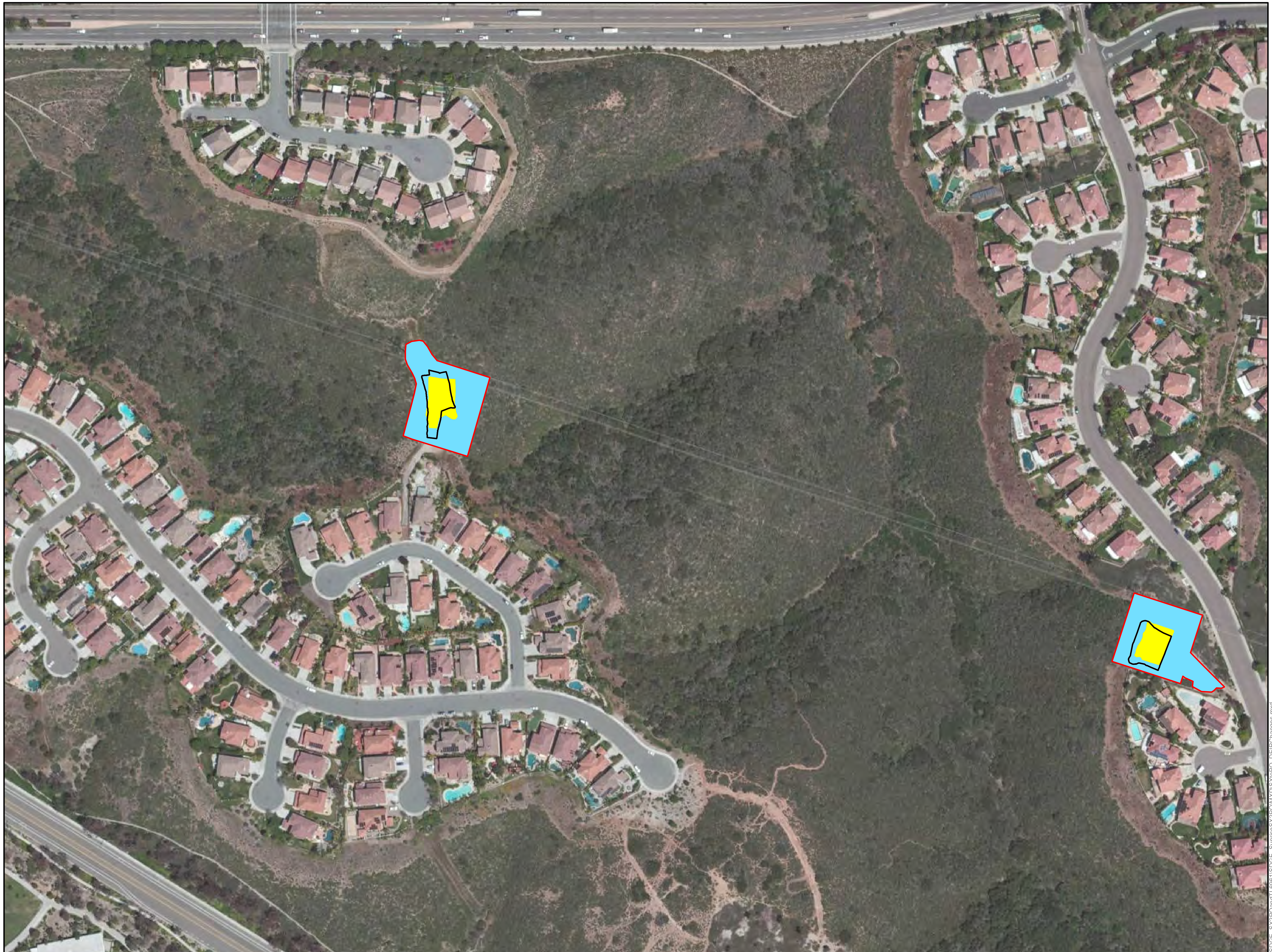
Sycamore to Penasquitos 230kV Transmission Line Project

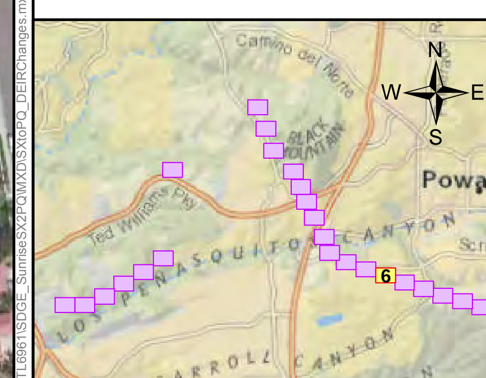
Exhibit 2 - Civil Design Updates



- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

SDGE A Sempra Energy utility   TRC

0   200   400 Feet



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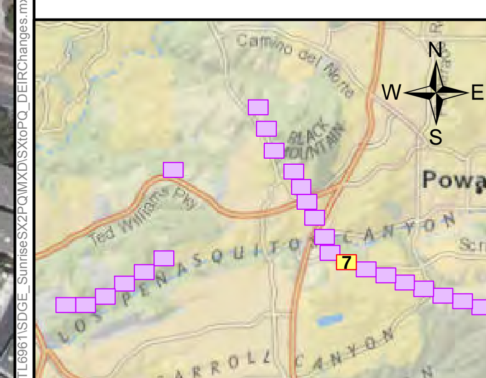
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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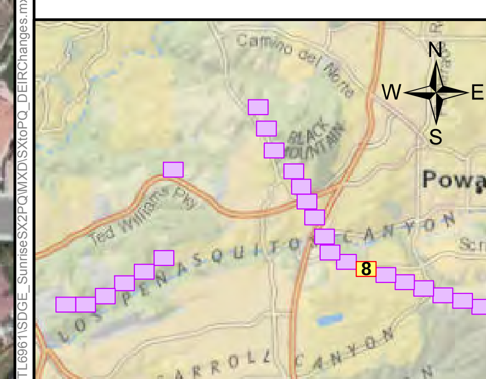
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

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- Revised Temporary Work Area
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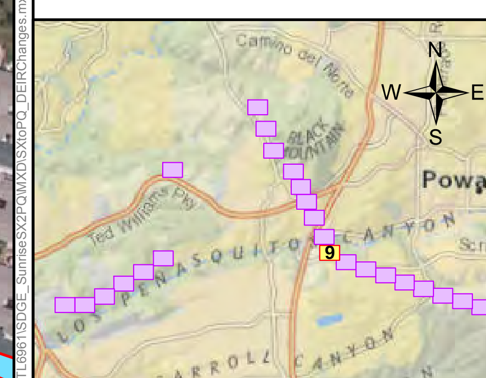
- Old Temporary Work Area

0 200 400 Feet



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Sycamore to Penasquitos 230kV Transmission Line Project

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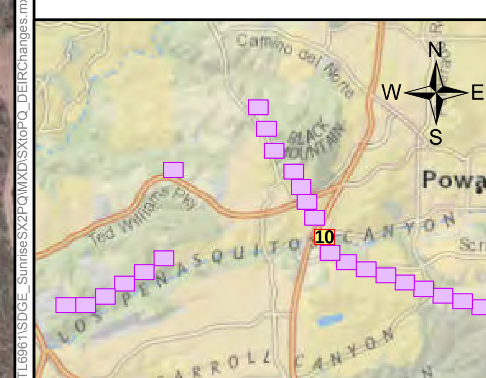

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Sycamore to Penasquitos 230kV Transmission Line Project

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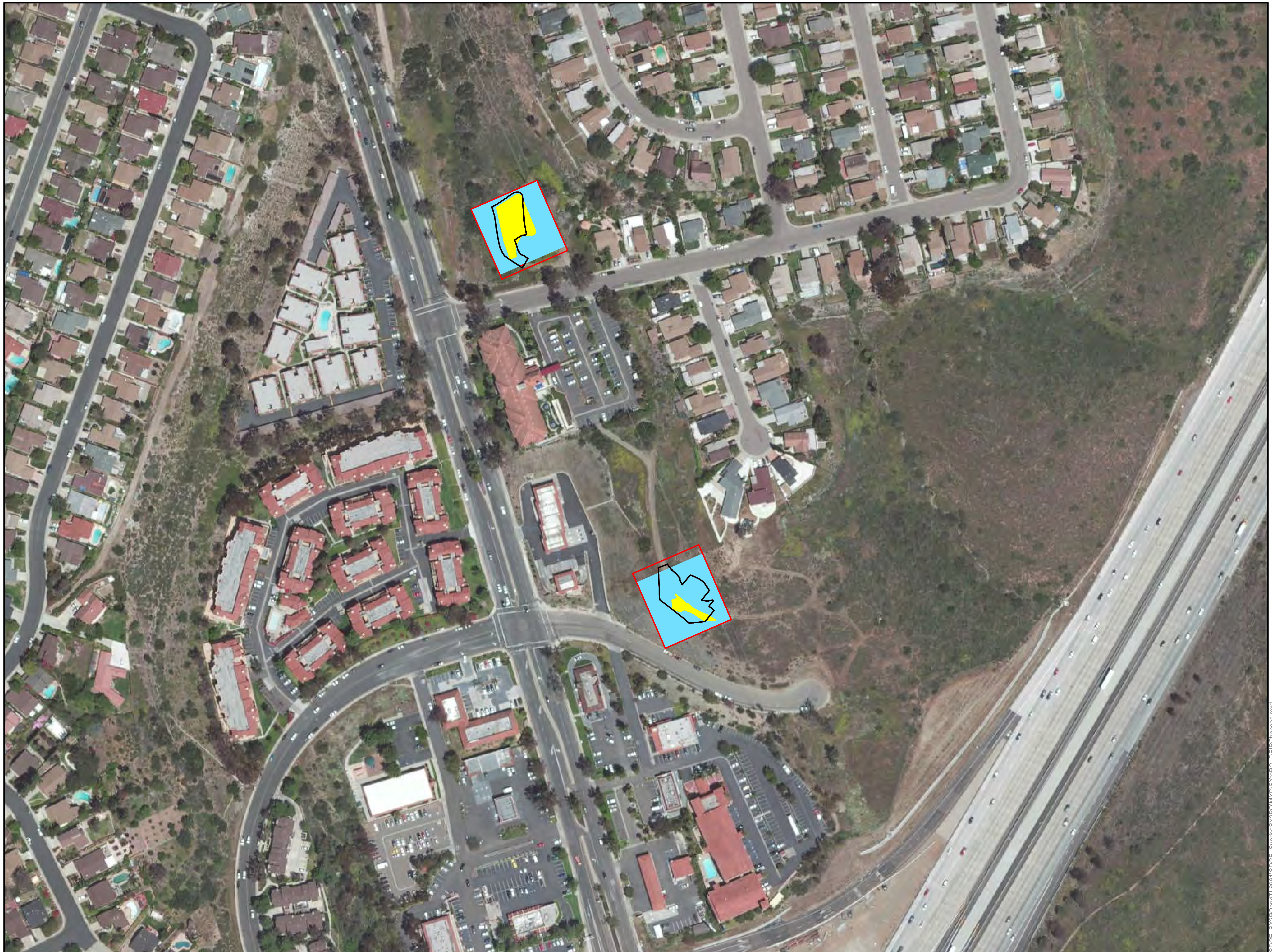

- Revised Permanent Impact
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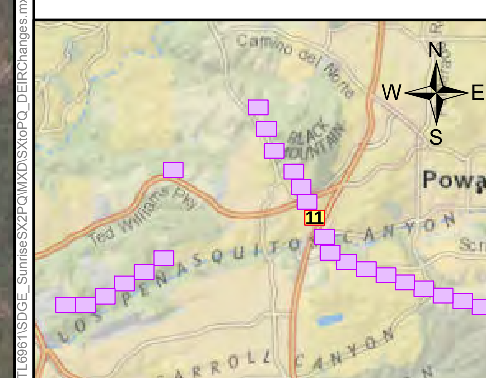
- Old Temporary Work Area

0 200 400 Feet



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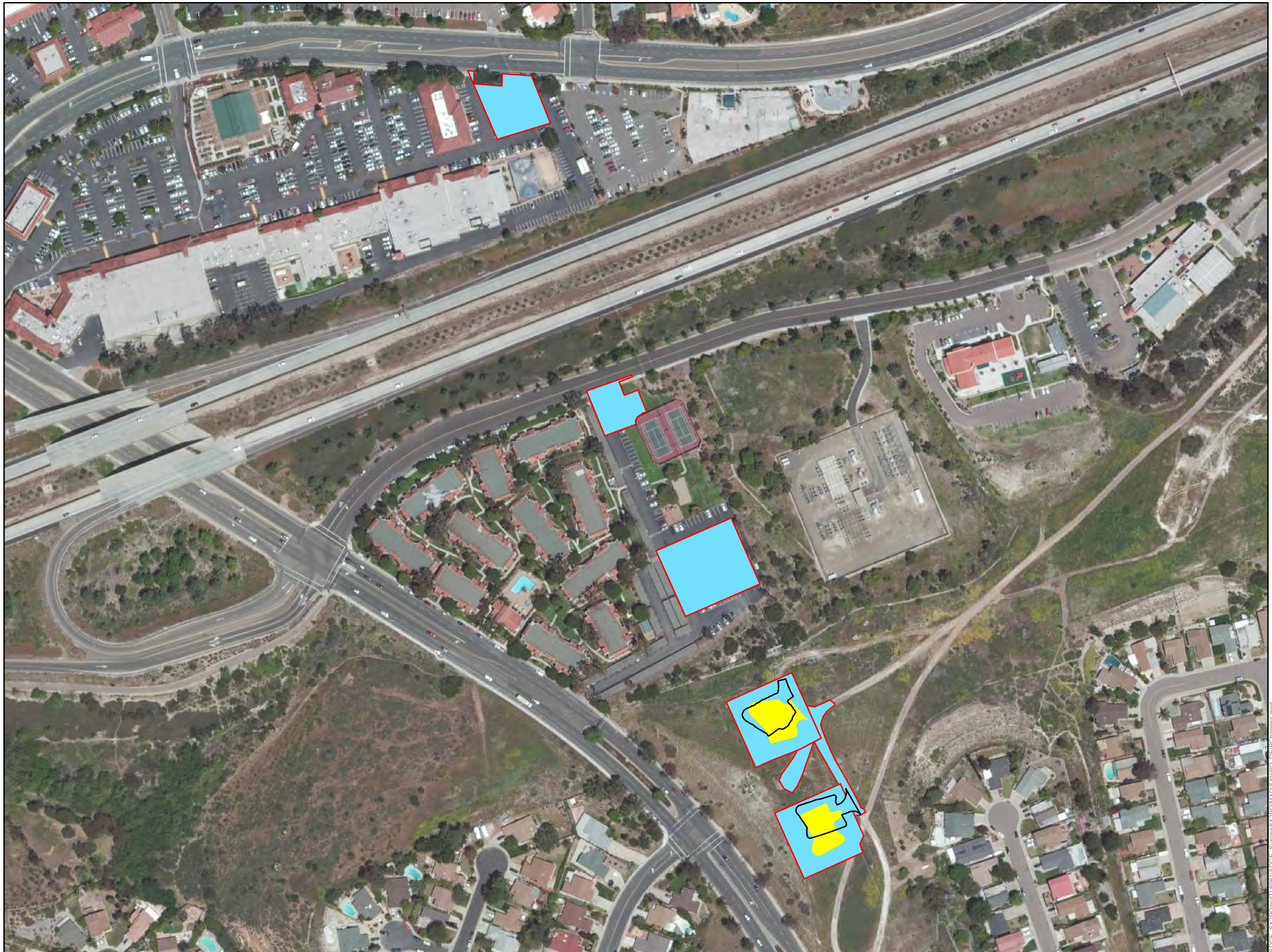

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

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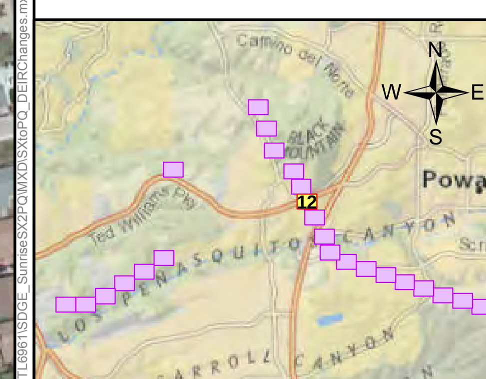
- Old Temporary Work Area

SDGE A Sempra Energy utility   TRC

0   200   400 Feet



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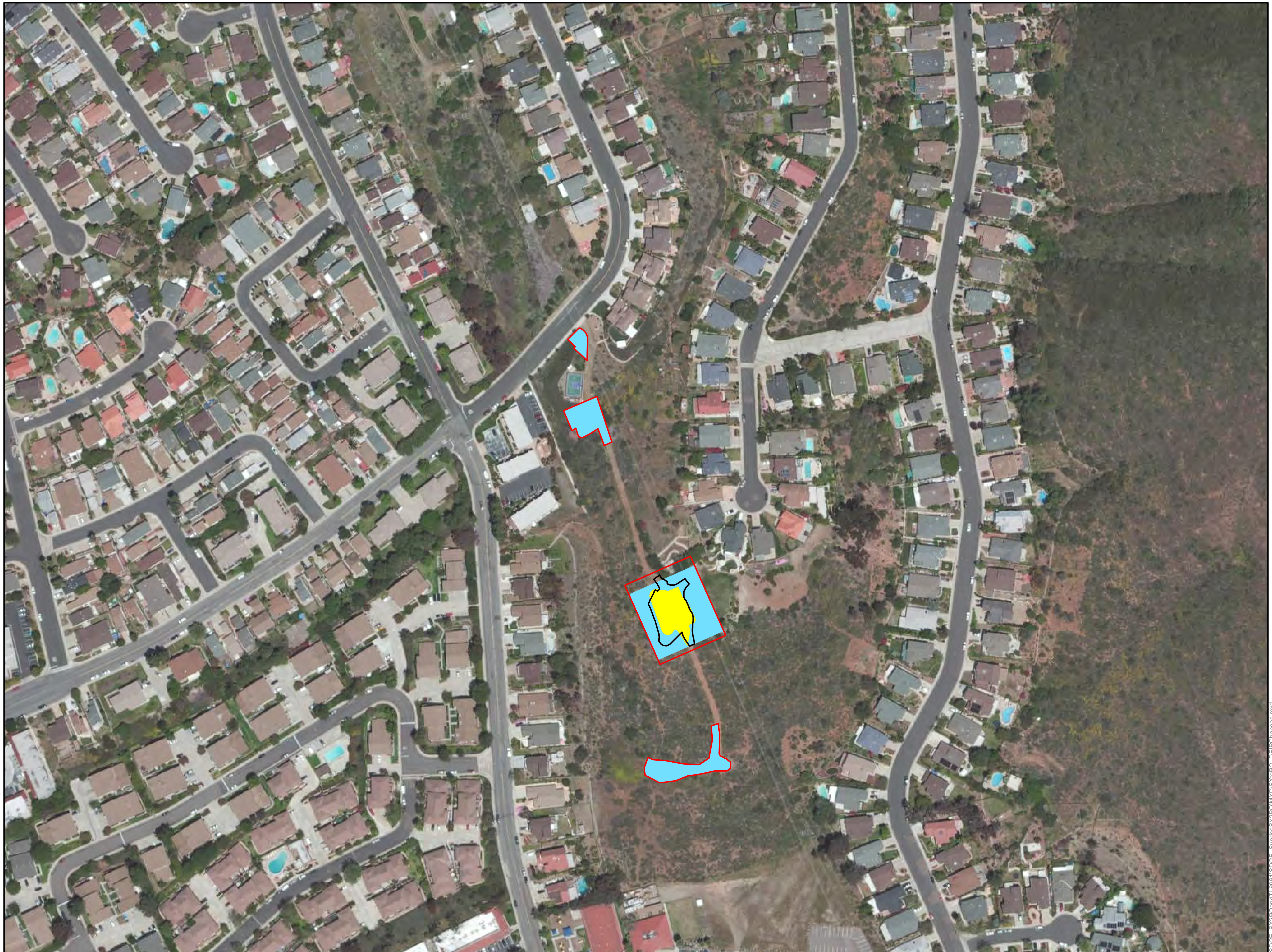

Sycamore to Penasquitos 230kV Transmission Line Project

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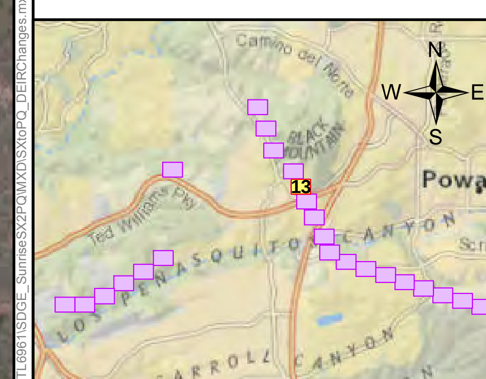

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Sycamore to Penasquitos 230kV Transmission Line Project

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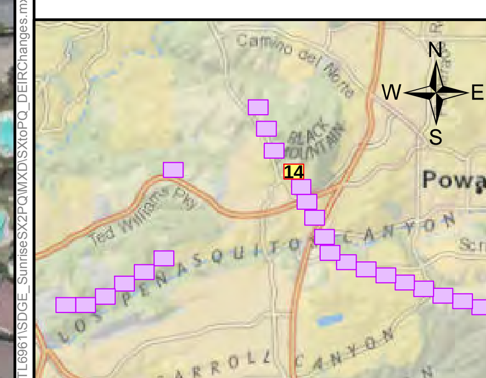
- Old Temporary Work Area

0 200 400 Feet



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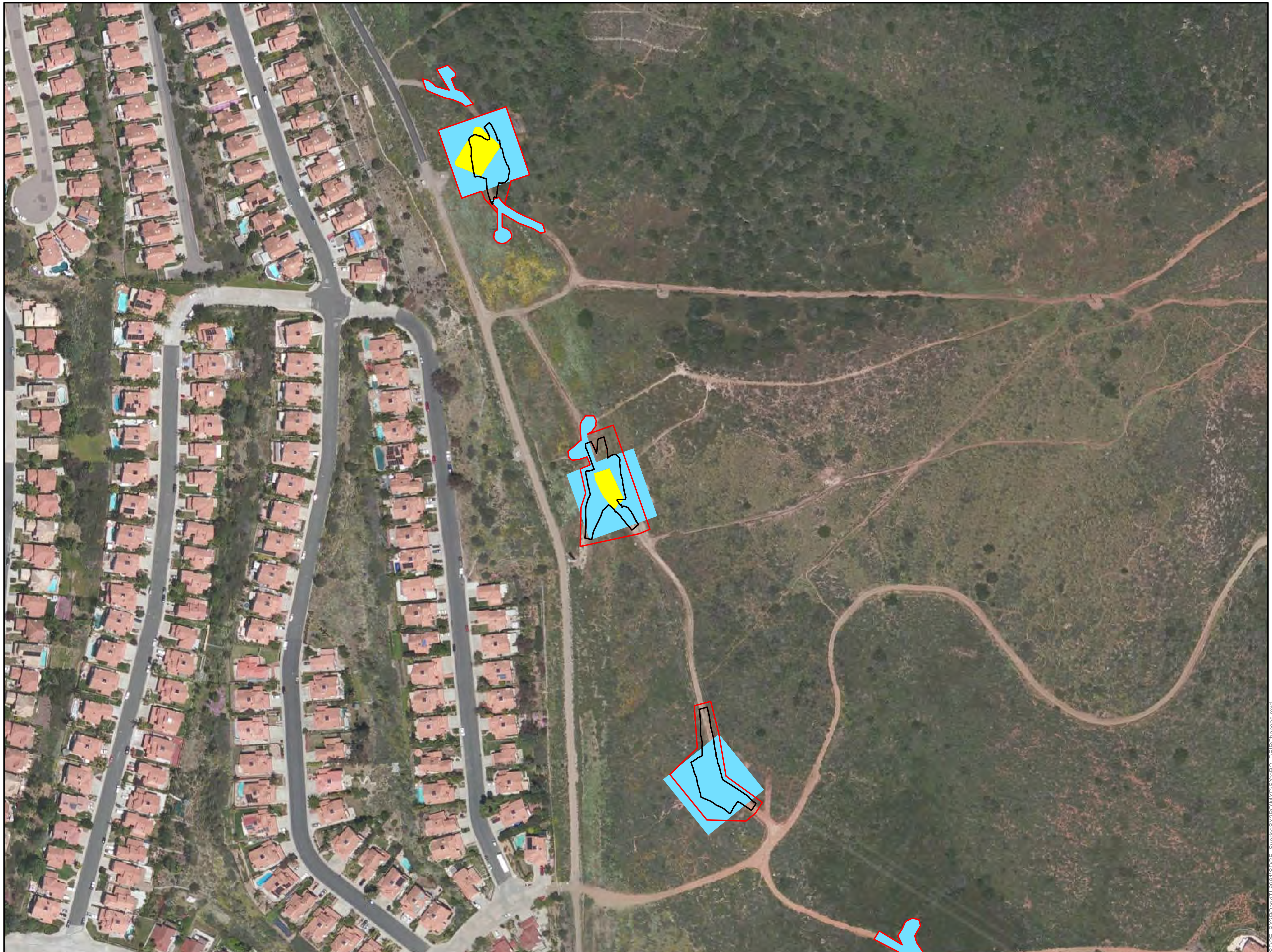

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

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- Old Permanent Impact
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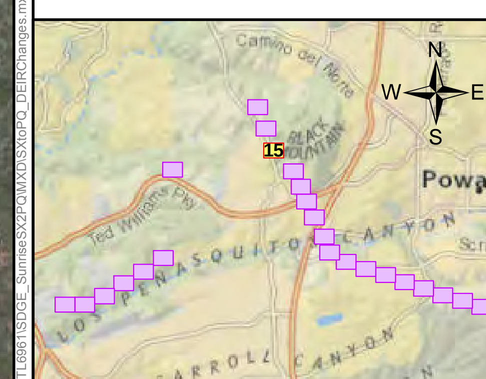

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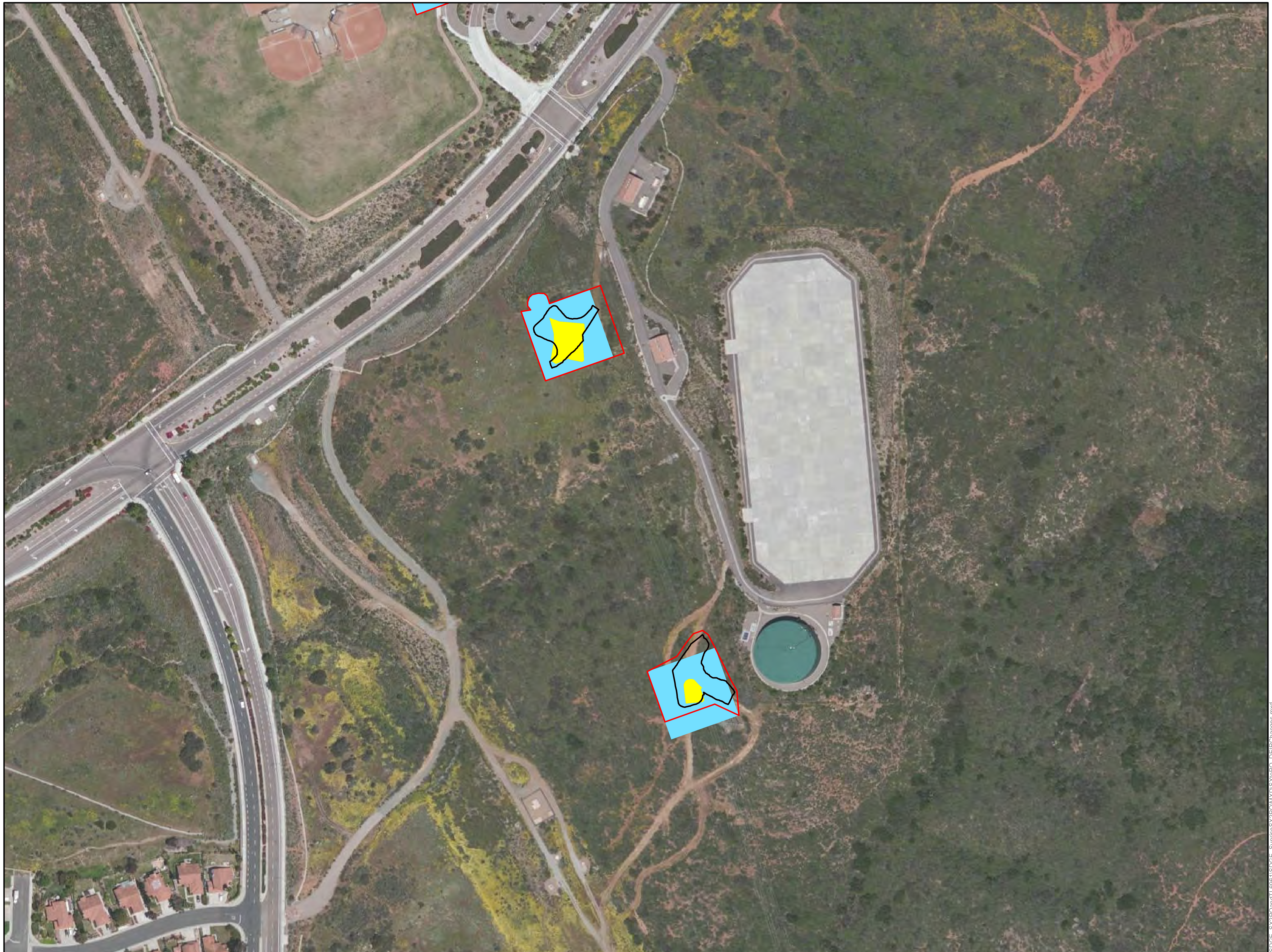

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

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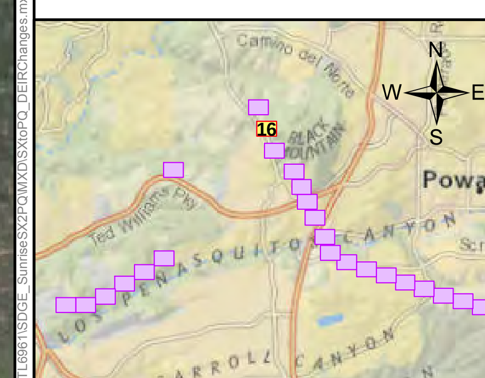
0 200 400 Feet



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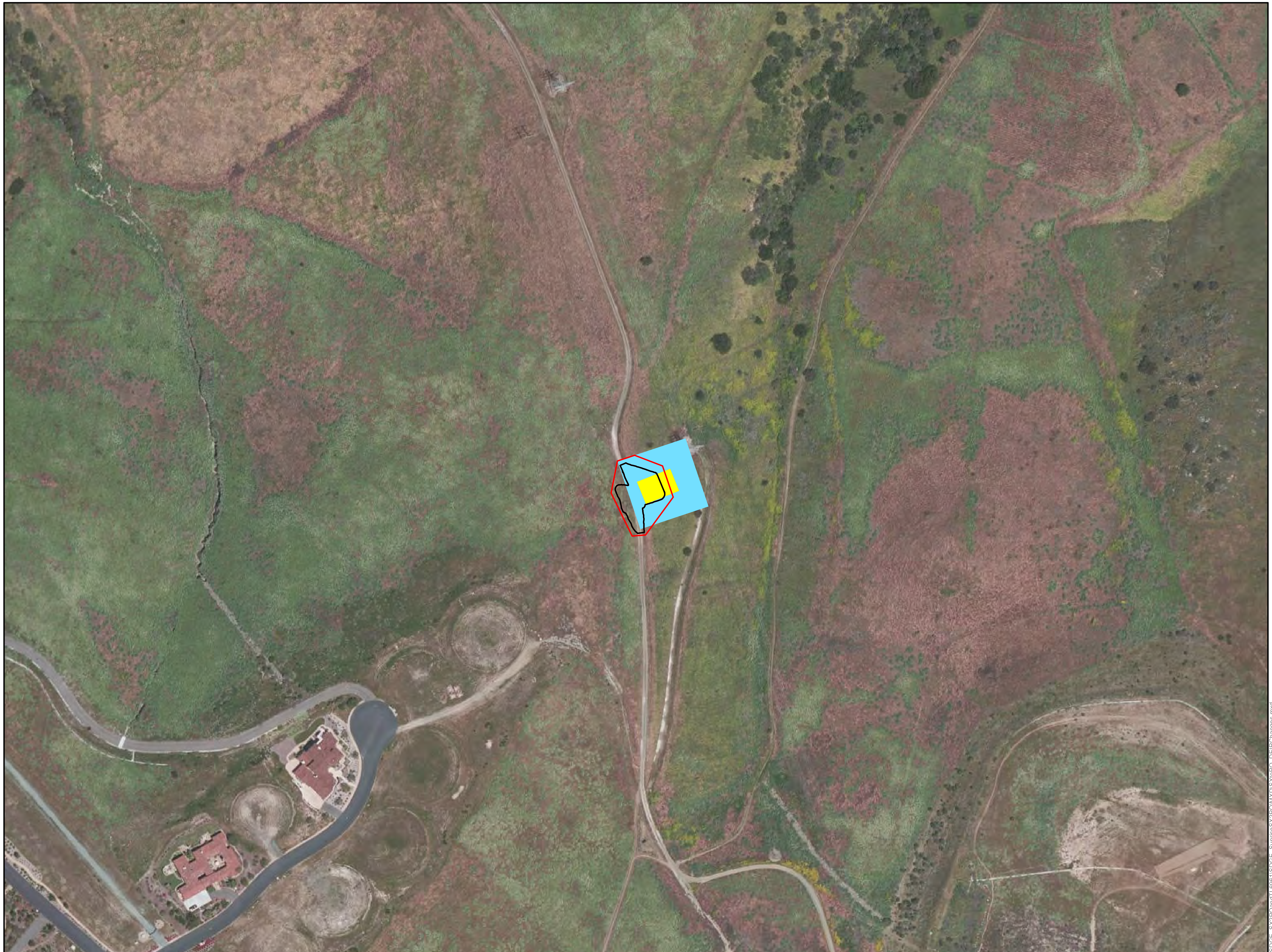

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

SDGE A Sempra Energy utility   TRC

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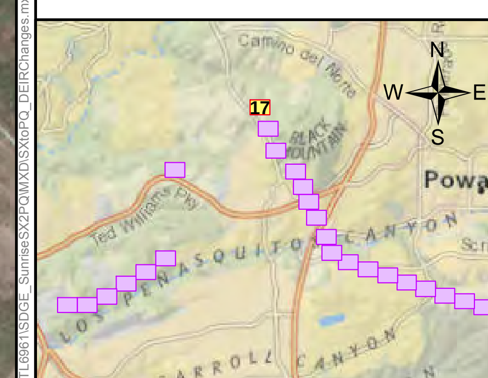

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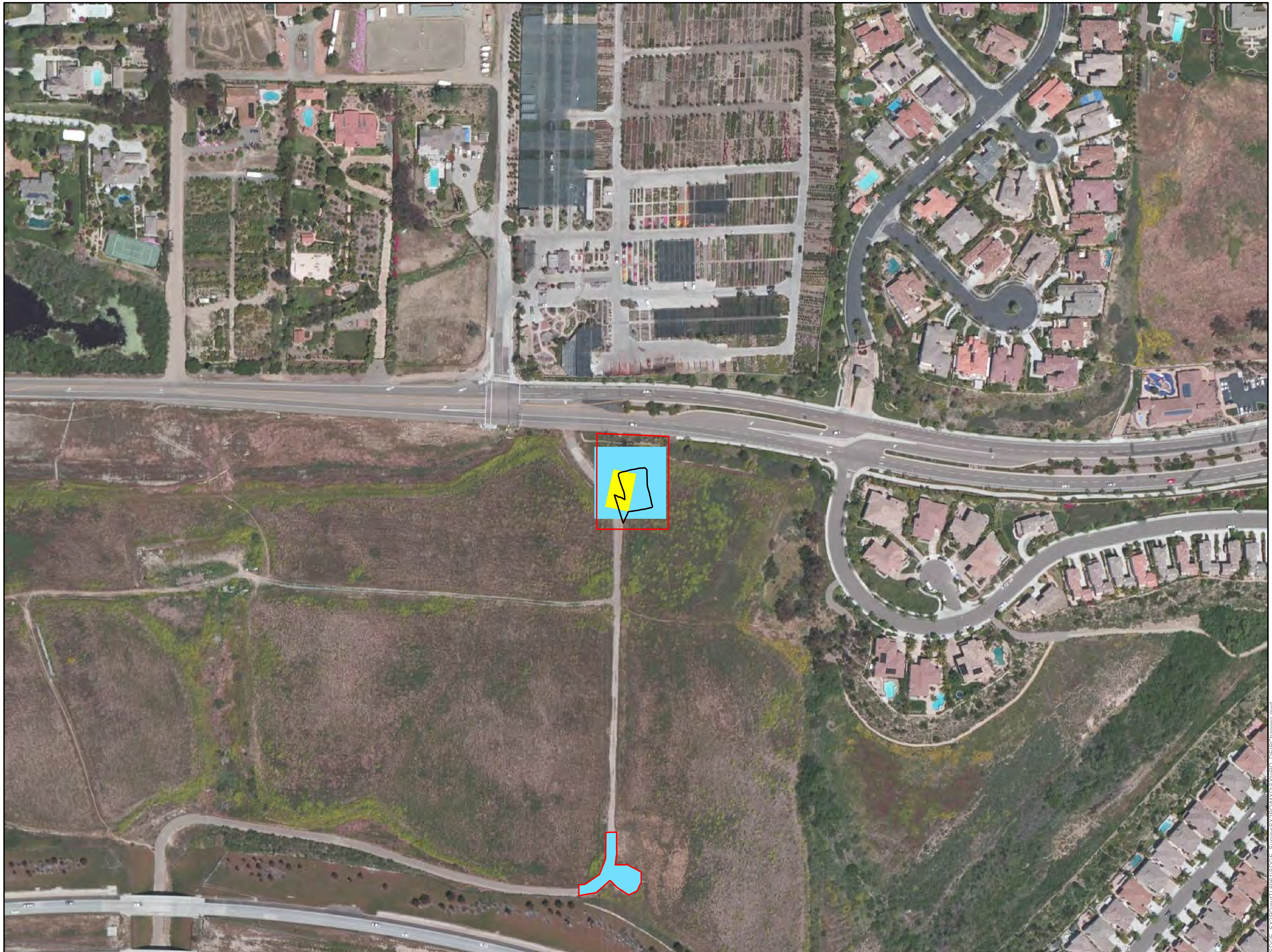
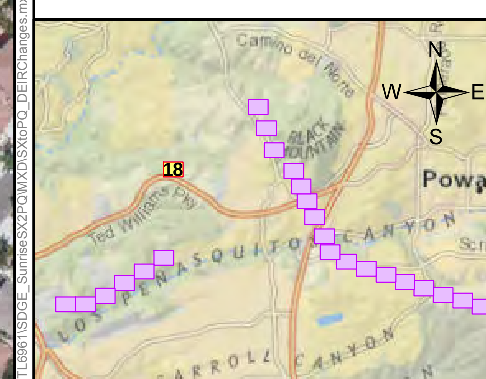


Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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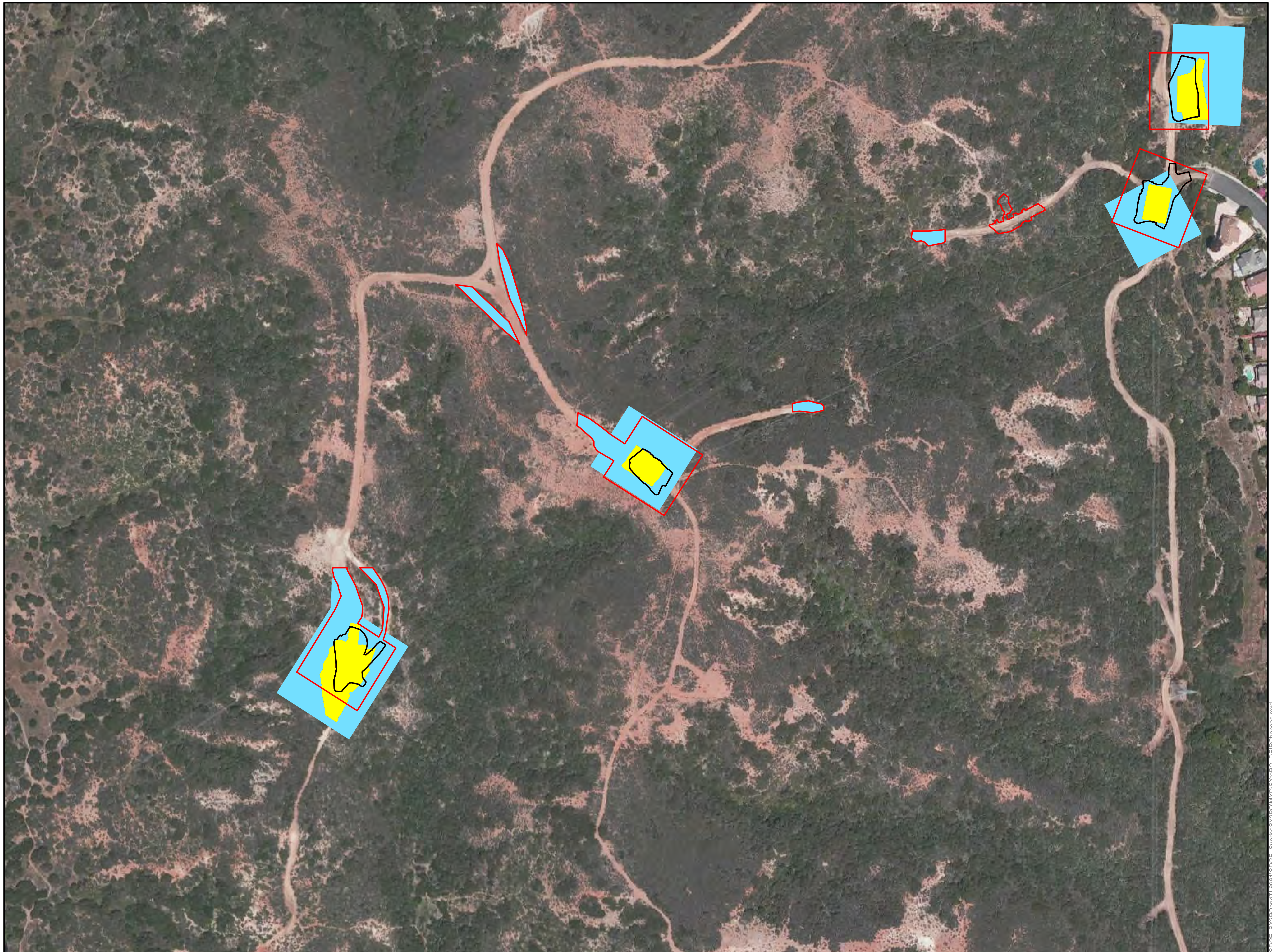
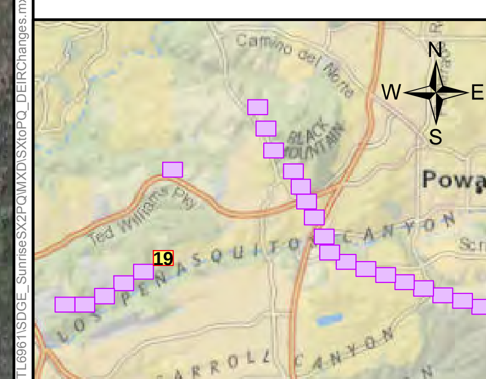


Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

Revised Permanent Impact

Revised Temporary Work Area

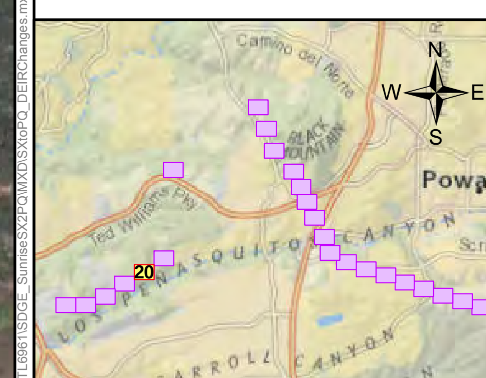
Old Permanent Impact

Old Temporary Work Area

SDGE A Sempra Energy utility

TRC

0 200 400 Feet



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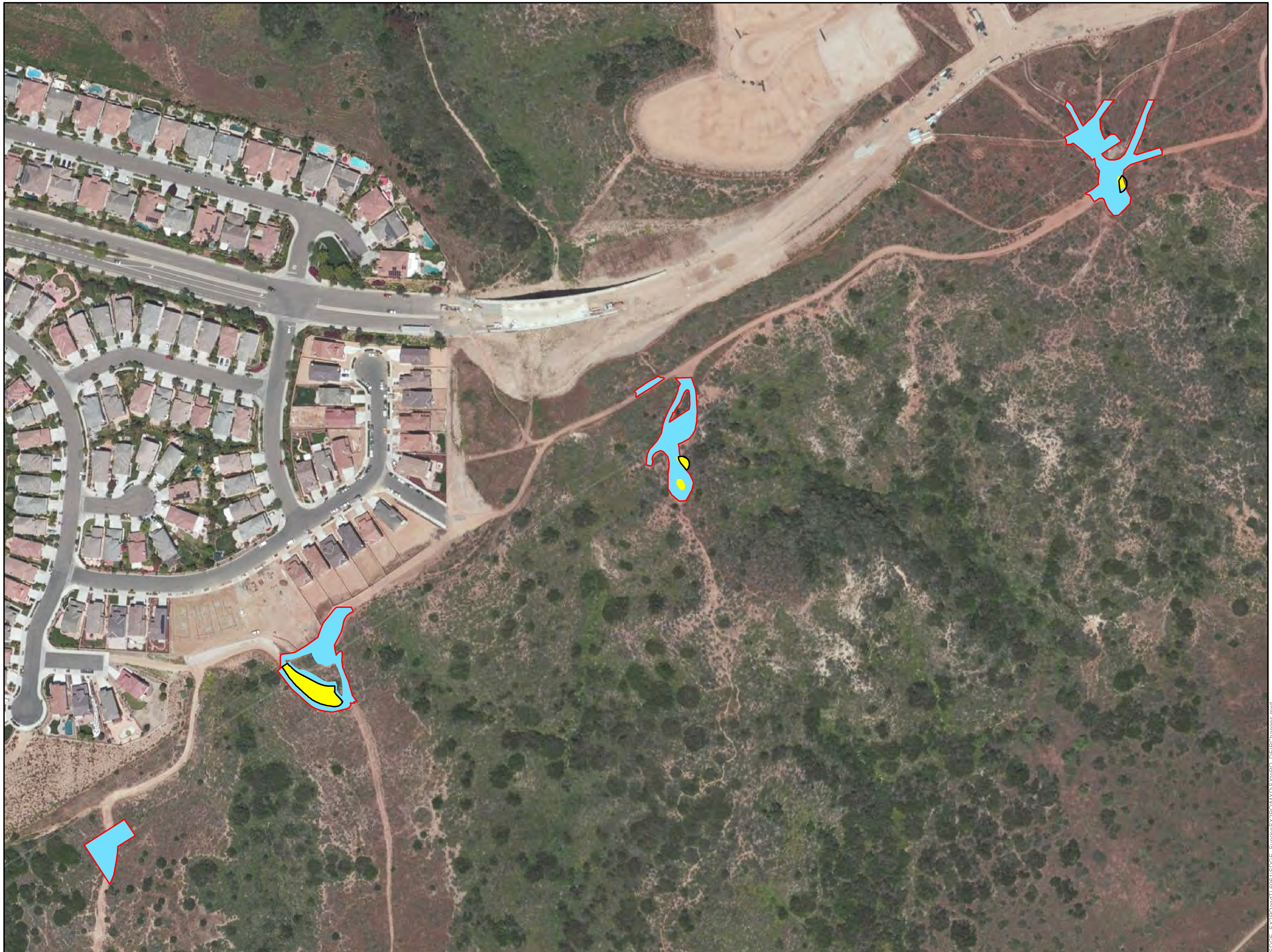


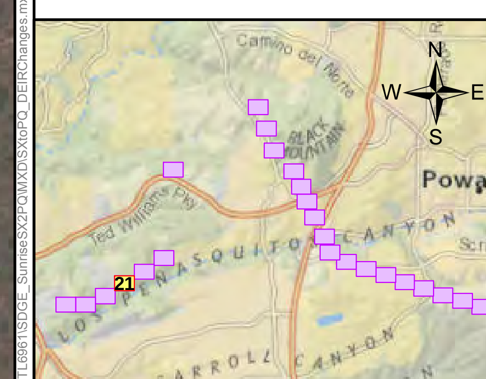
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

A Sempra Energy utility

0 200 400 Feet



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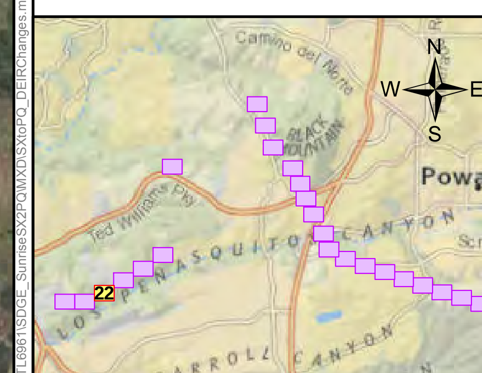
11/16/2015

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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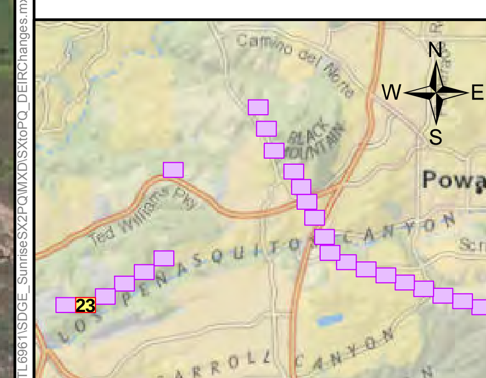
11/16/2015

Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates

- Revised Permanent Impact
- Revised Temporary Work Area
- Old Permanent Impact
- Old Temporary Work Area

0 200 400 Feet



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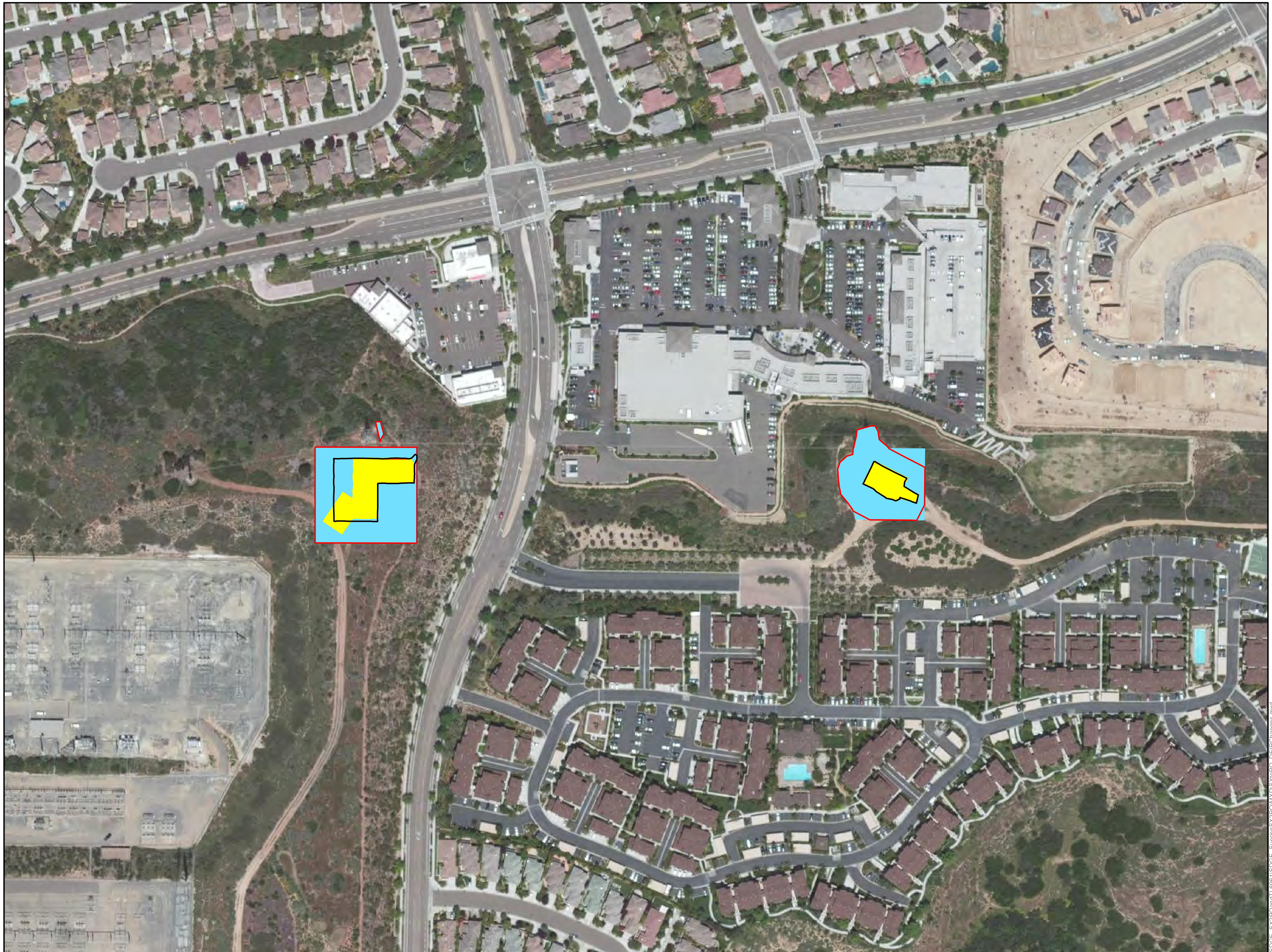
Sycamore to Penasquitos 230kV Transmission Line Project

Exhibit 2 - Civil Design Updates



Revised Permanent Impact
Revised Temporary Work Area
Old Permanent Impact
Old Temporary Work Area

0 200 400 Feet

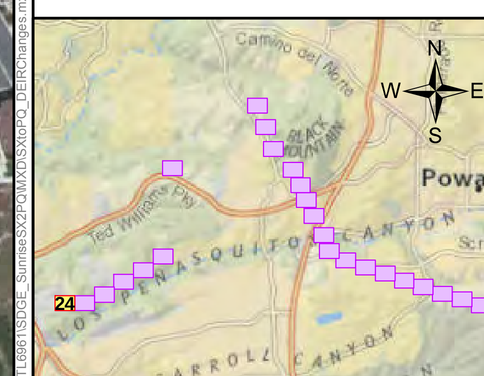


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EXHIBIT 3

Sycamore Canyon Substation Layout Update (CONFIDENTIAL)

(Privileged and Confidential pursuant to P.U. Code 583, 454.5(g), GO 66-C and D.06-06-066)

EXHIBIT 4

Alternative 3 East Cable Pole Shift

Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 4 - Alternative 3
East Cable Pole Shift

- Relocated Pole Location
- Structure to be Removed
- Replacement Structure
- DEIR Pole Location

Impact

- Revised Temporary Work Space
- Revised Permanent Impact

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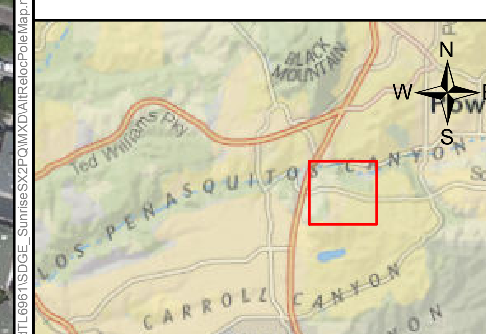

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EXHIBIT 5

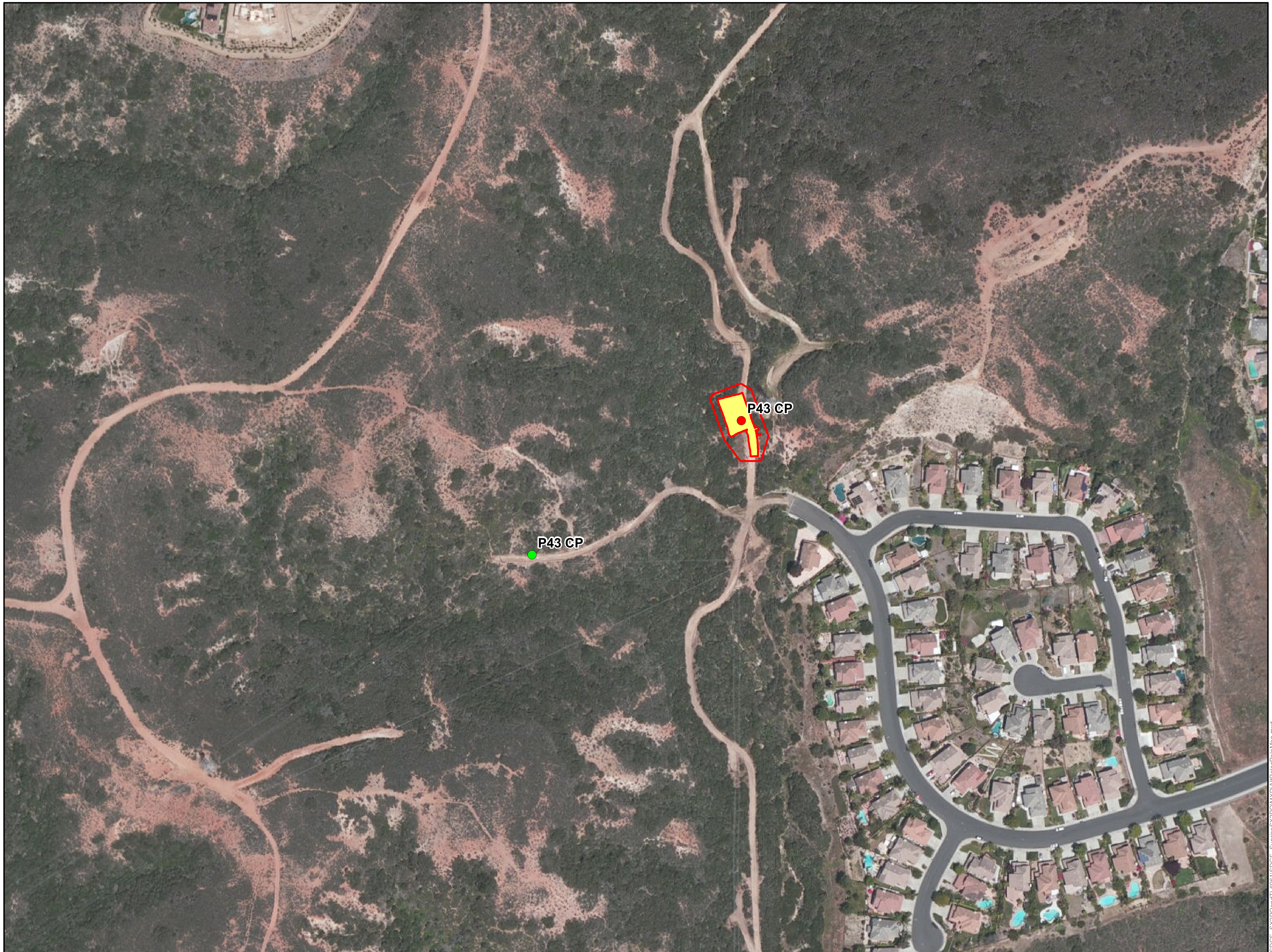
Structure Details for Suggested Design Revisions and DEIR Comments

Structure Details for Suggested Design Revisions and DEIR Comments

Alternatives	Structure Number	X Easting (ft)	Y Northing (ft)	Z Based on Grading	Final Structure Ht. Based on Grading	Description
Alt 1	P40 CP	6292065.057	1939856.356	688.50	**210**	Cable Pole immediately South of Carmel Valley Rd. Refer to Detailed Comment Table for additional information. Note that cable pole structures taller than 160 feet (such as P40 CP) would have a pole top diamter of 2-3 feet, a pole base diamter of 7-9 feet, a foundation diameter of 12-13 feet, and a voundation depth of 50 - 60 feet.
	P40A	6291852.868	1940364.673	729.133	**70**	Deadend H-Frame with Distribution underbuild. Would replace existing tangent, wood H-frame structure.
Alt 3	P19CP	6302790.593	1921604.652	678.28	**165**	Suggested Cable Pole shift one span South to replace P19.
	P20A	6302278.277	1921743.93	665.46	**70**	New Steel deadend H-Frame structure required to reaplce existing tangent wood H-frame structure approximately 10 feet back (south).
	P43 CP	6279675.649	1922809.679	272.22	**165**	Suggested new locatoin for PQ JCT Cable pole to replace an existing 138kV steel H-frame structure (Approximately 10 feet north).
Alt 5	P06A	6317988.146	1916509.64	870.87	**55**	New Steel deadend H-Frame structure required to reaplce existing tangent wood H-frame structure approximately 10 feet back.
	I-15 E CP	6296519.641	1906179.329	496.15	**185**	Alternative I-15 crossing Option. Cable poles tall enough to span I-15 without the need for interset structures. The Heights were based on publicly available survey data and is not considered final. Based on the height and proximity of structures to Miramar these pole may require lighting and installation of marker balls on the span. Note that cable pole structures taller than 160 feet (such as the I-15 crossing Cable Poles) would have a pole top diamter of 2-3 feet, a pole base diamter of 7-9 feet, a foundation diameter of 12-13 feet, and a voundation depth of 50 - 60 feet.
	I-15 W CP	6295450.553	1906377.615	503.6	**185**	
	CC MM CP	6269089.389	1904905.827	147.07	**165**	Carrol Canyon Cable Pole (CC MM CP) suggested relocation approximately 125 north based on field review by SDG&E. LiDAR data is outdated and does not consider developments being made by Caltrans in the vicinity.

EXHIBIT 6

Alternative 3 West Cable Pole Shift



Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 6 - Alternative 3
West Cable Pole Shift

DEIR Pole Location

Relocated Pole Location

Impact

Revised Temporary Work Space

Revised Permanent Impact

0 200 400 Feet

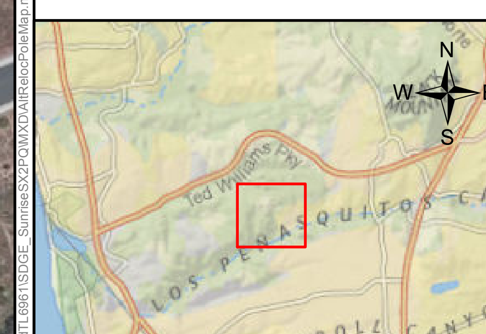


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EXHIBIT 7

Alternative 5 H-Frame Replacement

Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 7 - Alternative 5
H-Frame Replacement

- Replacement Structure
- DEIR Pole Location
- Structure to be Removed

Impact

- Revised Temporary Work Space
- Revised Permanent Impact

0 200 400 Feet

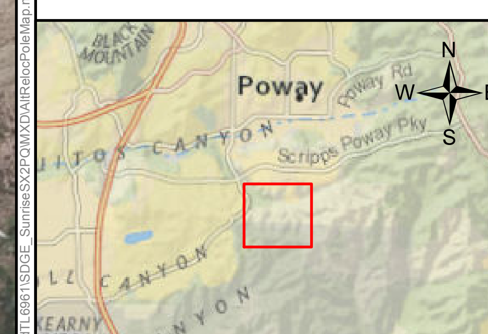

EXHIBIT 8

Alternative 5 I-15 Crossing Revisions

Map Title: Alt5 I-15 Crossing Option1
Printed By: CORP\VHuynh
Printed Date: 11/6/2015

SDGE
A Sempra Energy utility

Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 8 - Alternative 5
I-15 Crossing Revisions

DEIR Pole Location
Relocated Pole Location

Impact

Revised Temporary Work Space
Revised Permanent Impact

0 200 400 Feet

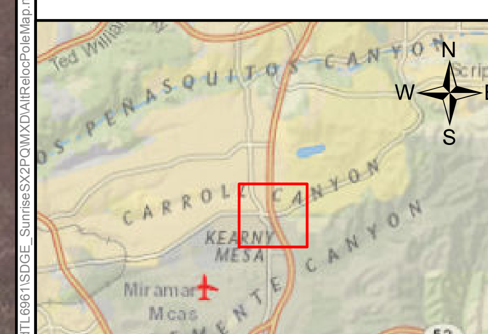

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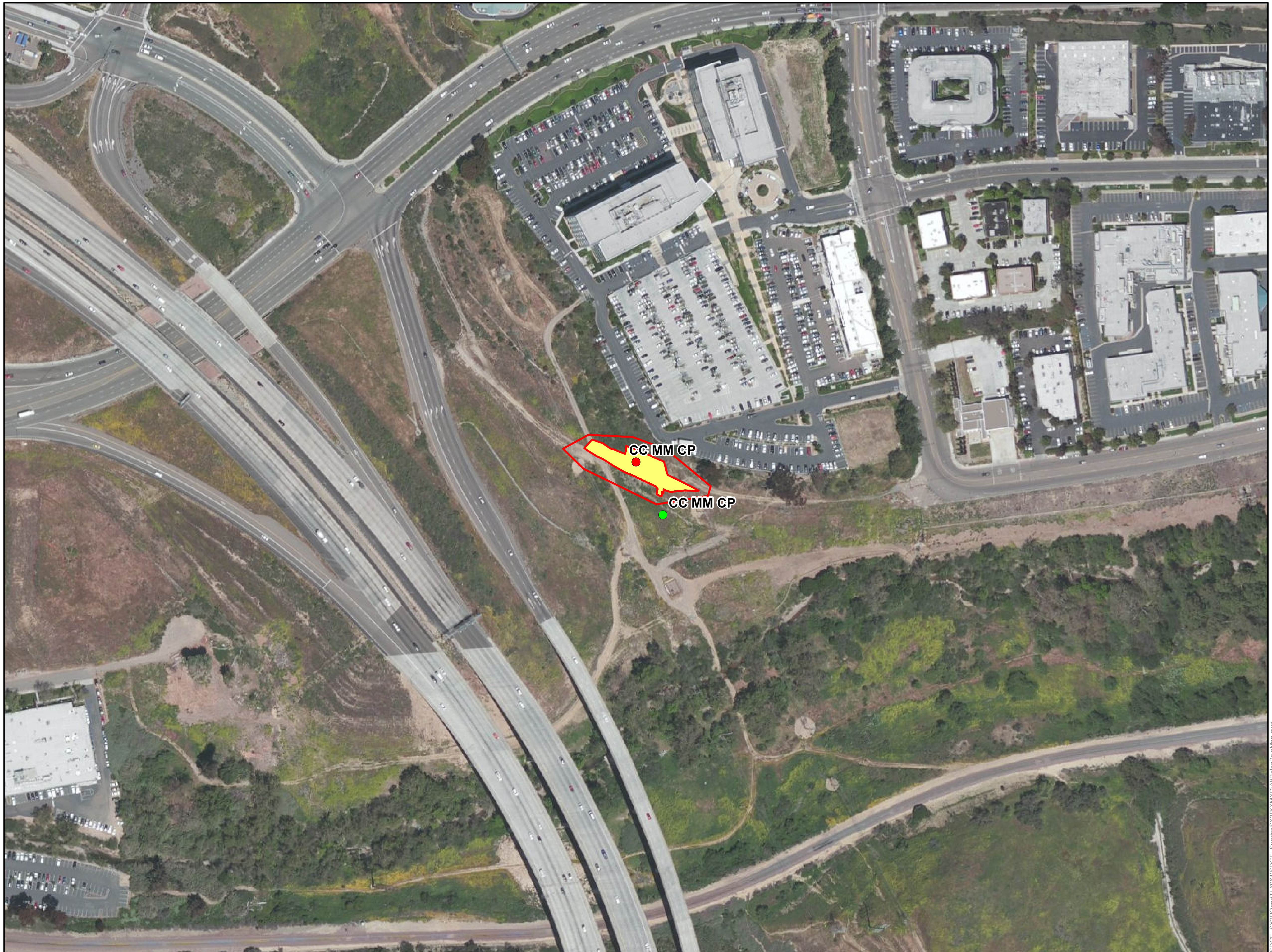
EXHIBIT 9

Alternative 5 CC MM CP Shift



Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 9 - Alternative CC MM CP Shift

- DEIR Pole Location
- Relocated Pole Location

Impact

- Revised Temporary Work Space
- Revised Permanent Impact

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EXHIBIT 10

Alternative 1 Design Corrections/Comments

Sycamore to Peñasquitos 230kV Transmission Line Project

Exhibit 10 - Detailed Comment on DEIR Alternative 1

- Structure to be Removed
- Structure Location
- Replacement Structure
- Old Impact Area

Impact

- Revised Temporary Work Space
- Revised Permanent Impact

0 200 400 Feet

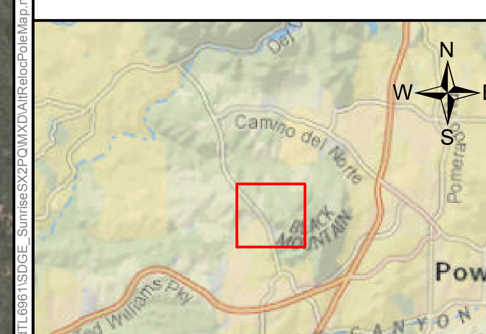

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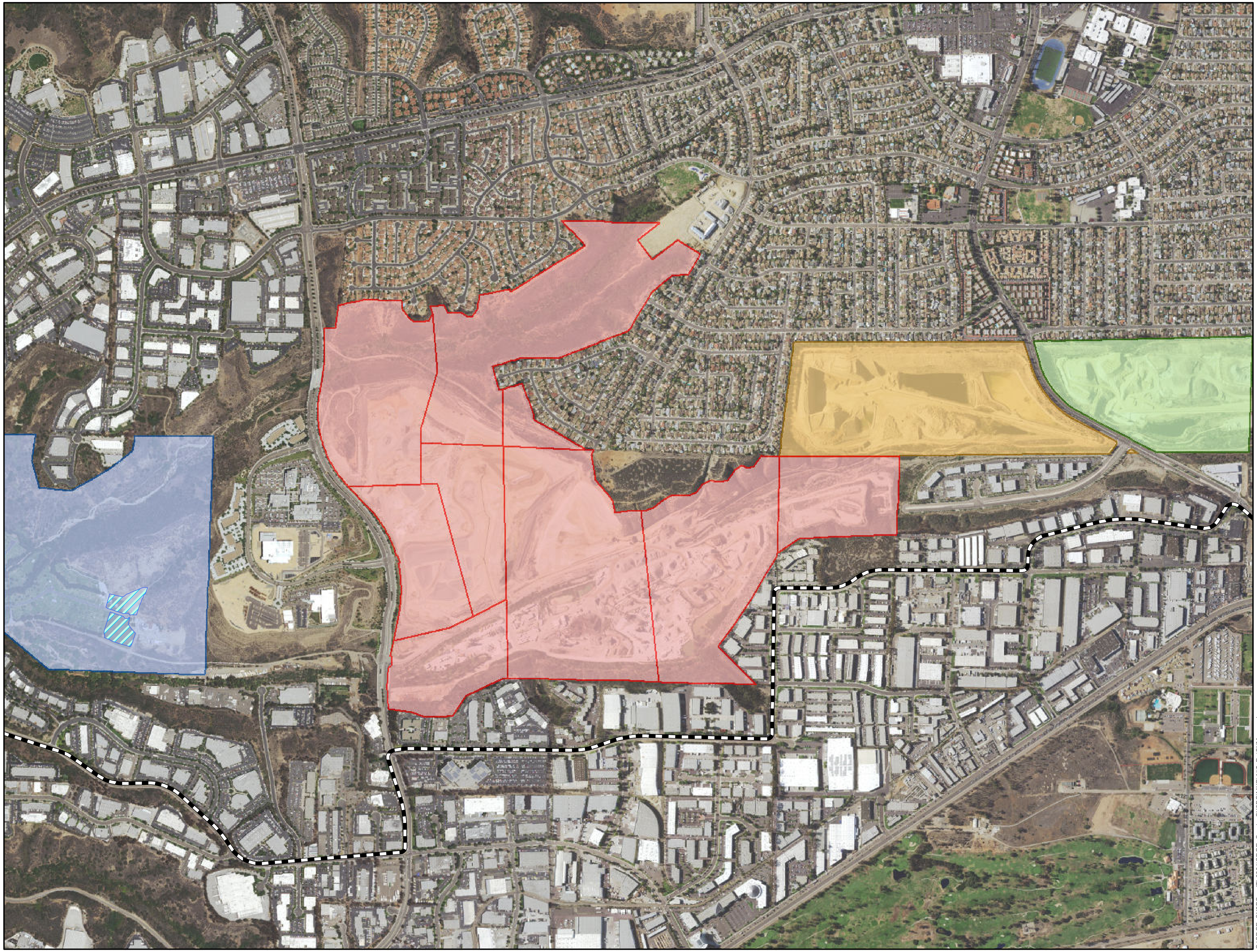
EXHIBIT 11

Alternative 5 Potential Staging Yard Locations

Sycamore to Peñaquitos 230kV Transmission Line Project

Exhibit 11 - Alternative 5 Staging Yards



- Alternative 5 Route
- Potential Staging Yard
- Hanson Aggregates Pacific Southwest, Inc.
- SE Combined Services of California, Inc.
- Conrock Co.
- CALMAT Properties Co.

0 1,000 2,000 Feet

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EXHIBIT 12

Geotechnical Study

Geotechnical Study

Sycamore to Penasquitos
230kV Transmission Line
San Diego County, California

Prepared for:

BURNS & McDONNELL

Attention: Mr. Kevin Mathey, PE

Project No.: T-0126-G

April 15, 2015

**TRINITY Geotechnical Engineering, Inc.
13230 Evening Creek Drive, Suite 206
San Diego, CA 92128**

Burns & McDonnell
4225 Executive Square
La Jolla, CA 92037

April 15, 2015
Project No.: T-0126-G

Attention: Mr. Kevin Mathey, PE

Subject: Geotechnical Study

Project: SDG&E 230kV Transmission Line
Sycamore to Penasquitos
San Diego County, California

Dear Mr. Mathey:

This report presents the results of the geotechnical study for the proposed Sycamore to Penasquitos 230kV Transmission Line project. The project begins at the Sycamore Substation located in Poway, California extending approximately 16.5 miles in total length to the Penasquitos Substation located to the west in the coastal region of San Diego, California. The proposed project includes construction of approximately 13.8 miles of new 230 kV transmission line supported through a combination of forty-four (44) tubular steel pole structures, buried underground conduit and existing lattice tower structures. Additionally, the proposal includes the replacement of existing wood pole H-frame structures which support a 69 kV transmission line with eighteen (18) tubular steel pole structures. The geotechnical parameters and recommendations presented herein are to be used for foundation design and construction consideration for the new engineered steel pole structures and for the underground portion of the project. We have also provided general grading recommendations for the pole access roads and maintenance pads that will likely be necessary to support the project; as well as, preliminary parameters for earth retention structures (i.e., retaining walls) planned to encompass some of the maintenance pads.

The attached report includes the subsurface soil/rock conditions observed and inferred during our study, a review of available relevant geotechnical documents, and geotechnical engineering analyses. It is our opinion that the site is suitable for the proposed improvements, provided recommendations and parameters contained in this report are incorporated during the design and construction of the proposed project. Specific recommendations have been made in this report to address the varying subsurface conditions underlying representative pole sites requiring engineered foundations and / or underground installation of the new transmission line.

It is also recommended that the Design Engineer consider the information contained in ***Tables 4 to 6*** in *Section 8* of this report for the structural design of the steel pole foundations, as well as the development of the project plans and specifications.

It is recommended that the forthcoming project plans and specifications, be reviewed by TRINITY Geotechnical Engineering (TGE) for consistency with our report prior to the bid process in order to avoid possible conflicts, misinterpretations, inadvertent omissions, etc. It should also be noted that the applicability and final evaluation of recommendations presented herein are contingent upon construction phase field monitoring by TGE in light of the widely acknowledged importance of geotechnical consultant continuity through the various planning, design and construction stages of a project.

TGE appreciates the opportunity to provide this geotechnical engineering service for this project and we look forward to continuing our role as your geotechnical engineering consultant.

Respectfully submitted,
TRINITY Geotechnical Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER JEFFREY JAN ALVAREZ MAGALONG C81303 EXP. 9/30/15 CIVIL ENGINEER STATE OF CALIFORNIA

Jeff Magalong, PE
President

REGISTERED GEOLOGIST DENNIS M. POLAND No. C.E.G. 2079 Exp. 8-31-15 CERT. ENG. GEOLOGIST STATE OF CALIFORNIA

Dennis Poland, PG, CEG
Principal Engineering Geologist

Reviewed by,
VO Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER VAN OLIN No. C-60076 No. GE-2578 Exp. 6/30/16 RCE, RGE CIVIL-GEOTECHNICAL STATE OF CALIFORNIA

Van Olin, PE, GE
Principal Geotechnical Engineer 4/7/15

JM/DP/VO

Distribution: (1) Addressee, via email

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FIGURES

APPENDICES

1. INTRODUCTION

This report provides the results of the geotechnical study conducted for the proposed 230 kV new transmission line which extends from the Sycamore Substation to the Penasquitos Substation. The report has been specifically prepared to provide geotechnical parameters in connection with the foundation design of a total of sixty two (62) proposed tubular steel pole structures and the underground installation of a portion of the new transmission line. The alignment of the proposed project in relation to nearby streets and landmarks is shown on *Figure 1, Vicinity Map*. The purpose of this study was to evaluate the subsurface conditions within the project site and to provide geotechnical recommendations for the design and construction of the proposed steel pole foundations as well as, preliminary recommendations for the appurtenant maintenance pads, access roads, and earth retention structures. Subsurface considerations specific to the underground installation portion of the transmission line have also been addressed by this study. This report summarizes the data collected and presents our findings, conclusions, and geotechnical design recommendations.

This report has been prepared for the exclusive use of the client and their consultants in the design of the proposed project. Contract requirements set forth by the project plans and specifications will supersede any general observations and all recommendations presented in this report.

2. SCOPE OF SERVICES

Our scope of services for this project included the following tasks:

- Reviewed readily available background data, including in-house geotechnical data, geologic maps, topographic maps, and literature relevant to the subject project.
- Performed site reconnaissance of select pole sites to observe the general surficial site conditions, check for accessibility, and to determine the exploratory boring and seismic refraction line locations.
- Prepared a field exploration plan for submittal to SDG&E's environmental division.
- Coordinated with various environmental professionals/agencies having jurisdiction over the field exploration activities including biologists, archaeologists, and others.
- Performed a field exploration program, including thirteen (13) seismic refraction lines and sixteen (16) exploratory borings, at the various steel pole and underground vault locations (see *Figure Nos. 2 to 23 and Appendices A and B*).
- Performed laboratory testing on selected representative bulk and relatively undisturbed soil and weathered bedrock samples obtained during the field exploration program, to evaluate the geotechnical engineering and where appropriate, the thermal conductivity properties of these materials (see *Appendix D*).

- Performed an assessment of general geotechnical considerations affecting the area and their possible impact on the subject project.

- Engineering evaluation of data by others was collected to develop geotechnical design parameters and recommendations for some of the proposed steel pole foundations and underground line segment.

- Preparation of this report including reference maps and graphics, presenting our findings, conclusions and geotechnical recommendations specifically addressing the following items:

    - Evaluation of general subsurface conditions and description of types, distribution, and engineering characteristics of subsurface materials.

    - Evaluation of the site geology and geotechnical/geologic hazards.

    - Evaluation of project feasibility and suitability of on-site soils/bedrock for foundation support.

    - Recommendations including geotechnical parameters to be used for foundation design analysis.

    - General construction considerations and preliminary recommendations for the steel pole foundations, as well as the appurtenant maintenance pads, access roads, and earth retention structures, respectively.

3. PROJECT DESCRIPTION

The project site extends from the Sycamore Substation in Poway, CA to the Penasquitos Substation located south of the confluence of Soledad and Carmel Valleys in the coastal region of San Diego, CA. The transmission line is approximately 16.5 miles in total length but is identified by four distinct segments as follows:

Segment A – Replace existing 138 kV wood frame structures with new 230 kV steel poles (8.3 miles, all located in SDG&E's existing right-of-way);

Segment B – Install new 230 kV underground transmission line along Carmel Valley Road (2.8 miles, all located in SDG&E's existing franchise position);

Segment C – Install new 230 kV conductor on existing 230 kV steel structures (2.2 miles, all located in SDG&E's existing right-of-way);

Segment D – Install new 230 kV conductor on existing 230 kV steel lattice towers and relocate two existing 69 kV power lines to new tubular steel poles (3.3 miles, all in SDG&E's existing right-of-way).

The project includes minor modifications of the existing Sycamore Canyon and Penasquitos Substations to allow for connection of the new 230 kV transmission line.

The proposed alignment traverses an overall gently sloping westward trending topographic plain with local moderately variable terrain. Elevations for the project range from a high of approximately 860 feet above mean sea level (MSL) at the easterly beginning (Sycamore Substation) to a low of approximately 310 feet MSL at the western terminus (Penasquitos Substation). Detailed geographic and topographic information for the project alignment is presented on *Figure 1*, *Vicinity Map*.

4. FIELD EXPLORATION PROGRAM

Given the highly variable nature of the topographical site setting and subsurface conditions, as well as the high number of sites, limited access, environmental considerations and previous related geotechnical studies, only a select number of sites were investigated through the field exploration program. Several methods of investigation were utilized to obtain the necessary design information for this project. All of the sites explored were accessed via existing dirt service roads. All of the investigative field work was performed in previously disturbed areas as required by permit. A summary of the methods of field exploration utilized at or near proposed engineered steel pole foundation locations has been tabulated below followed by a description of each method.

Table 1: Field Exploration Summary

TGE Number	Pole Structure Number	Latitude	Longitude	Approx. Elev. (MSL)	Field Exploration Method
SL-1	P6	32.92300	-117.04410	872.6	Seismic Refraction Line
SL-2	P12	32.93038	-117.07105	792.7	Seismic Refraction Line
SL-3	P16	32.93373	-117.08362	738.9	Seismic Refraction Line
SL-4	P24	32.94567	-117.10336	356.8	Seismic Refraction Line
SL-5	P26	32.95186	-117.10665	552.8	Seismic Refraction Line
SL-6	P30	32.95783	-117.10980	589.2	Seismic Refraction Line
SL-7	P35	32.97158	-117.11728	820.1	Seismic Refraction Line
SL-8	P36	32.97536	-117.12442	834.9	Seismic Refraction Line
SL-9	P45	32.93724	-117.17262	404.9	Seismic Refraction Line
SL-10	P47	32.93404	-117.17849	298.8	Seismic Refraction Line
SL-11(1)	*P50*	32.92960	-117.18650	403.0	Seismic Refraction Line
SL-12(1)	*P53*	32.92459	-117.19530	352.0	Seismic Refraction Line
SL-13	P57	32.91981	-117.20931	392.4	Seismic Refraction Line
B-1	P21	32.93811	-117.09930	685.0	Air-Percussion Boring
B-2	P24	32.94567	-117.10336	416.7	Rock Coring
B-3	P30	32.95783	-117.10980	589.0	Auger / Air percussion Boring
B-4	P32	32.96065	-117.11142	576.0	Small Dia. Auger Boring
B-5	P36	32.97536	-117.12442	835.7	Rock Coring
B-6	P39	32.98375	-117.12810	765.0	Rock Coring

B-7	P41a	32.98951	-117.13026	724.0	Small Dia. Auger Boring
B-8	VAULT	32.97253	-117.15081	373.0	Small Dia. Auger Boring
B-9	P42	32.96971	-117.16898	353.0	Small Dia. Auger Boring
B-10	P44	32.93860	-117.16914	247.0	Small Dia. Auger Boring
B-11	P45	32.93724	-117.17262	403.0	Small Dia. Auger Boring
B-12	P47	32.93404	-117.17849	288.0	Small Dia. Auger Boring
B-13(1)	*P50*	32.92960	-117.18650	403.0	Small Dia. Auger Boring
B-14(1)	*P54*	32.92187	-117.20040	290.0	Small Dia. Auger Boring
B-15(1)	*P55*	32.91970	-117.20420	270.0	Small Dia. Auger Boring
B-16	P61	32.91954	-117.21730	389.0	Small Dia. Auger Boring

(1) The field explorations at these pole locations are located within the Coastal Zone.

4.1 Seismic Refraction Lines

Seismic refraction surveys were performed at thirteen (13) of the proposed steel pole sites. The approximate locations of the seismic refraction lines are depicted on *Figures 2 to 23, Plot Plans*. The length of the seismic lines ranged from 60 to 120 feet, and provided compression wave velocity profiles up to a depth of about 15 to 35 feet. The compression wave velocity profiles are provided in *Appendix A, Seismic Refraction Line Profiles.*

Seismic refraction investigates the subsurface by generating arrival time and offset distance information to determine the path and velocity of the elastic disturbance in the ground. The disturbance was created by hammer for putting impulsive energy into the ground. Detectors (i.e. geophones), laid out at regular intervals, measured the first arrival of the energy and its' time. The data is plotted in Time versus Distance graphs from which the velocities of the different layers and their depth was calculated. The impulse energy was conducted at evenly spaced intervals throughout the entire length of the lines in order to increase coverage and generally determine whether or not the layering was horizontal, dipping or undulating.

4.2 Borings

The borings were performed using either a Unimog M5 or Diedrich D50 drill rig utilizing 6.25-inch ID diameter hollow-stem augers. Both drill rigs utilized an automatic hammer with 80% hammer efficiency for obtaining soil/formational samples. The borings were extended to a maximum depth of approximately 50 feet below existing grades. Disturbed bulk and relatively undisturbed soil and weathered bedrock samples were obtained for further characterization and laboratory testing. The borings were then backfilled with bentonite / cement mixture and returned to essentially their pre-drilled elevation. The approximate locations of the borings are shown on *Figures 2 to 23, Plot Plans*. The boring logs as well as a brief overview of the boring sample acquisition and logging is presented in *Appendix B, Exploratory Boring Logs*. Rock core photographs are presented in *Appendix C.*

4.3 Geotechnical Information by Others

Previous geotechnical studies (Woodward Clyde, 1992, Geocon, 2012, and Owen Consultants 1990) associated with the design/construction of Sycamore Substation, TL 6961, and Evergreen Nursery has been performed by others within portions of the proposed project alignment (i.e., Segment A and B). The studies included seismic lines, test pits, hollow-stem auger borings, Cone Penetration Testing (CPT's) and associated laboratory testing. TGE has reviewed the referenced reports and the information presented was included, in addition to our own investigation, to provide the appropriate design parameters and recommendations. Previous subsurface explorations used in reference to the proposed pole structures are provided in *Appendix H, Previous Geotechnical Information*.

5. LABORATORY TESTING

Laboratory testing was performed on selected representative bulk and relatively undisturbed soil, formation and bedrock samples obtained from the exploratory borings, to aid in the classification and to evaluate engineering properties of the foundation materials. The following tests were performed:

- In-situ density and moisture content (ASTM D-2216 and ASTM D-2937);
- Particle size analyses and No. 200-wash (ASTM D-422 and ASTM D-1140);
- Direct Shear (ASTM D-3080);
- Thermal resistivity (ASTM D-5334);
- Unconfined Compressive Strength of Rock Cores (ASTM D-7012); and
- Corrosivity series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422, and 532/643).

Testing was performed in general accordance with applicable ASTM standards and California Test Methods. The laboratory test results and a summary of the laboratory testing program are presented in *Appendix D, Laboratory Test Results*.

6. GEOLOGY

6.1 Regional Geology

The proposed project traverses the Coastal Plains section of the Peninsular Ranges physiographic province. This province extends from the tip of Baja California peninsula north to the Transverse Ranges, and is bound by the Colorado Desert to the east. The Coastal Plains sub-province extends from the western edge of the Peninsular Ranges highlands and runs roughly parallel to the coastline. The terrain generally includes rolling hills and dissected mesa-like features. The sub-province is underlain primarily by sedimentary rocks composed of sandstone, shale and conglomerate reflecting the erosion of the mountains to the east. Outcrops of granitic pluton rock and mildly metamorphosed associated country rock are also found within the eastern areas of the Coastal Plain section.

Prior to the mid-Mesozoic, the Peninsular Ranges region was covered by seas where thick marine sedimentary and volcanic sequences were deposited. Later, during the Cretaceous, extensive mountain building occurred during the emplacement of the southern California batholith. Multiple pulses of intrusive activity resulted in compositional variations in the intrusive rock. The present day ranges were faulted and uplifted during the late Tertiary and Quaternary periods which resulted in a series of northwest-oriented mountain ranges separated by similar trending valleys. The dominating orientation of these structures is related to the major fault systems located in the province, including the San Andres, San Jacinto, and Elsinore Fault zones.

6.2 Site Geology

Based on our review of published geologic maps, geotechnical reports and observations during the field investigation, the geology along the proposed transmission line consists of crystalline igneous rocks, metavolcanic and metasedimentary rocks, sedimentary rocks, alluvial and colluvial deposits and associated topsoil (see *Figure 24, Regional Geology Map*). Each of the soil types and geologic unit encountered are described below.

6.2.1 Topsoil (Qt)

A thin veneer of topsoil covers the majority of the undisturbed areas within the subject site. The topsoil deposits can be generally characterized as loose, silty sands to stiff clays. Topsoil will require remedial treatment in areas where structural support is planned.

6.2.2 Artificial Fill

The fill generally consisted of silty/clayey sands and sandy clays with varying amounts of gravel. The fill was encountered in the following boring locations and underlain by their respective geologic unit as presented in *Table 2*.

6.2.3 Linda Vista Formation (Tln)

The Linda Vista Formation was encountered within Segment D. The sedimentary formation consists of silty sand with gravel and cobble conglomerate. The cobble generally ranges form 4-inches to 12-inches in diameter. The formation is stained by iron oxides giving it an orange to light reddish brown color. Borings advanced through this unit were performed utilizing the hollow stem auger method.

6.2.4 Pomerado Conglomerate and Stadium Conglomerate (Tp/Tst)

The Pomerado Conglomerate and Stadium Conglomerate were encountered within Segment A. To be consistent with other reports the two units have been described together since their engineering characteristics are similar. These deposits generally consist of dense light brown to orange brown, sandy to clayey, gravel and cobble conglomerate with interbedded silty sands. Borings advanced through this unit were performed utilizing the air-percussion method.

6.2.5 Mission Valley Formation (Tmv)

The Mission Valley Formation underlies portions of Segment A and B. The formation typically consists of dense to very dense, light brown to very light gray fine to medium grained sandstone with interbedded siltstone and claystone.

The Mission Valley Formation often exhibits highly cemented zones, which may result in excavation difficulty during site improvement or foundation construction. Moderate to heavy ripping and possible coring should be expected if these zones are encountered during excavation. Rock excavation methods and tooling may be required during foundation construction. Generation of oversized materials requiring special handling and possible exportation should be expected.

6.2.6 Friars Formation/Del Mar Formation (Tf/Td)

Friars/Del Mar Formation was encountered throughout Segment D. To be consistent with other reports the two units have been described together as they are undifferentiated in the field or by their engineering characteristics.

The formations consist of dense sandstones to hard claystone and siltstone. Borings advanced through this unit were performed utilizing the hollow stem auger method. However, several cemented layers and /or concretionary zones were encountered in proximal investigations. Moderate to heavy ripping and possible coring should be expected if these zones are encountered during excavation. Rock excavation methods and tooling may be required during foundation construction. Generation of oversized materials requiring special handling and possible exportation should be expected.

6.2.7 Scripps Formation (Tsc)

The Scripps Formation was encountered within Segment D. The sedimentary formation generally consists of interbedded, sandy siltstone and fine grained sandstone with occasional thin claystone beds. The formation encountered appeared light brown to buff in color. Borings advanced through this unit were performed utilizing the hollow stem auger method.

6.2.8 Granitic Rocks (Kd)

Granitic rock units of diorite, granodiorite and gabbro have been identified in Segment A. The rock material that will be encountered during foundation construction will have variable weathering ranging from completely weathered decomposed granite to fresh extremely strong, hard rock. The hard rock will be difficult to excavate. Moderate to heavy ripping and possible coring should be expected during excavation of this unit. Rock excavation methods and tooling may be required during foundation construction. Generation of oversized materials requiring special handling and possible exportation should be expected. Borings advanced through this unit were performed utilizing the rotary wash coring method.

6.2.9 Santiago Peak Volcanics (Jsp)

The Santiago Peak Volcanics consisting of metavolcanic and metasedimentary rock was encountered within Segment A and may be encountered in the eastern portion of Segment B.

This unit typically consists of mildly metamorphosed volcanic, sedimentary and granitic rocks. Although they are different in composition and genesis, the bearing, stability and excavation characteristics of this formation should be similar to those of the granitic unit described herein. Therefore, moderate to heavy ripping and possible coring should be expected during excavation of this unit. Rock excavation methods and tooling may be required during foundation construction. Generation of oversized materials requiring special handling and possible exportation should be expected. Borings advanced through this unit were performed utilizing the rotary wash coring method.

Table 2 below indicates the represented pole numbers with the description of geologic unit contacts along the transmission line.

Table 2: Geologic Units

Pole Numbers	Geologic Unit (Abbreviation)
P30, P31 P41, P42, P55, V1, V10	Artificial Fill
P50, P51, P57, P60, V5, V6	Tln
P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P15, P17, P18, P19, P20, P21, P22, P27, P35, P45, P46, P48, P49, V9	Tp / Tst
P1, P14, P16, P28, P29, P30, P31, P32, P34, P41, P41a, P42, V1, V4, V7, V8, V10	Tmv
P23	Tf / Td
P43, P44, P47, P52, P53, P54, P55, P56, P58, P59, P61	Tsc
P36, P39, V3	Kd
P24, P25, P26, P33, P37, P38, P40, V2	Jsp

7. GEOTECHNICAL/GEOLOGIC CONSIDERATIONS

Various geotechnical and geologic considerations were developed for each of the affected steel pole sites investigated based on our site reconnaissance, information from our field exploration program, laboratory testing, and engineering evaluation/analyses. A summary of the geotechnical conditions which may affect the design and construction of the project are provided in *Table 3: Geotechnical Considerations*.

Table 3: Geotechnical Considerations

Groundwater	Slope Instability	Liquefaction	Rockfall / Landslide	Erosion	Expansive Soil
P30, P31 (42 ft.) P41, P41a (35 ft.) P42 (21 ft.)	Low Potential	Not Anticipated	Not Anticipated	Low Potential	Not Anticipated

7.1 Faulting

Based on review of the USGS fault map, no known active faults with the potential for surface fault rupture are known to exist beneath the project alignment. Accordingly, the potential for surface rupture at the site due to faulting is considered very low during the design life of the proposed structures.

The nearest potentially active fault is the Rose Canyon Fault. The Rose Canyon is associated with the Newport-Inglewood fault system, a northwest trending right-lateral fault that extends south from the Los Angeles Basin to the northern coastline of Baja California. The off-shore extension of the mapped line is approximately 4.5 miles west of the Penasquitos Substation. The Rose Canyon Fault is considered capable of generating an earthquake of $M_W = 6.7$ resulting in strong ground shaking.

7.2 Seismicity / Ground Shaking

Although the site could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the structures are designed and constructed in conformance with current building codes and engineering practices (see *Section 8.8, Seismic Design*).

7.3 Groundwater

Groundwater was encountered in Boring B-3, B-7 and B-9. The estimated depth to groundwater (see *Table 3*) is based on information obtained from the borings. It should be noted that groundwater conditions may vary due to seasonal precipitations, irrigation, and other factors.

7.4 Slope Instability

Certain pole sites are located or adjacent to steeply sloping terrain. However, these pole sites are founded on formations that are not known to have gross slope instability in its natural state. Therefore, the potential for a slope failure is considered low.

It should be noted that all slopes (natural, cut, fill or otherwise) are subject to downhill "creep" to some degree, as well as possible surficial deterioration and erosion due to normal weathering. This general observation is made in order to emphasize the importance of slope maintenance, and is not intended to suggest a particularly unusual or compelling adverse condition.

7.5 Slope Erosion

Certain pole sites are located or adjacent to sloping terrain. However, these pole sites are founded on medium dense to very dense formations that have low potential for excessive erosion. Although minor erosion due to normal weathering are anticipated to occur on top soils, it should be noted that SDG&E require a minimum of 2-feet soil discount to be incorporated into the pole foundation design.

7.6 Liquefaction and Seismically-induced Settlement

Liquefaction of soils can be caused by ground shaking during earthquakes. Research and historical data indicate that loose, relatively clean granular soils are susceptible to liquefaction and dynamic settlement, whereas the stability of the majority of clayey silts, silty clays and clays is not adversely affected by ground shaking. Liquefaction is generally known to occur in saturated cohesionless soils at depths shallower than approximately 50 feet. Dynamic settlement due to earthquake shaking can occur in both dry and saturated sands.

The project alignment is underlain by either very dense rock or very dense/hard formation. Liquefaction is not anticipated within the poles founded within the rock and formational sites due to the very dense nature of the rock/formation and the lack of a groundwater table. Therefore, the potential for liquefaction and the associated ground deformation occurring beneath the structural site areas is considered nil.

7.7 Rockfall / Landslide

Review of regional geology maps and literature did not reveal the existence of rockfall, landslides or landslide activity within the alignment or at specific pole locations.

7.8 Expansive Soil

It is anticipated that the proposed vault structures located at both ends of Segment B will be underlain by clayey sand to sandy clay fill. Based on the results of the sieve analyses and Atterberg Limits, the Expansion Index of the on-site surficial materials within the upper 10-feet is anticipated to be in the "Very Low" to "Low" range.

8. DESIGN RECOMMENDATIONS

Based on the results of the field exploration, data review of previous geotechnical information, and engineering analyses, it is TGE's opinion that the proposed project is feasible from a geotechnical standpoint, provided that the recommendations in this report are incorporated into the design plans and implemented during construction.

The following sections provide geotechnical design recommendations for the proposed steel pole structures, underground conduits, and vaults, as well as preliminary parameters for maintenance pad and access road earthwork and retention structures.

8.1 Deep Foundation Design

Design parameters for drilled piers are presented below for the proposed steel pole structures requiring engineered foundations.

Drilled Pier Parameters (Vertical Analysis)

Table 4 below summarizes the engineering properties to be used by SDG&E to design any drilled pier foundations for the purposes of vertical analyses. These properties are estimates based on the field exploration program, visual observations, laboratory testing, engineering evaluation and analyses, empirical correlations, technical research, and our professional judgment.

Table 4: Drilled Pier Parameters (1, 2)

Drilled Pier Design Parameter	Material 1(3)	Material 2(4)	Material 3(5)	Material 4(6)	Material 5(7)
Total Unit Weight, γ (pcf)	120	125	130	140	150
Apparent Cohesion (psf)	100	100	300	1,000	2,000
Internal Friction Angle (^{0})	28	32	36	42	45
Allowable Skin Friction (psf)(8)	500	800	1,500	10,000	15,000
End Bearing Capacity (psf)	2,000	3,000	5,000	10,000	15,000

(1) The drilled pier foundations for any of the structures constructed over exposed soil outside a substation should neglect the upper 2 feet (i.e., "soil discount") for surficial erosion considerations;
(2) The drilled pier foundations for any of the structures constructed over engineered fill associated with a substation pad do not require any "soil discount" for surficial erosion considerations;
(3) Soil, loose to medium dense;
(4) Soil, medium dense to very dense;
(5) Bedrock/Rock, completely to highly weathered;
(6) Rock, moderately weathered;
(7) Rock, slightly weathered;
(8) For the uplift design condition these values should be reduced by 30%; however, the unfactored pier weight may be added to the resistance;

MFAD Parameters (Lateral Analysis)

Tables 5 and 6 below summarize the engineering properties and subsurface material profiles for each of the proposed steel pole locations and may be utilized in the Moment Foundation Analysis and Design (MFAD) computer program used by SDG&E for pier foundation design. These properties and profiles are estimates which were derived based on the field exploration program, visual observations, laboratory testing, engineering evaluation and analyses, empirical correlations, technical research, and our professional judgment. It should be noted that the estimated parameters are, in part, based on empirical correlations developed by Electric Power Research Institute (EPRI; see *Section 11, Selected References* which contains technical information that correlates the lateral subgrade moduli to blow count N-values for different soil types and soft rock) and are considered to be conservative and do not reflect the actual in-situ strengths since pressure meter testing was not performed as a part of this project. **TGE has also assumed that there will not be significant grade change from the existing elevations. If the improvements involve cut-fill grading operations, TGE should be contacted for further evaluation and provision of relevant amended site specific parameters**.

Table 5: MFAD Design Parameters 1

MFAD Design Parameter	Material 1(1)	Material 2(2)	Material 3(3)	Material 4(4)	Material 5(5)
Total Unit Weight, γ (pcf)	120	125	130	140	150
Apparent Cohesion (psf)	100	100	300	1,000	2,000
Internal Friction Angle (^{0})	28	32	36	42	45
Deformation Modulus (6) (E_{pmt}) (ksi)	2.0	6.0	10.0	20.0	250.0
Strength Reduction Factor (7)	1.0	1.0	0.98	1.0	1.0
Passive Pressure Multiplier(8)	2.2	2.6	2.9	3.0	3.0

(1) Soil, loose to medium dense;
(2) Soil, medium dense to very dense;
(3) Bedrock/Rock, completely to highly weathered;
(4) Rock, moderately weathered;
(5) Rock, slightly weathered;
(6) Deformation modulus representing pressure meter test;
(7) The parameters provided for the Strength Reduction Factor are for use in MFAD version 4.0;
(8) Passive pressure multiplier is a factor representing increased lateral capacity from material arching.

A generalized subsurface profile was developed for all of the proposed steel pole locations, which generally utilized 5 material types ranging from soil to rock. The recommended subsurface profiles at all of the proposed steel pole locations are presented in *Table 6* below.

Table 6: MFAD Design Parameters 2

Steel Pole Site	Subsurface Exploration	Layer Depth Range (feet; below existing grades)				
		Material 1	Material 2	Material 3	Material 4	Material 5
P1	WC(1)	0-5	5-25	25+	-	-
P2	WC(1)	0-50	-	50+	-	-
P3	Geo(2)	-	0-5	5+	-	-
P4	Geo(2)	0-2	2-5	5+	-	-
P5	Geo(2)	-	0-10	10+	-	-
P6	SL-1(3)	0-5	5-10	10+	-	-
P7	Geo(2)	-	0-20	20+	-	-
P8	Geo(2)	-	0-20	20+	-	-
P9	Geo(2)	-	-	0+	-	-
P10	Geo(2)	-	-	0+	-	-
P11	Geo(2)	-	-	0+	-	-
P12	SL-2(3)	0-5	5-10	10+	-	-
P13	Geo(2)	-	0-5	5+	-	-
P14	Geo(2)	0-2	2-5	5+	-	-
P15	Geo(2)	0-2	-	2+	-	-

P16	SL-3[3]	0-5	-	5-20	20+	-
P17	Geo[2]	0-2	-	2+	-	-
P18	Geo[2]	0-2	-	2+	-	-
P19	Geo[2]	0-2	-	2+	-	-
P20	Geo[2]	0-2	-	2+	-	-
P21	B-1[4]	-	0-5	5+	-	-
P22	Geo[2]	-	-	0+	-	-
P23	Geo[2]	-	0-55	55+	-	-
P24	B-2[4], SL-4[3]	-	-	0-5	5-10	10+
P25	Geo[2]	0-2	-	-	5-10	10+
P26	SL-5[3]	-	0-5	5-8	8-15	15+
P27	Geo[2]	0-3	-	3+	-	-
P28	Geo[2]	0-2	2-5	5+	-	-
P29	Geo[2]	0-2	2-15	15+	-	-
P30	B-3[4], SL-6[3]	-	0-15	15-25	25+	-
P31	Geo[2]	-	0-15	15-25	25+	-
P32	B-4[4]	0-5	5-10	10-30	30+	-
P33	Geo[2]	0-3	-	3+	-	-
P34	Geo[2]	0-3	-	3+	-	-
P35	SL-7[3]	0-5	5-10	10-20	20+	-
P36	B-5[4]	-	-	0-15	15-20	20+
P37	Geo[2]	0-8	-	8-20	-	20+
P38	Geo[2]	0-3	-	3-10	10+	-
P39	B-6[4]	-	0-5	5-25	-	25+
P40	Geo[2]	0-2	-	2-18	-	18+
P41	Geo[2]	0-12	-	12+	-	-
P41a	B-7[4]	0-20	-	20+	-	-
P42	B-9[4]	0-5	-	5+	-	-
P43	B-10[5]	-	0-10	10+	-	-
P44	B-10[4]	-	0-10	10+	-	-
P45	B-11[4], SL-9[3]	-	0-10	10+	-	-
P46	B-12[5], SL-10[5]	-	0-5	5+	-	-
P47	B-12[4], SL-10[3]	-	0-5	5+	-	-
P48	B-13[5]	0-5	5-10	10+	-	-
P49	B-13[5]	0-5	5-10	10+	-	-
P50	B-13[4], SL-11[3]	0-5	5-10	10+	-	-
P51	B-13[5]	0-5	5-10	10+	-	-
P52	B-14[5]	0-5	5-10	10+	-	-
P53	SL-12[3]	0-5	5-10	10+	-	-
P54	B-14[4]	0-5	5-10	10+	-	-
P55	B-15[4]	0-5	5-10	10+	-	-
P56	B-15[5]	0-5	5-10	10+	-	-
P57	SL-13[3]	0-5	5-10	10+	-	-
P58	B-16[5]	0-5	5-10	10+	-	-
P59	B-16[5]	0-5	5-10	10+	-	-

P60	B-16(5)	0-5	5-10	10+	-	-
P61	B-16(4)	0-5	5-10	10+	-	-

(1) The layer depth range of these steel pole locations was evaluated based on the data obtained from Woodward - Clyde (1992). Plan and cross section details are provided in *Appendix H*.
(2) The layer depth range of these steel pole locations was evaluated based on the data obtained from Geocon (2012). Geotechnical Boring and seismic line information excerpts are provided in *Appendix H*.
(3) The layer depth range of these steel pole locations was evaluated based on the data obtained from Seismic Refraction lines performed as part of this investigation (see *Appendix A*).
(4) The layer depth range of these steel pole locations was evaluated based on the data obtained from Borings performed as part of this investigation (see *Appendix B*).
(5) The layer depth range of these steel pole locations was evaluated based on the data obtained from nearby borings and seismic lines performed as part of this investigation (see *Appendix A & B*).

Some of the material values above are based on data obtained during seismic refraction surveys. The seismic refraction methodology requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones/outcrops, can also result in the misinterpretation of the subsurface conditions. The generally accepted value for depth accuracy for any particular contact and P-wave velocity value is 20%.

Micropiles

Micropile foundations may be used as an alternative to drilled pier foundations. Micropiles will be designed by a micropile specialty contractor and/or structural engineer based on the specific design requirements and our recommended soil parameters. An experienced contractor specializing in pier and/or micropile construction and familiar with the regional geologic conditions should be selected for the project. The micropile specialty contractor is responsible for furnishing of all designs, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachements for the project.

The micropile contractors should also be aware that due to the permeable nature of overburden soils and formation, grout overrun beyond the theoretical quantitiy of drilled holes should be expected where uncased.

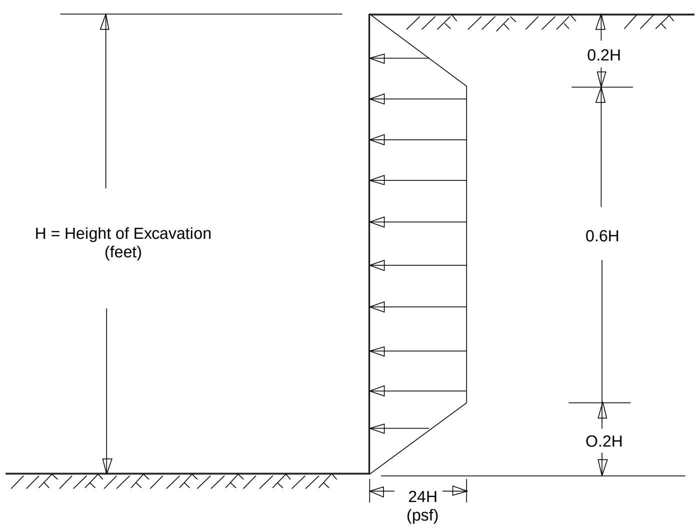
The contractor should prepare and submit a full-length installation record for each micropile installed. Pile load tests including verification load tests and proof load tests should be performed in accordance with the standard procedures of *Micropile Design and Construction Guidelines* (FHWA, June 2000) and *SDG&E Specification For Design And Installation Of Micropile Foundations For Transmission Steel Poles* (SDG&E, 2014). Grout testing should also be performed as a part of QA/QC procedures.

8.2 Temporary Excavations

Excavation of the on-site soils may be achieved with conventional heavy-duty grading equipment within the fill/formational materials. Temporary, shallow excavations with vertical side slopes less than 4 feet high will generally be stable, although there is a potential for localized sloughing. Vertical excavations greater than 4 feet high should not be attempted without proper shoring to prevent local instabilities. Shoring may be accomplished with hydraulic shores and trench plates, and/or trench boxes, soldier piles and lagging. The actual method of a shoring system should be provided and designed by a contractor experienced in installing temporary shoring under similar soil conditions. If soldier piles and lagging are to be used, we should be contacted for additional recommendations.

All trench excavations should be shored in accordance with CalOSHA regulations. For your planning purposes, the fill/alluvial and formational materials may be considered a Type C and Type A soil, respectively, as defined the current CalOSHA soil classification.

Braced excavations should be designed to resist a trapezoidal distribution of lateral earth pressure. The recommended pressure distribution, for the case where the grade is level behind the shoring, is illustrated in the following diagram with the maximum pressure equal to 24H in psf, where H is the height of the excavation in feet.



Any surcharge (live, including traffic, or dead load) located within a 1(H): 1 (V) plane drawn upward from the base of the shored excavation should be added to the lateral earth pressures. The lateral load contribution of a uniform surcharge load located across the 1(H): 1(V) zone behind the excavation walls may be calculated by using *Figure 25, Lateral Surcharge Loads*. Lateral load contributions of surcharges can be provided once the load configurations and layouts are known. As a minimum, a 2-foot equivalent soil surcharge is recommended to account for nominal construction loads.

Stockpiled (excavated) materials should be placed no closer to the edge of a trench excavation than a distance defined by a line drawn upward from the bottom of the trench at an inclination of 1(H): 1(V), but no closer than 10 feet. All trench excavations should be made in accordance with CalOSHA requirements.

8.3 Temporary Construction Dewatering

Groundwater was encountered at a depth of about 35 feet and 22 feet below the existing surface in Boring B-7 and B-9, respectively. These borings are within the underground portion of the project. The depths to groundwater are deeper than the proposed construction activities; however, temporary dewatering may be required to allow construction.

If necessary, dewatering may be achieved by means of excavating a series of shallow trenches directed by gradient (i.e., gravity) to sumps with pumps at either end of proposed reinforced concrete pipe. In any case, the actual means and method of dewatering should be established by a contractor with local experience. It is important to note that temporary dewatering, if necessary, will require a permit and plan that complies with SDG&E Environmental and RWQCB requirements and regulations.

8.4 Thrust Forces

If thrust blocks are used, the blocks may be designed using a passive resistance equal to an equivalent fluid pressure of 300 pounds per cubic foot (pcf).

8.5 Vertical Pressures

Loads exerted on the pipes should not exceed the manufacturer's recommendations. TGE has provided the following tables as estimates of the vertical pressures. If more specific pressures are needed at spot locations, TGE may be contacted for more in-depth analysis.

Table 7: Design Vertical Pressures (soil) (1)

Depth of Cover (feet)	D (psf)
0-5	650
6-10	1,300

(1) Dead load vertical pressure from soil prism considering load coefficients for cohesionless backfill.

Table 8: Design Vertical Pressures (Dynamic Loads) (1)

Depth of Cover (feet)	D (psf)
2	3,200
4	1,150
6	600
8	360
10	240

(1) Dead load vertical pressure equivalent based on a dynamic load from a truck with a contact pressure of 100 psi.

8.6 Vaults

It is our understanding that the project includes proposed vaults which are precast and will not require shallow spread foundations. The vaults should be supported entirely on competent fill or competent native material. The bottom of excavation should be smooth, uniform, and free from rocks, vegetation and other foreign matter (Note: as per Section 3.1.6 of the SDG&E TE-0107).

8.7 Trench Backfill

Following completion of the underground conduit installation, backfilling will be required. Backfill should follow the procedures for trench backfill as indicated in the SDG&E TE-0107. These procedures are summarized below:

Materials used for encasement of conduits (i.e., Sand-Cement Slurry, Fluidized Thermal Backfill, or Encasement Concrete) should meet the requirements as specified in Section 4.0 of the SDG&E TE-0107.

The portion of the excavation above the encasement and below 12-inches of the final grade shall be backfilled using lean concrete (Note: per Section 4.2.1 of the SDG&E TE-0107). The upper 12-inches below final grade shall be backfilled using materials and methods meeting the requirements of the applicable government agencies or landowners (Note: in the absence of such requirements, native and/or import materials can be used for backfill if approved by SDG&E).

All subsurface utility trench backfill should be mechanically compacted. Water jetting should not be used for compaction. All backfill should be compacted to at least 90 percent relative compaction based on the latest version of the ASTM D1557 procedure. The upper 12 inches of subgrade soils underlying the pavement section should be compacted to at least 95 percent relative compaction. In the event that SDG&E requires Fluidized Thermal Backfill, please refer to the requirements of Section 4.3 in SDG&E TE-0107.

8.8 Seismic Design

Studies and calculations performed by SDG&E conclude that forces resulting from seismic loading are less than forces generated by wind and broken conductor loading on pole structures. Therefore, seismic ground motion does not need to be considered for design of SDG&E transmission structures.

However, seismic loads may need to be considered for the 10 proposed vaults. Seismic design parameters for each vault sites were developed as per guidelines outlined in the 2013 CBC, Volume 2, Chapter 16 (Note: 2012 International Building Code). These seismic parameters are provided in *Appendix G* and summary of their respective S_{DS} and S_{D1} are shown in *Table 9* below.

Table 9: Seismic Design Parameters (Vaults)

Vault No.	Site Class	S_{DS} (g)	S_{D1} (g)
V1	D	0.700	0.406
V2	C	0.638	0.348
V3	C	0.638	0.348
V4	C	0.638	0.348
V5	C	0.639	0.349
V6	C	0.640	0.349
V7	C	0.641	0.349
V8	C	0.642	0.350
V9	C	0.646	0.352
V10	C	0.649	0.354

8.9 Pavements

The proposed underground alignment is within the existing driveway and street right-of-way. Replacement of driveway and street surface improvements should match existing flexible asphalt concrete, rigid concrete pavement section and concrete curb/gutter and sidewalk.

The upper foot of subgrade soils should be compacted to at least 95% relative compaction based on ASTM D1557. The aggregate base should conform to the Crushed Aggregate Base per Greenbook requirements, Section 200-2.2. The base course should be compacted to a minimum dry density of 95% of the materials maximum density as determined by the ASTM D1557 test procedure. Field and lab testing should be used to check compaction, aggregate gradation, and compacted thickness.

The asphalt concrete pavement should be compacted to 95% of the unit weight as tested in accordance with the Hveem procedure. The maximum lift thickness should be 2.0 inches. The asphalt concrete material shall conform to Type III, Class C2 or C3, 2001 edition of the Greenbook Standard Specifications for Public Works Construction. An approved mix design should be submitted 30 days prior to placement. The mix design should include proportions of materials, maximum density and required lay-down temperature range. Field and lab testing should be used to verify oil content, aggregate gradation, compaction, compacted thickness, and lay-down temperature.

8.10 Retaining Structures

It is anticipated that Mechanically Stabilized Earth (MSE) retaining walls will be utilized at various locations in the project alignment to accommodate maintenance pads. These locations are listed below:

- P2, P5, P15, P24, P25, P26, P46, P47, P52 and P58

The following sections are preliminary designs recommendations and parameters for the earth retention MSE structures.

8.10.1 Lateral Earth Pressure

Retaining walls should be designed to resist a triangular distribution of lateral earth pressure plus surcharges from any adjacent loads. The recommended lateral earth pressures for retaining walls free to rotate, with level, 1.5:1 (H:V), and 2:1 (H:V) slope backfills, are 40, 55 and 50 pounds per cubic foot (equivalent fluid pressure), respectively. For restrained walls, at-rest lateral equivalent fluid pressures of 60, 75, and 70 pounds per cubic foot may be used. Simple surface surcharge pressures and point loads should be added to the active pressure contribution from the backfill. The geotechnical engineer should check the lateral magnitude and distribution resulting from surcharge loads.

The recommended earth pressure is calculated assuming that a drainage system will be installed behind the retaining walls, so that external water pressure will not develop.

8.10.2 Seismic Lateral Earth Pressure

In addition to the above-mentioned lateral earth pressures, walls more than 6 feet in height should be designed to support a seismic active pressure. The recommended seismic active pressure distribution on the retaining walls is an inverted triangular with the maximum pressure equal to 24H pounds per square foot for free to rotate and 36H pounds per square foot for restrained where H is the differential wall height in feet.

8.10.3 Drainage

Retaining walls should be properly drained. Adequate backfill drainage is essential to provide a free-drained backfill condition and to limit hydrostatic buildup behind walls.

Retaining walls should be appropriately waterproofed. Drainage behind the retaining walls may be provided with a geosynthetic drainage composite such as TerraDrain, MiraDrain, or equivalent, attached to the outside perimeter of the wall. The drain should be placed continuously along the back of the wall and connected to a 4-inch-diameter perforated pipe. The pipe should be sloped at least 2% and surrounded by 3 cubic feet per foot of ¾-inch crushed rock wrapped in suitable non-woven filter fabric (Mirafi 140N or equivalent) or Caltrans Class 2 permeable granular filter materials without filter fabric. The crushed rock should meet the requirements defined in Section 200-1.2 of the latest edition of the Standard Specification for Public Works Construction (Greenbook). These drains should be connected to an adequate discharge system.

8.10.4 Backfill

Any retaining wall backfill material should be non-expansive (E.I. of 20 or less) and free draining. Based on expansion index testing, a majority of the on-site materials are not suitable for use as backfill. Import of select fill meeting the expansion index requirement may be required. Wall backfill should be moisture conditioned to about 1 to 3 percent above optimum moisture content, and compacted in 8-inch lifts to at least 90 percent relative compaction (ASTM D1557).

It should be noted that the sections above are only preliminary design recommendations in consideration for the retaining wall design. Upon completion of the retaining wall design, TGE should be contacted for additional evaluation specifically for each site location including (1) global stability, (2) suitability of on-site soils as backfill, and (3) earthwork recommendations, such as, over-excavation and stabilization measures.

8.11 Site Earthwork

The following section is provided in connection with the grading of access roads and pole maintenance pads.

<u>Clearing and Grubbing</u>

Prior to grading, the project area should be cleared of all rubble, trash, debris, etc. Any buried organic debris or other unsuitable contaminated material encountered during subsequent excavation and grading work should also be removed.

Excavations for removal of any existing footings, utility lines, tanks, and any other subterranean structures should be processed and backfilled in the following manner:

1. Clear the excavation bottom and sidecuts of all loose and/or disturbed material.

2. Prior to placing backfill, the excavation bottom should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 90 percent of the ASTM D-1557 laboratory test standard.

3. Backfill should be placed, moisture conditioned (i.e., watered and/or aerated as required and thoroughly mixed to a uniform, near optimum moisture content), and compacted by mechanical means in approximate 6-inch lifts. The degree of compaction obtained should be at least 90 or 95 percent of the ASTM D-1557 laboratory test standard, as applicable.

It is also critical that any surficial subgrade materials disturbed during initial demolition and clearing work be removed and/or recompacted in the course of subsequent site preparation earthwork operations.

Site Grading

In order to create uniform subgrade support conditions for the maintenance pads and access roads, the following earthwork operations are recommended.

- Prior to placing fills, the exposed soils shall be scarified a minimum of 8 inches, moisture conditioned to within 2 percent of optimum moisture content, and recompacted to a minimum of 90 percent relative compaction per ASTM D1557.

- Fill soils shall consist of low expansive import/on-site soils with an EI of 50 or less and maximum rock size of 6 inches (Note: surface of pads shall not contain rocks greater than 3-inches in maximum dimension). All fills shall be compacted to a minimum 90 percent relative compaction (Note: ASTM D1557). In addition to the relative compaction requirements, all fills shall be compacted to a firm unyielding condition.

- If materials at the bottom of receiving subgrades and/or any excavations are disturbed during construction activities, these should be removed and recompacted to a minimum 90 percent relative compaction, based on ASTM D-1557.

- Where grading is planned within sloping terrain, suitable keyways and benching should be established by the engineer prior to fill placement. The final slope face shall be densified by over-building with compacted fill and trimming back to shape with appropriate equipment.

- Import soils if required, should be sampled, tested, and approved by TGE prior to arrival on site. Imported and on-site soils shall consist of clean soils with low expansion (EI of 50 or less), free from vegetation, debris, or rocks larger than 6 inches maximum dimension.

TGE understands that fill and cut slopes will be constructed as part of the grading for the maintenance pads and access roads. Slopes constructed at a gradient of 2:1 (horizontal to vertical) are considered to be stable if constructed in accordance with the recommendations in this section. TGE should be contacted to perform a gross slope stability analysis if slopes steeper than a 2:1 are planned.

8.12 Soil Corrosion

The corrosion potential of the on-site materials to steel and buried concrete was evaluated. Laboratory testing was performed on representative samples of the existing surficial materials to evaluate pH, minimum resistivity, and chloride and soluble sulfate content. Laboratory test procedures are discussed in *Appendix D.* General recommendations to address the corrosion potential of the on-site materials are provided below. If additional recommendations are desired, it is recommended that a corrosion specialist be consulted. The results of the tests are summarized in *Table 10* below.

Table 10: Corrosion Test Data

Boring No.	Structure No.	Depth (feet)	pH	Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
B-1	P21	1-4	6.3	2371	30	13
B-2	P24	0-2	7.0	4828	30	12
B-3	P30	1-4	10.0	1096	26	6
B-4	P32	1-4	8.3	786	35	62
B-5	P36	1-4	7.6	1357	58	6
B-6	P39	0-3	6.9	1405	47	16
B-7	CP-1	0-3	8.7	905	45	110
B-8	Vault	0-2	9.4	1128	29	67
B-9	P42	1-4	7.2	718	35	3
B-10	P44	0-3	6.1	386	413	74
B-11	P45	0-3	6.5	621	38	12
B-12	P47	0-3	8.3	285	240	220
B-13	P50	1-4	6.2	2205	52	18
B-14	P54	1-4	8.3	1024	368	80
B-15	P55	1-4	7.7	377	49	4
B-16	P61	1-4	5.6	646	173	25

8.12.1 Reinforced Concrete

Laboratory tests indicate that the potential of sulfate attack on concrete in contact with the soils is “Negligible”, with the exception of P47 where the potential is “Moderate” based on 2010 California Building Code Table 19-A-4. Location P47 is considered to be the worst case for the poles within the project alignment. It is recommended that Type II cement to be used for all proposed steel pole sites. It is further recommended that at least a 4.0-inch thick concrete cover be maintained over the reinforcing steel where possible for concrete in contact with the soil for non-wet holes and increase to 6.0-inches for wet holes.

The results of chloride content testing at the near-surface soil indicate the potential of chloride attack on concrete structures is low. Reinforcing steel in concrete structures and pipes in contact with soil are not considered to be susceptible to chloride attack; however, TGE recommends that the level of protection should anticipate a chloride content of 200 ppm. The pH-value range of 5.6 to 10.0 is marginally near-neutral and may warrant corrosion consideration. Location P30 and P61 represent the worst case scenarios. If considered necessary, possible methods of protection that could be used include increased concrete cover, low water-cement ratio, corrosion inhibitor admixture, silica fume admixture, waterproof coating on the concrete exterior.

8.12.2 Metallic

Laboratory tests indicate that the soils generally have very low electrical resistivity, which presents a high potential for corrosion to buried ferrous metals. Therefore, metallic elements should be reviewed by a Corrosion Engineer for the proposed steel pole structures.

9. CONSTRUCTION CONSIDERATIONS

<u>Drilled Piers</u>

1. The drilled pier foundation excavation should be observed by the engineer during excavation to verify that they extend to the recommended pier tip elevations or deeper.

2. Groundwater is anticipated within numerous pole locations as specified in *Table 3* of this report. In addition, periodic ground water seepage zones may occur along geologic contacts.

3. Shaft excavation within alluvial materials may require temporary casing.

4. At the pole locations where the drilled pier foundations are to be constructed, the contractor should anticipate variable drilling conditions within the bedrock materials. The contractor should also anticipate the need for soft and hard rock drilling techniques to extend the drilled piers to the specified tip elevations. The amount of drilling difficulty experienced by the contractor will vary with the methods used.

<u>Access Roads / Maintenance Pads</u>

1. Seismic refraction surveys were conducted along the proposed project alignment to evaluate the underlying subsurface material conditions. Based on this information the pole sites are underlain by soil to very hard rock. In general, seismic wave velocities can be correlated to material density and/or rock hardness. The relationship between rippability and seismic velocity is empirical and assumes a homogeneous mass. Localized areas of differing composition, texture, and/or structure may affect both the measured data and the actual rippability of the mass. The seismic P-wave velocity ranges presented in *Table 11* are based on TGE's experience with similar materials. The rippability of the mass can be classified on a scale of "Easy" to "Blasting Generally Required", as presented here in *Table 11* below. The rippability classifications are also dependent on the excavation equipment used and the skill of the equipment operator. Caterpillar D-9 Dozer ripping with a single shank. The rippability values and classifications are considered approximate and that rock characteristics, such as depth, orientation and fracturing, have an effect in determining the rock rippability.

Table 11: Rippability Classification

Seismic P-wave Velocity	Rippability	Soil/Rock Description
0 to 2,000 ft/sec	Easy	Soil, loose to medium dense
2,000 to 3,000 ft/sec	Moderate	Soil, medium dense
3,000 to 4,000 ft/sec	Difficult, Possible Local Blasting	Soil, dense to very dense Rock, very weak to weak
4,000 to 8,000 ft/sec	Very Difficult, Probable Local to General Blasting	Rock, medium strong to strong
Greater than 8,000 ft/sec	Blasting Generally Required	Rock, very strong

Table 11 above may be used as a basis for preliminary evaluations of excavatability when utilizing the Seismic Refraction Survey Data (see *Appendix A*).

10. LIMITATIONS

The recommendations and opinions expressed in this report are based on TGE's review of background documents and on information developed during this investigation. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site. More detailed limitations of the geotechnical engineering report are presented in the ASFE's information bulletin in *Appendix I*.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during pole/tower pier foundation drilling operations.

Site conditions, including ground-water level, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which TGE has no control.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. TGE should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

TGE has endeavored to perform this study using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil/rock conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

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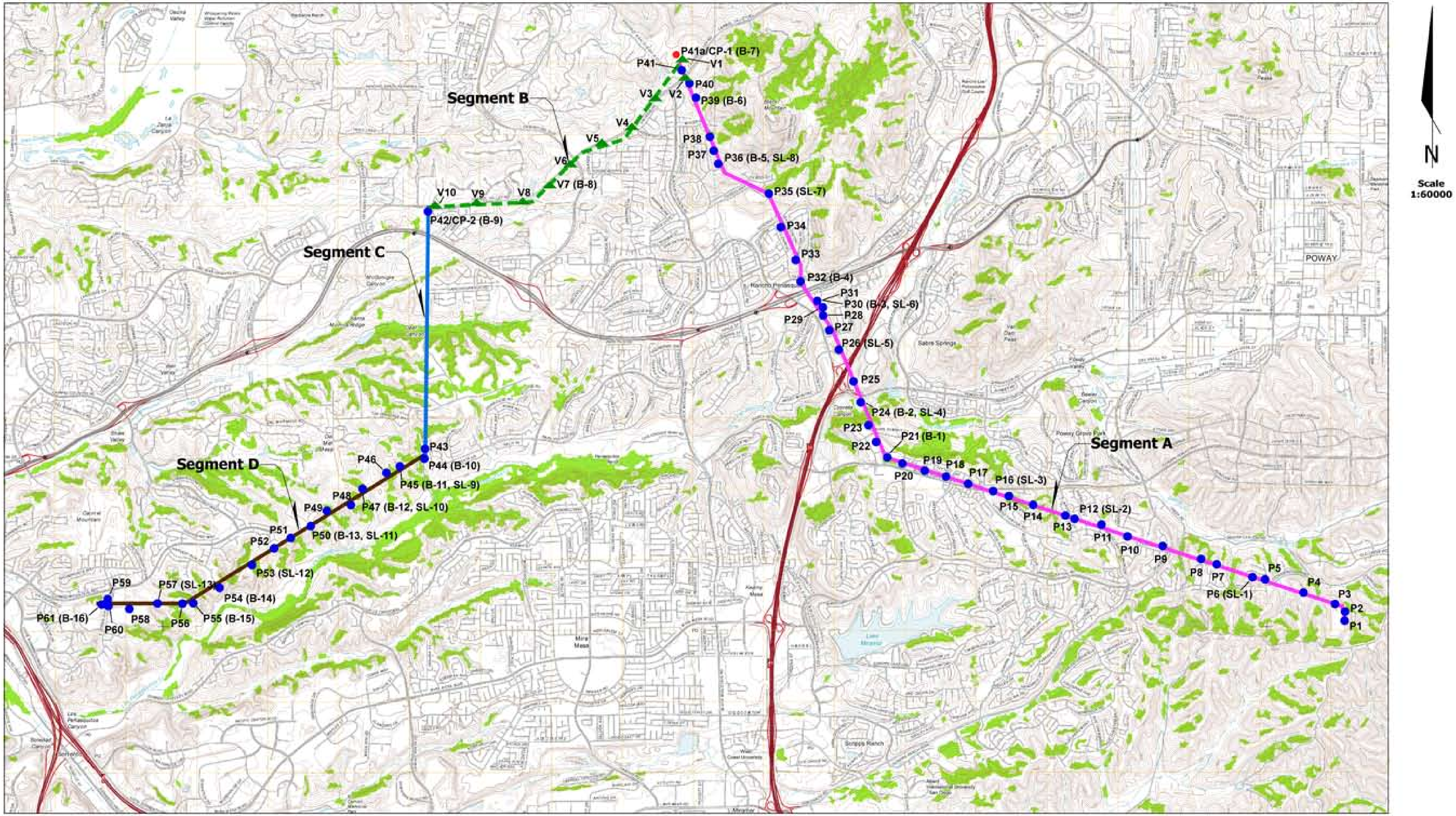
FIGURES



References: USGS 2012 Topographic Map (Poway, CA and Del Mar, CA - 7.5 minute Quadrangle)

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Legend

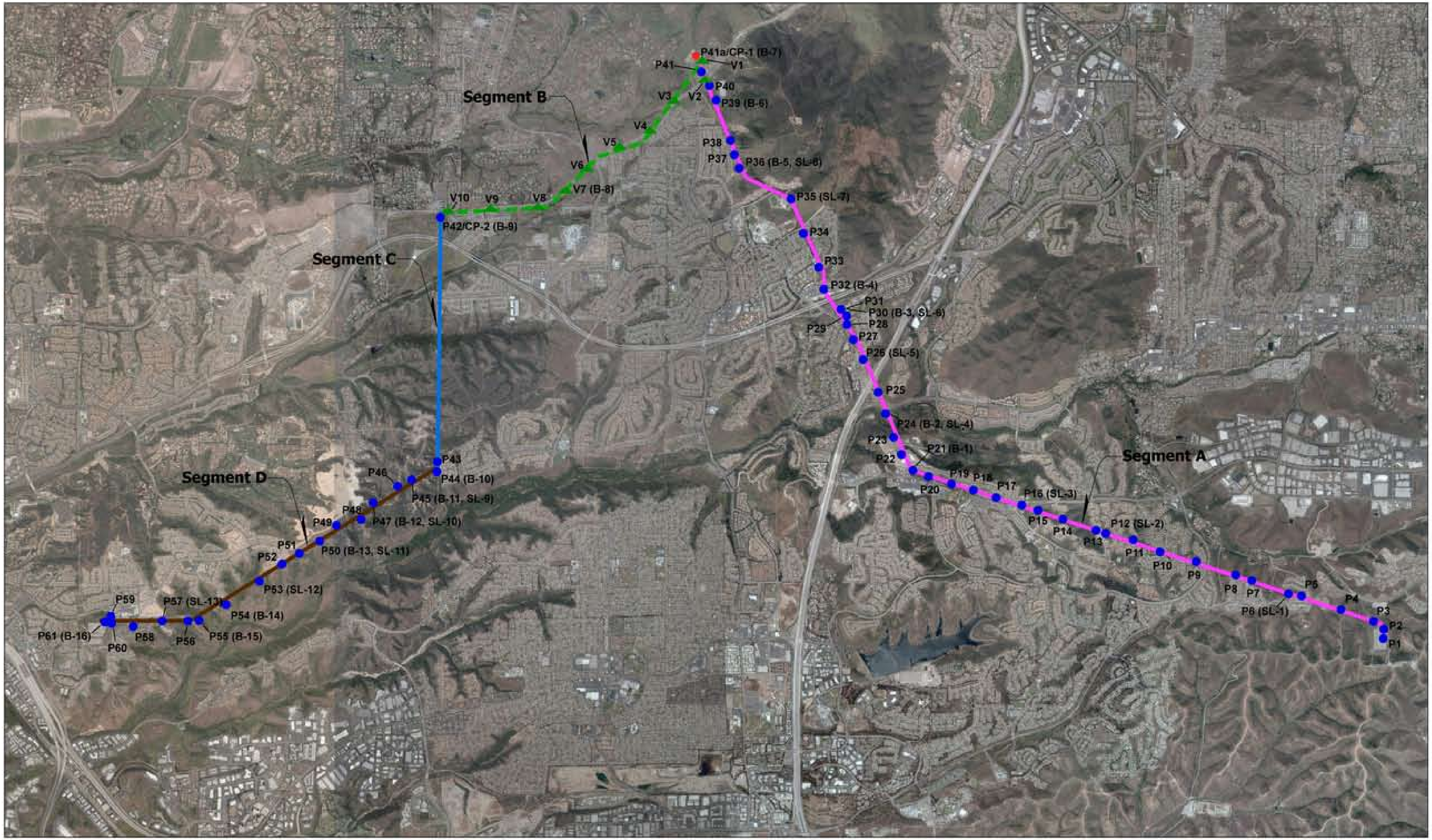
- Proposed 230 kV Standard Pole
- Proposed 230 kV Underground Vaults
- Proposed Cable Pole
- (SL-13) Seismic line location
- (B-16) Boring location

- Segment A - (8.3 miles) Replacement of existing wood H-frames with new 230 kV steel poles
- Segment B - (2.8 miles) New underground 230 kV line in existing franchise position (Carmel Valley Road)
- Segment C - (2.2 miles) New 230 kV conductor on existing steel lattice towers
- Segment D - (3.3 miles) Replacement of existing wood H-frames with new 69 kV steel poles

Vicinity Map

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	Figure No.: 1



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References: USGS 2012 Topographic Map (Poway, CA and Del Mar, CA - 7.5 minute Quadrangle)

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- Segment D - (3.3 miles) Replacement of existing wood H-frames with new 69 kV steel poles

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 2**

References: Google EARTH 2014

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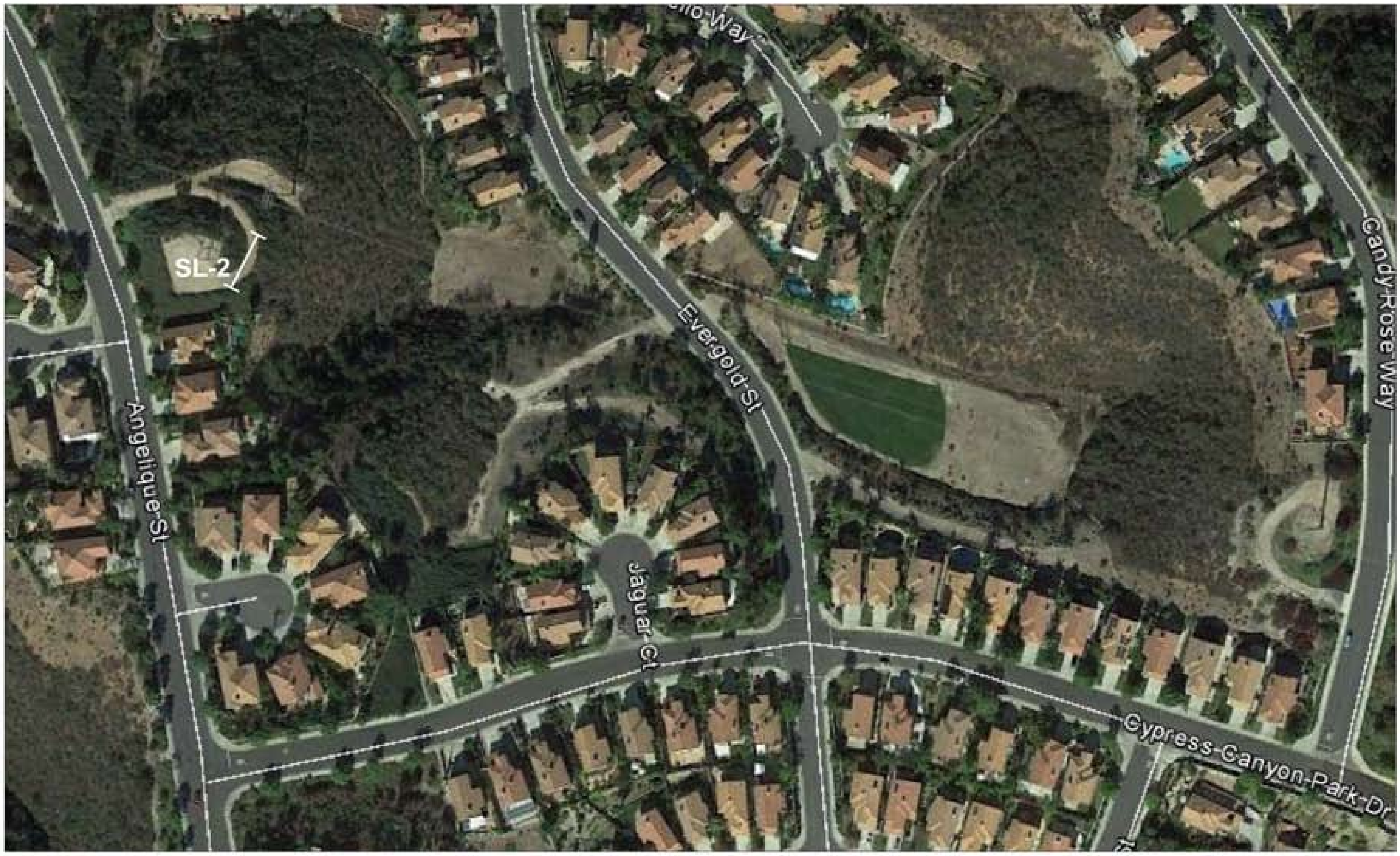
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 3**



References: Google EARTH 2014

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Phone: 858.486.2888

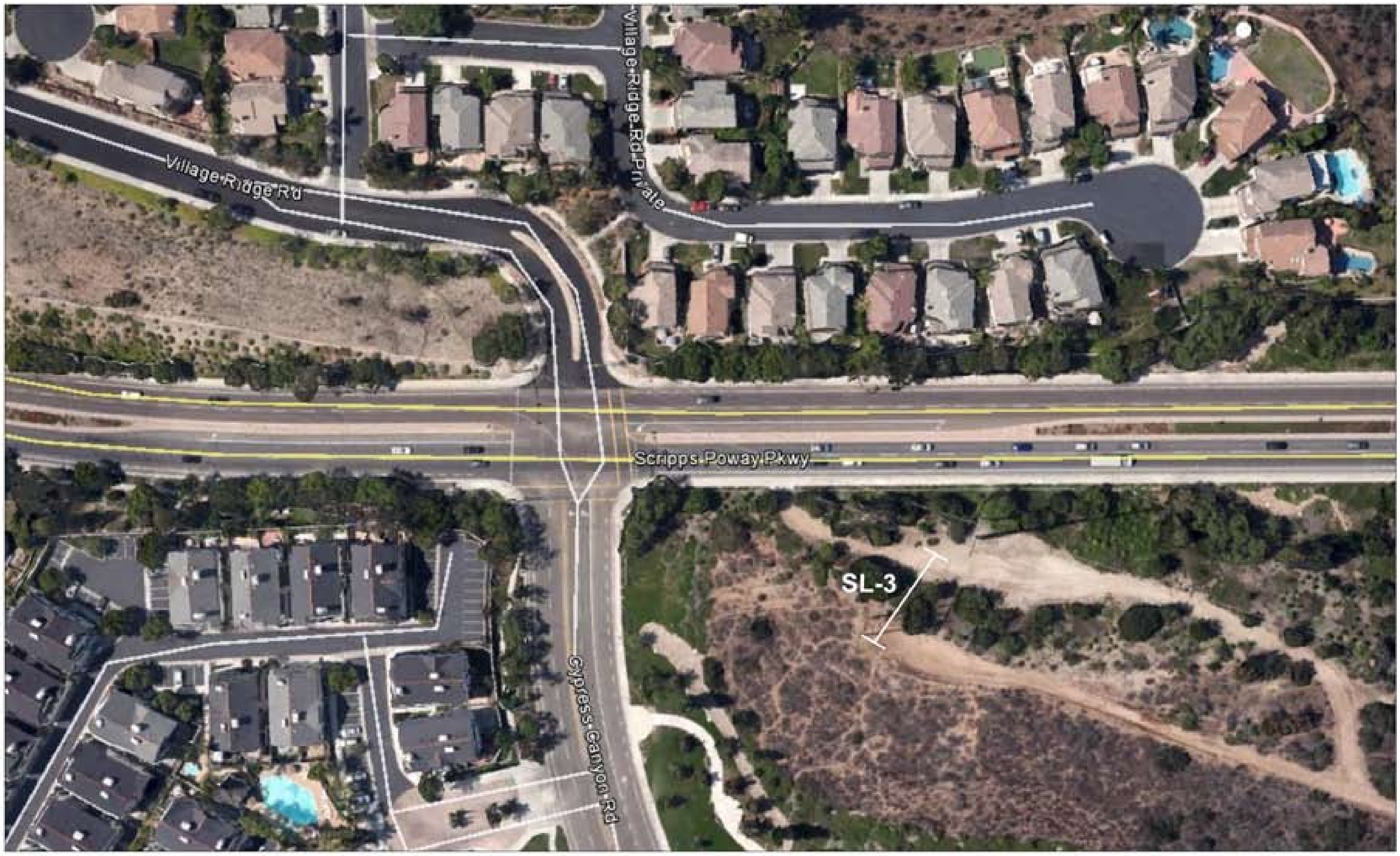
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 4**



References: Google EARTH 2014

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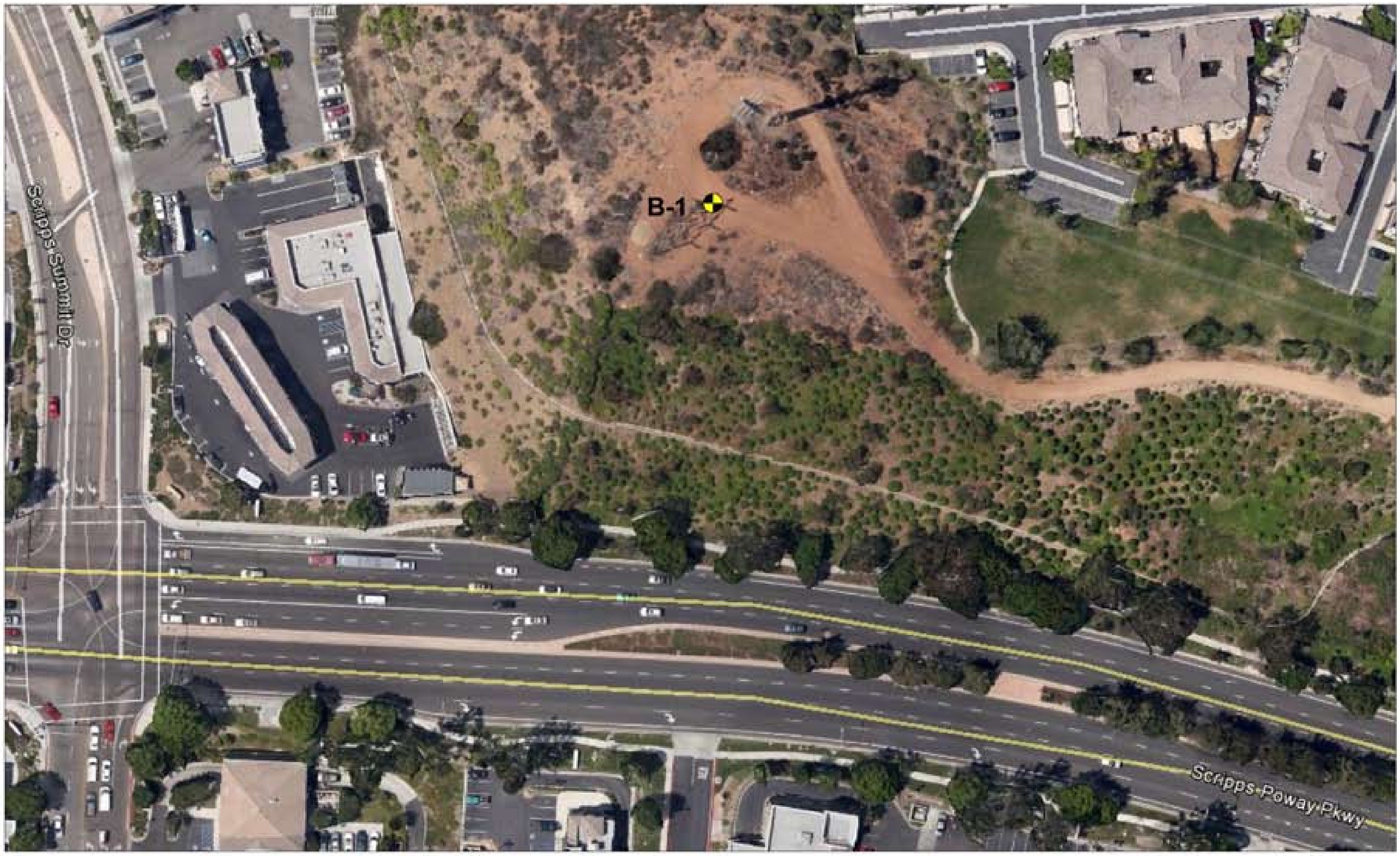
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: 5**



References: Google EARTH 2014

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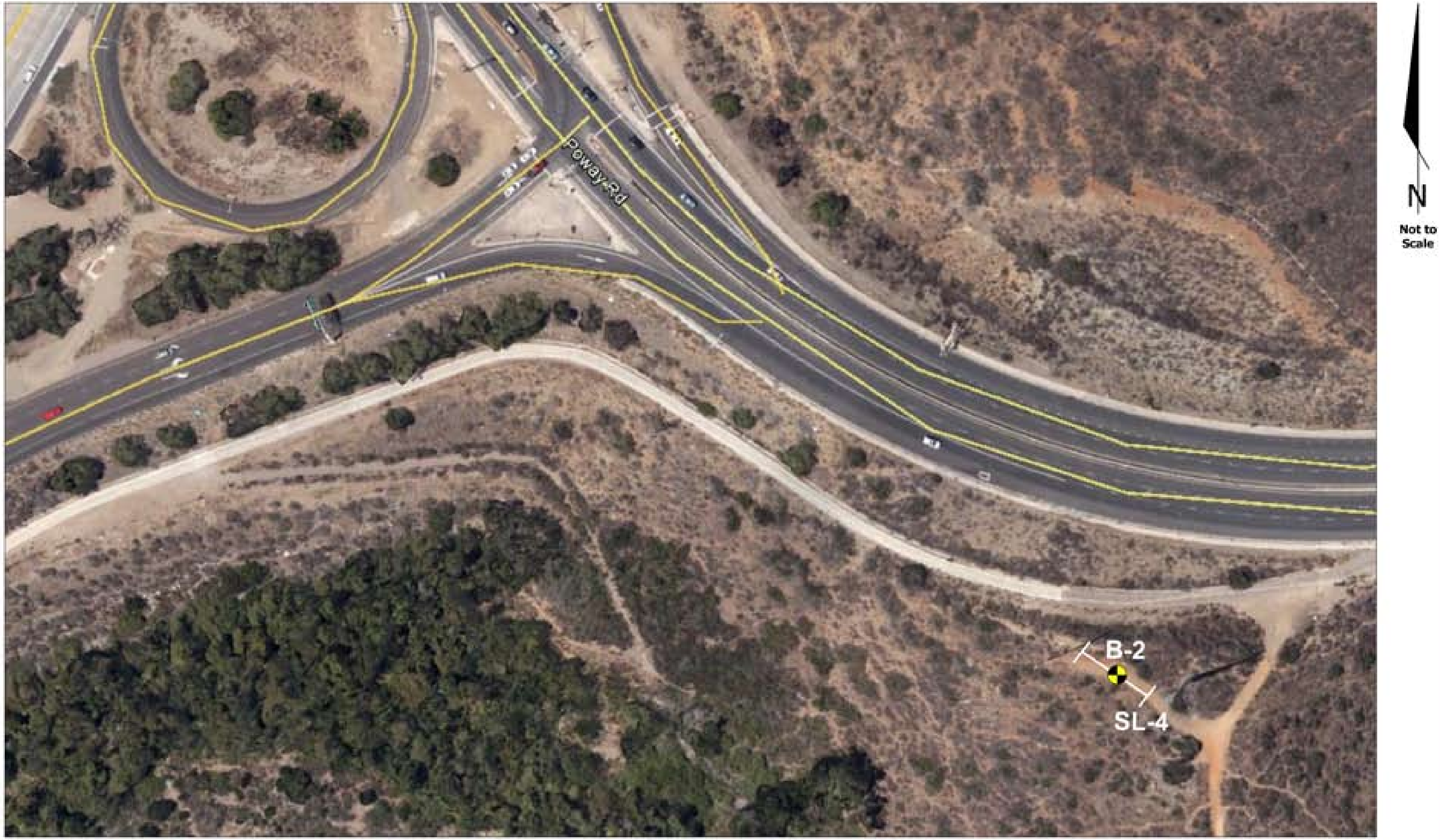
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	Figure No.: 6



References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 7**

References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 8**

References: Google EARTH 2014

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Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 9**

References: Google EARTH 2014

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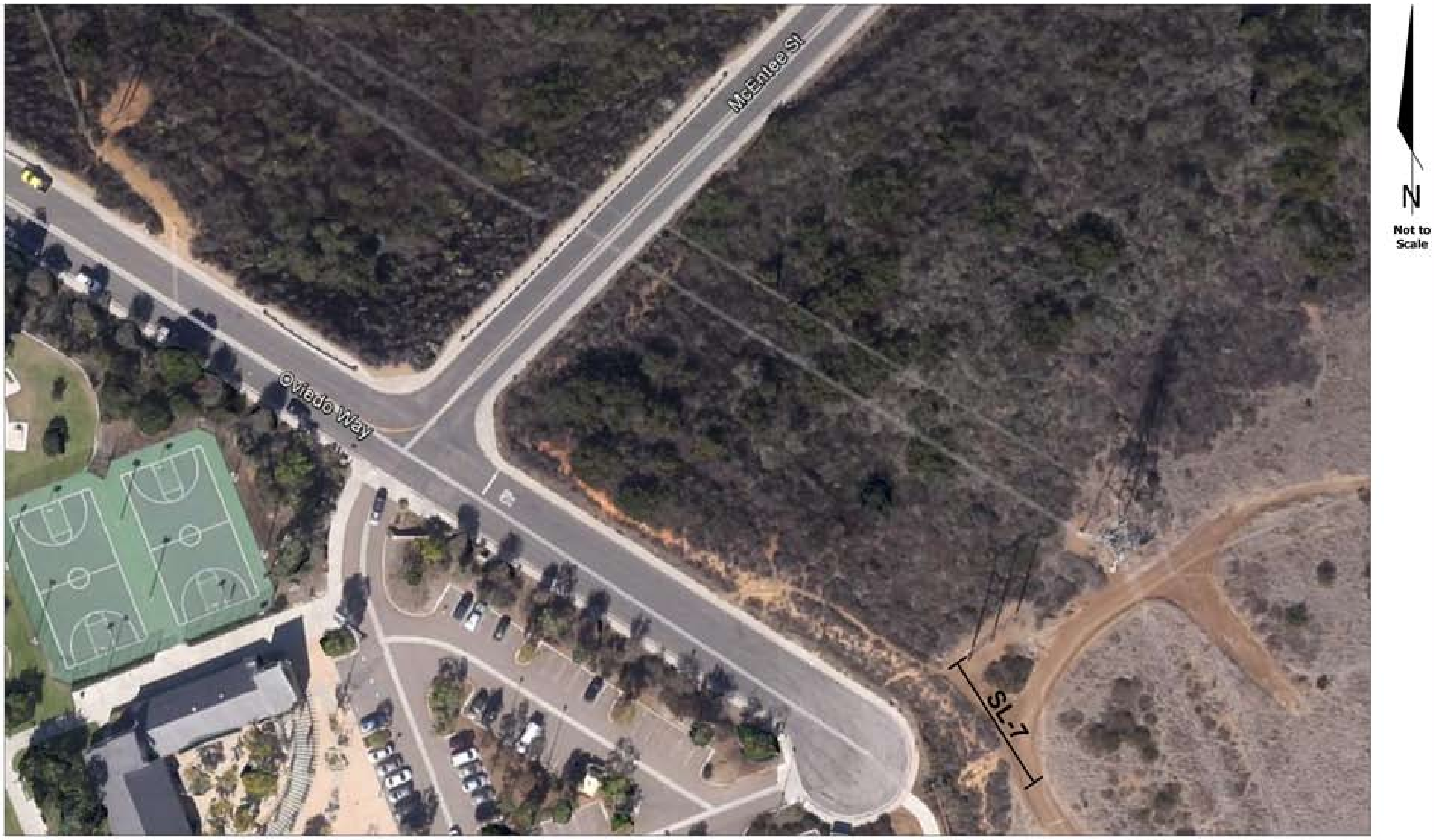
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 10**



References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 11**

References: Google EARTH 2014

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Legend

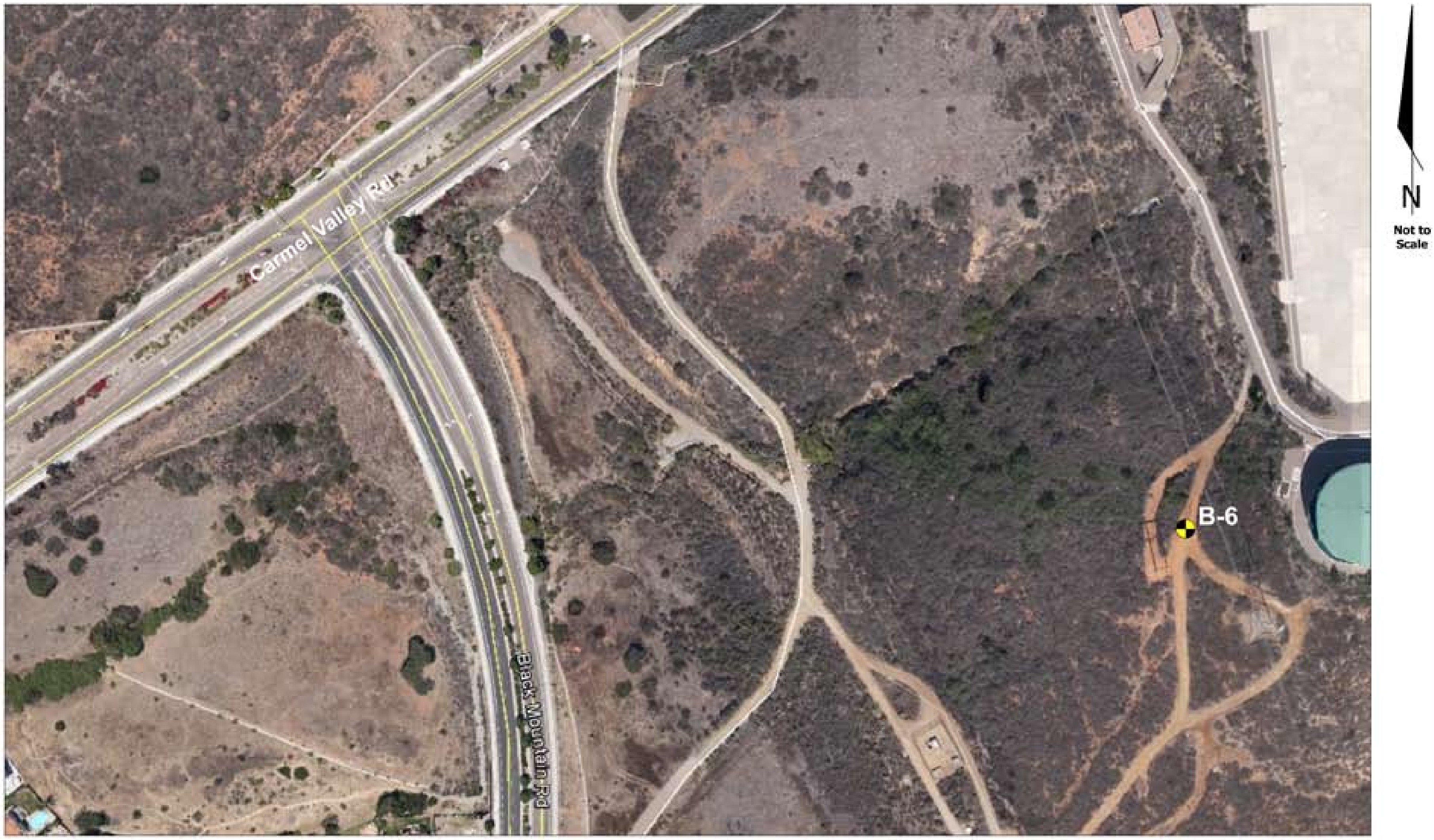
Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 12**



References: Google EARTH 2014

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Legend

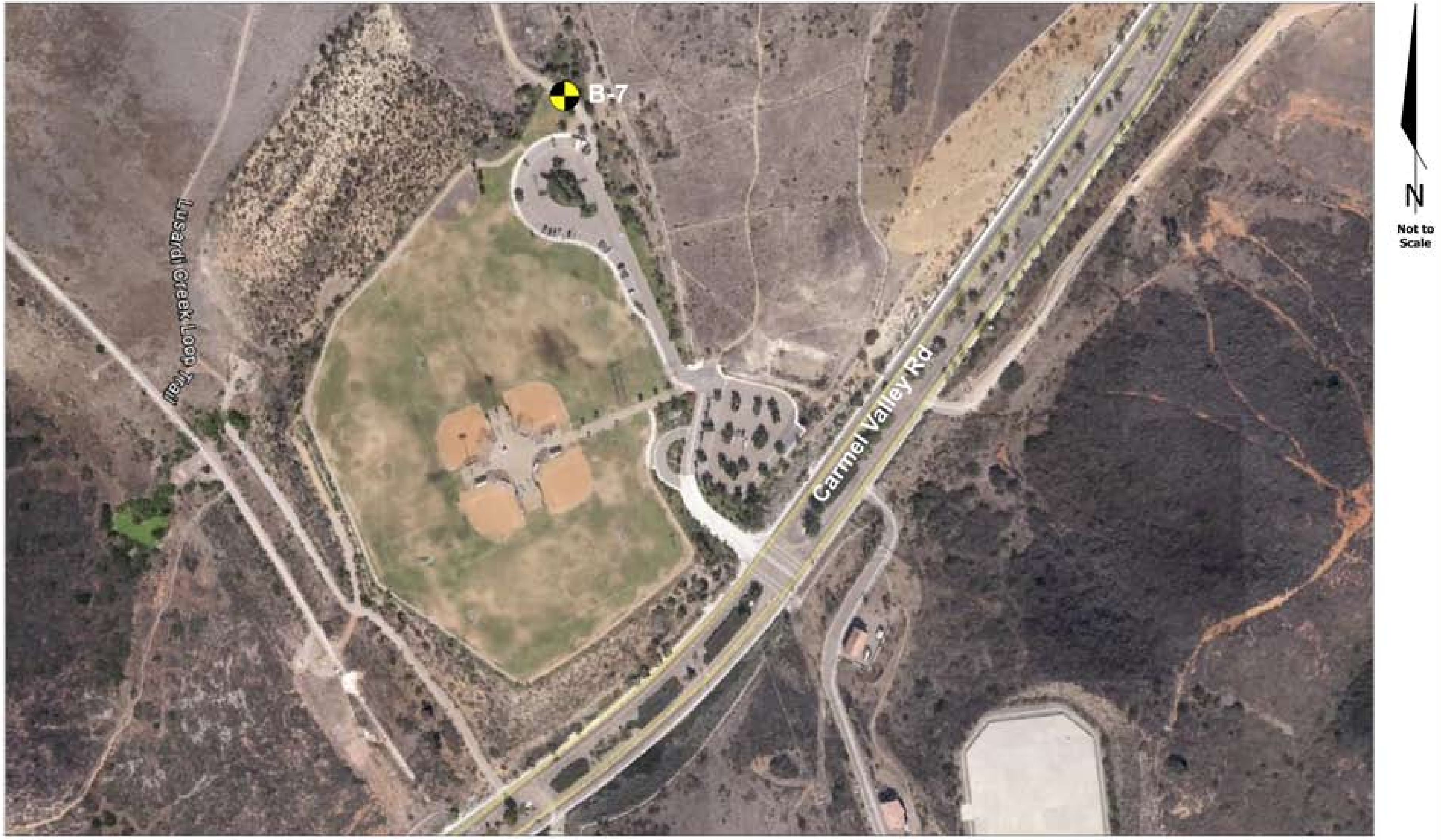
Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 13**



References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 14**

References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 15**

References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 16**

References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 17**

References: Google EARTH 2014

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Legend

Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 18**

References: Google EARTH 2014

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Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: 19**

References: Google EARTH 2014

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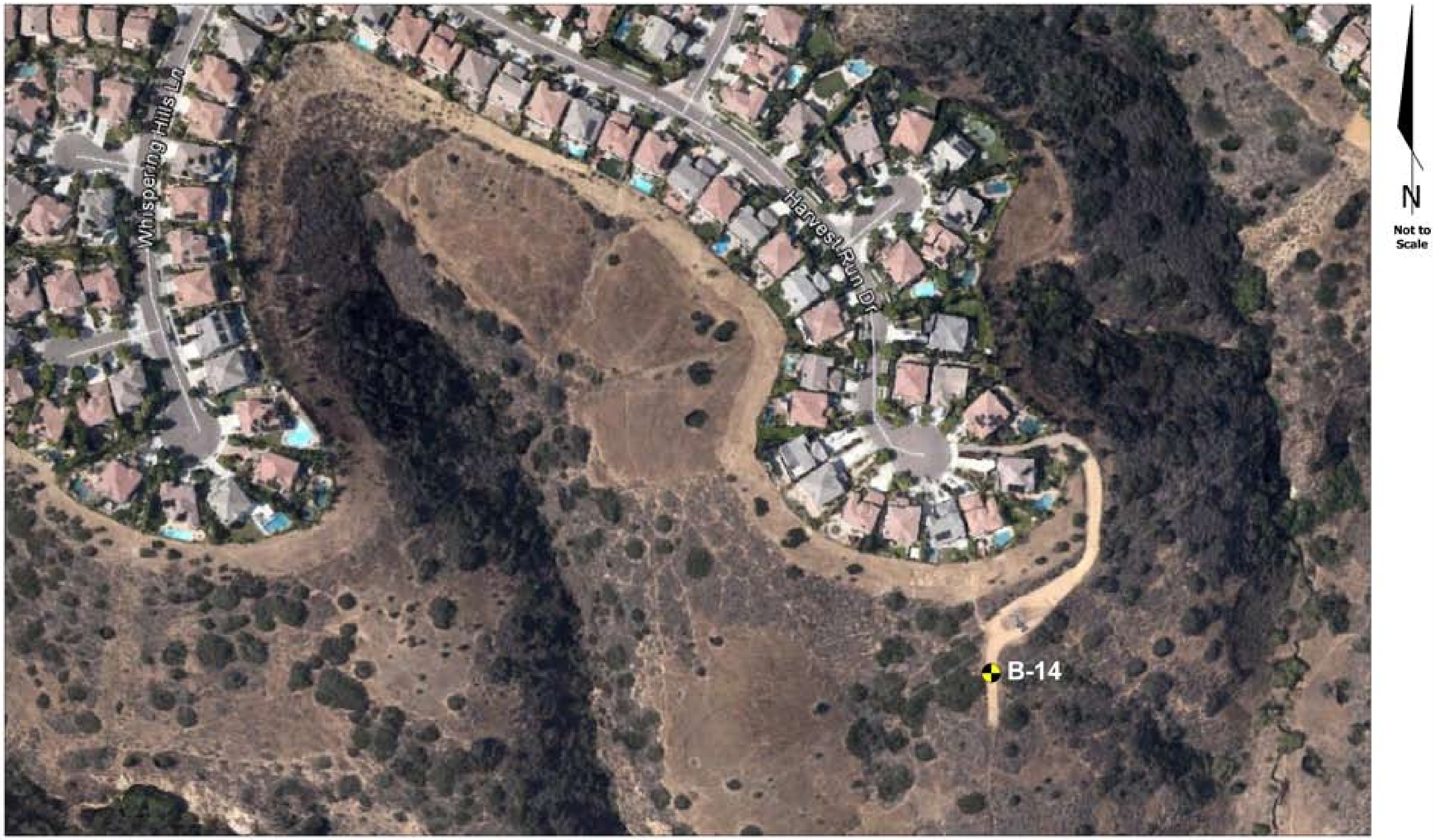
Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 20**



References: Google EARTH 2014

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Legend

- Boring Location (Approx.)
- Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 21**

References: Google EARTH 2014

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Legend

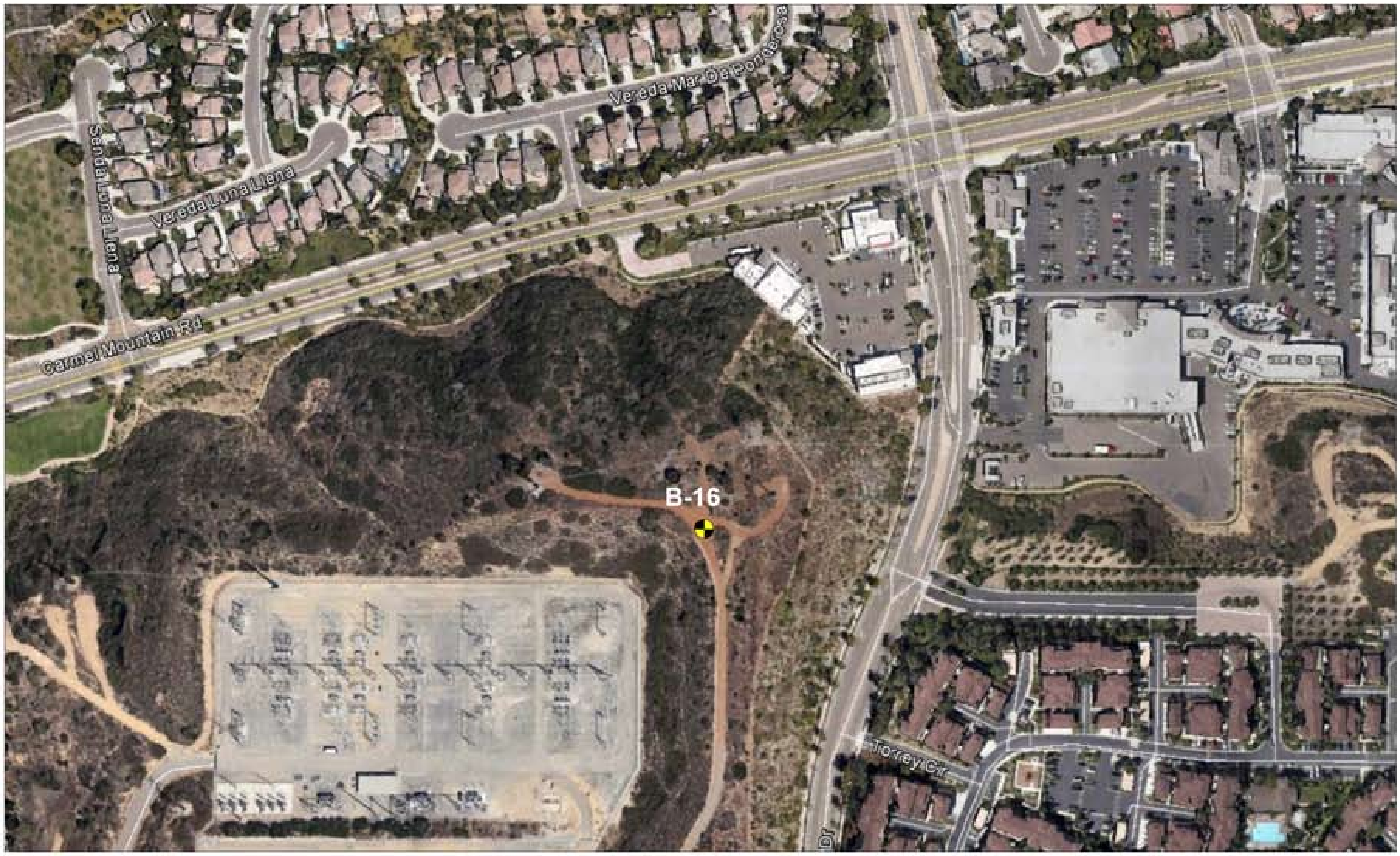
Boring Location (Approx.)

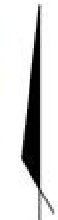
Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 22**





References: Google EARTH 2014

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Legend

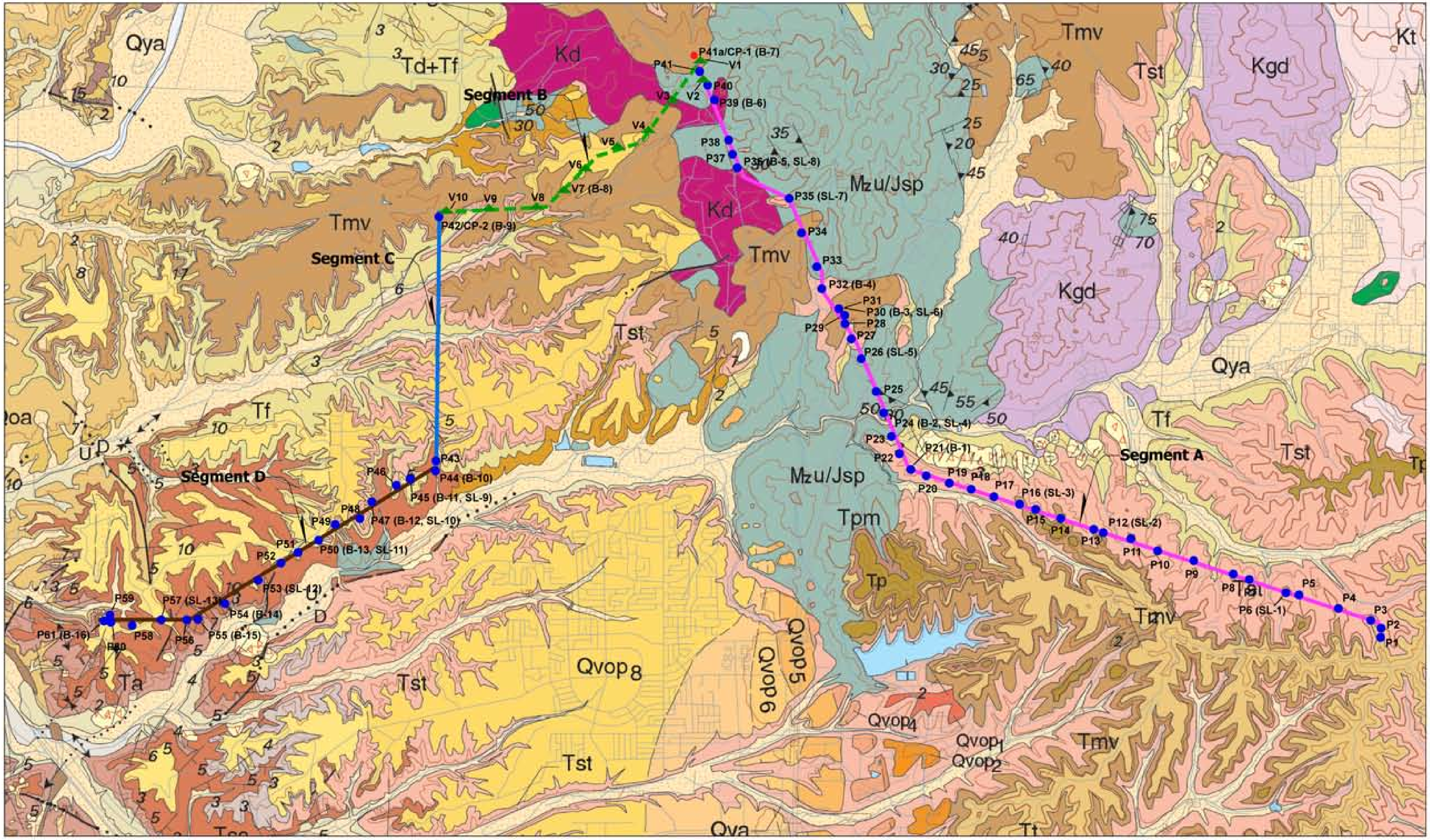
Boring Location (Approx.)

Seismic Line Location (Approx.)

Plot Plan

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 23**



References: Geologic Map of the San Diego 30' x 60' Quadrangle, California, 2008

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Legend

- Proposed 230 kV Standard Pole
- Proposed 230 kV Underground Vaults
- Proposed Cable Pole
- (SL-13) Seismic line location
- (B-16) Boring location
- Segment A - (8.3 miles)
- Segment B - (2.8 miles)
- Segment C - (2.2 miles)
- Segment D - (3.3 miles)

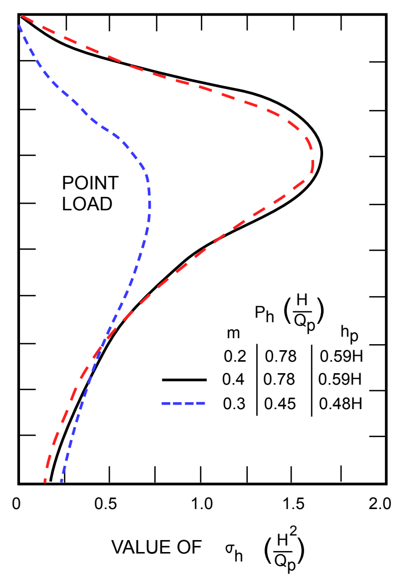
Geologic Unit

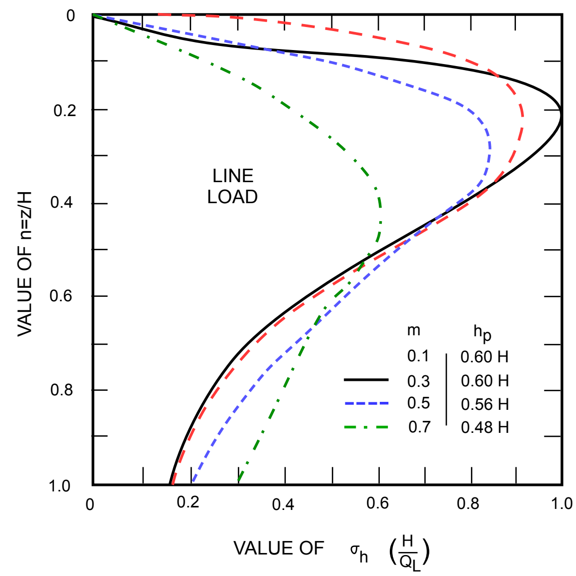
Kd	Granitic Rock, undivided (mid-Cretaceous)
MzU/Jsp	Santiago Peak Volcanics (Jurassic)
Tf	Friars Formation (middle Eocene)
Tmv	Mission Valley Formation (middle Eocene)
Tsc	Scripps Formation (middle Eocene)
Tst	Stadium Conglomerate (middle Eocene)
Qvop$_9$/Tln	Linda Vista Formation (Pleistocene)

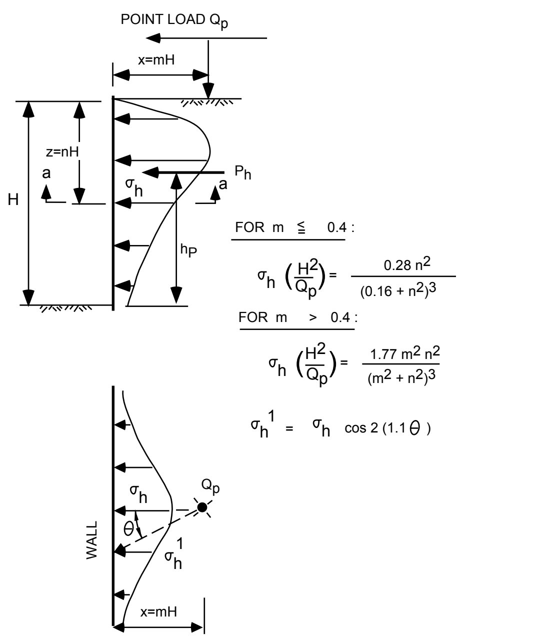
Regional Geology Map

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

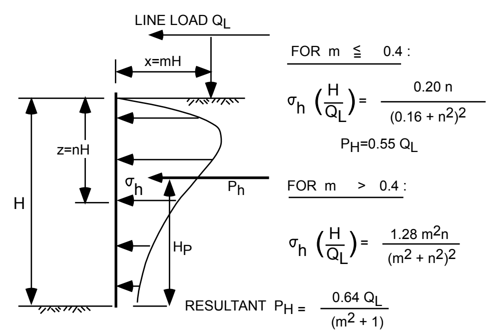
Project No.: T-0126-G | **Figure No.: 24**







SECTION a ~a
PRESSURE FROM POINT LOAD Q_p
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)



PRESSURE FROM LINE LOAD Q_L
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

Reference: Navfac, DM 7.02, Chapter 3, Analysis of Walls and Retaining Structures, Figure 11, Horizontal Pressures on Rigid Wall from Surface Loads, pg. 7.2.74, September, 1986.

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Lateral Surcharge Loads

SDGE&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: 25**

APPENDIX A

Seismic Refraction Survey Profiles

Seismic Refraction Survey

Thirteen seismic refraction surveys were performed by TGE at 13 locations within the proposed project alignment (see *Figure 2, Plot Plan*). A brief overview of the seismic refraction survey data acquisition equipment, methodology, and data processing is presented below.

Data Acquisition Equipment

- 24 Channel Seismic Source digital seismic recording system (Seismograph DAQ);
- Approximate 5 to 10 foot geophone interval cable;
- Geophone "group array": the use of a linear spread of 12 geophone sensor channels (Geophones: 12, 10 Hertz geophones);
- Sledge hammer.

Survey Methodology

The seismic refraction method uses first-arrival times of refracted P-waves to estimate the thickness and seismic velocities of subsurface geologic layers.

Seismic P-waves generated at the surface, using a sledge hammer and plate, are refracted at boundaries between different geologic contacts separating materials of contrasting velocities. These refracted seismic waves are detected by a series of surface vertical component geophones, and recorded with a 24-Bit Seismic Source DAQ Link II seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information of the subsurface materials.

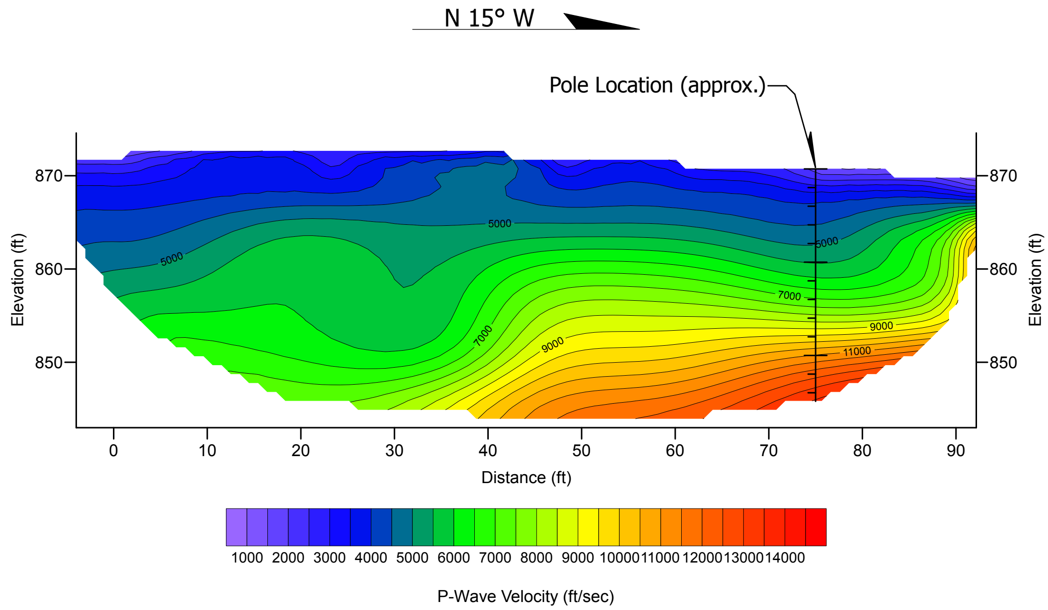
The refraction method requires that the subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones and outcrops, can also result in the misinterpretation of subsurface material conditions.

Data Processing

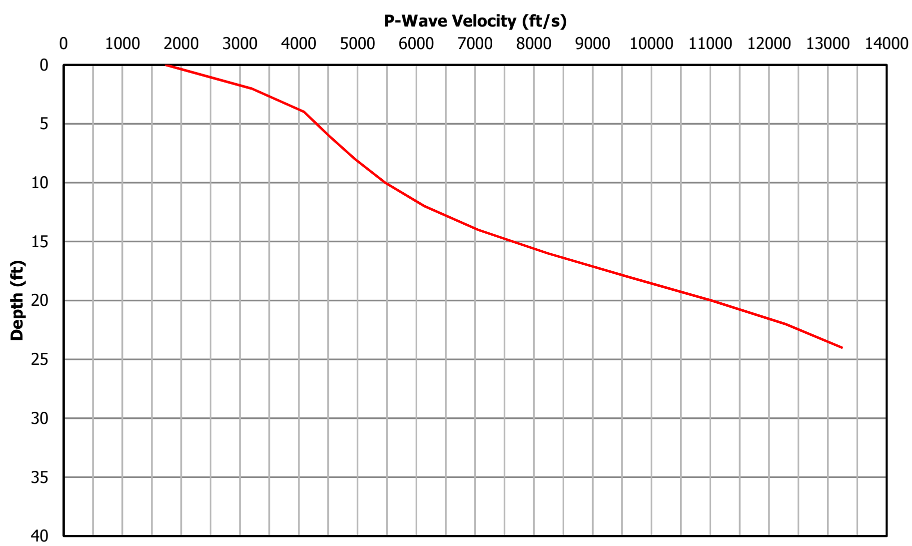
SeisOpt @2D was used to map the subsurface P-wave velocity structure characterized by strong lateral velocity variations. The program was used to generate a 2 dimensional map of subsurface velocity structure using first-arrival picks from recorded seismic data created from an active seismic source. The subsurface velocity structures of the seismic refraction lines are depicted on the figures within this appendix.

The values of the subsurface velocity are then used to determine the geotechnical parameters and site classification of the soil in accordance with the California Building Code (CBC).

Seismic Refraction Profile



Pole Site V_p Profile



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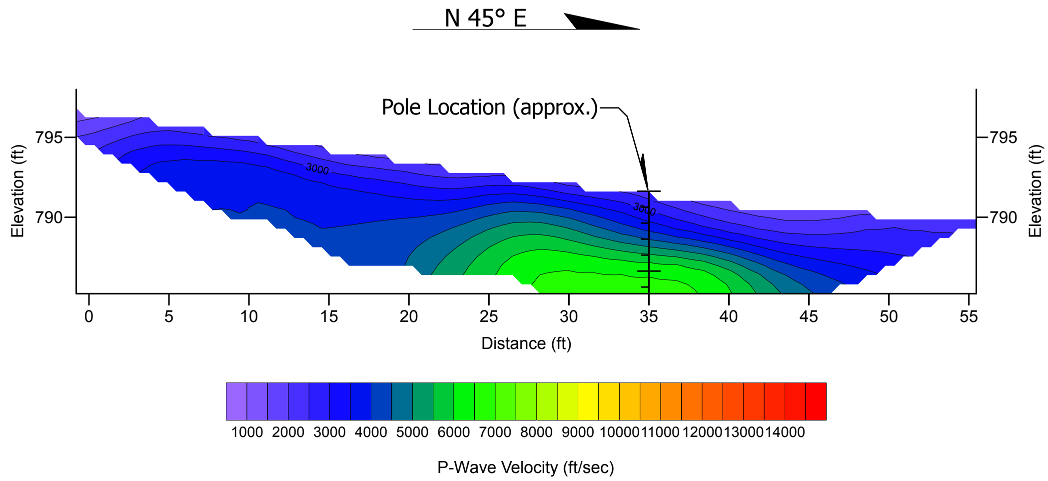
SL-1 (P-6)

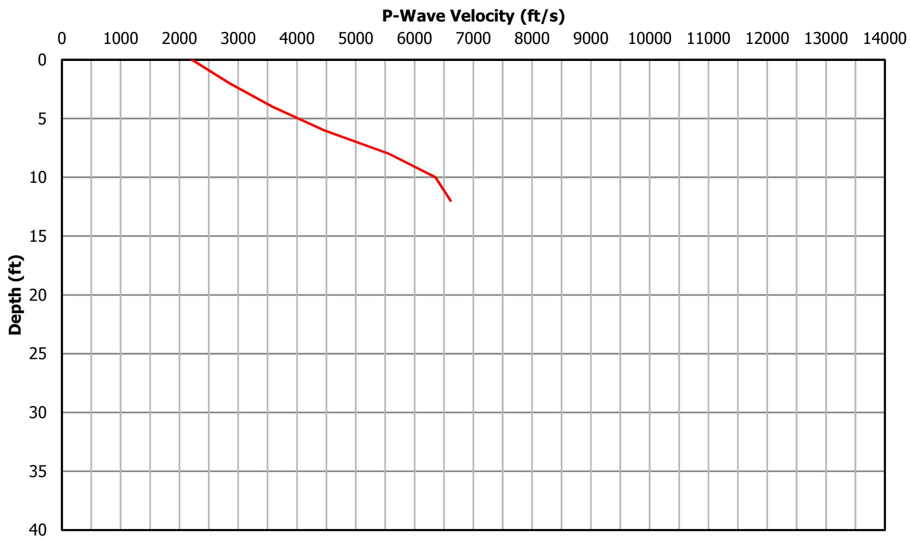
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: A-1**

Seismic Refraction Profile



Pole Site V_p Profile



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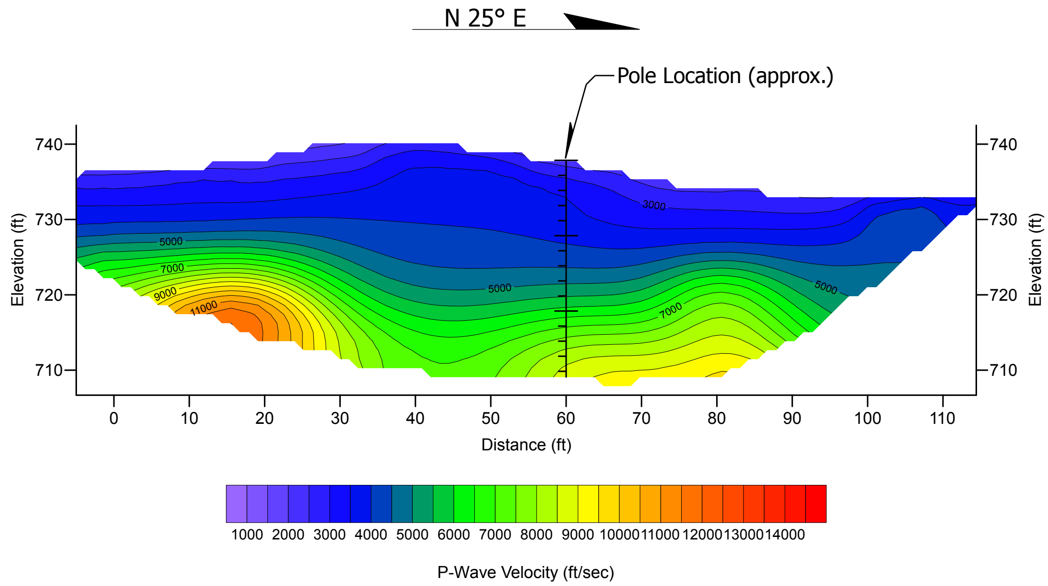
SL-2 (P-12)

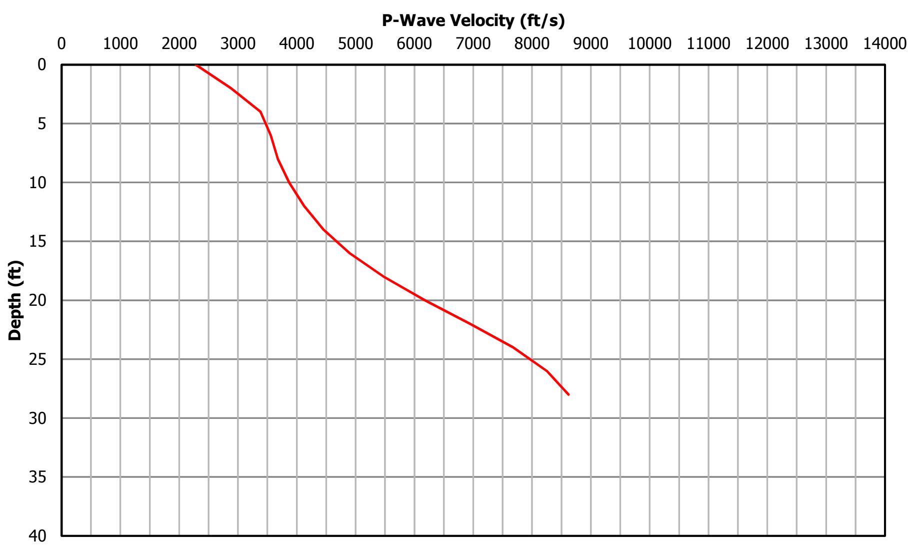
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-2**

Seismic Refraction Profile



Pole Site V_p Profile



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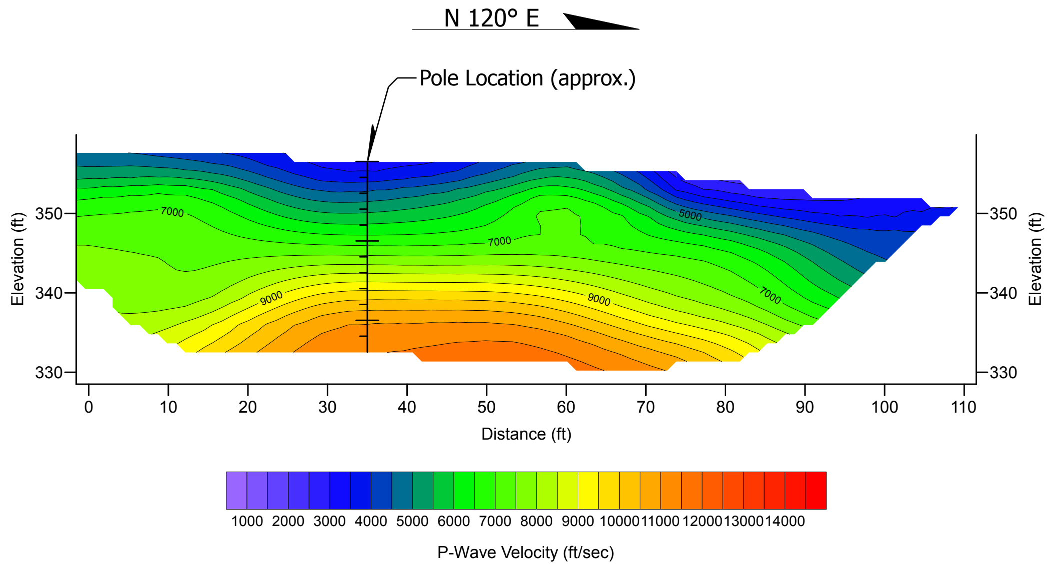
SL-3 (P-16)

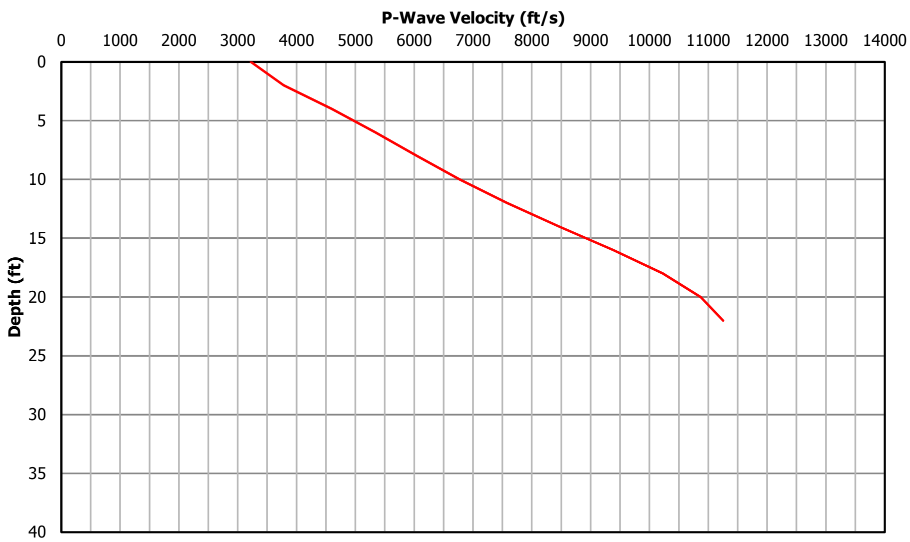
SDG&E 230kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-3**

Seismic Refraction Profile



Pole Site V_p Profile



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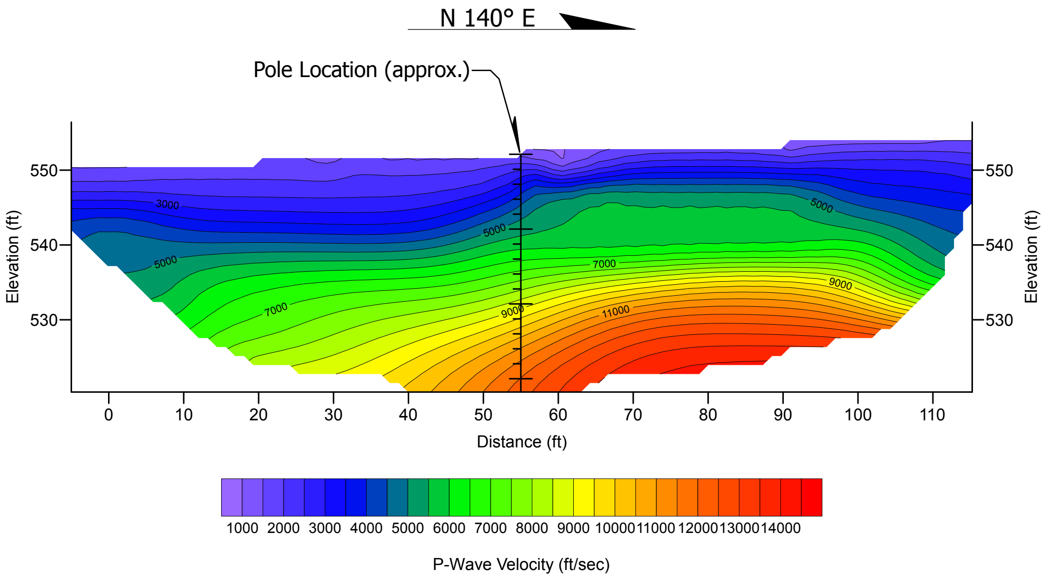
SL-4 (P-24)

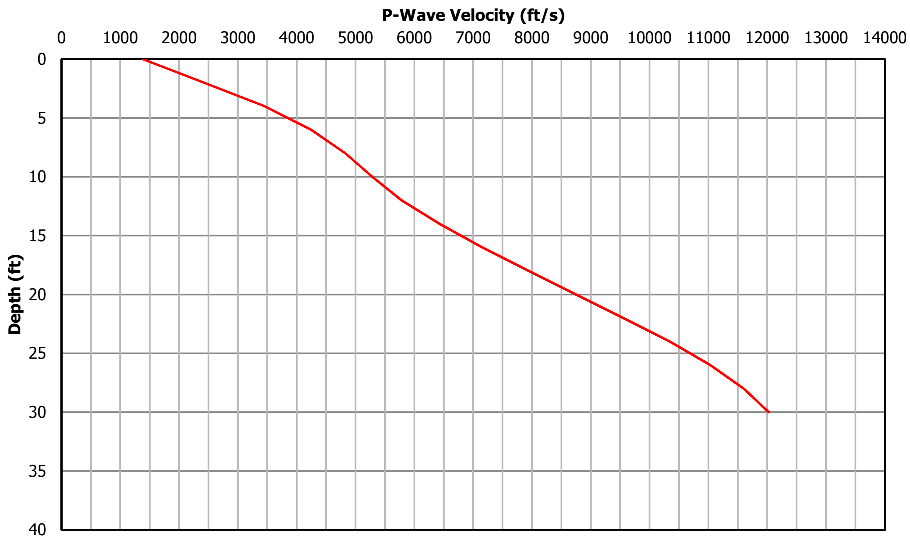
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-4**

Seismic Refraction Profile



Pole Site V_p Profile



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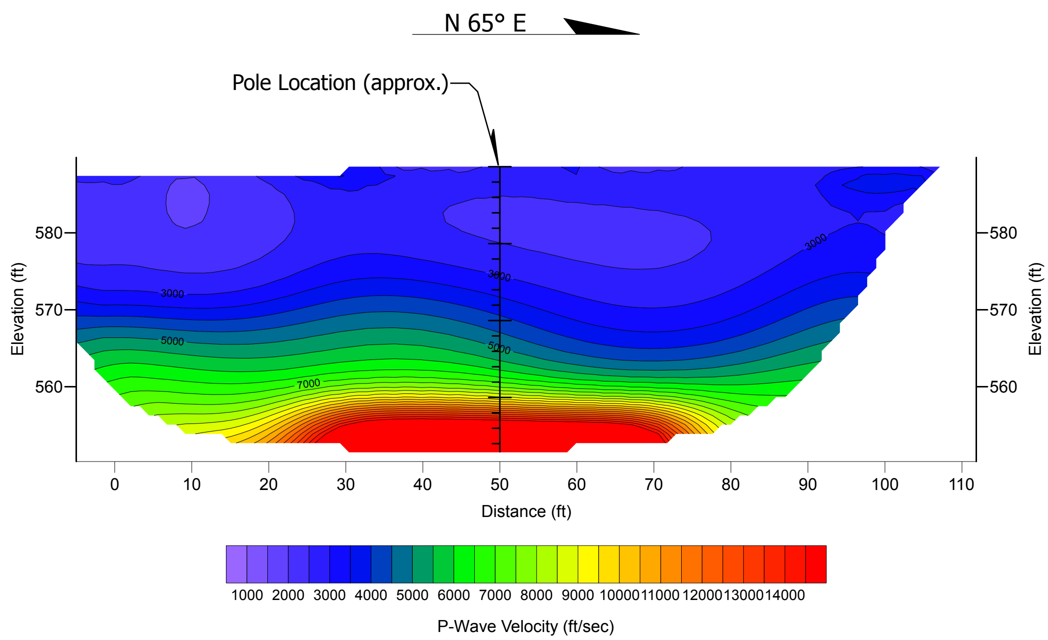
SL-5 (P-26)

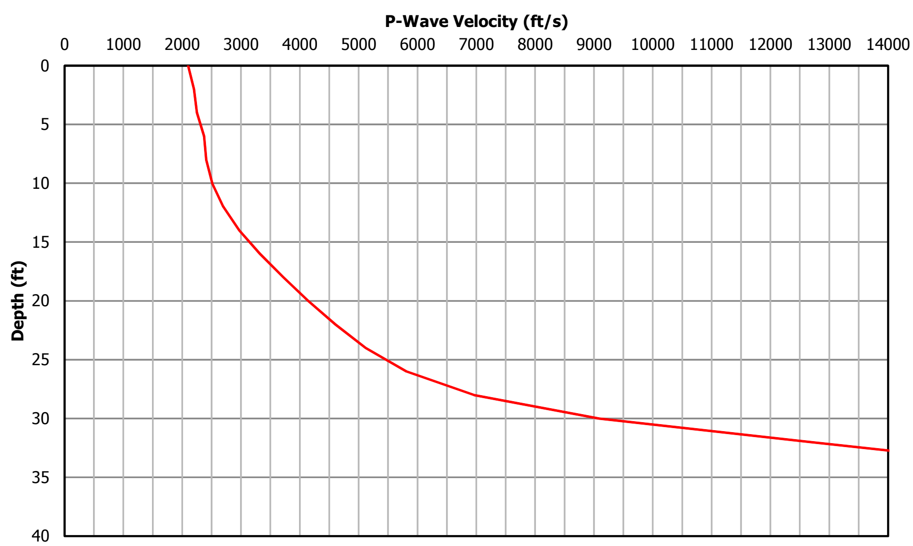
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-5**

Seismic Refraction Profile



Pole Site V_p Profile



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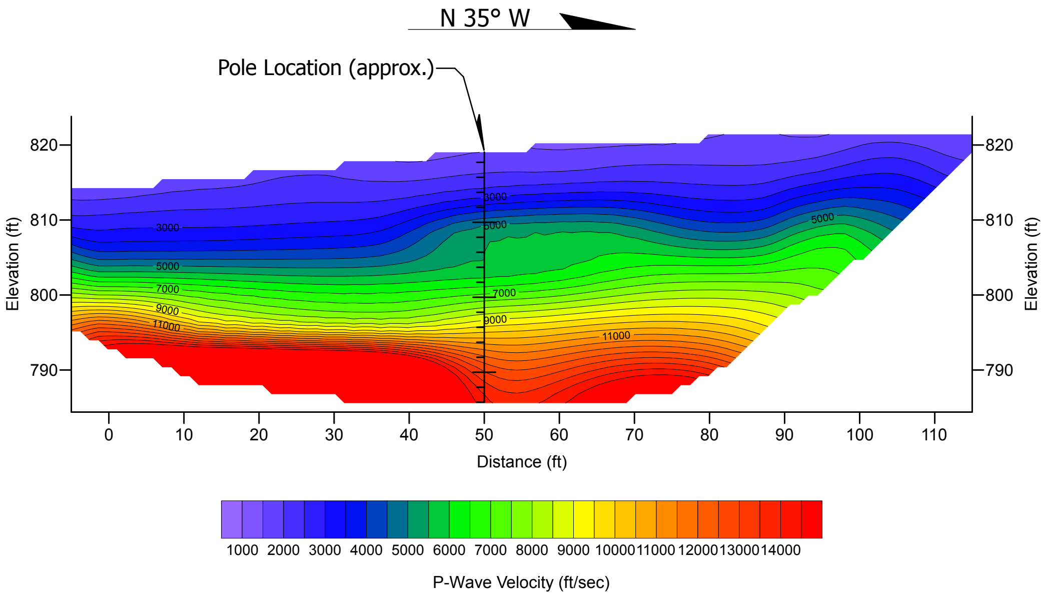
SL-6 (P-30)

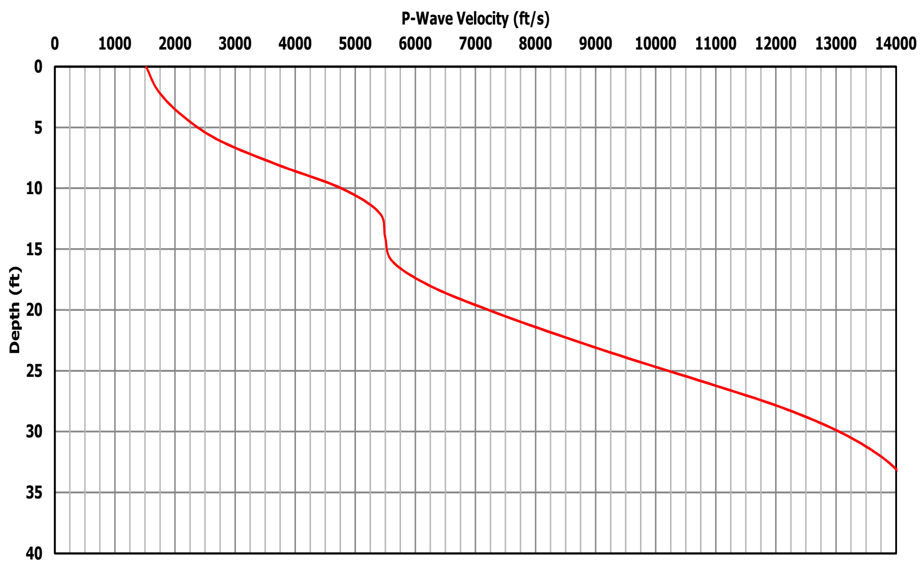
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-6**

Seismic Refraction Profile



Pole Site V_p Profile



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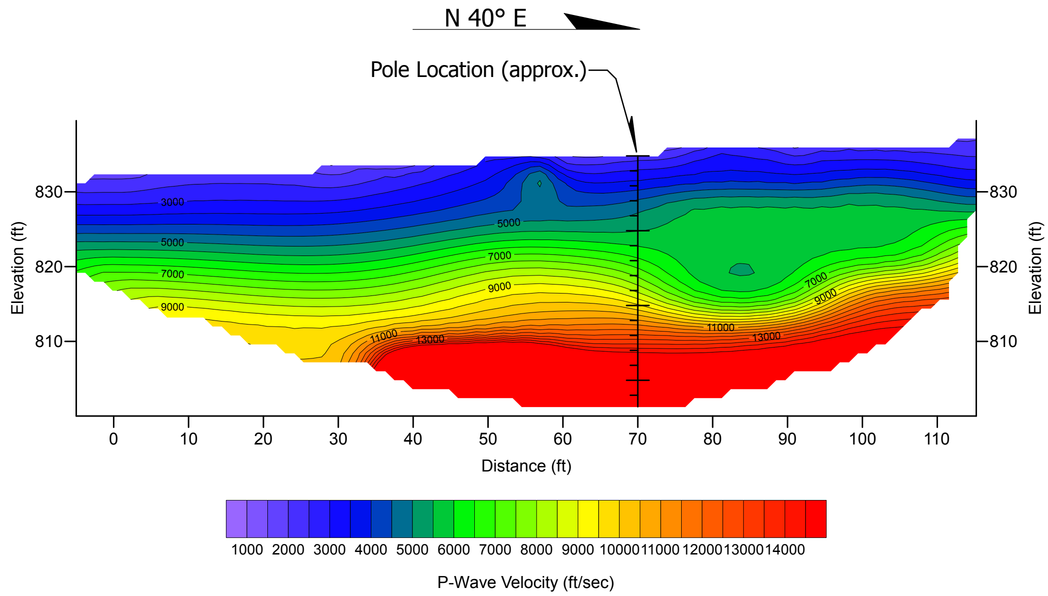
SL-7 (P-35)

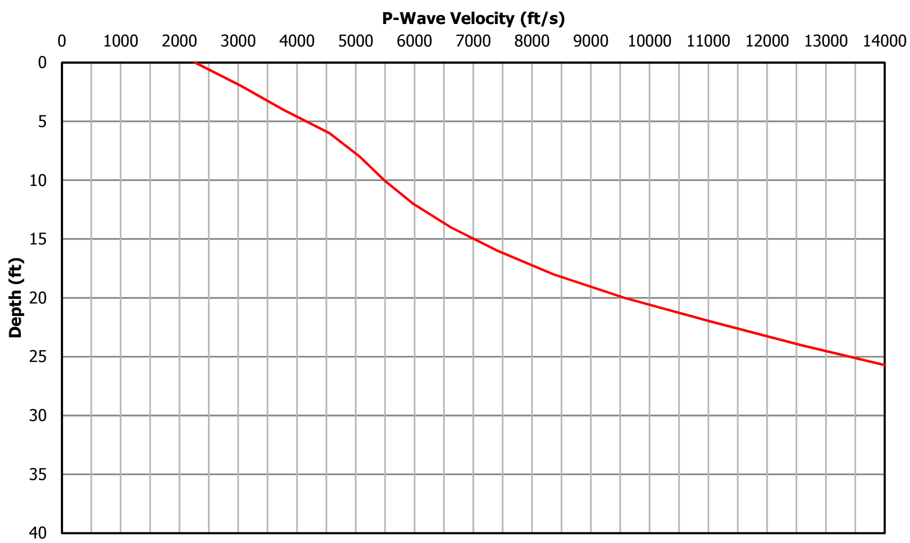
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-7**

Seismic Refraction Profile



Pole Site V_p Profile



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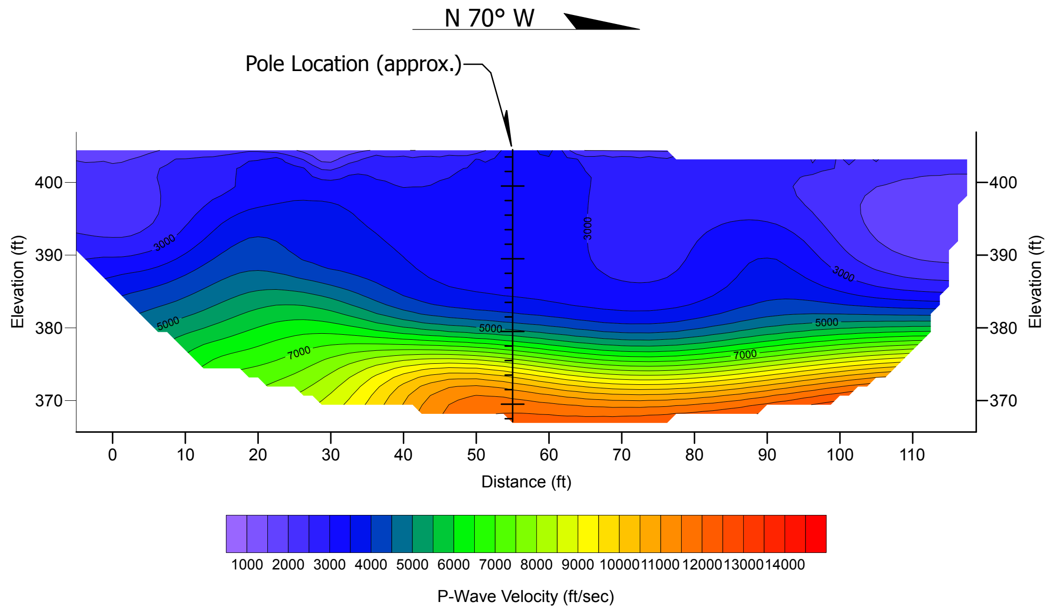
SL-8 (P-36)

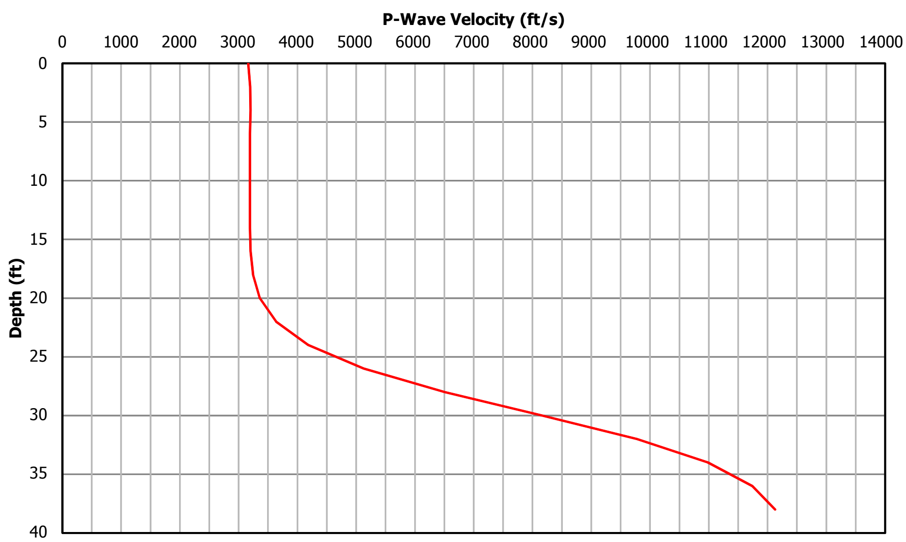
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: A-8**

Seismic Refraction Profile



Pole Site V_p Profile



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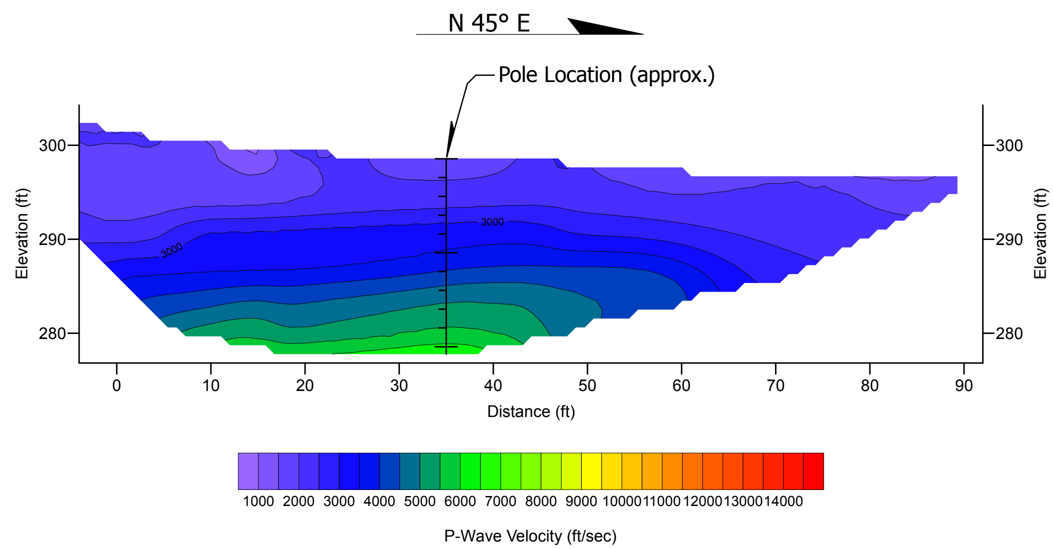
SL-9 (P-45)

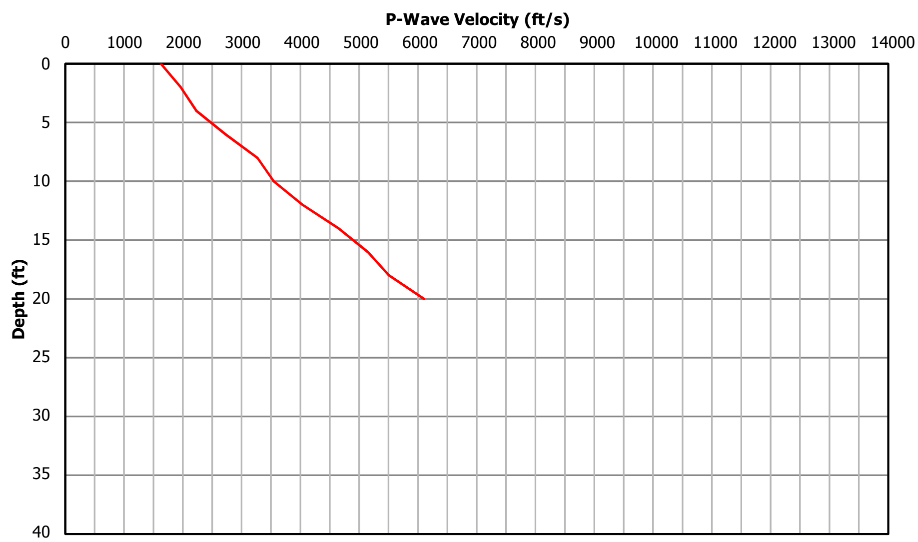
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: A-9**

Seismic Refraction Profile



Pole Site V_p Profile



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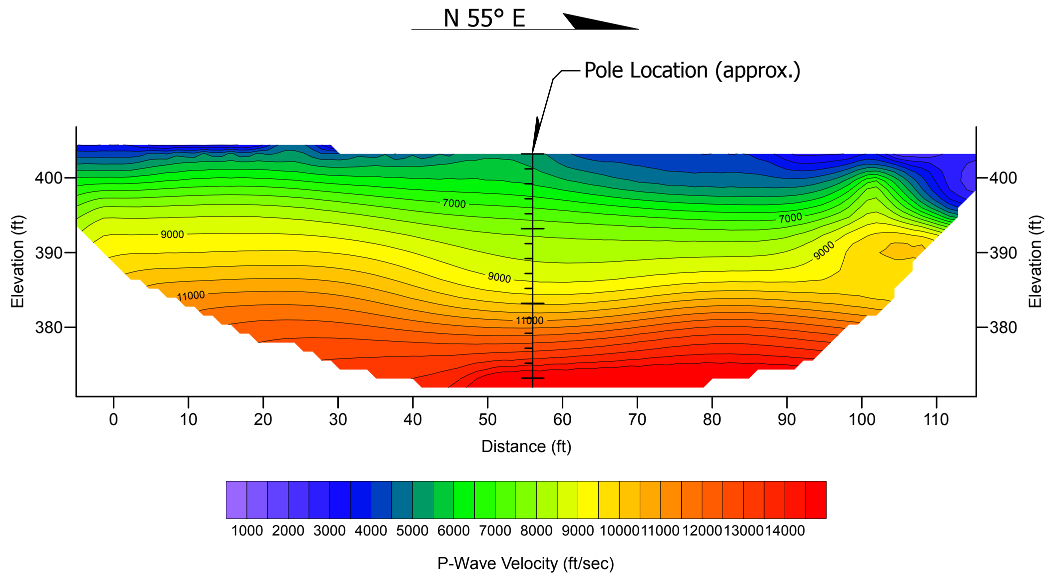
SL-10 (P-47)

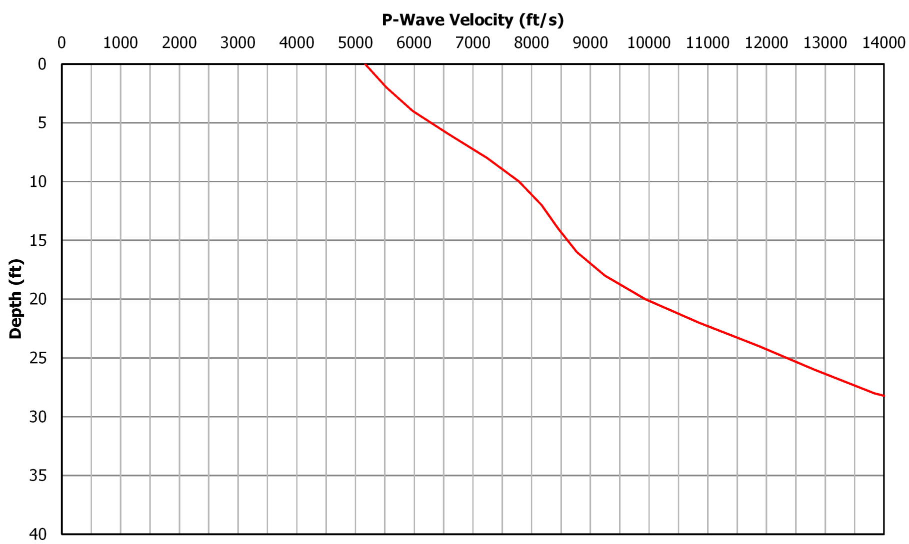
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-10**

Seismic Refraction Profile



Pole Site V_p Profile



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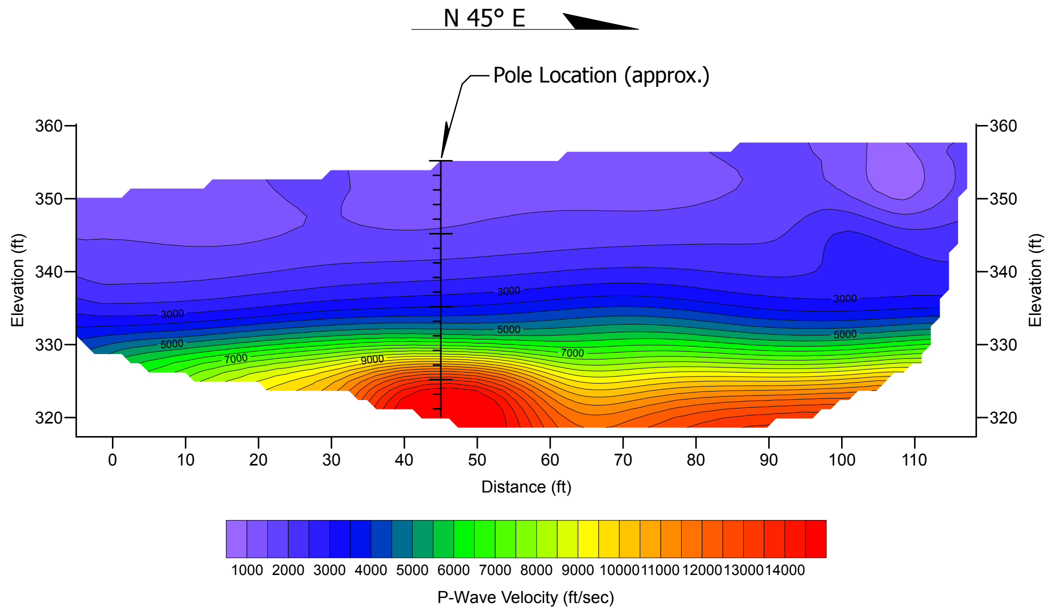
SL-11 (P-50)

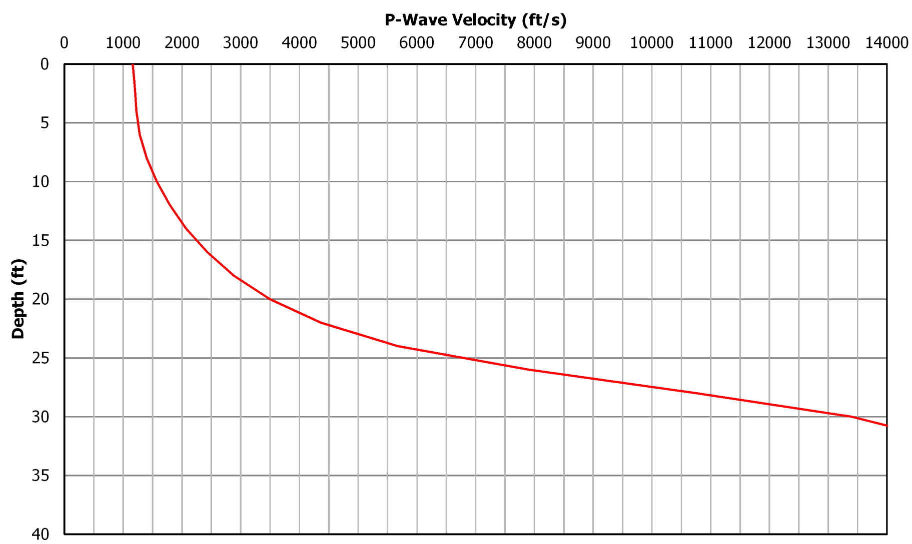
SDG&E 230kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	Figure No.: A-11

Seismic Refraction Profile



Pole Site V_p Profile



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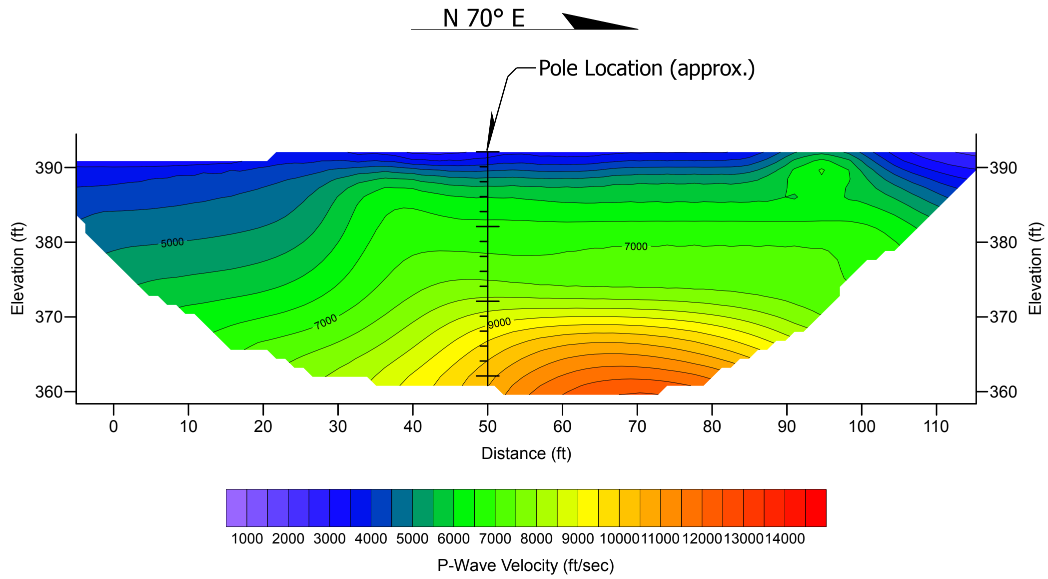
SL-12 (P-53)

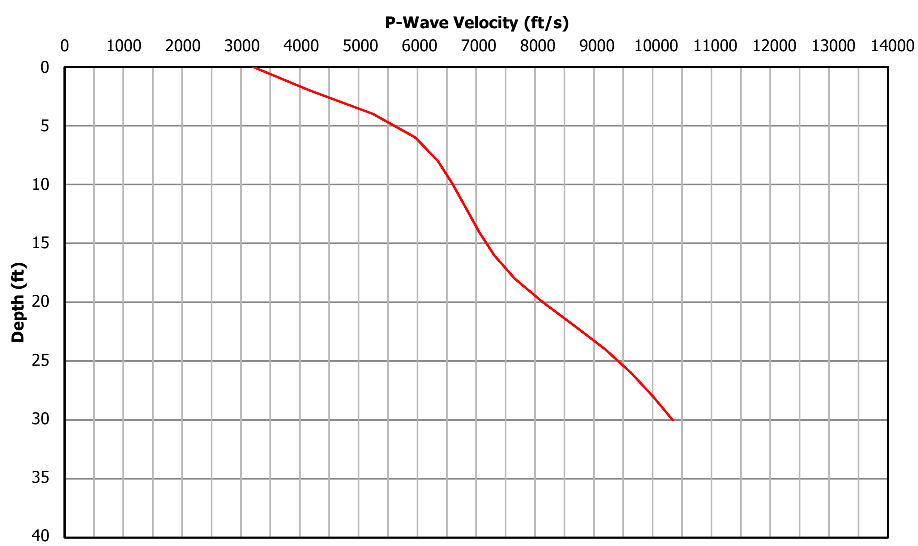
SDG&E 230kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-12**

Seismic Refraction Profile



Pole Site V_p Profile



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SL-13 (P-57)

SDG&E 230kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: A-13**

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APPENDIX B

Exploratory Boring Logs

FIELD TESTING AND SAMPLING

The Standard Penetration Test (SPT)
The SPT were performed in accordance with test method ASTM D 1586-99. The SPT sampler was typically driven into the ground 12 to 18-inches with a 140-pound hammer free falling from a height of 30-inches. Blow counts were recorded for every 6-inches of penetration. The N-values were determined for the SPT Sampler by taking the sum for the last two 6-inch intervals of the 18-inch sampler penetration. The split-barrel sampler has an external diameter of 2-inches and an unlined internal diameter of 1-3/8-inches. The samples of earth materials collected in the sampler were classified in the field, bagged, sealed and transported to the laboratory for testing.

The California Sampler (Ring)
The Ring sampler was driven into the ground in accordance with test method ASTM D 3550-84. The sampler, with an external diameter of 3.0-inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler was driven into the ground 12 or 18-inches with a 140-pound hammer free falling from a height of 30-inches. Blow counts were recorded for every 6-inches of penetration. The N-values were estimated for the California Sampler by multiplying the sum of the blow counts for the last two 6-inch intervals of the 18-inch sampler penetration by a factor of 0.6 (Reference: Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction in California, G.R. Martin and M. Lew, 1999). The samples were removed from the sample barrel in the brass rings, sealed and transported to the laboratory for testing.

Rock Core Driling
Rock coring was performed in accordance with test method ASTM D2113-08. Drilling was accomplished by circulating a drilling medium through the drill bit while rotating and lowering or advancing the string of drill rods as downward force is applied to a cutting bit. The core was recovered by means of rotating the core barrel equipped with a coring bit into the rock. The 2-inch drilled core was carefully collected in the core barrel as the drilling progressed and was retrieved once the barrel was full. Samples were logged, packaged, and shipped for testing.

Large Bulk Samples
Samples of representative earth materials over 20 pounds in weight were collected from the auger cuttings, placed in bags, sealed and transported to the laboratory for testing.

Small Bulk Samples
Samples less than 5-pounds in weight of representative earth materials were collected from the split spoon sampler, hand digging or exploratory cuttings. These samples were used for determining natural moisture content and classification indices.

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LOG SYMBOLS:

Bulk/Bag sample

Modified California sampler
(3 inch outside diameter)

Standard penetration
Split spoon sampler
(2 inch outside diameter)

Shelby tube

Rock Core Drilling
(2-inch diameter)

Water level
(level after completion)

Water level
(level where first encountered)

Abbreviations:

SA - (38% SAND analysis (percent
passing #200 sieve)
WA - (38%) - One point grain size analysis
(Percent passing #200 sieve)
PI - Plasticity index
LL - Liquid limit
DS - Direct shear test
'R' - R-value test
CORR - Corrosivity test
EI - UBC expansion index
LC - Laboratory compaction test

General Notes:

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, unified soil classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

Consistency criteria based on field tests

Granular Soils

Relative density	SPT* (# blows/ft)	Relative density (%)
Very Loose	<4	0 - 15
Loose	4 - 10	15 - 35
Medium Dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very dense	>50	85 - 100

Cohesive Soils

		Torvane	Pocket** penetrometer
Consistency	SPT (# blows/ft)	Undrained shear strength (tsf)	Unconfined compressive strength
Very soft	<2	<0.13	<0.25
Soft	2 - 4	0.13 - 0.25	0.25 - 0.5
Firm	4 - 8	0.25 - 0.5	0.5 - 1.0
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0
Very stiff	15 - 30	1.0 - 2.0	2.0 - 4.0
Hard	>30	>2.0	>4.0

* Number of blows of 140 pounds hammer falling 30 inches to drive a 2 inch O.D. (1 3/8" I.D.) split barrel samler (ASTM - D 1586-99 standard penetration test)

** Unconfined compressive strength in Tons/ft^2. Read from pocket penetrometer

Moisture content

Description	Field test
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

Cementation

Description	Field test
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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Log Legend

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-2**

DISCONTINUITY DESCRIPTORS

a	Dip of discontinuity, measured relative to a plane normal to the core axis.											
b	Discontinuity Type	F	J	Sh	Fo	V	B					
		Fault	Joint	Shear	Foliation	Vein	Bedding					
c	Aperture (inches)	W	Mw	N	Vn	T						
		Wide (0.5-2.0)	Moderately Wide (0.1-0.5)	Narrow (0.05-0.1)	Very Narrow (<0.05)	Tight (0)						
d	Type of infilling	Cl	Ca	Ch	Fe	Gy	H	Mn	No	Py	Qz	Sd
		Clay	Calcite	Chlorite	Iron Oxide	Gypsum	Healed	Manganese Oxide	None	Pyrite	Quartz	Sand
e	Amount of infilling	Su	Sp	Pa	Fi	N						
		Surface Stain	Spotty	Partially Filled	Filled	None						
f	Surface Shape of Joint	Pl	Wa	St	Ir							
		Planar	Wavy	Stepped	Irregular							
g	Roughness of Surface	Slk	S	Sr	R	Vr						
		Slickensided [surface has smooth, glassy finish with visual evidence of striations]	Smooth [surface appears smooth and feels so to the touch]	Slightly Rough [asperities on the discontinuity surfaces are distinguishable and can be felt	Rough [some ridges and side-angle steps are evident; asperities are clear visible, and discontinuity surface feels very abrasive]	Very Rough [near vertical steps and ridges occur on the discontinuity surface]						

ROCK WEATHERING/ALTERATION

Description	Recognition
Residual Soil	Original minerals of rock have been entirely decomposed to secondary minerals, and original rock fabric is not apparent; material can be easily broken by hand
Completely Weathered/Altered	Original minerals of rock have been almost entirely decomposed to secondary minerals, although original fabric may be intact; material can be granulated by hand
Highly Weathered/Altered	More than half of the rock is decomposed; rock is weakened so that a minimum 2-inch-diameter sample can be broken readily by hand across rock fabric
Moderately Weathered/Altered	Rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 2-inch-diameter sample cannot be broken readily by hand across rock fabric
Slightly Weathered/Altered	Rock is slightly discolored, but not noticeably lower in strength than fresh rock
Fresh/Unweathered	Rock shows no discoloration, loss of strength, or other effect of weathering/alteration

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very Hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blows or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure; breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Moderately Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

References: CALTRANS Soil and Rock Logging, Classification, and Presentation Manual, 2010 Edition

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Rock Coring Legend

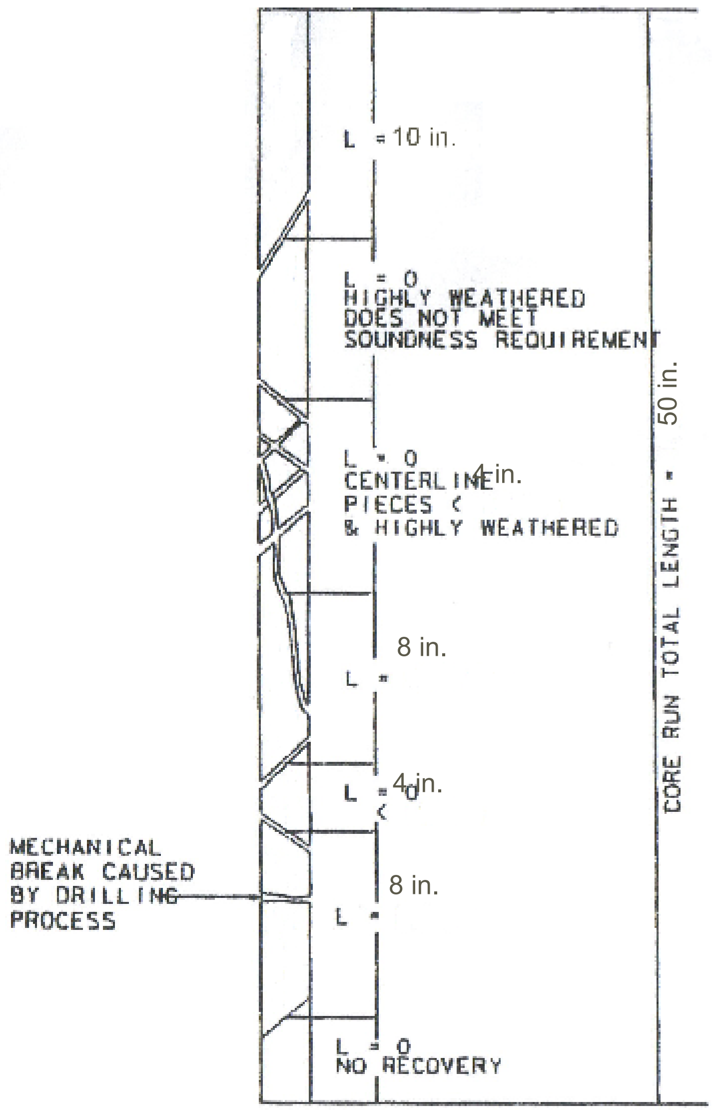
SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-3**

CORE RECOVERY CALCULATION (%)
$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$

RQD CALCULATION (%)
$\frac{\Sigma \text{Length of intact core pieces > 4 in.}}{\text{Total length of core run (in.)}} \times 100$
Example:
$RQD = \frac{10 + 8 + 8}{50} \times 100 = 52\%$ (FAIR)

RQD (ROCK QUALITY DESIGNATION)	DESCRIPTION OF ROCK QUALITY
0 - 25 %	Very Poor
25 - 50 %	Poor
50 - 75 %	Fair
75 - 90 %	Good
90 - 100 %	Excellent



RELATIVE STRENGTH OF INTACT ROCK	
Descriptor	**Uniaxial Compressive Strength (psi)**
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

FRACTURE DENSITY	
Descriptor	**Criteria**
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft.
Slightly Fractured	Lengths from 1 to 3 ft., few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft., with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

References: CALTRANS Soil and Rock Logging, Classification, and Presentation Manual, 2010 Edition; Deere and Deere, 1989

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Rock Coring Legend

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

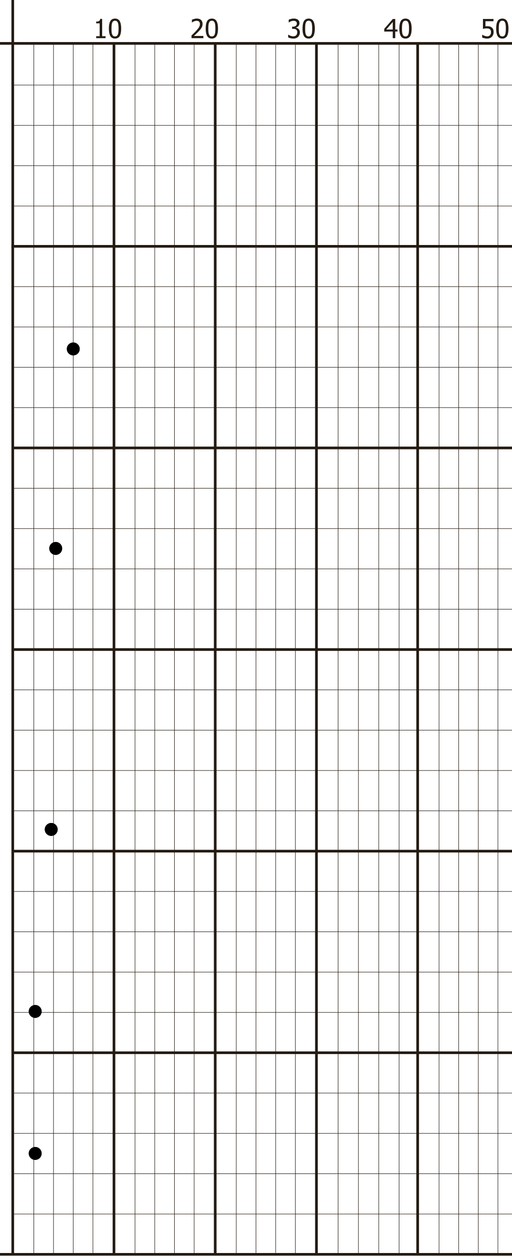
Project No.: T-0126-G | **Figure No.: B-4**

Boring Log B-1

Date Drilled: 12-8-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 685 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 50.0 Feet
Drilling Method: Hollow Stem Auger/Air Percussion	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Stadium Conglomerate (Tst) - Silty SAND with Abundance of Gravel and Cobble: Hard Drilling	NA	Brown	Very Dense	Damp		
				Switched to Air Percussion Drilling						
5									3:02	
									7:03	
10										
									9:40	
15									7:36	
									7:48	
20										
									12:20	
25										
									8:51	
30										

Moisture Content (% Dry Weight)



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B-1 (P-21)

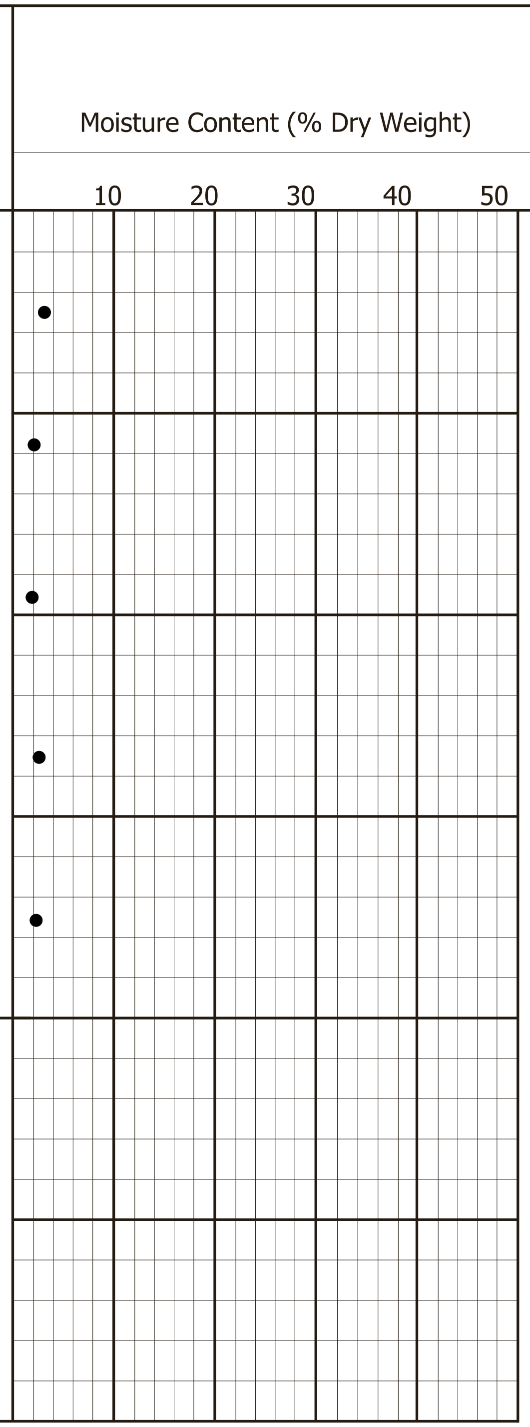
SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-5**

Boring Log B-1

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Stadium Conglomerate (Tst, cont.) - Silty SAND with Abundance of Gravel and Cobble: Hard Drilling	NA	Brown	Very Dense	Damp		
	■								7:10	
35	■								4:27	
40	■								5:25	
	■								10:10	
45										
	■								8:48	
50				**End of Boring at 50.0 Feet**						

Notes:
1. Groundwater not encountered.
2. Switched to air percussion drilling at 4 Feet.



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B-1 (P-21)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-6**

Boring Log B-2

Date Drilled: 12-11-2014	**Logged By:** Andres Lopez, EIT
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 416 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 23.5 Feet
Drilling Method: Hollow Stem Auger/Rock Coring	**Groundwater Elevation During Drilling:** Not Identified

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	Time (Min:Sec)	Run Number	Recovery %	RQD	Compressive Strength (psi)	Fracture No.	Fracture Drawing	Discontinuity Description
0–1.5				**Santiago Peak Volcanics (Jsp) -** Decomposed Metagranitic-Granitic Rock, Light Brown, Fine Grained, Dry								
				Switched to Coring Becomes Moderately Weathered, Strong Rock, Hard, Moderately Fractured, Some Fe_2O_3 Staining	25:02	1	82	25		1 2 3 4 5	NR	1: 10°J/N/Fe+Sd/Sp/Wa/R 2: 40°J/N/Fe+Sd/Sp/Wa/Sr 3: 75°J/N/Fe/Su/Pl/Sr 4: 30°J/N/Fe+Sd/Sp/Wa/Sr-R 5: 10°J/Vn/Sd/Sp/Wa/R
5				Becomes Slightly Weathered, Slightly Fractured, Very Strong Rock	26:30	2	96	60	19,569	1 2		1: 80°J/Vn/Fe/Sp/Pl/Sr 2: 18°J/N/Fe+Sd/Sp/Wa/Sr
10				Becomes Moderately to Highly Weathered, Increase in Fe_2O_3 Staining and MnO Staining, Moderately Fractured	31:27	3	98	33		1–11		1: 8°J/N/Fe+Mn/Pa/Wa/R 2: 85°J/N/Fe+Mn/Pa/Pl/Sr 3: 40°J/Vn/Fe+Mn/Pa/Wa/R 4: 15°J/Vn/Fe/Sp/Wa/R 5: 80°J/N/Fe/Sp/Pl/Sr 6: 55°J/N/Fe/Sp/Pl/Sr 7: 50°J/N/Fe/Sp/Wa/R 8: 17°J/N/Fe+Sd/Sp/Wa/R 9: 88°Sh/N/Fe/Sp/Wa/Sr 10: 8°J/Vn/Fe+Sd/Sp/Wa/Sr 11: 8°J/Vn/Sd+Fe/Sp/Wa/R
15				Clay and Fe_2O_3 Staining, Intensely Fractured, Some Near Vertical Fractures, Strong to Moderately Strong Rock, Moderately Hard to Moderately Soft Rock	20:56	4	100	25	10,444	1–11		1: 40°J/Vn/Fe+Mn/Sp/Wa/Sr 2: 50°J/Vn/Fe+Mn/Sp/Wa/Sr 3: 15°J/N/Fe/Sp/Wa/Sr 4: 12°J/N/Fe/Sp/Wa/R 5: 60°J/Vn/Fe/Sp/Pl/Sr 6: 20°J/Vn/Cl/Sp/Pl/Sr 7: 30°J/Vn/Fe/Sp/Pl/Sr 8: 50°J/N/Fe/Sp/Wa/R 9: 5°J/N/Fe/Sp/Wa/R 10: 30°J/N/Fe/Sp/Wa/Sr 11: 8°J/N/Fe/Sp/Wa/Sr
20					26:10	5	75	0		1–6	NR	1: 10°J/N/Fe/Sp/Wa/Sr 2: 80°J/N/Fe/Sp/Ir/R 3: 8°J/N/Fe+Sd/Sp/Ir/R 4: 8°J/Vn/Fe/Sp/Wa/R 5: 80°J/Vn/Fe+Mn/Sp/Pl/R 6: 8°J/N/Fe+Mn/Sp/Ir/R
				Becomes Highly Weathered, Very Intensely Fractured	8:05	6	40	0		1	NR	1: 8°J/N/Fe/Sp/Wa/R
25				**End of Boring at 23.5 Feet** Notes: 1. Groundwater not identified. 2. Switched to coring at 1.5 Feet.								

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B-2 (P-24)

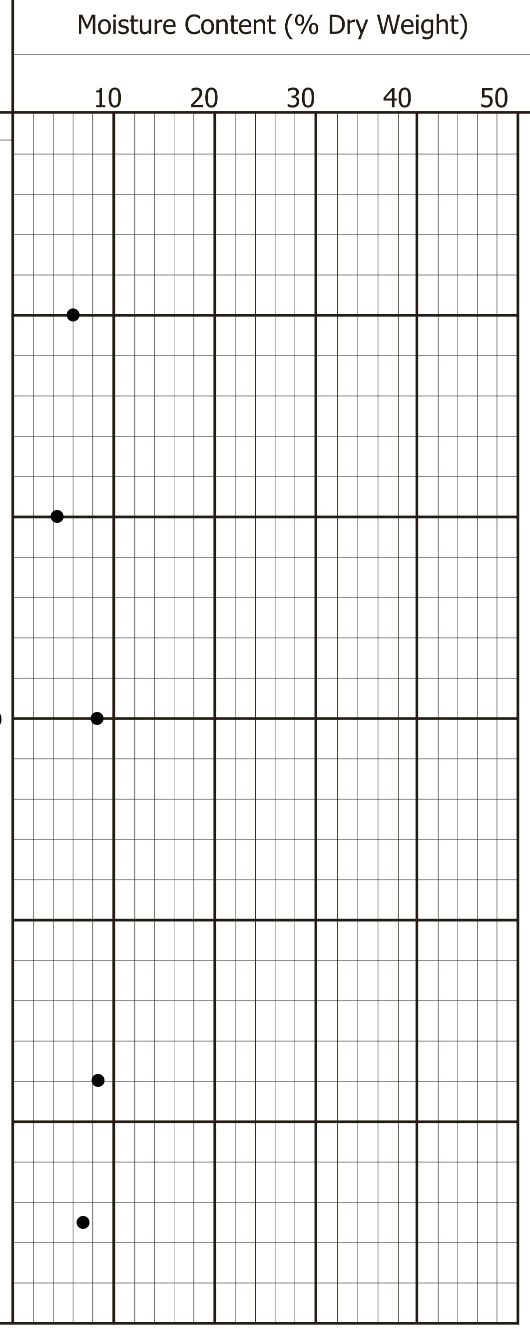
SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-7**

Boring Log B-3

Date Drilled: 12-4-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 589 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 51.5 Feet
Drilling Method: Hollow Stem Auger/Air Percussion	**Groundwater Elevation During Drilling:** 547 - Feet MSL (Approx.)

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				5.5 - Inch Asphalt						
				Artificial Fill (Qaf) - Clayey SAND	SC	Gray Brown	Medium Dense	Damp		
				Mission Valley Formation (Tmv) - Silty SANDSTONE: Fine to Medium Grained, Trace of Fe_2O_3 Staining, Very Friable	NA	Olive Gray	Very Dense			
5		20 37 44	81							
				Gravel Encountered (Hard Drilling)						
10		50+	50+	Clayey SANDSTONE with Gravel up to 1-Inch		Brown				
				Gravel Encountered (Hard Drilling)						
15		32 50+	50+	Silty SANDSTONE with Gravel: Fine to Medium Grained						108.0
				Stadium Conglomerate (Tst) - Silty SANDSTONE						
20		50+	50+	No Recovery Abundance of Gravel and Cobble						
				Switched to Air Percussion Drilling						
				Clayey SANDSTONE with Gravel and Cobble					5:24	
25										
									5:07	
30										



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B-3 (P-30)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.:** B-8

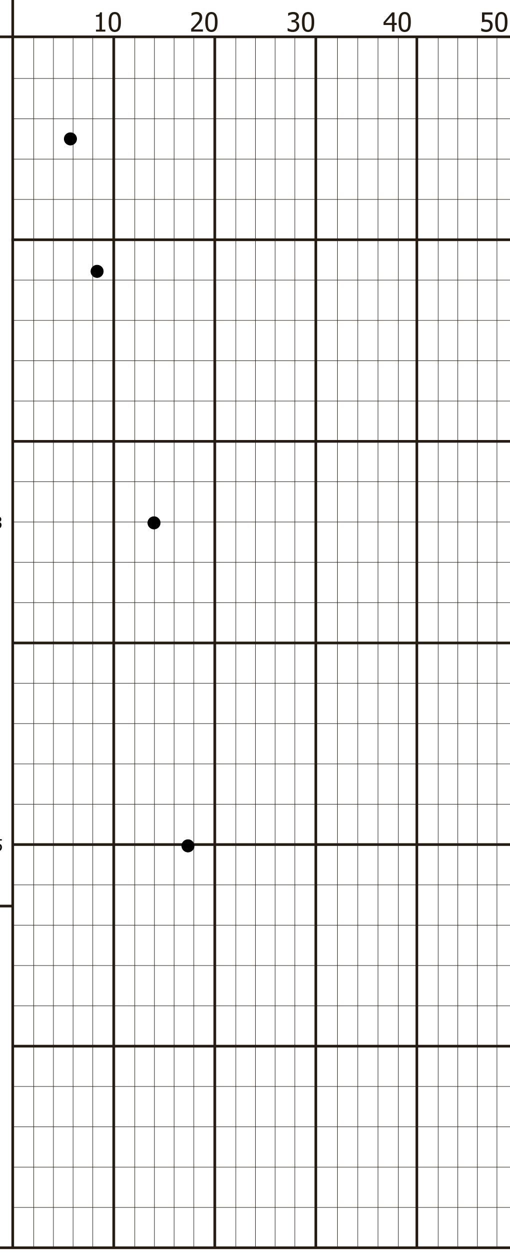
Boring Log B-3

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Stadium Conglomerate (Tst, cont.) - Clayey SANDSTONE with Gravel and Cobble	NA	Olive Gray	Very Dense	Damp		
				Well Cemented SANDSTONE (Hard Drilling)					7:19	
35									5:40	
				Becomes Gravelly (Hard Drilling)						
40									5:46	
		34 50+	50+	Silty SANDSTONE with Gravel: Friable				Wet		105.3
									6:16	
45										
									9:00	
50		8 39 50+	50+	Clayey SILTSTONE/Silty CLAYSTONE:Some Gravel			Hard			114.5
55										

End of Boring at 51.5 Feet

Notes:
1. Groundwater encountered at 42 Feet.
2. Switched to air percussion drilling at 22 Feet.

Moisture Content (% Dry Weight)



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B-3 (P-30)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

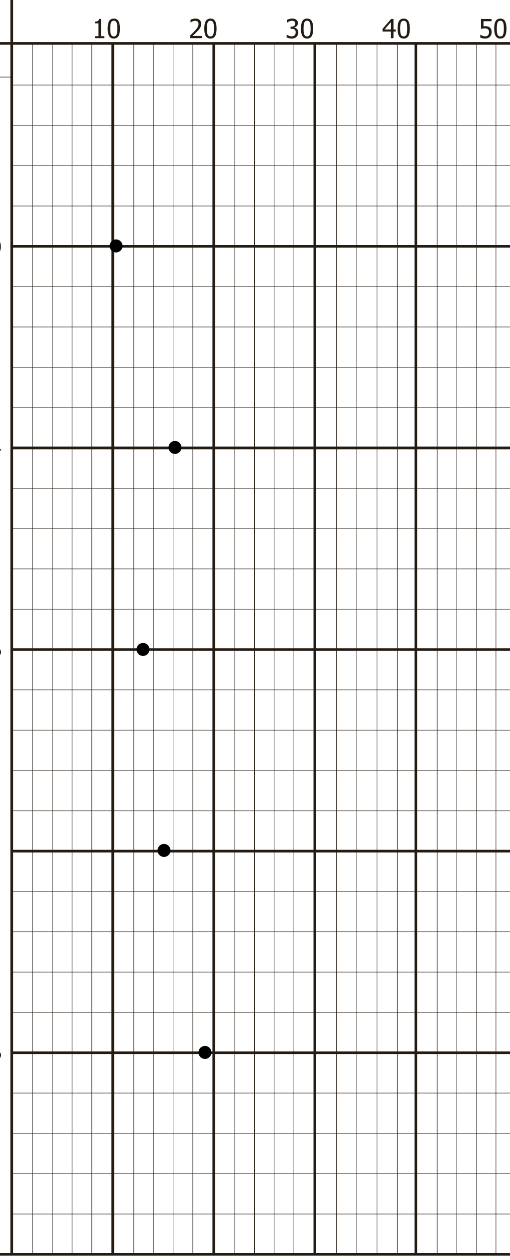
Project No.: T-0126-G | **Figure No.: B-9**

Boring Log B-4

Date Drilled: 12-8-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 576 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 50.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**4 - Inch Asphalt, 6 - Inch Base**						
1	Bulk			**Mission Valley Formation (Tmv)** - SILTSTONE: Fine Grained, Trace of Clay, Some Fe_2O_3 Staining	NA	Tan Brown	Hard	Damp		
5	Driven	21 50+	50+							120.0
10	Driven	18 40 50+	50+			Tan to Olive Gray		Very Moist		114.4
15	Driven	13 50+	50+	Silty SANDSTONE: Fine Grained, Trace of Clay			Very Dense			114.6
20	Driven	40 50+	50+	Fe_2O_3 Staining Gravel Encountered (Hard Drilling)						99.8
25										106.6
27	Driven	12 22 48	42	Silty CLAYSTONE: with Streaks of Fe_2O_3 Staining		Olive Gray to Gray	Hard			
30										

Moisture Content (% Dry Weight)



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B-4 (P-32)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

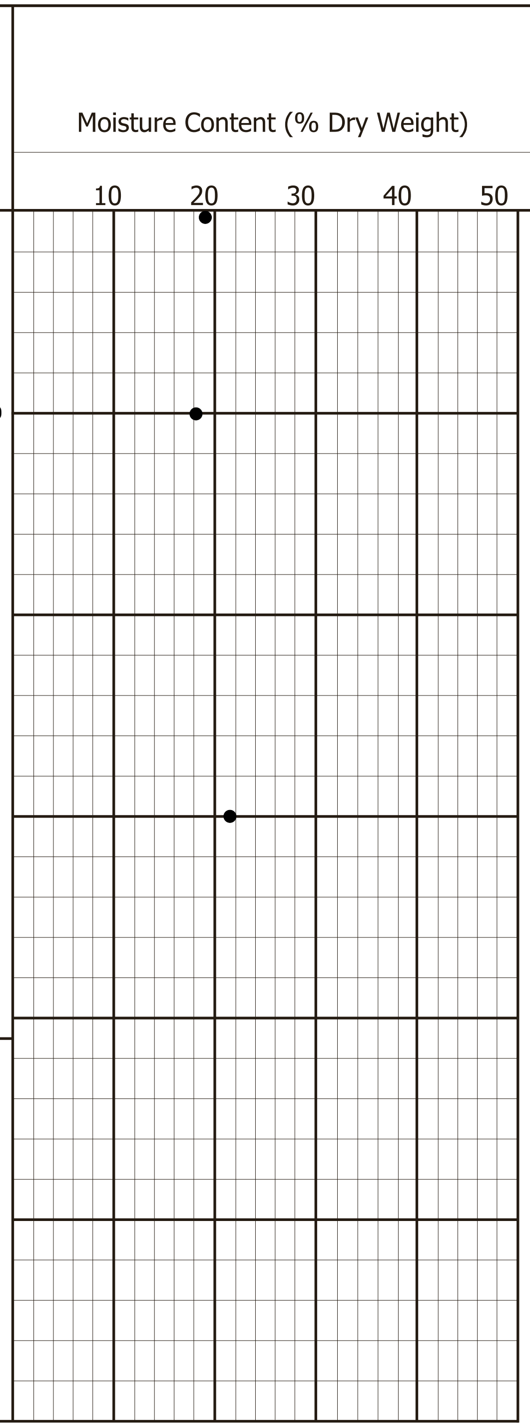
Project No.: T-0126-G | **Figure No.: B-10**

Boring Log B-4

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
	X	14 23 50+	50+	**Mission Valley Formation (Tmv, cont.) -** Silty CLAYSTONE with Streaks of Fe_2O_3 Staining	NA	Olive Gray to Gray	Hard	Very Moist		105.5
35	X	16 50+	50+							106.0
40	X	18 50+	50+	Some Gravel and Caliche Deposits Encountered, Highly Cemented						
45	X	17 50+	50+							97.7
50	X	50+	50+							
55										

End of Boring at 50.5 Feet

Note: 1. Groundwater not encountered.



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B-4 (P-32)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-11**

Boring Log B-5

Date Drilled: 12-10-2014	**Logged By:** Andres Lopez, EIT
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 836 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 39.5 Feet
Drilling Method: Hollow Stem Auger/Rock Coring	**Groundwater Elevation During Drilling:** Not Identified

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	Time (Min:Sec)	Run Number	Recovery %	RQD	Compressive Strength (psi)	Fracture No.	Fracture Drawing	Discontinuity Description
				Granitic Rock (Kd) - Decomposed Granite: Red Brown, Fine to Medium Grained, Damp, Trace of Gravel								
				Becomes Light Brown, Dry, Trace of Clay, Some Gravel								
5		50+	50+	No Recovery								
10		50+	50+	No Recovery (Very Hard Drilling)								
15				Switched to Coring Highly Weathered, Weak Rock, Intensely Fractured, Trace of Clay and Fe_2O_3 Staining	9:47	1	61	0		1, 2, 3, 4	NR	1: 10°J/Vn/Cl+Fe/Sp/Wa/R 2: 10°J/Vn/Cl+Fe/Sp/Wa/Vr 3: 10°J/Vn/Cl+Fe/Sp/Wa/R 4: 20°J/Vn/Cl+Fe/Sp/Pl/Sr
					18:43	2	60	7		1, 2, 3	NR	1: 40°J/Vn/Cl+Fe/Sp/Pl/S 2: 8°J/N/Cl+Fe/Sp/Wa/R 3: 10°J/Vn/Cl+Fe/Sp/Wa/Sr
20				Increase in Fe_2O_3 Staining								
				Becomes Moderately Weathered, Moderately Strong to Weak Rock, Moderately Fractured, Occasional Near Vertical Fractures	22:49	3	88	33	3,185	1, 2, 3, 4, 5, 6	NR	1: 5°J/Vn/Cl+Fe/Su/Wa/R 2: 5°J/Vn/Cl+Fe/Su/Wa/R 3: 12°J/N/Cl+Fe/Sp/Wa/Sr 4: 9°J/N/Cl+Fe/Sp/Wa/Sr 5: 8°J/N/Cl+Fe/Sp/Wa/R 6: 10°J/Vn/Cl/Sp/Pl/Sr
25				Becomes Highly to Moderately Weathered, Intensely Fractured, Weak to Very Weak Rock	24:30	4	71	7		1, 2, 3, 4		1: 52°J/Vn/Fe/Su/Pl/Sr 2: 35°J/Vn/Cl+Fe/Su/Pl/Sr 3: 45°J/Vn/Cl+Fe/Su/Pl/Sr 4: 9°J/N/Fe/Su/Pl/Sr
30												

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B-5 (P-36)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.:** B-12

Boring Log (B-5)

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	Time (Min:Sec)	Run Number	Recovery %	RQD	Compressive Strength (psi)	Fracture No.	Fracture Drawing	Discontinuity Description
				Granitic Rock (Kd, cont.) - Highly to Moderately Weathered	24:30	4	71	7		5 6	NR	5: 60°J/Vn/Fe/Su/Pl/Sr 6: 25°J/Vn/Fe/Su/Pl/Sr
35				Becomes Moderately to Slightly Weathered, Moderately Strong to Strong Rock, Moderately Fractured, Moderately Hard to Hard Rock	32:25	5	99	61		1 2 3 4 5 6 7 8 9 10		1: 2°J/Vn/Fe/Su/Pl/Sr 2: 50°J/Vn/Fe/Sp/Pl/Sr 3: 50°J/Vn/Fe/Sp/Pl/Sr 4: 25°J/Vn/Fe/Sp/Pl/Sr 5: 28°J/Vn/Fe/Sp/Pl/Sr 6: 22°J/Vn/Fe/Su/Pl/S 7: 85°J/Vn/Fe/Sp/Pl/Sr 8: 5°J/N/Fe/Sp/Wa/Sr 9: 8°J/N/Fe/Sp/Wa/Sr 10: 8°J/N/Fe/Sp/Wa/Sr
				Becomes Very Strong Rock	40:11	6	78	44	27,720	1 2 3 4 5 6	NR	1: 25°J/Vn/Fe/Sp/Pl/Sr 2: 25°J/Vn/Fe/Sp/Pl/Sr 3: 27°J/Vn/Fe/Sp/Pl/Sr 4: 40°J/Vn/Fe/Sp/Pl/Sr 5: 5°J/N/Fe/Sp/Wa/R 6: 22°J/Vn/Fe/Su/Pl/Sr
40				**End of Boring at 39.5 Feet**								

Notes:
1. Groundwater not identified.
2. Switched to coring at 15 Feet.

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B-5 (P-36)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-13**

Boring Log B-6

Sheet 1 of 1

Date Drilled: 12-1-2014, 12-9-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 765 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 27 Feet
Drilling Method: Hollow Stem Auger/Rock Coring	**Groundwater Elevation During Drilling:** Not Identified

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	Time (Min:Sec)	Run Number	Recovery %	RQD	Compressive Strength (psi)	Fracture No.	Fracture Drawing	Discontinuity Description
				Santiago Peak Volcanics (Jsp) - Completely Weathered Meta-Sedimentary/Metavolcanic Rock, Red Brown, Fine Grained, Dry								
5				Disturbed Sample Switched to Coring								
				Becomes Slightly Weathered	5:48	1	100	0		1		1: 45°J/Vn/Fe/Sp/Pl/Sr
				Resumed Coring on 12/9/2014 Strong Rock, Some Fe_2O_3 Staining					10,840	1		1: 45°J/N/Ca/Su/Pl/Sr
10					32:05	2	47	28		2	NR	2: 20°J/Vn/Fe/Su/Pl/Sr
15				Intermittent Zones of Completely Weathered and Slightly Weathered Rock	27:09	3	20	0			NR	
20				No Recovery, Becomes Completely Weathered	13:30	4	0	0			NR	
25				Intermittent Zones of Completely Weathered and Slightly Weathered Rock	18:42	5	29	12			NR	
				Becomes Slightly Weathered Rock, Moderately Hard to Hard, Moderately Strong, Some Fe_2O_3 Staining					4,563	1		1: 45°J/Vn/Fe/Su/Pl/Sr
30				**End of Boring at 27.0 Feet**								

Notes:
1. Groundwater not identified.
2. Switched to coring at 6.0 Feet.

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B-6 (P-39)

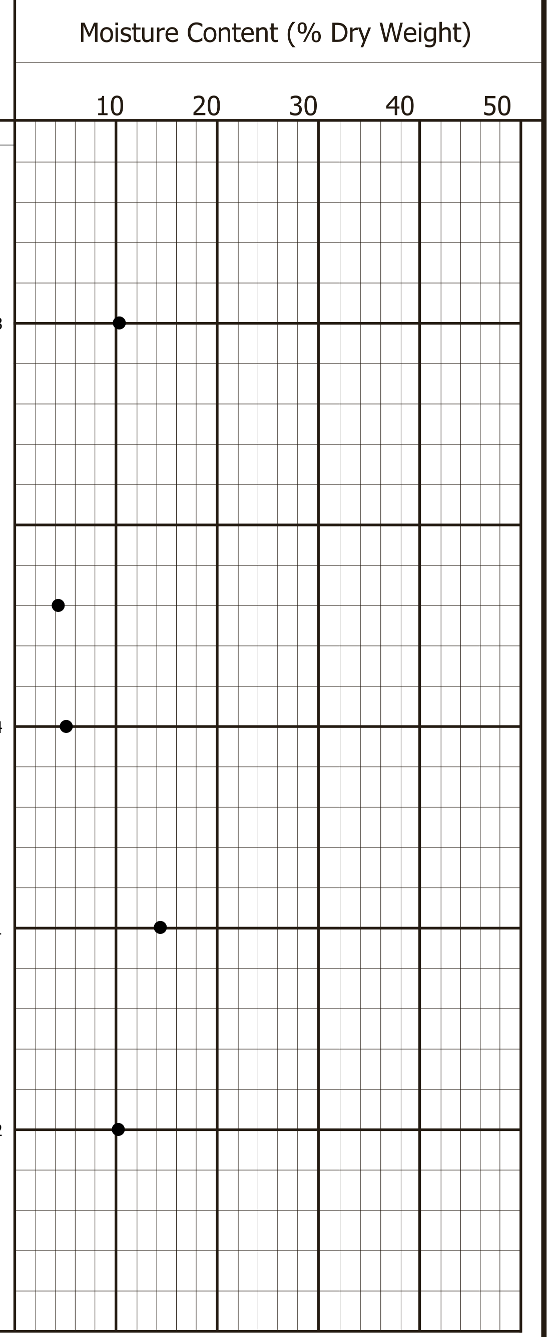
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-14**

Boring Log B-7

Date Drilled: 12-1-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 724 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 51.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** 689 - Feet MSL (Approx.)

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**3 - Inch Decomposed Granite**						
				Artificial Fill (Qaf) - Clayey SAND with Gravel: Fine to Coarse Grained	SC	Brown	Medium Dense	Damp		
				Abundance of Gravel						
5		7 14 11	15			Light Brown				123.8
10										
		7 14 22	22	Abundance of Gravel		Brown				
15		11 15 17	19							124.4
20		17 36 47	50	**Mission Valley Formation (Tmv)** - Silty CLAYSTONE: Moderately Weathered, White Streaks (Striations), Some Fe_2O_3 Staining		Gray Brown	Hard	Very Moist		115.1
25		20 50+	50+							108.2
30										



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B-7 (P-41a/CP-1)

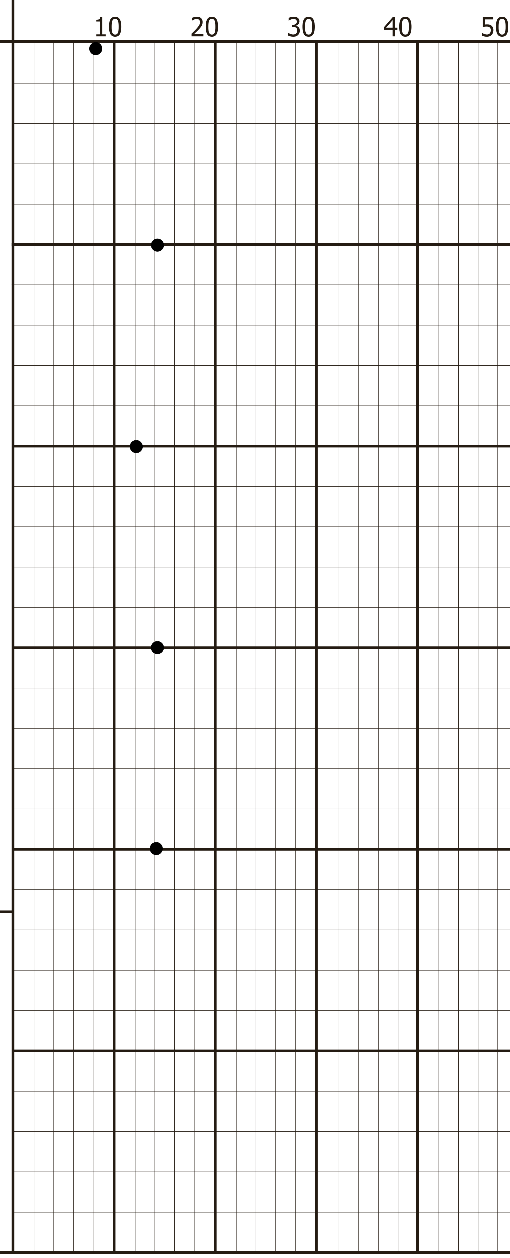
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-15**

Boring Log B-7

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
		45 50+	50+	**Mission Valley Formation (Tmv, cont.) -** Silty CLAYSTONE: Moderately Weathered, White Streaks (Striations), Some Fe_2O_3 Staining		Gray Brown	Hard	Damp		120.7
35		42 50+	50+					▽ Wet		116.9
40		30 50+	50+	Becomes Less Weathered, Absence of Fe_2O_3 Staining						117.0
45		32 50+	50+	Becomes Moderately Weathered, Some Fe_2O_3 Staining						113.3
50		17 31 50+	50+	Some Gravel Encountered						108.9
				End of Boring at 51.5 Feet Note: 1. Groundwater encountered at 35 Feet.						
55										

Moisture Content (% Dry Weight)



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B-7 (P-41a/CP-1)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

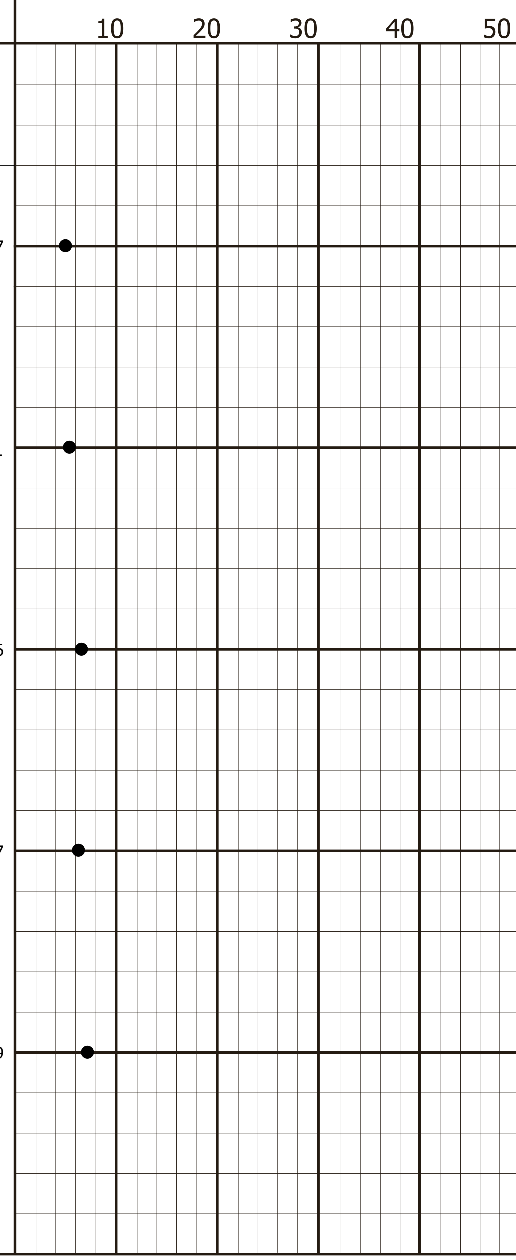
Project No.: T-0126-G | **Figure No.: B-16**

Boring Log B-8

Date Drilled: 11-25-2014	**Logged By:** Jeremiah Harrington, EIT
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 373 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 31.0 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**6 - Inch Asphalt, 2.5 - Feet Class II Base**						
3				**Mission Valley Formation (Tmv)** - Highly Weathered SANDSTONE: Fine Grained	NA	Gray	Very Dense	Damp		
5		22 45 50+	50+							113.7
10		28 50+	50+							107.1
15		28 50+	50+							115.6
20		18 50+	50+							112.7
25		21 50+	50+							112.9
30										

Moisture Content (% Dry Weight)



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B-8 (Vault)

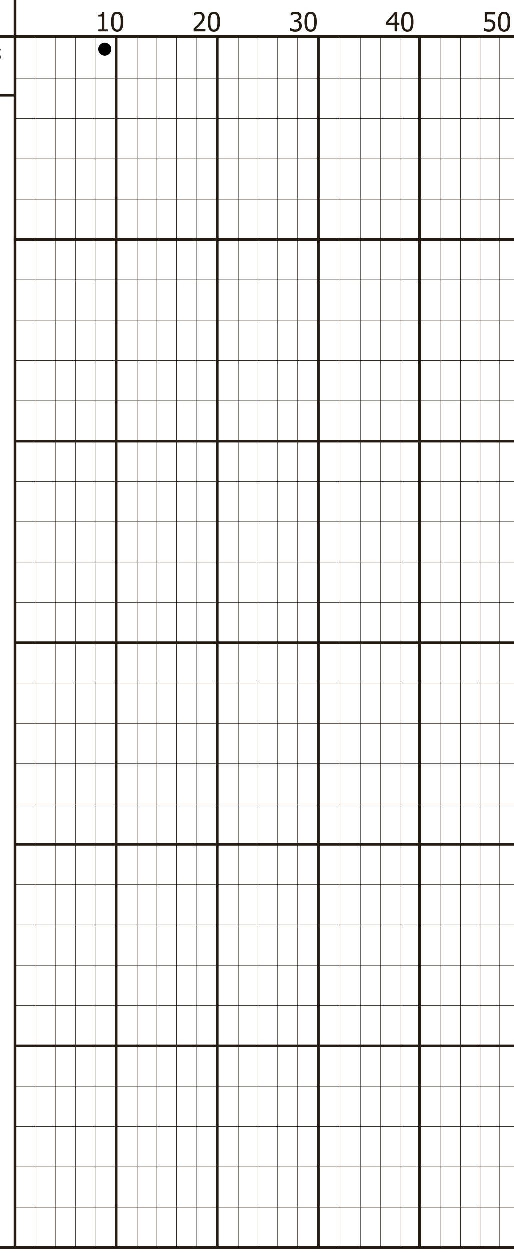
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-17**

Boring Log B-8

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
		33 50+	50+	**Mission Valley Formation (Tmv, cont.) -** Highly Weathered SANDSTONE:Fine Grained	NA	Gray	Very Dense	Damp		107.5
				End of Boring at 31.0 Feet Note: 1. Groundwater not encountered.						
35										

Moisture Content (% Dry Weight)



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B-8 (Vault)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

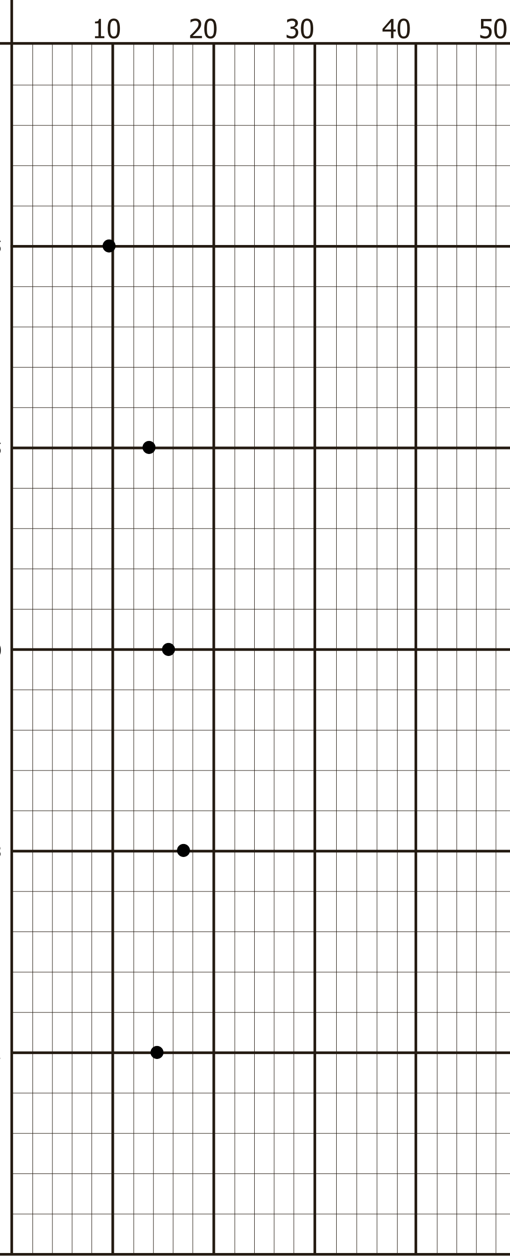
Project No.: T-0126-G | **Figure No.: B-18**

Boring Log B-9

Date Drilled: 11-25-2014	**Logged By:** Jeremiah Harrington, EIT
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 353 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 51.0 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** 332 - Feet MSL (Approx.)

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Disturbed Native - Sandy CLAY: Some Organics	CL	Dark Brown	Medium Dense	Damp		
				Mission Valley Formation (Tmv) - Silty SANDSTONE: Abundant Fe_2O_3 Staining, Friable, Fine to Medium Grained	NA	Olive Gray	Dense			
5		15 31 39	42							110.5
10		21 37 50+	50+				Very Dense			116.5
15		18 39 50+	50+					Very Moist		114.0
20										111.3
		23 37 47	50			Tan		▽ Wet		
25		18 48 50+	50+							105.1
30										

Moisture Content (% Dry Weight)



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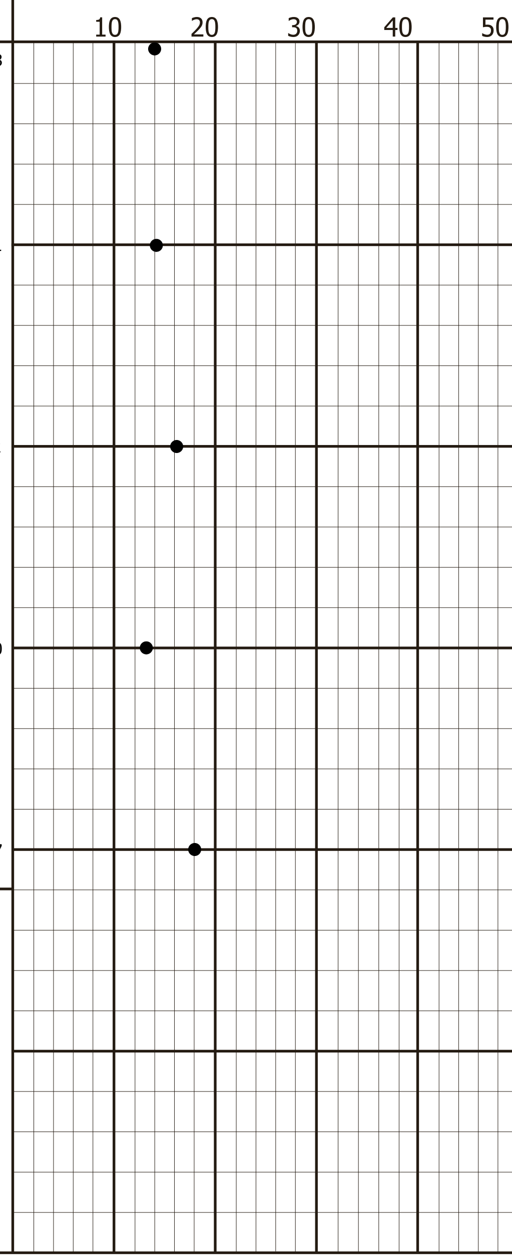
B-9 (P-42/CP-2)

**SDG&E 230 kV Transmission Line
Sycamore to Penasquitos**

Project No.: T-0126-G | **Figure No.: B-19**

Boring Log B-9

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)	Moisture Content (% Dry Weight)
	X	27 50+	50+	**Mission Valley Formation (Tmv, cont.)** Silty SANDSTONE	NA	Tan	Very Dense	Wet		110.8	
35	X	25 50+	50+							108.1	
40	X	30 50+	50+			Light Gray				105.2	
45	X	32 50+	50+							113.0	
50	X	35 50+	50+							106.7	
55				**End of Boring at 51.0 Feet** Note: 1. Groundwater encountered at 21.5 Feet.							



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B-9 (P-42/CP-2)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

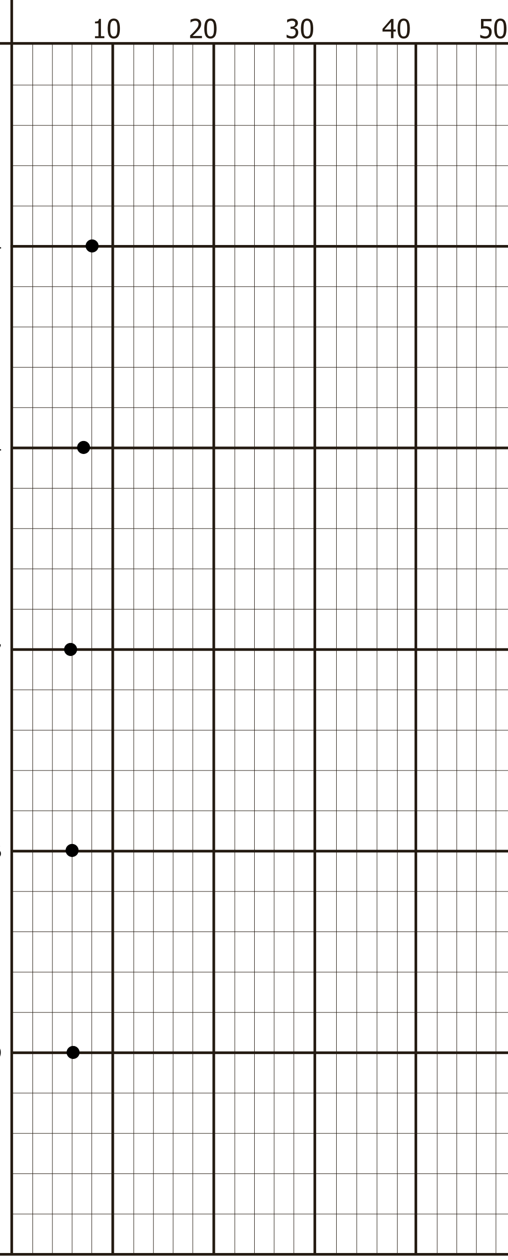
Project No.: T-0126-G | **Figure No.: B-20**

Boring Log B-10

Date Drilled: 11-25-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Unimog	**Surface Elevation:** 247 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 50.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**Scripps Formation (Tsc)** - Silty CLAYSTONE with Gravel	NA	Brown	Stiff	Damp		
5		8 16 21	22	Clayey SANDSTONE with Gravel: Some Fe_2O_3 Staining and Caliche Deposits		White to Gray	Medium Dense			122.4
10		10 50+	50+				Very Dense			123.4
15		24 50+	50+	Sandy CLAYSTONE: Fine to Medium Grained, Some Biotite Specs		Yellow Gray	Hard			113.7
20				SANDSTONE: Fine to Medium Grained, Biotite Specs, Some Fe_2O_3 Staining, Trace of Clay, Friable		Buff	Very Dense			103.6
		21 37 50+	50+							
25		32 50+	50+							112.9
30										

Moisture Content (% Dry Weight)



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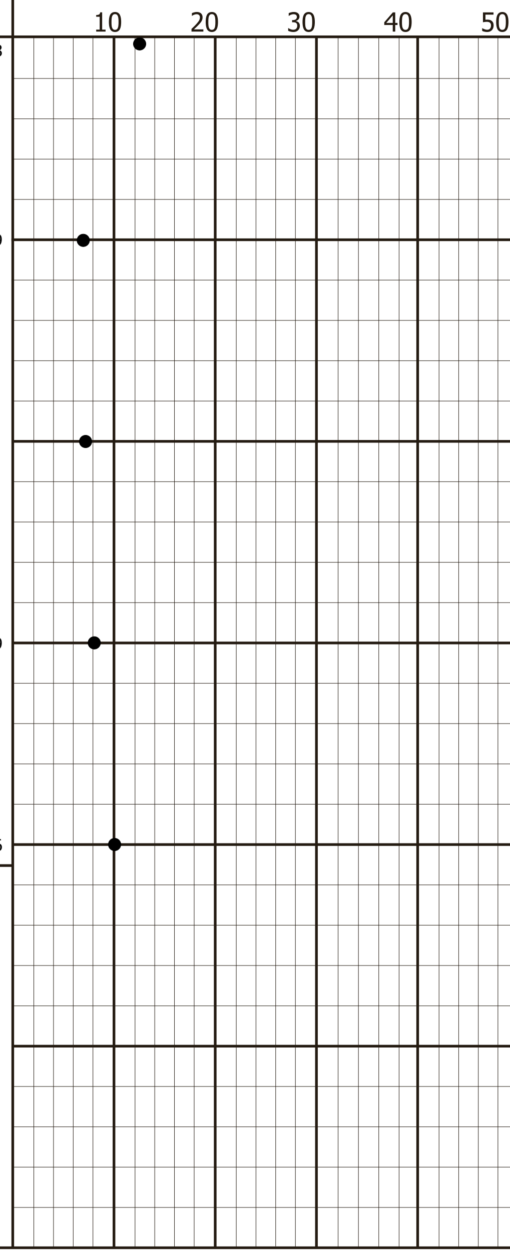
B-10 (P-44)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.:** B-21

Boring Log B-10

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)	Moisture Content (% Dry Weight)
	X	27 50+	50+	**Scripps Formation (Tsc, cont.)** Clayey SANDSTONE: Fine Grained	NA	White Gray	Very Dense	Damp		114.8	
35	X	25 50+	50+	Abundance of Fe_2O_3 Staining						120.9	
40	X	50+	50+	Fine to Medium Grained		Light Gray				99.9	
45	X	50+	50+	Some Gray Siltstone						113.9	
50	X	50+	50+							112.6	
55											



End of Boring at 50.5 Feet

Note: 1. Groundwater not encountered.

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B-10 (P-44)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

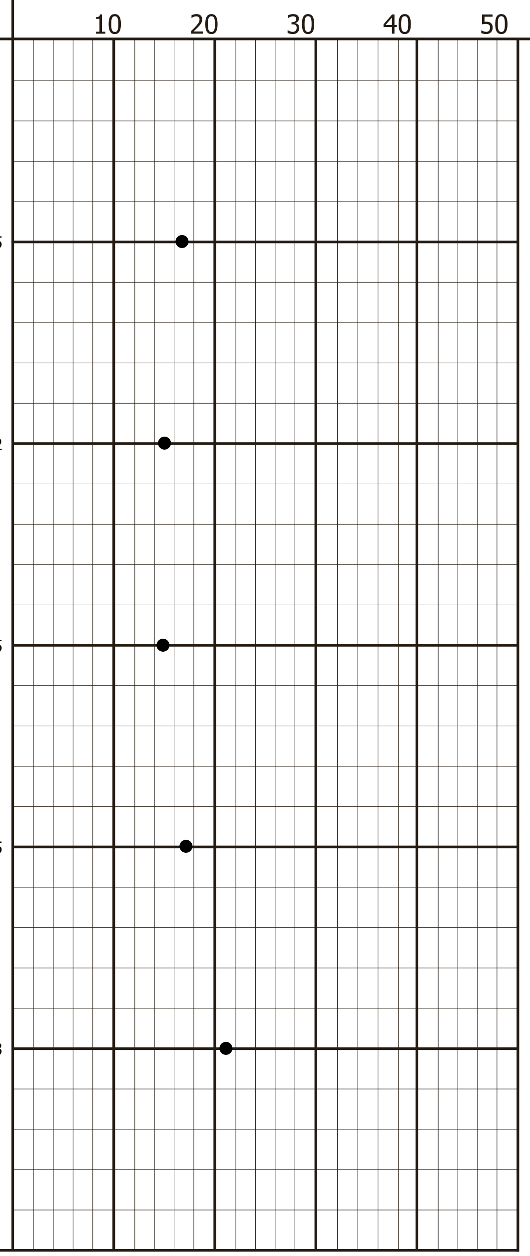
Project No.: T-0126-G | **Figure No.: B-22**

Boring Log B-11

Date Drilled: 11-25-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Unimog	**Surface Elevation:** 403 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 51.0 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Stadium Conglomerate (Tst) - Silty/Clayey SANDSTONE with Abundant Gravel and Cobble		Brown	Medium Dense	Damp		
5		11 31 50+	50+	**Friars Formation (Tf)** - Clayey SANDSTONE/Sandy CLAYSTONE: Some Fe_2O_3 Staining, Fine Grained		Gray	Very Dense	Very Moist		114.5
10		10 50+	50+							110.2
15		19 50+	50+	Fine to Medium Grained, Trace of Silt and Clay		Yellow Brown				103.5
20				SILTSTONE/CLAYSTONE		Gray				113.5
		21 37 50+	50+							
25		10 19 40	35							106.3
30										

Moisture Content (% Dry Weight)



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B-11 (P-45)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-23**

Boring Log B-11

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)	Moisture Content (% Dry Weight)
		26 50+	50+	**Friars Formation (Tf, cont.)** SANDSTONE: Fine Grained, Specs of Black Biotite		Buff	Very Dense	Damp		109.2	
35		50+	50+	No Recovery, Hard Drilling, Some Gravel							
40		50+	50+	Fine to Medium Grained, Trace of Clay, Some Fe_2O_3 Staining, Specs of Black Biotite		Light Gray				104.6	
45		50+	50+							110.5	
50		24 50+	50+								
55											

End of Boring at 51.0 Feet

Note: 1. Groundwater not encountered.

Moisture Content scale: 10, 20, 30, 40, 50

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B-11 (P-45)

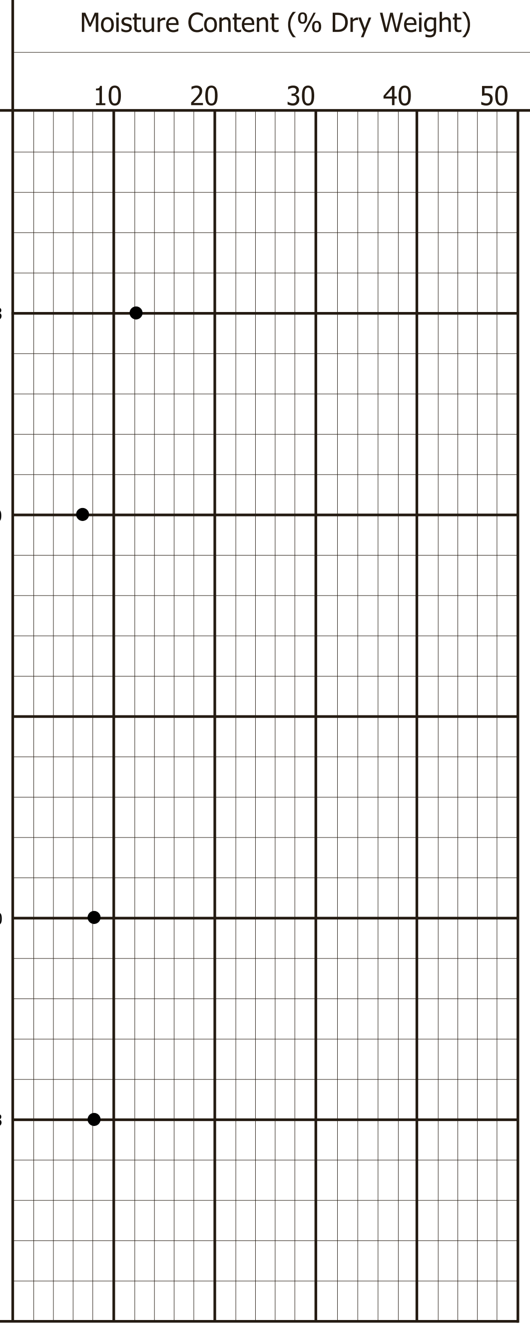
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-24**

Boring Log B-12

Date Drilled: 11-24-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Unimog	**Surface Elevation:** 288 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 43.0 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**Scripps Formation (Tsc)** - Silty SANDSTONE: Fine Grained, Some Fe_2O_3 Staining		Gray	Medium Dense	Damp		
5		11 31 50+	50+	Fine to Medium Grained			Very Dense			119.3
10		10 50+	50+	Gravel Encountered						107.0
15		19 50+	50+	Gravel Encountered						
20				Slow Drilling Due to Gravel						106.0
		21 37 50+	50+	Fine to Medium Grained, Trace of Silt and Clay, Interbedded Gravel Layers						
25		10 19 40	35	Becomes Silty						111.3
				2-Feet of Gravel Encountered						
30										



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B-12 (P-47)

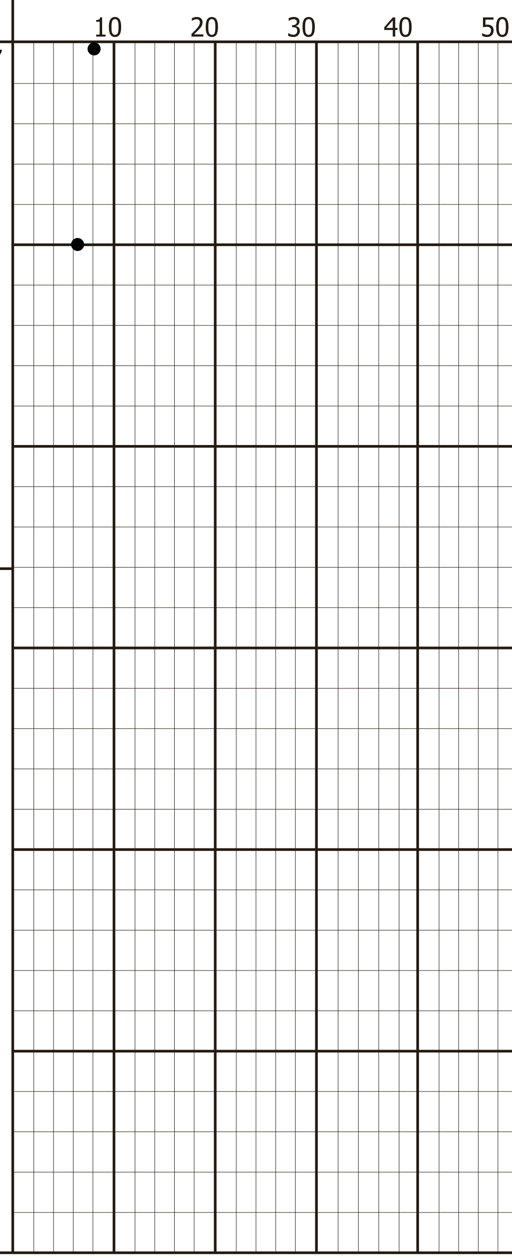
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: B-25**

Boring Log B-12

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
		50+	50+	**Scripps Formation (Tsc, cont.)** Silty SANDSTONE with Gravel		Gray	Very Dense	Damp		116.7
35		50+	50+							99.2
				Gravel Encountered						
40		50+	50+	Some Fe_2O_3 Staining, Interbedded Layers of Silty Sand and Gravel, Trace of Clay						
				Refusal						
				End of Boring at 43.0 Feet						
45				Note: 1. Groundwater not encountered.						

Moisture Content (% Dry Weight)



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B-12 (P-47)

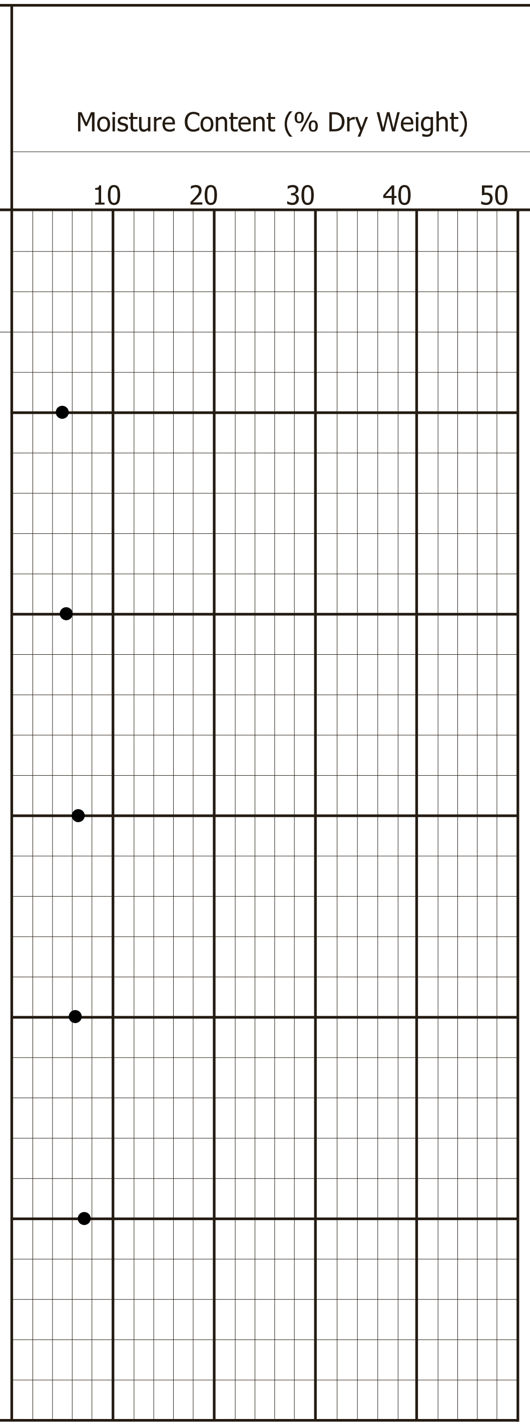
SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-26**

Boring Log B-13

Date Drilled: 1-23-2015	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 404 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 31.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**6 - Inch Asphalt, 2.5 - Feet Class II Base**						
3				**Mission Valley Formation (Tmv)** - Highly Weathered SANDSTONE: Fine Grained		Gray	Very Dense	Damp		
5		22 45 50+	50+							113.7
10		28 50+	50+							107.1
15		28 50+	50+							115.6
20		18 50+	50+							112.7
25		21 50+	50+							112.9
30										



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B-13 (P-50)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-27**

Boring Log B-13

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)	Moisture Content (% Dry Weight)
	⧓	33 50+	50+	**Mission Valley Formation (Tmv, cont.) -** Highly Weathered SANDSTONE:Fine Grained		Gray	Very Dense	Damp		107.5	● (~9)
35				**End of Boring at 31.5 Feet** Note: 1. Groundwater not encountered.							

Moisture Content scale: 10 20 30 40 50

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B-13 (P-50)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

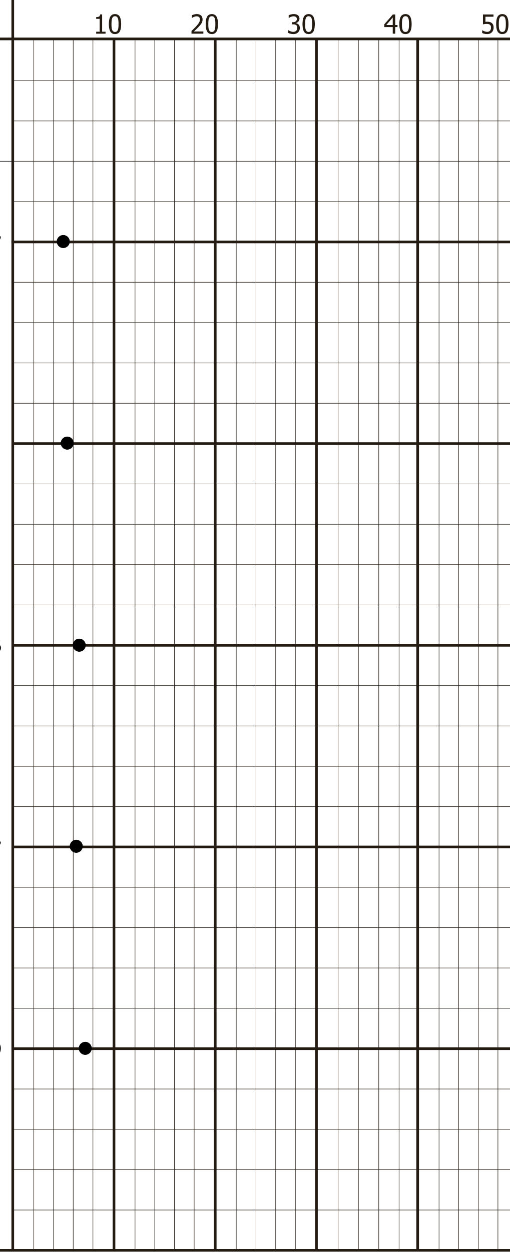
Project No.: T-0126-G | **Figure No.: B-28**

Boring Log B-14

Date Drilled: 1-23-2015	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Diedrich D-50	**Surface Elevation:** 295 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 31.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**6 - Inch Asphalt, 2.5 - Feet Class II Base**						
				Mission Valley Formation (Tmv) - Highly Weathered SANDSTONE: Fine Grained		Gray	Very Dense	Damp		
5	X	22 45 50+	50+							113.7
10	X	28 50+	50+							107.1
15	X	28 50+	50+							115.6
20	X	18 50+	50+							112.7
25	X	21 50+	50+							112.9
30										

Moisture Content (% Dry Weight)



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B-14 (P-54)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-29**

Boring Log B-14

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)	Moisture Content (% Dry Weight)
		33 50+	50+	**Mission Valley Formation (Tmv, cont.) -** Highly Weathered SANDSTONE:Fine Grained		Gray	Very Dense	Damp		107.5	~9
				End of Boring at 31.5 Feet							
				Note: 1. Groundwater not encountered.							
35											

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B-14 (P-54)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

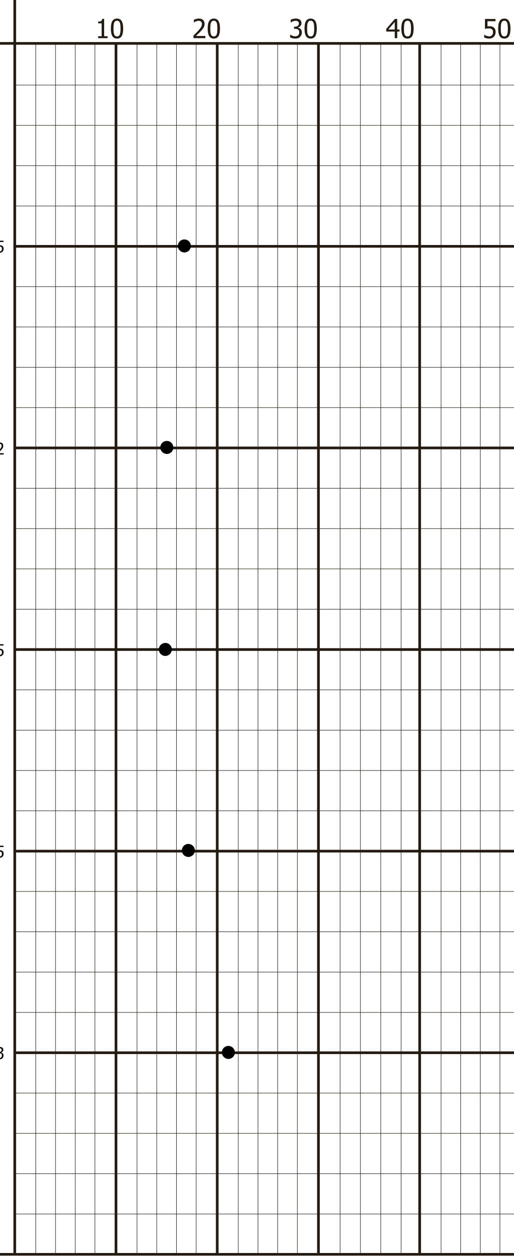
Project No.: T-0126-G | **Figure No.: B-30**

Boring Log B-15

Date Drilled: 1-23-2015	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Unimog	**Surface Elevation:** 270 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 51.0 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
0				**Stadium Conglomerate (Tst)** - Silty/Clayey SANDSTONE with Abundant Gravel and Cobble		Brown	Medium Dense	Damp		
5		11 31 50+	50+	**Friars Formation (Tf)** - Clayey SANDSTONE/Sandy CLAYSTONE: Some Fe_2O_3 Staining, Fine Grained		Gray	Very Dense	Very Moist		114.5
10		10 50+	50+							110.2
15		19 50+	50+	Fine to Medium Grained, Trace of Silt and Clay		Yellow Brown				103.5
20				SILTSTONE/CLAYSTONE		Gray				113.5
22		21 37 50+	50+							
25		10 19 40	35							106.3
30										

Moisture Content (% Dry Weight)



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B-15 (P-55)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-31**

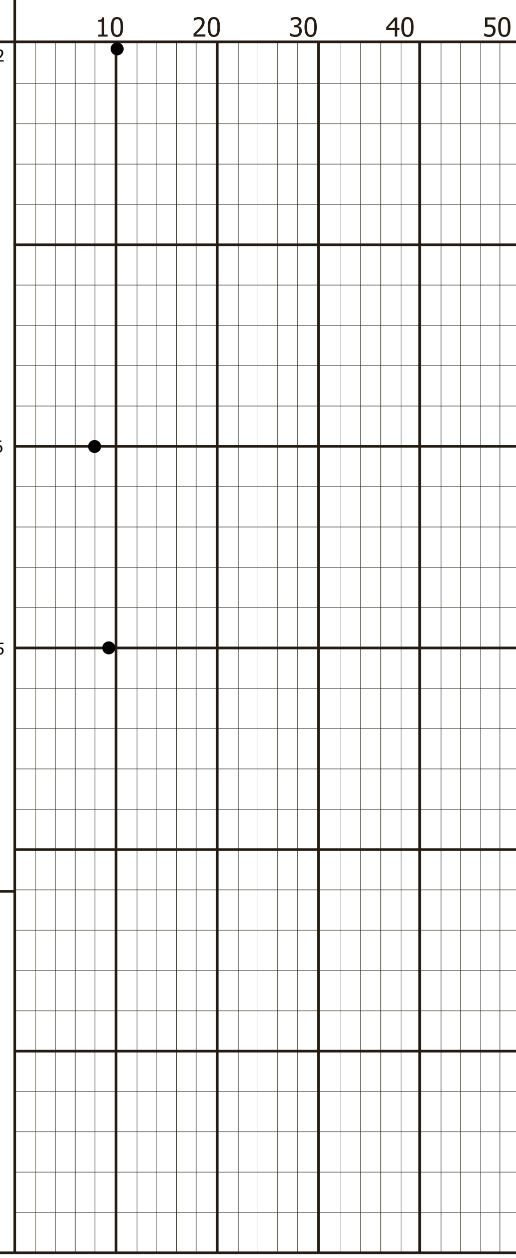
Boring Log B-15

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
	X	26 50+	50+	**Friars Formation (Tf, cont.)** SANDSTONE: Fine Grained, Specs of Black Biotite		Buff	Very Dense	Damp		109.2
35	X	50+	50+	No Recovery, Hard Drilling, Some Gravel						
40	X	50+	50+	Fine to Medium Grained, Trace of Clay, Some Fe_2O_3 Staining, Specs of Black Biotite		Light Gray				104.6
45	X	50+	50+							110.5
50	X	24 50+	50+							
55										

End of Boring at 51.0 Feet

Note: 1. Groundwater not encountered.

Moisture Content (% Dry Weight)



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B-15 (P-55)

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

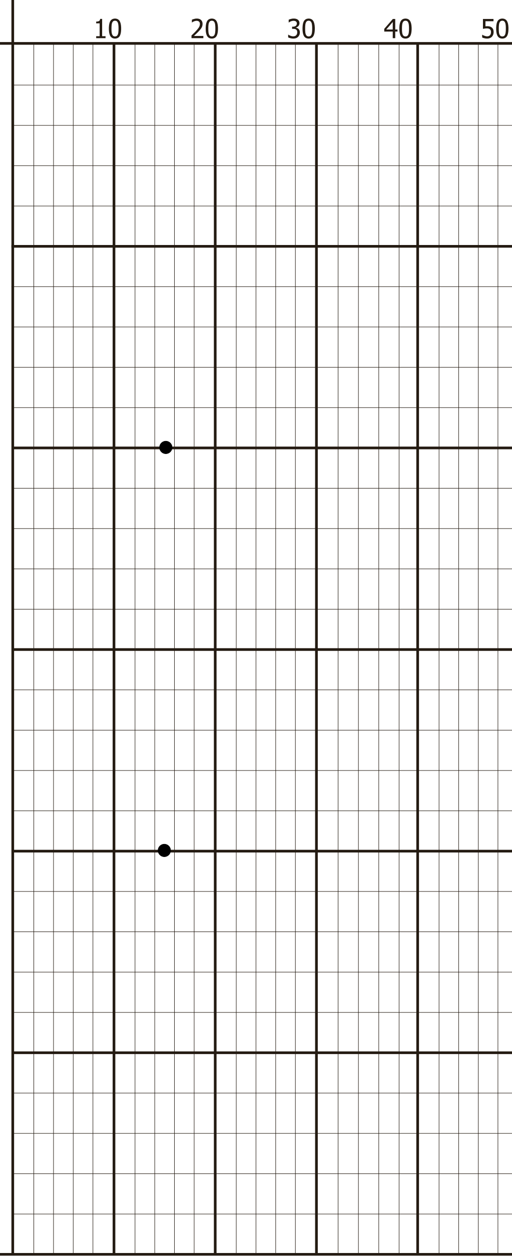
Project No.: T-0126-G | **Figure No.: B-32**

Boring Log B-16

Date Drilled: 11-24-2014	**Logged By:** Nicholas Tracy, PE
Exploratory Equipment: Unimog	**Surface Elevation:** 389 - Feet MSL (Approx.)
Driving Weight: 140 lbs - 30" drop	**Total Depth of Boring:** 50.5 Feet
Drilling Method: Hollow Stem Auger	**Groundwater Elevation During Drilling:** Not Encountered

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
				Linda Vista Formation (Tln) - Silty SANDSTONE with Gravel		Orange Brown	Medium Dense	Damp		
				Scripps Formation (Tsc) - SANDSTONE: Fine Grained, Some Fe_2O_3 Staining		Light Brown	Very Dense			
5		50+	50+							
10		27 50+	50+					Very Moist		96.0
15		19 50+	50+							
20		30 50+	50+							95.4
25		31 50+	50+							
30										

Moisture Content (% Dry Weight)



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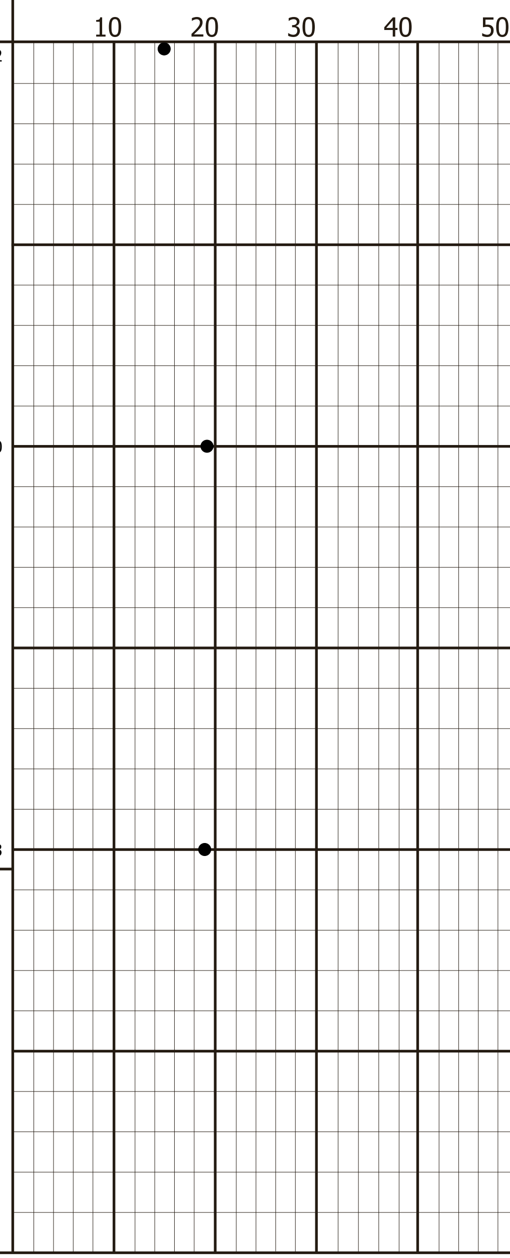
B-16 (P-61)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: B-33**

Boring Log B-16

Depth in Feet	Driven Sample	Blow Counts	N value	Material Description	USCS	Color	Consistency	Moisture	Time (Min:Sec)	Dry Density (pcf)
		27 50+	50+	**Scripps Formation (Tsc, cont.)** SANDSTONE		Gray Brown	Very Dense	Very Moist		102.2
35		50+	50+	Trace of Clay, Slightly Friable						
40		50+	50+	Some Fe_2O_3 Staining, Increase in Clay Content						108.0
45		50+	50+							
50		50+	50+	Fine Grained, Trace of Clay						101.3
55										



End of Boring at 50.5 Feet

Note: 1. Groundwater not encountered.

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B-16 (P-61)

**SDG&E 230 kV Transmission Line
Sycamore to Penasquitos**

Project No.: T-0126-G | **Figure No.: B-34**

APPENDIX C

Rock Core Photographs

Core Run No.: 1
Depth (ft.): 1.5-4.5
Time (Min:Sec): 25:02
Recovery: 82%
RQD: 25%

Core Run No.: 2
Depth (ft.): 4.5-6.5
Time (Min:Sec): 26:30
Recovery: 96%
RQD: 60%

Core Run No.: 3
Depth (ft.): 6.5-11.5
Time (Min:Sec): 31:27
Recovery: 98%
RQD: 33%

Core Run No.: 4
Depth (ft.): 11.5-16.5
Time (Min:Sec): 20:56
Recovery: 100%
RQD: 25%

Core Run No.: 5
Depth (ft.): 16.5-21.5
Time (Min:Sec): 26:10
Recovery: 75%
RQD: 0%

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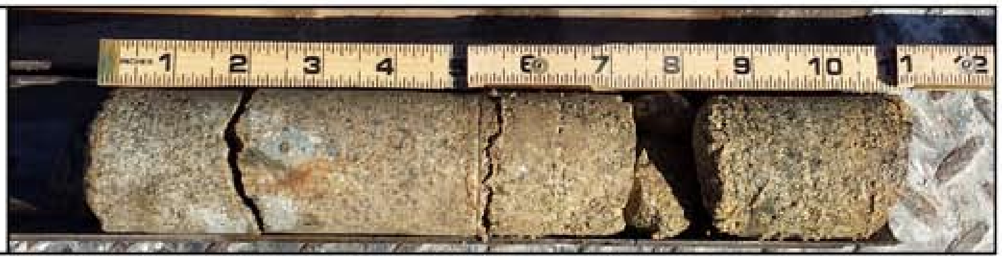
B-2 (P-24) - 1 of 2

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: C-1**

Core Run No.: 6
Depth (ft.): 21.5-23.5
Time (Min:Sec): 8:05
Recovery: 40%
RQD: 0%

Core Run No.: 1
Depth (ft.): 15-16.5
Time (Min:Sec): 9:47
Recovery: 61%
RQD: 0%



Core Run No.: 2
Depth (ft.): 16.5-21.5
Time (Min:Sec): 18:43
Recovery: 60%
RQD: 7%

Core Run No.: 3
Depth (ft.): 21.5-26.5
Time (Min:Sec): 22:49
Recovery: 88%
RQD: 33%

Core Run No.: 4
Depth (ft.): 26.5-31.5
Time (Min:Sec): 24:30
Recovery: 71%
RQD: 7%

Core Run No.: 5
Depth (ft.): 31.5-36.5
Time (Min:Sec): 32:25
Recovery: 99%
RQD: 61%

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B-5 (P-36) - 1 of 2

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: C-3**

Core Run No.: 6
Depth (ft.): 36.5-39.5
Time (Min:Sec): 40:05
Recovery: 78%
RQD: 44%

Core Run No.: 1
Depth (ft.): 6-7
Time (Min:Sec): 5:48
Recovery: 100%
RQD: 0%

Core Run No.: 2
Depth (ft.): 7-12
Time (Min:Sec): 32:05
Recovery: 47%
RQD: 28%

Core Run No.: 3
Depth (ft.): 12-17
Time (Min:Sec): 27:09
Recovery: 20%
RQD: 0%

Core Run No.: 4
Depth (ft.): 17-22
Time (Min:Sec): 13:30
Recovery: 0%
RQD: 0%

NO RECOVERY

Core Run No.: 5
Depth (ft.): 22-27
Time (Min:Sec): 18:42
Recovery: 29%
RQD: 12%

APPENDIX D

Laboratory Test Results

Laboratory Test Results

In-Situ Moisture Content and Dry Density

The in-situ moisture content of the soils was determined in accordance with ASTM D-2216 and D-2937 laboratory test method. This method involves obtaining the moist weight of the sample and then drying the sample to obtain its dry weight, the moisture content is calculated by taking the difference between the wet and dry weights, dividing it by the dry weight of the sample and expressing the result as a percentage. The dry density is calculated by dividing the dry weight by the total volume. The results of the in-situ moisture content and dry density tests are presented in the table below and on *Appendix B, Exploratory Boring Logs*:

Table 1: Moisture Content and Dry Density Test Results (ASTM D-2216 & D-2937)

Location	Moisture Content (%)	Dry Density (pcf)
B-1 @ 6-10’	6.0	--
B-1 @ 10-14’	4.4	--
B-1 @ 18-22’	3.8	--
B-1 @ 22-26’	2.6	--
B-1 @ 26-30’	2.6	--
B-1 @ 30-34’	3.1	--
B-1 @ 34-38’	2.0	--
B-1 @ 38-42’	1.8	--
B-1 @ 42-46’	2.8	--
B-1 @ 46-50’	2.5	--
B-3 @ 5’	6.0	--
B-3 @ 10’	4.5	--
B-3 @ 15’	8.6	108.0
B-3 @ 22-26’	8.6	--
B-3 @ 26-30’	7.5	--
B-3 @ 30-34’	5.9	--
B-3 @ 34-38’	8.9	--
B-3 @ 42’	14.0	105.3
B-3 @ 50’	17.8	114.5
B-4 @ 5’	10.9	120.0
B-4 @ 10’	16.7	114.4
B-4 @ 15’	13.0	114.6
B-4 @ 20’	15.4	99.8

Location	Moisture Content (%)	Dry Density (pcf)
B-4 @ 25’	19.5	106.6
B-4 @ 30’	19.7	105.5
B-4 @ 35’	18.3	106.0
B-4 @ 45’	21.8	97.7
B-7 @ 5’	10.7	123.8
B-7 @ 10-12’	8.6	--
B-7 @ 12’	4.5	--
B-7 @ 15’	5.7	124.4
B-7 @ 20’	14.6	115.1
B-7 @ 25’	10.5	108.2
B-7 @ 30’	8.9	120.7
B-7 @ 35’	14.5	116.9
B-7 @ 40’	12.4	117.0
B-7 @ 45’	14.8	113.3
B-7 @ 50’	14.3	108.9
B-8 @ 5’	5.4	113.7
B-8 @ 10’	5.8	107.1
B-8 @ 15’	6.9	115.6
B-8 @ 20’	6.3	112.7
B-8 @ 25’	7.5	112.9
B-8 @ 30’	9.6	107.5
B-9 @ 5’	9.8	110.5
B-9 @ 10’	13.2	116.5
B-9 @ 15’	15.9	114.0
B-9 @ 20’	17.0	111.3
B-9 @ 25’	14.7	105.1
B-9 @ 30’	14.0	110.8
B-9 @ 35’	14.5	108.1
B-9 @ 40’	16.1	105.2
B-9 @ 45’	13.7	113.0
B-9 @ 50’	18.2	106.7
B-10 @ 5’	8.2	122.4
B-10 @ 10’	7.4	123.4

Location	Moisture Content (%)	Dry Density (pcf)
B-10 @ 15’	5.8	113.7
B-10 @ 20’	6.5	103.6
B-10 @ 25’	6.7	112.9
B-10 @ 30’	12.6	114.8
B-10 @ 35’	7.1	120.9
B-10 @ 40’	7.5	99.9
B-10 @ 45’	8.7	113.9
B-10 @ 50’	10.6	112.6
B-11 @ 5’	16.9	114.5
B-11 @ 10’	15.0	110.2
B-11 @ 15’	13.8	103.5
B-11 @ 20’	17.3	113.5
B-11 @ 25’	21.2	106.3
B-11 @ 30’	10.3	109.2
B-11 @ 40’	8.1	104.6
B-11 @ 45’	9.6	110.5
B-12 @ 5’	12.1	119.3
B-12 @ 10’	7.3	107.0
B-12 @ 20’	8.2	106.0
B-12 @ 25’	8.5	111.3
B-12 @ 30’	8.1	116.7
B-12 @ 35’	6.8	99.2
B-13 @ 5’	8.6	112.3
B-13 @ 10’	5.3	--
B-13 @ 15’	10.2	120.8
B-13 @ 20’	8.5	117.0
B-13 @ 25’	10.7	109.1
B-13 @ 30’	10.7	116.7
B-14 @ 5’	16.4	111.3
B-14 @ 10’	7.1	98.9
B-14 @ 15’	13.4	112.8
B-14 @ 20’	18.2	109.8
B-14 @ 25’	17.1	113.7
B-14 @ 30’	19.2	110.3

Location	Moisture Content (%)	Dry Density (pcf)
B-15 @ 5'	14.3	112.5
B-15 @ 10'	14.8	109.8
B-15 @ 15'	15.6	109.3
B-15 @ 20'	16.4	114.3
B-15 @ 25'	15.8	112.1
B-15 @ 30'	14.8	117.8
B-15 @ 35'	16.9	110.8
B-15 @ 40'	15.8	115.7
B-15 @ 50'	1.5	--
B-16 @ 10'	15.0	96.0
B-16 @ 20'	15.1	95.4
B-16 @ 30'	14.8	102.2
B-16 @ 40'	19.4	108.0
B-16 @ 50'	18.9	101.3

Particle Size Analyses

In accordance with ASTM D-422, quantitative determinations of the distribution of coarse-grained particle sizes in selected samples were made. Mechanically actuated sieves were utilized for separating the various classes of coarse-grained (gravel and sand) particles. For soil samples containing fine-grained particle sizes, additional testing was conducted in accordance with ASTM D-1140 to determine the fines content (i.e., soil passing a No. 200 Sieve). The sieve analysis test results are provided in the table below:

Table 2: Sieve Analysis Test Results (ASTM D-422 & D-1140)

Sieve Size	B-1 @ 1-4' Percent Passing	B-2 @ 0-2' Percent Passing	B-3 @ 1-4' Percent Passing	B-4 @ 1-4' Percent Passing	B-5 @ 1-4' Percent Passing	B-6 @ 0-3' Percent Passing
2 in	100	100	100	100	100	100
1 in	92	91	100	100	100	95
¾ in	89	91	100	100	100	91
½ in	78	90	100	98	100	81
$^{3}/_{8}$ in	76	88	100	97	100	73
¼ in	71	86	100	96	100	64
#4	67	84	100	95	99	58
#8	59	75	99	93	87	48
#10	56	71	99	93	87	46
#16	50	59	98	91	70	41
#30	41	48	95	88	52	36
#40	35	43	87	86	45	34
#50	30	39	79	84	40	32
#100	24	30	59	75	31	29
#200	20	26	49	60	26	26
Classification	(SM)	(SM)	(SC)	(ML)	(SC)	(SM)

Sieve Size	B-7 @ 0-3' Percent Passing	B-8 @ 0-2' Percent Passing	B-9 @ 1-4' Percent Passing	B-10 @ 0-3' Percent Passing	B-11 @ 0-3' Percent Passing	B-12 @ 0-3' Percent Passing
2 in	100	100	100	100	100	100
1 in	100	100	100	100	100	100
¾ in	100	100	100	100	97	100
½ in	95	91	100	100	92	100
$^{3}/_{8}$ in	90	80	100	99	89	100
¼ in	87	67	100	99	84	100
#4	83	61	100	99	80	100
#8	73	44	100	99	70	99
#10	70	40	100	99	68	98
#16	64	32	99	98	63	96
#30	57	24	98	96	58	93
#40	53	21	96	91	54	92
#50	49	17	87	82	51	91
#100	42	10	66	61	41	76
#200	37	7	55	53	31	39
Classification	(SC)	(SM)	(CL)	(CL)	(SM)	(SM)

Sieve Size	B-13 @ 1-4' Percent Passing	B-14 @ 1-4' Percent Passing	B-15 @ 2-4' Percent Passing	B-16 @ 1-4' Percent Passing
2 in	100	100	100	100
1 in	100	100	100	100
¾ in	96	95	100	100
½ in	91	93	100	100
$^{3}/_{8}$ in	86	92	100	99
¼ in	81	90	100	97
#4	78	88	100	95
#8	71	85	99	92
#10	69	85	99	91
#16	64	82	99	88
#30	54	80	98	80
#40	45	79	98	70
#50	37	79	97	59
#100	27	68	91	45
#200	22	45	79	38
Classification	(SM)	(SM)	(ML)	(SM)

Direct Shear

Direct shear tests were performed on relatively undisturbed samples in accordance with ASTM D-3080 to evaluate the shear strength characteristics of the in-situ materials. The test method consists of placing the soil sample in the direct shear device, applying a series of normal stresses, and then shearing the sample at a constant rate of shearing deformation. The shearing force and horizontal displacements are measured and recorded as the soil specimen is sheared. The shearing is continued well beyond the point of maximum stress until the stress reaches a constant or residual value. Final test results are presented in the table below:

Table 3: Direct Shear Test Results (ASTM D-3080)

Location	Apparent Cohesion (psf)	ϕ (degrees)
B-3 @ 15'	100	32
B-4 @ 10'	75	42
B-9 @ 15'	500	39
B-10 @ 10'	190	39
B-10 @ 20'	200	29
B-11 @ 10'	347	44
B-12 @ 20'	290	30
B-13 @ 15'	1000	35
B-14 @ 10'	405	34
B-15 @ 5'	880	32
B-15@ 25'	1135	35
B-16 @ 15'	208	34

Thermal Resistivity

Thermal resistivity tests were performed on remolded and relatively undisturbed samples in accordance with ASTM D-5334 to evaluate the thermal properties of the on-site materials. The test method consists of inserting a single probe into the specimen that applies heat at a continuous rate. The probe is connected to a thermal sensor that measures the rate at which heat is transferred away from the probe. The results of the tests are summarized in the table below:

Table 4: Thermal Resistivity (ASTM D-5334)

Location	Undisturbed or Remolded	As Received (cm °C W^{-1})	As Received Moisture Content (%)	Mid-Point (cm °C W^{-1})	Mid-Point Moisture Content (%)	0% Moisture (cm °C W^{-1})
B-7 @ 5’	Undisturbed	63.7	8.4	67.8	6.4	94.8
B-7 @ 11’	Undisturbed	81.2	5.4	83.7	4.6	138.6
B-8 @ 5’	Remolded	62.9	4.6	67.1	4.0	133.3
B-8 @ 10’	Undisturbed	74.8	4.7	84.5	4.0	165.1
B-9 @ 5’	Remolded	67.2	4.7	68.5	3.9	110.9
B-9 @ 10’	Undisturbed	67.1	5.0	67.3	4.2	109.9

Unconfined Compressive Strength of Rock Cores

Unconfined compressive strength tests were performed on rock core specimens in accordance with ASTM D-7012. The test method determines compressive strength of intact rock core samples by applying an axial load at a continuous rate until a maximum load is achieved. The results of the tests are summarized in the table below and on *Appendix B, Exploratory Boring Logs*:

Table 5: Unconfined Compressive Strength Results (ASTM D-7012)

Boring No.	Depth (ft)	Unconfined Compressive Strength (psi)
B-2	5.5	19,569
B-2	12.0	10,444
B-5	21.5	3,185
B-5	37.0	27,720
B-6	7.0	10,840
B-6	27.0	4,563

Corrosion Tests

Chemical analytical tests were performed on bulk soil samples collected during the field exploration program to evaluate the corrosion potential of the on-site materials. These tests were performed in accordance with California Test Method Nos. 417 (sulfate), 422 (chloride), and 643 (pH and resistivity). The results of the tests are summarized below:

Table 6: Corrosion Test Results (CTM Nos. 417, 422, & 643)

Boring No.	Depth (feet)	pH	Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
B-1	1-4	6.3	2371	30	13
B-2	0-2	7.0	4828	30	12
B-3	1-4	10.0	1096	26	6
B-4	1-4	8.3	786	35	62
B-5	1-4	7.6	1357	58	6
B-6	0-3	6.9	1405	47	16
B-7	0-3	8.7	905	45	110
B-8	0-2	9.4	1128	29	67
B-9	1-4	7.2	718	35	3
B-10	0-3	6.1	386	413	74
B-11	0-3	6.5	621	38	12
B-12	0-3	8.3	285	240	220
B-13	1-4	6.2	2205	52	18
B-14	1-4	8.3	1024	368	80
B-15	1-4	7.7	377	49	4
B-16	1-4	5.6	646	173	25

APPENDIX E

Rock Core Breaks

TRINITY GEOTECHNICAL ENGINEERING, INC.

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-2 (P-24) - 5 Feet

SDG&E 230 kV Transmission Line Sycamore to Penasquitos

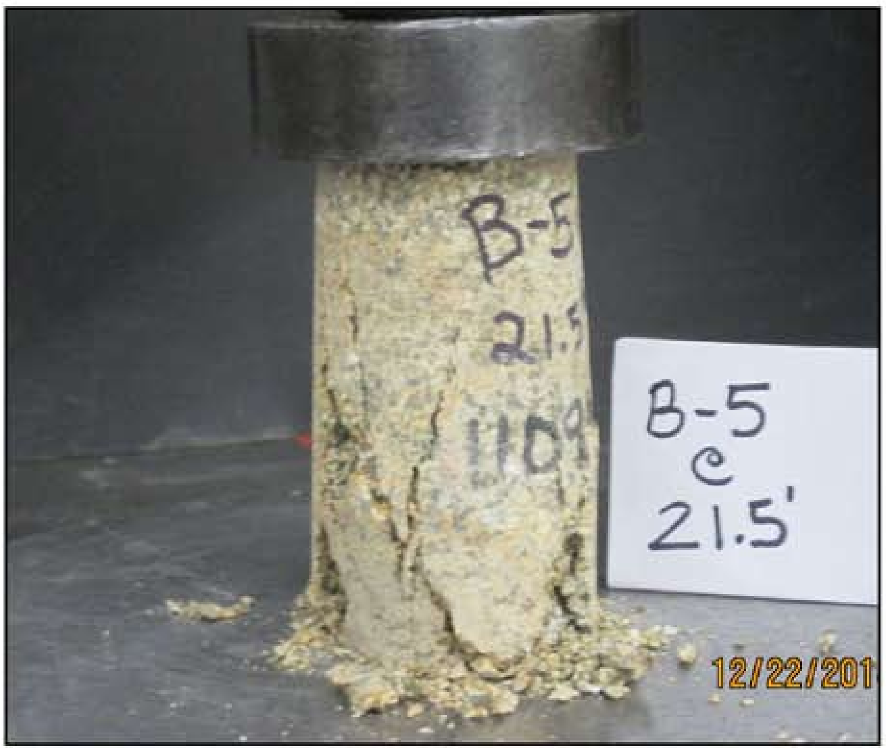
Project No.: T-0126-G	**Figure No.: E-1**

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-2 (P-24) - 12 Feet

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	Figure No.: E-2



TRINITY
GEOTECHNICAL ENGINEERING, INC.

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-5 (P-36) - 21.5 Feet

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: E-3**

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-5 (P-36) - 37 Feet

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: E-4**

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-6 (P-39) - 7 Feet

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G	**Figure No.: E-5**

Trinity Geotechnical Engineering, Inc.
13230 Evening Creek Drive
Suite 206
San Diego, CA 92128
Phone: 858.486.2888

B-6 (P-39) - 27 Feet

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: E-6**

APPENDIX F

Rock Mass Classification

Boring Number	Core Run No.	Depth of Run (feet)	Strength of Intact Rock (MPa)	RQD	Spacing of Discontinuities (mm)	Groundwater	Discontinuity					Rock Mass Classification		
							Persistence (Discontinuity Length)	Aperture (Separation) (mm)	Roughness	Gouge (Infilling)	Weathering	RMR	Class Number	Description
B-2	1	1.5 - 4.5	50 - 100	25	60 - 200	Completely Dry	N/A	1 - 5	Sr	Hard Filling > 5 mm	Moderately Weathered	47	III	Fair Rock
	Rating	-	7	8	8	15	-	1	3	2	3			
	2	4.5 - 6.75	100 - 250	60	200 - 600	Completely Dry	N/A	1 - 5	Sr	Hard Filling > 5 mm	Slightly Weathered	61	II	Good Rock
	Rating	-	12	13	10	15	-	1	3	2	5			
	3	6.75 - 11.75	100 - 250	33	< 60	Completely Dry	N/A	1 - 5	Sr-R	Hard Filling > 5 mm	Highly Weathered	49	III	Fair Rock
	Rating	-	12	8	5	15	-	1	4	2	1			
	4	11.75 - 16.75	50 - 100	25	< 60	Completely Dry	N/A	1 - 5	Sr-R	Hard Filling > 5 mm	Highly Weathered	44	III	Fair Rock
	Rating	-	7	8	5	15	-	1	4	2	1			
	5	16.75 - 21.75	50 - 100	0	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Highly Weathered	39	IV	Poor Rock
	Rating	-	7	3	5	15	-	1	5	2	1			
	6	21.75 - 23.75	50 - 100	0	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Highly Weathered	39	IV	Poor Rock
	Rating	-	7	3	5	15	-	1	5	2	1			

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Rock Mass Classification

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: F-1**

Boring Number	Core Run No.	Depth of Run (feet)	Strength of Intact Rock (MPa)	RQD	Spacing of Discontinuities (mm)	Groundwater	Discontinuity					Rock Mass Classification		
							Persistence (Discontinuity Length)	Aperture (Separation) (mm)	Roughness	Gouge (Infilling)	Weathering	RMR	Class Number	Description
B-5	1	15 - 16.5	5 - 25	0	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Highly Weathered	34	IV	Poor Rock
	Rating	-	2	3	5	15	-	1	5	2	1			
	2	16.5 - 21.5	5 - 25	7	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Highly Weathered	34	IV	Poor Rock
	Rating	-	2	3	5	15	-	1	5	2	1			
	3	21.5 - 26.5	25 - 50	33	60 - 200	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Moderately Weathered	46	III	Fair Rock
	Rating	-	4	8	8	15	-	1	5	2	3			
	4	26.5 - 31.5	5 - 25	7	< 60	Completely Dry	N/A	1 - 5	Sr	Hard Filling > 5 mm	Highly Weathered	32	IV	Poor Rock
	Rating	-	2	3	5	15	-	1	3	2	1			
	5	31.5 - 36.5	50 - 100	61	60 - 200	Completely Dry	N/A	1 - 5	Sr	Hard Filling > 5 mm	Slightly Weathered	54	III	Fair Rock
	Rating	-	7	13	8	15	-	1	3	2	5			
	6	36.5 - 39.5	50 - 100	44	< 60	Completely Dry	N/A	1 - 5	Sr	Hard Filling > 5 mm	Slightly Weathered	46	III	Fair Rock
	Rating	-	7	8	5	15	-	1	3	2	5			

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Rock Mass Classification

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: F-2**

Boring Number	Core Run No.	Depth of Run (feet)	Strength of Intact Rock (MPa)	RQD	Spacing of Discontinuities (mm)	Groundwater	Discontinuity					Rock Mass Classification		
							Persistence (Discontinuity Length)	Aperture (Separation) (mm)	Roughness	Gouge (Infilling)	Weathering	RMR	Class Number	Description
B-6	1	6 - 7	50 - 100	0	60 - 200	Completely Dry	N/A	0.1 - 1	Sr	Hard Filling > 5 mm	Slightly Weathered	47	III	Fair Rock
	Rating	-	7	3	8	15	-	4	3	2	5			
	2	7 - 12	50 - 100	28	60 - 200	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Slightly Weathered	51	III	Fair Rock
	Rating	-	7	8	8	15	-	1	5	2	5			
	3	12 - 17	5 - 25	0	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Highly Weathered	34	IV	Poor Rock
	Rating	-	2	3	5	15	-	1	5	2	1			
	4	17 - 22	NR	NR	NR	NR	N/A	NR	NR	NR	Decomposed	0	V	Very Poor Rock
	Rating	-	0	0	0	0	-	0	0	0	0			
	5	22 - 27	50 - 100	12	< 60	Completely Dry	N/A	1 - 5	R	Hard Filling > 5 mm	Moderately Weathered	41	III	Fair Rock
	Rating	-	7	3	5	15	-	1	5	2	3			

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Rock Mass Classification

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: F-3**

TRINITY
GEOTECHNICAL ENGINEERING, INC.

APPENDIX G

Seismic Design Parameters (Vaults)

References: "Pot Exhibit 230 kV Underground", Cover Sheet, drawn by Nolte Vertical Five, dated 9/23/2014

TRINITY GEOTECHNICAL ENGINEERING, INC.

Trinity Geotechnical Engineering, Inc.
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Phone: 858.486.2888

Legend

[□ □] Vault location (Approx.)

Plot Plan (Vaults)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: G-1**

2012 IBC Seismic Design Parameter	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
Latitude, N (deg)	32.9890	32.9865	32.9838	32.9801	32.9780	32.9757	32.9725	32.9708	32.9705	32.9700
Longitude, W (deg)	-117.1303	-117.1295	-117.1339	-117.1374	-117.1424	-117.1467	-117.1509	-117.1545	-117.1612	-117.1678
Site Class Definition	D	C	C	C	C	C	C	C	C	C
Mapped Spectral Accelerations for short periods, S_S (g)	0.931	0.930	0.932	0.932	0.934	0.936	0.938	0.942	0.950	0.957
Mapped Spectral Accelerations for 1-sec period, S_1 (g)	0.364	0.364	0.364	0.364	0.364	0.365	0.365	0.367	0.369	0.372
Site Coefficient, F_a	1.13	1.03	1.03	1.03	1.03	1.03	1.03	1.02	1.02	1.02
Site Coefficient, F_v	1.67	1.44	1.44	1.44	1.44	1.44	1.44	1.43	1.43	1.43
Maximum considered earthquake spectral response acceleration for short periods, S_{MS} adjusted for Site Class (g)	1.050	0.956	0.957	0.958	0.959	0.960	0.961	0.964	0.969	0.974
Maximum considered earthquake spectral response acceleration at 1-sec period, S_{M1} adjusted for Site Class (g)	0.609	0.522	0.523	0.523	0.523	0.524	0.524	0.525	0.528	0.531
Five-percent damped design spectral response acceleration at short periods, S_{DS} (g)	0.700	0.638	0.638	0.638	0.639	0.640	0.641	0.642	0.646	0.649
Five-percent damped design spectral response acceleration at 1-sec period, S_{D1} (g)	0.406	0.348	0.348	0.348	0.349	0.349	0.349	0.350	0.352	0.354

Note: The seismic design parameters above were developed using the USGS Seismic Design Maps & Tool available on the USGS website (http://earthquake.usgs.gov)

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Seismic Design Parameters (Vaults)

SDG&E 230 kV Transmission Line
Sycamore to Penasquitos

Project No.: T-0126-G | **Figure No.: G-2**

APPENDIX H

Previous Geotechnical Information

Woodward-Clyde Consultants

Engineering & sciences applied to the earth & its environment

May 15, 1992
Project No. 9051230A-SCS2

Mr. Craig Riker
San Diego Gas & Electric Company
P.O. Box 1831
San Diego, CA 92112

GEOTECHNICAL INVESTIGATION FOR THE
PROPOSED SDG&E SYCAMORE CANYON SUBSTATION
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Riker:

Woodward-Clyde Consultants is pleased to provide the accompanying report, which presents the results of our geotechnical investigation for the proposed SDG&E Sycamore Canyon Substation. This study was performed in general accordance with our revised proposal dated August 27, 1991 and your authorization of September 3, 1991 (SDG&E Purchase Order No. C 9106 10216). The report presents our conclusions and recommendations pertaining to the project, as well as the results of our field explorations and laboratory tests.

Our engineer and geologist assigned to this project are Messrs. Kevin Crennan and Mike Hatch, respectively. If you have any questions or if we can be of further service, please feel free to give us a call.

Very truly yours,

WOODWARD-CLYDE CONSULTANTS

REGISTERED PROFESSIONAL ENGINEER
MOISES ARZAMENDI
No. 43782
Exp. 6-30-93
CIVIL
STATE OF CALIFORNIA

Moi Arzamendi
R.C.E. 43782

Mark E. Schmoll

CERTIFIED ENGINEERING GEOLOGIST
MARK E. SCHMOLL
No. 1361
Exp. 6-30-92
STATE OF CALIFORNIA

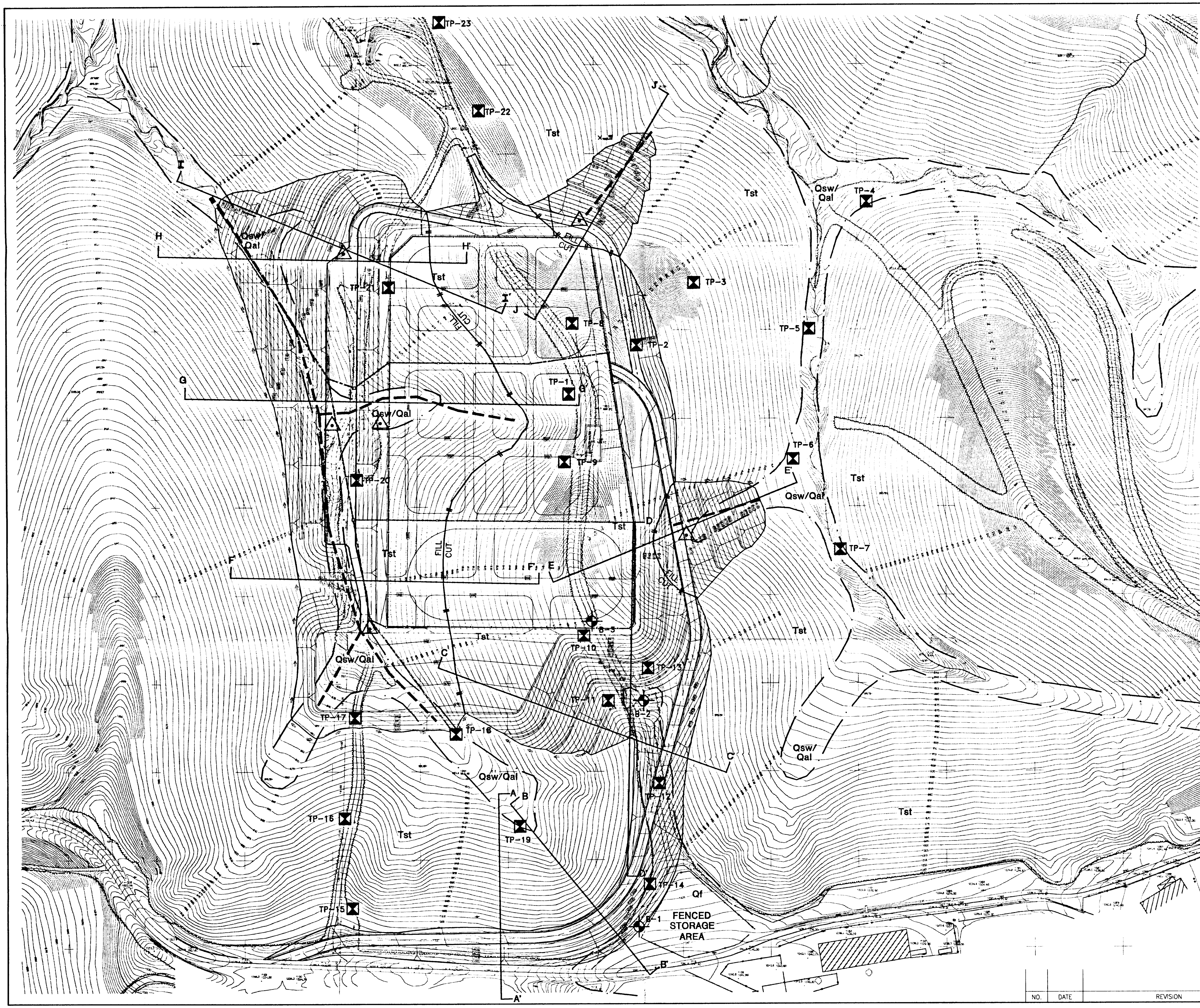
Mark E. Schmoll
C.E.G. 1361

MA/MES/as (E/9051230D-SCS2)

Attachments

(10) San Diego Gas & Electric Company
(2) Nolte and Associates

1550 Hotel Circle North • San Diego, California 92108
(619) 294-9400 • Fax (619) 293-7920



LEGEND:

(boring symbol)	INDICATES APPROXIMATE LOCATION OF LARGE DIAMETER TEST BORING
(test pit symbol)	INDICATES APPROXIMATE LOCATION OF TEST PIT
(triangle symbol)	INDICATES APPROXIMATE LOCATION OF PROPOSED SURFACE SETTLEMENT MONUMENT
(heavy dashed line)	INDICATES APPROXIMATE LOCATION OF PROPOSED SUBSURFACE CANYON DRAIN
(dash-dot line)	INDICATES APPROXIMATE LOCATION OF GEOLOGIC CONTACT
(cut/fill line symbol)	INDICATES APPROXIMATE LOCATION OF CUT/FILL LINE
(section symbol)	INDICATES APPROXIMATE LOCATION OF GEOLOGIC CROSS SECTION (FIGURE 4)
Qf	INDICATES APPROXIMATE LIMITS OF FILL
Qsw/Qal	INDICATES APPROXIMATE LIMITS OF SLOPEWASH/ALLUVIUM
Tst	INDICATES APPROXIMATE LIMITS OF STADIUM CONGLOMERATE

0 100 200

APPROXIMATE GRAPHIC SCALE (FEET)

N

SITE AND GEOLOGIC MAP

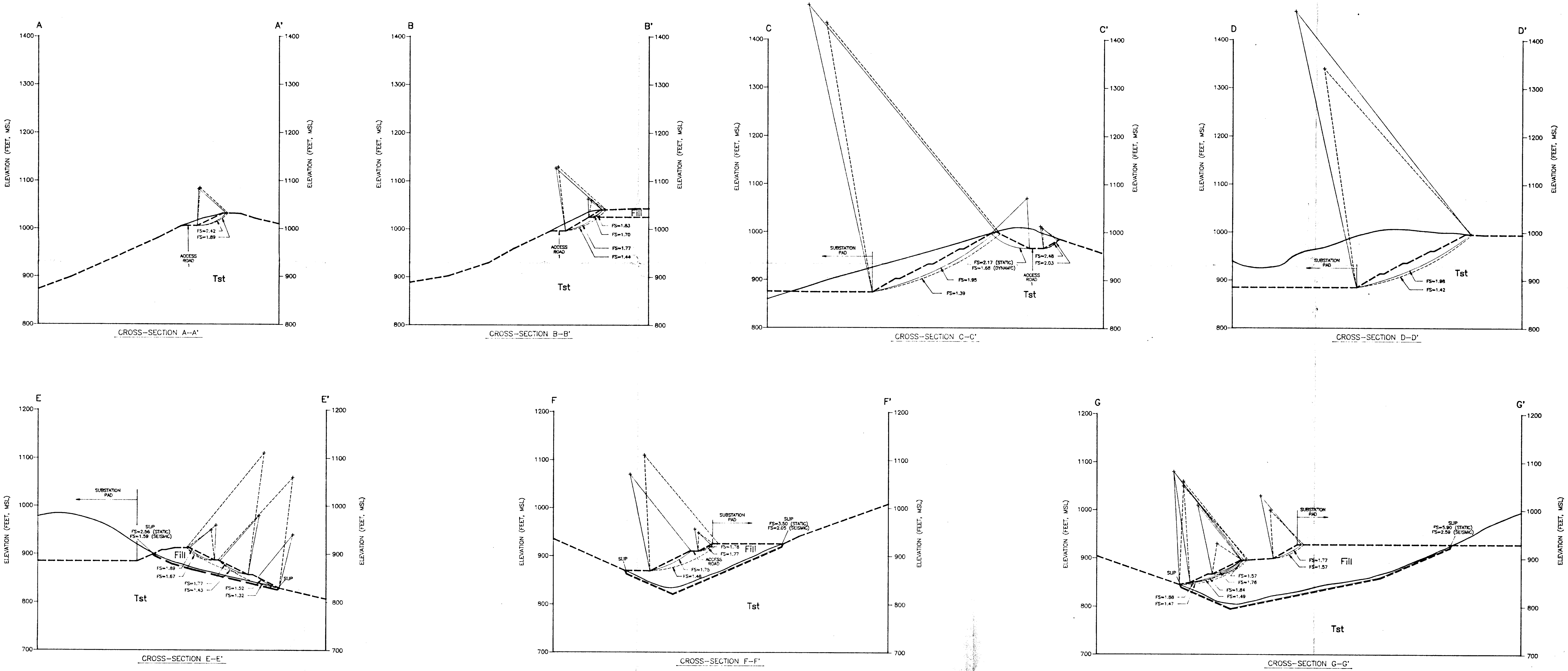
SDG&E SYCAMORE CANYON SUBSTATION

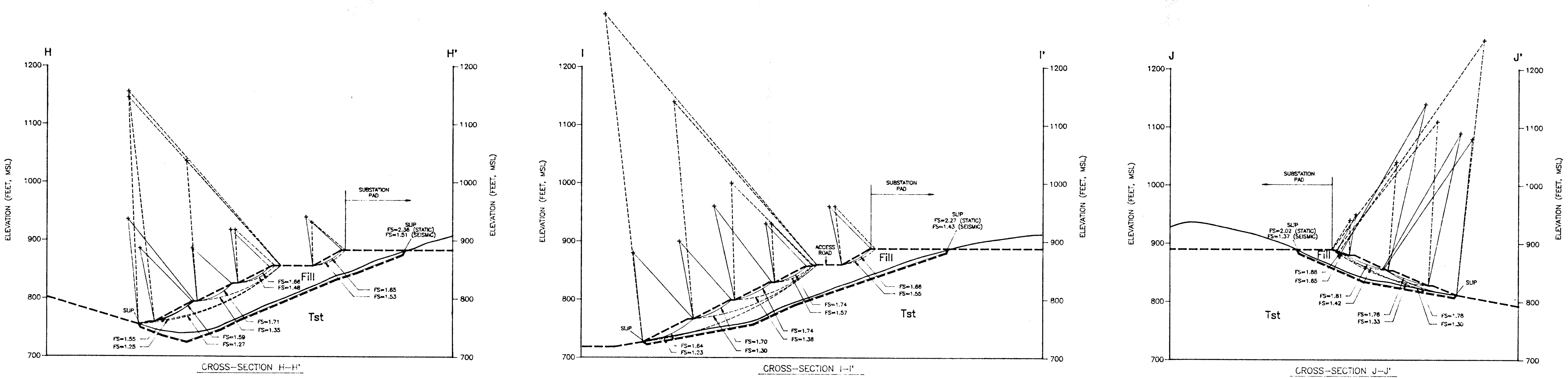
PROJ. MANAGER: MA	FIGURE NO: 3
DESIGNED BY: MEH	PROJECT NO: 9051230A-SCS2
DRAFTED BY: TEB	DATE: 5-14-92
CHECKED BY:	FN: SYCSITE

NO.	DATE	REVISION	BY

Woodward-Clyde Consultants

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
1550 HOTEL CIRCLE NORTH, SAN DIEGO CA. 92108 (619) 294-9400





LEGEND:

INDICATES EXISTING GRADE

INDICATES STATIC SLOPE STABILITY ANALYSIS (FS=FACTOR OF SAFETY)

INDICATES PROPOSED GRADE AND BOTTOM OF FILLS

INDICATES SEISMIC SLOPE STABILITY ANALYSIS (FS=FACTOR OF SAFETY)*

INDICATES SLIP WEDGE STABILITY ANALYSIS (FS=FACTOR OF SAFETY)

NOTES:

1) BENCH PREPARATION OF SLOPE TO RECIEVE FILL IS NOT SHOWN ON CROSS SECTIONS

2) *GROUND ACCELERATION USED FOR SEISMIC SLOPE STABILITY ANALYSIS IS a=0.18g

3) SEE FIGURE 3 FOR LOCATION OF CROSS SECTIONS

0 100 200
APPROXIMATE GRAPHIC SCALE (FEET)

NO.	DATE	REVISION	BY

GEOLOGIC CROSS SECTIONS A-A' THROUGH L-L'

SDG&E SYCAMORE CANYON SUBSTATION

PROJ. MANAGER: MA	FIGURE NO: 4
DESIGNED BY: HKK	PROJECT NO: 9051230A-SCS2
DRAFTED BY: TEB	DATE: 5-13-92
CHECKED BY: MA	FN: SYCSECTS

Woodward-Clyde Consultants

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
1550 HOTEL CIRCLE NORTH, SAN DIEGO CA. 92108 (619) 294-9400

Project: SDG&E SYCAMORE CANYON SUBSTATION	**Log of Boring No: B-3**

Date Drilled: 12-6-91 | Water Depth: Dry | Measured: At time of drilling

Type of Boring: 36" flight auger and 9' belling tool | Type of Drill Rig: Watson 3000

*/** see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Cobbles/ Gravels/ Sand (Fines) *	Other Tests*
			Approximate Surface Elevation: 992' MSL			
0			**STADIUM CONGLOMERATE** Dense, moist, red brown, well graded gravel and cobble with sand (GW)			
5						
6			Dense, moist, light yellow brown, well graded gravel and cobble with sand (GW) and trace boulders			
10						
15						
20						
23			Dense, moist, light yellow brown, silty sand (SM)			
24			Dense, moist, light yellow brown, well graded gravel and cobble with sand (GW) with trace boulders			
25						
30						

Project:SDG&E SYCAMORE CANYON SUBSTATION	Log of Boring No: B-3 (Cont'd.)

Depth, ft	Samples	Blows/ft		Material Description	Moisture Content, %	Cobbles/ Gravels/ Sand (Fines) *	Other Tests*
30				(Continued) dense, moist, yellow brown, well graded gravel and cobble with sand (GW) with trace boulders Belling tool used at bottom. Approximately 40 minutes required to excavate a 9' diameter bell.			
35				Bottom of Boring at 35 feet			
40							
45							
50							
55							
60							
65							

GEOTECHNICAL INVESTIGATION

SDG&E TL6961
POLE FOUNDATIONS
M.S.A. 6160015454
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

SAN DIEGO GAS AND ELECTRIC COMPANY
SAN DIEGO, CALIFORNIA

SEPTEMBER 12, 2012
PROJECT NO. G1115-32-39

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1115-32-39
September 12, 2012

San Diego Gas and Electric Company
Civil/Structural Engineering
8316 Century Park Court
San Diego, California 92123

Attention: Mr. Tyler Lonsdale

Subject: GEOTECHNICAL INVESTIGATION
SDG&E TL6961 POLE FOUNDATIONS
M.S.A. 6160015454
SAN DIEGO, CALIFORNIA

Dear Mr. Lonsdale:

In accordance with your authorization of our Proposal No. LG-12131 dated May 9, 2012, we herein submit the results of our geotechnical investigation for the power pole foundations proposed along the subject transmission line. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed improvements. The pole locations are suitable for foundations provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Troy K. Reist
CEG 2408

PROFESSIONAL GEOLOGIST
TROY K. REIST
No. 2408
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Joseph J. Vettel
GE 2401

REGISTERED PROFESSIONAL ENGINEER
JOSEPH J. VETTEL
No. 2401
EXP. 09/30/12
GEOTECHNICAL
STATE OF CALIFORNIA

TKR:JJV:dmc

(2) Addressee

PROJECT NO. 05545-22-30

BORING B 1

ELEV. (MSL.) ________ DATE COMPLETED 5/26/98

EQUIPMENT 30" BUCKET AUGER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3	B1-1			SM	**POMERADO CONGLOMERATE** Very dense, damp, light brown, Silty, fine to medium SANDSTONE C= 300 ϕ 33°	3/7"	100.0	21.0
3–9	B1-2			SM	Very dense, damp, brown, Silty, fine to coarse SAND matrix with 30% gravel and cobbles to 6 inches			
9–12	B1-3			SM	Very dense, damp, light brown, Silty, fine to coarse medium SANDSTONE C =850 ϕ =35°	8	118.8	11.7
12–26	B1-4			SM	Very dense, brown, Silty, fine to coarse SAND matrix with 30% gravel and cobbles to 6 inches -Boulder (24") at 23 feet to 25 feet			
26–30	B1-5			SC	**STADIUM CONGLOMERATE** Very dense, damp, brown, Clayey, fine to coarse SAND matrix with 40% gravel and cobbles to 8"			
30					BORING TERMINATED AT 30 FEET			

Figure A-2 **Log of Boring B 1, page 1 of 1**

SPPS

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▧ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06355-42-02

BORING LB 4

ELEV. (MSL.) 852 DATE COMPLETED 2/8/02

EQUIPMENT SOIL MEC. R-208 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	**TOPSOIL** Loose, medium dense, dry, medium to dark yellow-brown, very Clayey, fine to medium GRAVEL			
2				GM				
4				SM-GM	**STADIUM CONGLOMERATE** Very dense, humid, light brown, Sandy, medium to coarse CONGLOMERATE; massive, with 40 to 50% cobble, 1" to 3" diameter			
6				SM	Very dense, damp, light brown-tan, very Gravelly SANDSTONE ~20 to 30% cobble, 2" to 5" diameter			
8					Dense, damp, light brown-tan, Silty, fine to medium SANDSTONE			
10	LB4-1			GM	Very dense, damp, medium olive-brown to yellow-brown, Sandy, massive, coarse CONGLOMERATE ~40 to 50% 3" to 8" diameter cobble, some clay			
12–26					max 126.8 @10.6 Remolded shear 114.3@ 10.3 C=561 Ø=36° Sulfate = 0.007 Neg			
28					-Becomes more dense, with ~50% 3" to 8" diameter cobble			

Figure A-9, Log of Boring LB 4

SYCES

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06355-42-02

BORING LB 4

ELEV. (MSL.) 852 DATE COMPLETED 2/8/02

EQUIPMENT SOIL MEC. R-208 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30					Sandstone layer - approximately horizontal 8" to 10" thick			
32					Very dense, damp, medium brown, Sandy, coarse CONGLOMERATE 40 to 50% cobble 3" to 8", some clay			
34				GM				
36								
38					8" to 10" thick approximately horizontal sandstone layer			
40								
42								
44								
46								
					BORING TERMINATED AT 47 FEET			

Figure A-10, Log of Boring LB 4

SYCES

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◨ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

TRENCH T 28

ELEV. (MSL.) 875 DATE COMPLETED 7/23/99

EQUIPMENT JD 555 TRACKHOE 24"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				CL-SC	**TOPSOIL** Stiff, damp, reddish-brown, Gravelly, Sandy CLAY to Clayey SAND			
2 – 7				SM	**STADIUM CONGLOMERATE** Very dense, damp, light brown-tan, Silty, fine SANDSTONE -With some clay and clay-lined seams			
7 – 8				GM	Very dense, damp, light brown, Sandy, coarse CONGLOMERATE; with some silt			

TRENCH TERMINATED AT 8 FEET

Figure A-35, Log of Trench T 28

MONTE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

TRENCH T 29

ELEV. (MSL.) 830 DATE COMPLETED 7/23/99

EQUIPMENT JD 555 TRACKHOE 24"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Loose, dry, dark brown, very Gravelly-Silty SAND			
2								
4				GM	**STADIUM CONGLOMERATE** Very dense, humid, light tan-white, cemented, Sandy, coarse CONGLOMERATE; with some silt -Marginal to nonrippable			
					TRENCH TERMINATED AT 5 FEET			

Figure A-36, Log of Trench T 29

MONTE

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

TRENCH T 30

ELEV. (MSL.) 835 DATE COMPLETED 7/23/99

EQUIPMENT JD 555 TRACKHOE 24"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**TOPSOIL** Loose, dry, dark red-brown, Sandy, coarse GRAVEL; with some silt			
2								
4				GM	**STADIUM CONGLOMERATE** Very dense, damp, light brown to tan, Sandy, coarse CONGLOMERATE; with some silt -Massive, with imbricated clasts and moderate cemented			
6								
					TRENCH TERMINATED AT 7 FEET			

Figure A-37, Log of Trench T 30

MONTE

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

BORING B 2

ELEV. (MSL.) 870 DATE COMPLETED 7/27/99

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 13				GM	**STADIUM CONGLOMERATE** Very dense, humid, light brown to tan, Sandy, coarse CONGLOMERATE; with some silt			
13 – 19	B2-1 B2-2			SM	Dense, damp, light tan to gray, Silty, fine SANDSTONE -N 60 E, 10 S BEDDING -Horizontal contact	5	118.8	10.7
19 – 27				GM	Very dense, damp, light brown, Sandy, coarse CONGLOMERATE; with some silt			
27 –					Very dense, moist, medium olive-brown, Sandy, coarse CONGLOMERATE -With some clay			

Handwritten annotations (at B2-2): max 120.2 @ 12.8   107.4 @ 13.7 = 90%   Remolded shear C=814 φ=27°   EI = 9, 10   23.0%   113.2   EI=2

Figure A-4, Log of Boring B 2

MONTE

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

BORING B 2

ELEV. (MSL.) 870 DATE COMPLETED 7/27/99

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-3	GM				
36			Very dense, damp, light brown, Sandy, coarse CONGLOMERATE; with some silt			
42		GM	-Cemented zone 2 feet thick at 42 feet; with strong calcium carbonate cementation			
44			-8" sandstone layer at 47 feet			
50	B2-4	SM	Dense, damp, light gray-tan, Silty, fine SANDSTONE	10	118.4	14.6
52	B2-5	GM	Very dense, damp to moist, medium brown, Sandy, coarse CONGLOMERATE -With some clay and silt -12" cemented layer			

Figure A-5, Log of Boring B 2

MONTE

SAMPLE SYMBOLS: ... SAMPLING UNSUCCESSFUL; ... STANDARD PENETRATION TEST; ... DRIVE SAMPLE (UNDISTURBED); ... DISTURBED OR BAG SAMPLE; ... CHUNK SAMPLE; ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

BORING B 2

ELEV. (MSL.) 870 DATE COMPLETED 7/27/99

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60–69				GM	Very dense, damp, medium brown, Sandy, coarse CONGLOMERATE -With interbedded thin sandstone bed, with some clay			
70	B2-6				12"-24" SANDSTONE layer	30/11"	117.0	12.9
71–73								
74–78				SM	Dense, damp, light gray to tan, Silty, fine SANDSTONE -Horizontal contact			
79–89					Very dense, damp, medium brown, Sandy, coarse CONGLOMERATE -With silt and clay -Clasts up to 12" diameter			
88	B2-7			GM				

Figure A-6, Log of Boring B 2

MONTE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06160-42-03

BORING B 2

ELEV. (MSL.) 870 DATE COMPLETED 7/27/99

EQUIPMENT ROTARY BUCKET 30"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90					8-10" horizontal sandstone layer at 90 feet			
92								
94								
96								
98				SM	Dense, damp, light gray to tan, Silty, fine SANDSTONE			
100					BORING TERMINATED AT 100 FEET			

Figure A-7, Log of Boring B 2

MONTE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1115-32-39

BORING HA 1

ELEV. (MSL.) 822' DATE COMPLETED 07-25-2012

EQUIPMENT HAND AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	HA1-1			GM	**STADIUM CONGLOMERATE** Dense to very dense, dry, light brown, fine to medium, Sandy CONGLOMERATE, with 40-60% gravel, cobble and boulder size rock fragments up to 16" observed at the surface			
					REFUSAL AT 1.5 FEET			

G1115-32-39.GPJ

Figure A-1,
Log of Boring HA 1, Page 1 of 1

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

File No. D-3965-T01
September 28, 1987

BORING 4

ELEVATION 809MSL DATE DRILLED 9/3/87

EQUIPMENT Watson 3000

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0				GW	STADIUM CONGLOMERATE Very dense, slightly moist, tan, Silty, fine to coarse grained SAND and cobbles/gravels			
6					reddish brown, partially cemented			
					BREAK IN LOG			
17	B4-1				max 127.0 @ 10.1 Remold 90% 114.1 @ 10.3 C=430 φ=31		BULK SAMPLE	
18.5	B4-2				clay seam at 18'-19'		BULK SAMPLE	
					BREAK IN LOG			
27					cemented cobble layer			
33					light yellow brown			
34	B4-3						BULK SAMPLE	
40								

Figure A-6, Log of Test Boring 4

CONTINUED NEXT PAGE

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-3965-T01
September 28, 1987

BORING 4 CONTINUED

ELEVATION 809MSL DATE DRILLED 9/3/87

EQUIPMENT Watson 3000

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
40								
42					silty sand lense, trace gravel/cobble			
44								
46					cemented cobble layer			
48								
50				GW				
					BREAK IN LOG			
56								
58					silty sand lense			
60								
62					partially cemented cobble layer			
64								
66								
68					slight decrease in cobble size			
70					BORING TERMINATED AT 70.0 FEET			

Figure A-7, Log of Test Boring 4 continued

SAMPLE SYMBOLS — SAMPLING UNSUCCESSFUL — STANDARD PENETRATION TEST — DRIVE SAMPLE (UNDISTURBED) — DISTURBED OR BAG SAMPLE — CHUNK SAMPLE — WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1115-32-39

BORING HA 2

ELEV. (MSL.) 795' DATE COMPLETED 07-25-2012

EQUIPMENT HAND AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	HA2-1			SM	**STADIUM CONGLOMERATE** Dense, dry, light brown, Silty, fine to medium SANDSTONE			
1								
2								
				GM	Very dense, damp, light brown, fine to medium, Sandy CONGLOMERATE, with 40-60% gravel, cobble and boulder size rock fragments up to 16" observed in cut slope			
3					REFUSAL AT 3 FEET			

G1115-32-39.GPJ

Figure A-2,
Log of Boring HA 2, Page 1 of 1

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1115-32-39

BORING HA 3

ELEV. (MSL.) 765' DATE COMPLETED 07-25-2012

EQUIPMENT HAND AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	HA3-1			SM	**STADIUM CONGLOMERATE** Dense, dry, light brown, Silty, fine to medium SANDSTONE			
1								
				GM	Very dense, damp, light brown, fine to medium, Sandy CONGLOMERATE, with 40-60% gravel and cobble size rock fragments up to 8"			
2					REFUSAL AT 2 FEET			

Figure A-3,
Log of Boring HA 3, Page 1 of 1

G1115-32-39.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

FILE NO. D-4415-M03

TRENCH T-90

ELEVATION 808 DATE COMPLETED 8/15/89

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**SLOPEWASH**			
	T90-1			CL	Stiff, moist, medium-brown, Gravelly-Sandy CLAY			
2								
					POMERADO CONGLOMERATE			
4					Dense, moist, light yellow-brown, Clayey-Sandy COBBLE CONGLOMERATE			
					Horizontal bedding			
6								
8	T90-2				Dense, moist, light grayish-tan, Silty-Sandy COBBLE CONGLOMERATE			
10								
12					TRENCH TERMINATED AT 12 FEET			

Log of Test Trench T-90

SRNM3

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4415-M02

BORING B 6

ELEVATION 700 DATE COMPLETED 8/23/89

EQUIPMENT 30"DIA. BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**TOPSOIL** Loose, dry, dark brown, Silty-Sandy, COBBLE-GRAVEL			
2								
4				GM	**STADIUM CONGLOMERATE** Very dense, damp, light brown, Silty-Sandy COBBLE CONGLOMERATE; massive, occasional thin sandy zones			
6								
8								
10								
12					becomes more sandy at 11-13 feet			
14								
16								
18								
20								
22					BORING TERMINATED AT 22 FEET			

Log of Test Boring B 6, page 1 of 1

SRNM2

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◨ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ▤ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4415-M02

BORING B 5

ELEVATION 690 DATE COMPLETED 8/23/89

EQUIPMENT 30"DIA. BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**TOPSOIL** Loose, dry, dark brown, Silty-Sandy COBBLE-GRAVEL			
2				GM	**STADIUM CONGLOMERATE** Very dense, damp, light brown, Silty-Sandy COBBLE CONGLOMERATE			
4								
6					Nearly horizontal bedding-contact			
8				SM	Dense, moist, light tan, Silty fine SANDSTONE			
10								
12								
14				GM	Very dense, moist, light brown, Silty-Sandy COBBLE CONGLOMERATE			
16					max 128.7 @ 9.4			
18					90% Remold 115.8 @ 9.4			
20	B5-1				C= 200 Φ= 33			
22								
24								
26								
28								
					BORING TERMINATED AT 30			

Log of Test Boring B 5, page 1 of 1 SRNM2

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
⊠ ... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
▨ ... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. D-4415-M02

BORING B 8

ELEVATION 686 DATE COMPLETED 8/23/89

EQUIPMENT 30"DIA. BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**TOPSOIL** Loose, dry, dark brown, Silty-Sandy, COBBLE GRAVEL			
2				GM	**STADIUM CONGLOMERATE** Very dense, damp, light brown, Sandy COBBLE CONGLOMERATE; moderate calcium carbonate cementation			
4–6				GM	Dense, moist, light brown-orange, Silty-Sandy COBBLE CONGLOMERATE			
10				SM	Dense, moist, light tan-brown, Silty fine SANDSTONE			
14				GM	Very dense, moist, light-medium brown, Silty-Sandy COBBLE CONGLOMERATE			
20					BORING TERMINATED AT 20 FEET (ALMOST REFUSAL ON LARGE COBBLES)			

Log of Test Boring B 8, page 1 of 1

SRNM2

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◫ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

P22, P23

File No. D-1974-T02
April 24, 1981

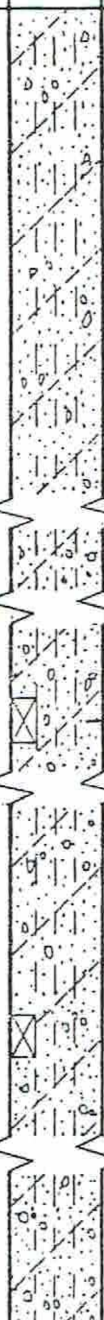
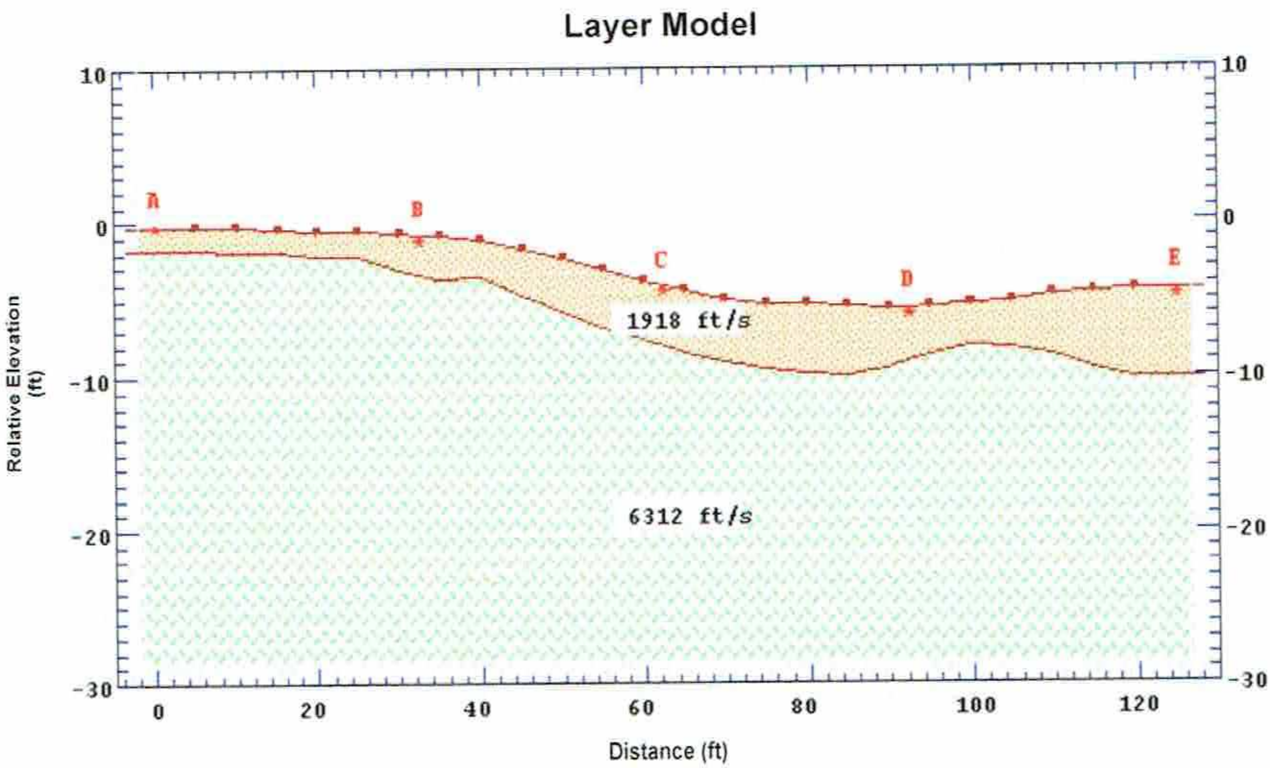
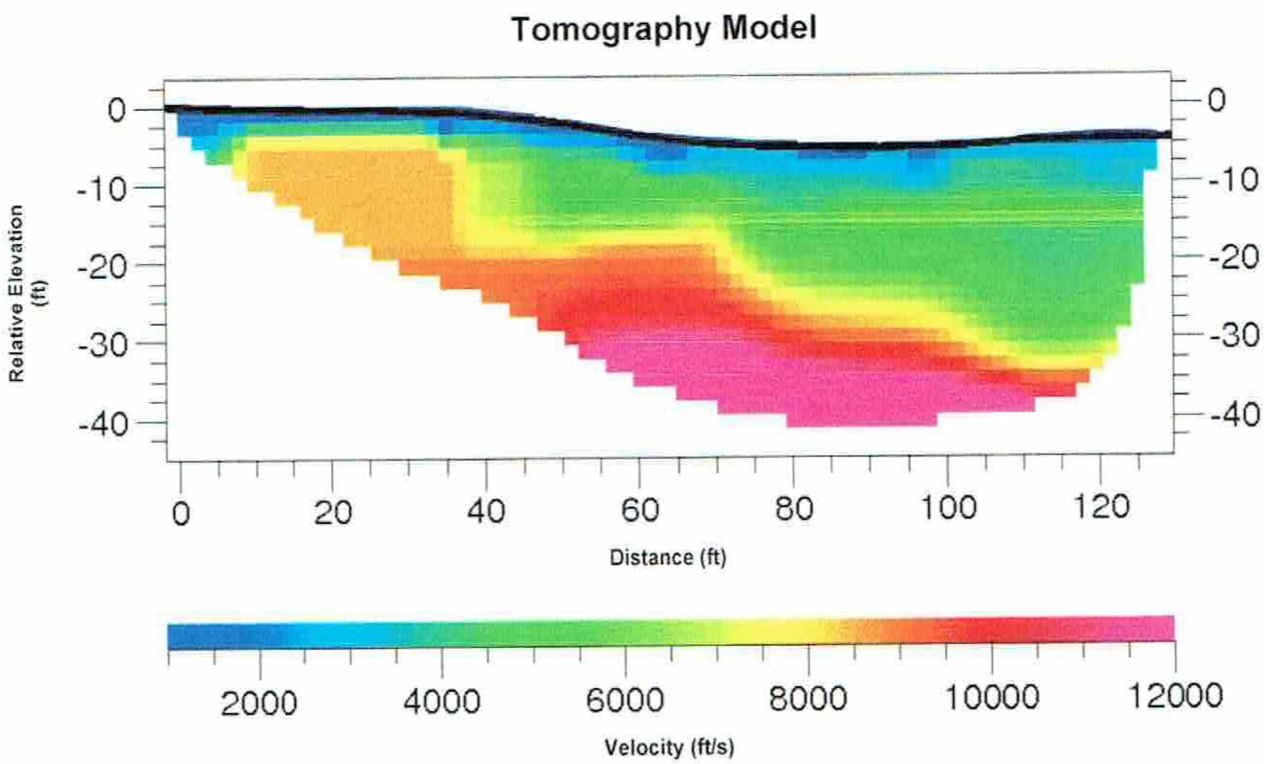
DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f	IN-PLACE MOISTURE CONTENT % dry wt
0				BORING NO. 10		
0–10				STADIUM CONGLOMERATE Silty and Clayey Sandy GRAVELS to 8" diameter		
10				becomes olive brown		
				break in log		
20				break in log		
32	10-1			Remolded 112.4 @ 9.8 C=170 φ=34 max 125.0 @ 9.8	BULK	SAMPLE
				break in log		
44	10-2			Remolded 110.6 @ 11.0 C=70 φ=33 max 123.2 @ 10.7		
54				BORING TERMINATED AT 53.0 FEET		

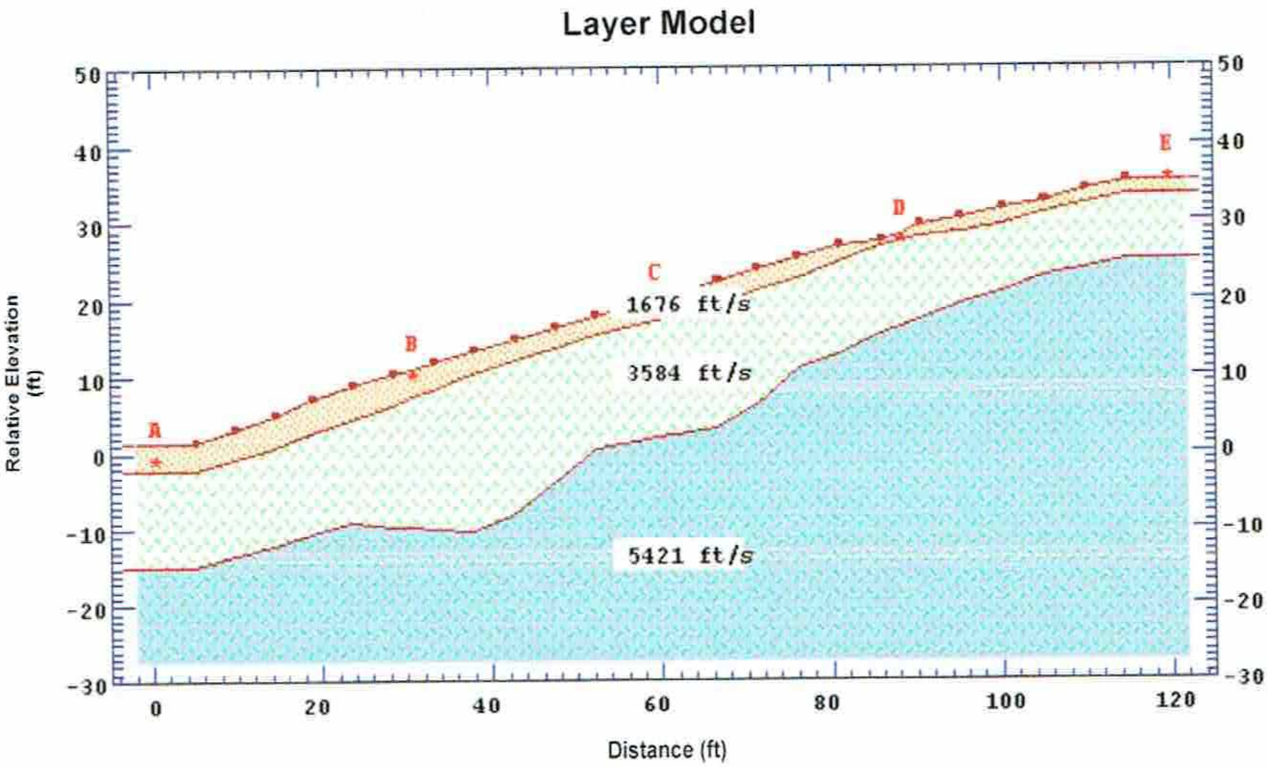
Figure 20, Log of Test Boring 10



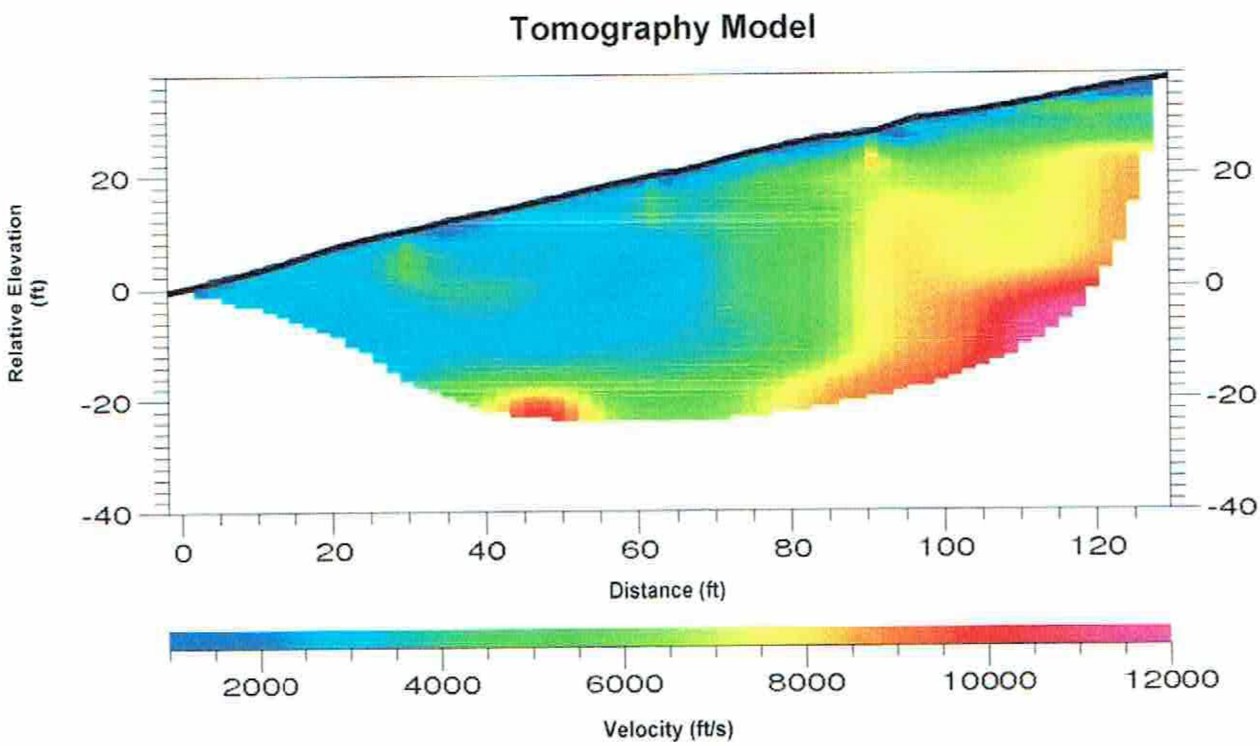


SEISMIC PROFILE SL-1	SDG&E Power Pole Replacement, TL 6961 Poway, California Project No.: 112303 Date: 08/12	SOUTHWEST GEOPHYSICS INC Figure 4a

Layer Model



Tomography Model



SEISMIC PROFILE SL-2	SDG&E Power Pole Replacement, TL 6961 Poway, California	SOUTHWEST GEOPHYSICS INC. Figure 4b
	Project No.: 112303 · Date: 08/12	

PROJECT NO. G1115-32-39

BORING B 1

ELEV. (MSL.) 546' DATE COMPLETED 08-09-2012

EQUIPMENT CME 75 HOLLOW STEM RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B1-1			SM	**UNDOCUMENTED FILL** Loose, damp, brown to dark brown, Gravelly, fine to coarse SAND, with 10-20% gravel and cobble			
2					-Contact estimated			
4				SM	**STADIUM CONGLOMERATE** Dense to very dense, damp, brown, Silty/Gravelly, fine to coarse SAND, with estimated 20-25% gravel and cobble content			
					-No recovery on CAL sample; shoe destroyed on cobble	50/2"		
6	B1-2							
8								
10					-No recovery on SPT sample	50/3"		
	B1-3							
12								
14								
	B1-4				-No recovery on CAL sample; very dense, damp, gray and orange brown, silty fine to medium sandstone lense at 15 feet	51		
16	B1-5							
18								
20					-No recovery on CAL or SPT sample	50/2"		
					BORING TERMINATED AT 20 FEET			

G1115-32-39.GPJ

Figure A-4,
Log of Boring B 1, Page 1 of 1

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1115-32-39

BORING B 2

ELEV. (MSL.) 586' DATE COMPLETED 08-09-2012

EQUIPMENT CME 75 HOLLOW STEM RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT AND BASE**			
				SM	**MISSION VALLEY FORMATION** Dense, damp, gray, Silty, fine to medium SANDSTONE, with estimated 20-30% gravel and cobble			
2								
4					-No recovery on SPT sample	50/2"		
6	B2-1							
8								
10	B2-2							
12								
14	B2-3					99		
					-Little to no gravel and becomes orange brown			
16				ML	Hard, damp, gray, Clayey/fine, Sandy SILTSTONE, with white caliche			
	B2-4					50/6"		
18								
20	B2-5				-Silty claystone lense with white caliche layer at 20 feet	50/6"		
	B2-6				-Becomes dark gray and sandier below 20.5 feet	73		
22					BORING TERMINATED AT 22 FEET			

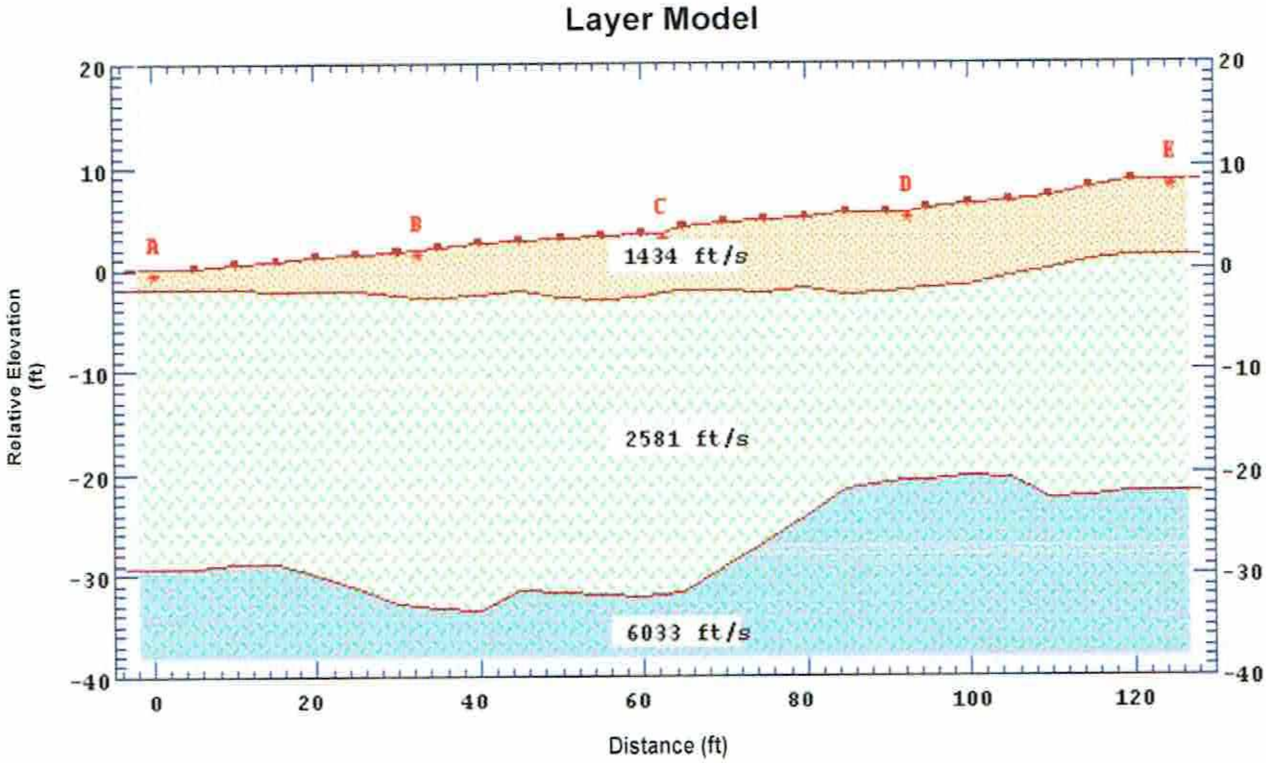
Figure A-5,
Log of Boring B 2, Page 1 of 1

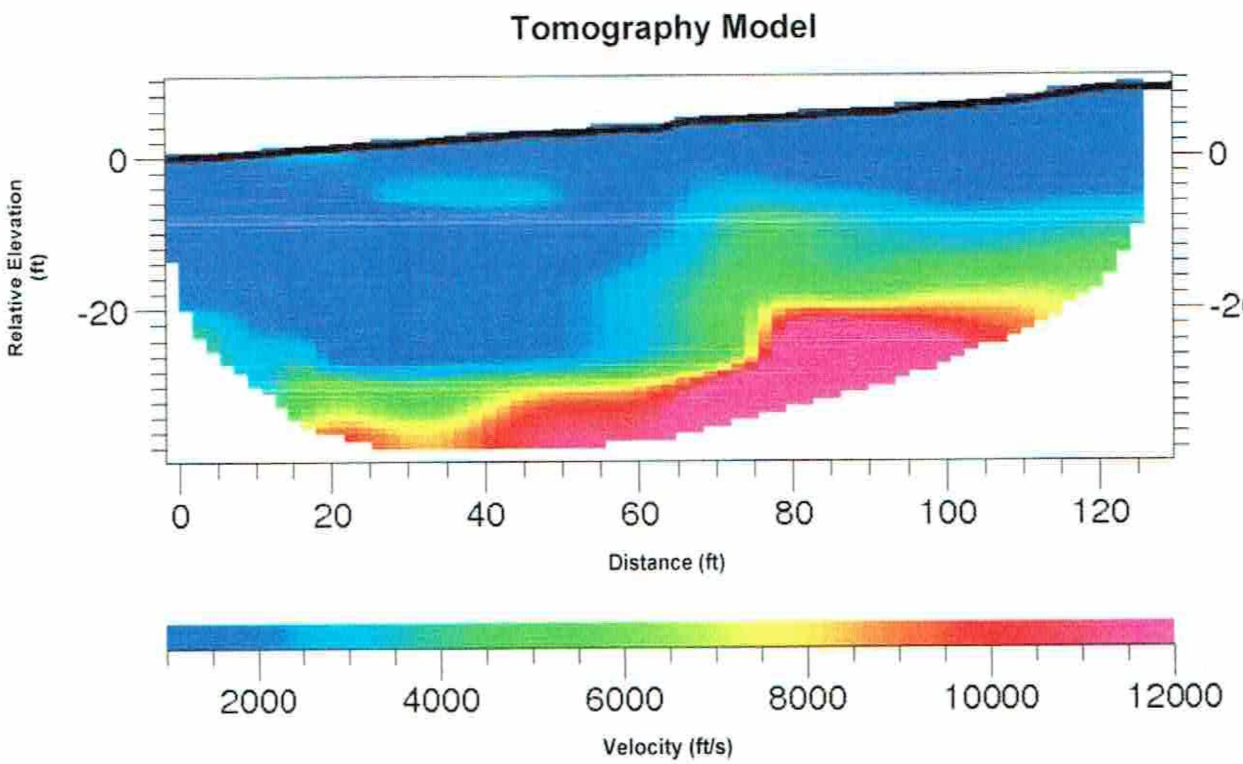
G1115-32-39.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

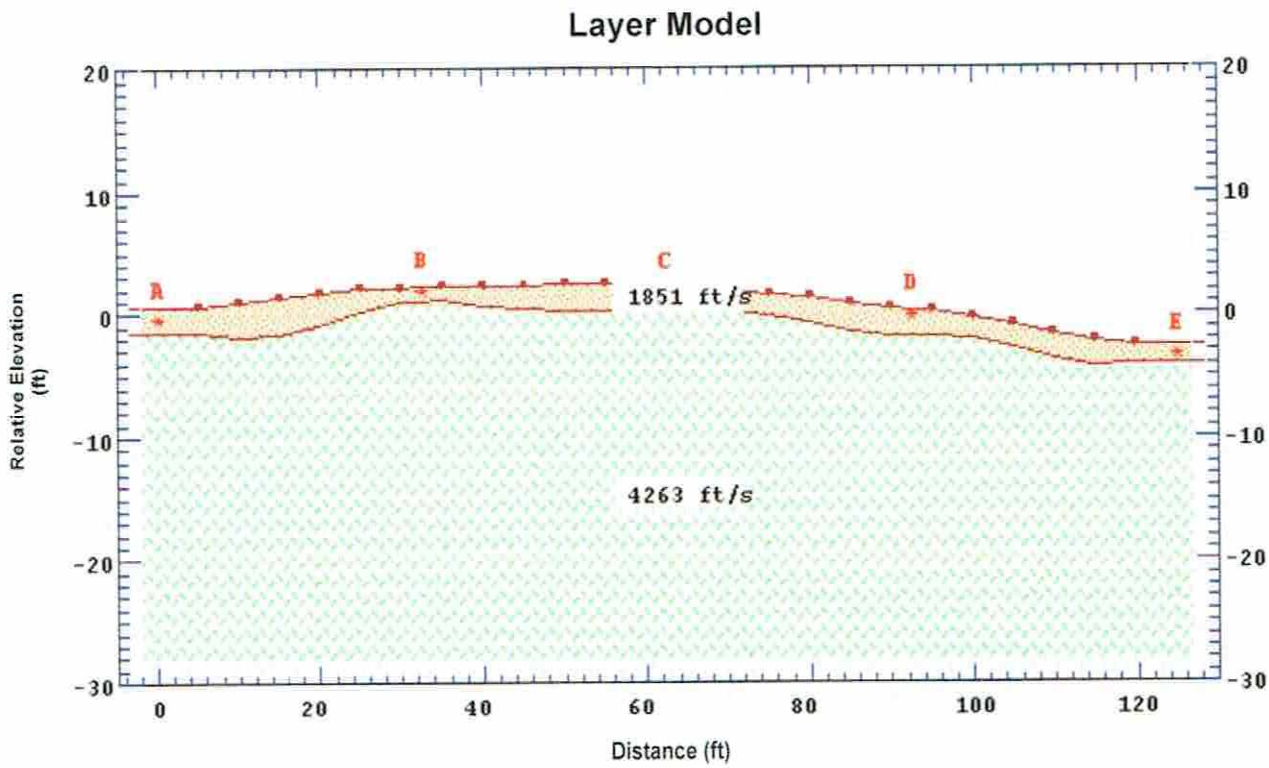
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

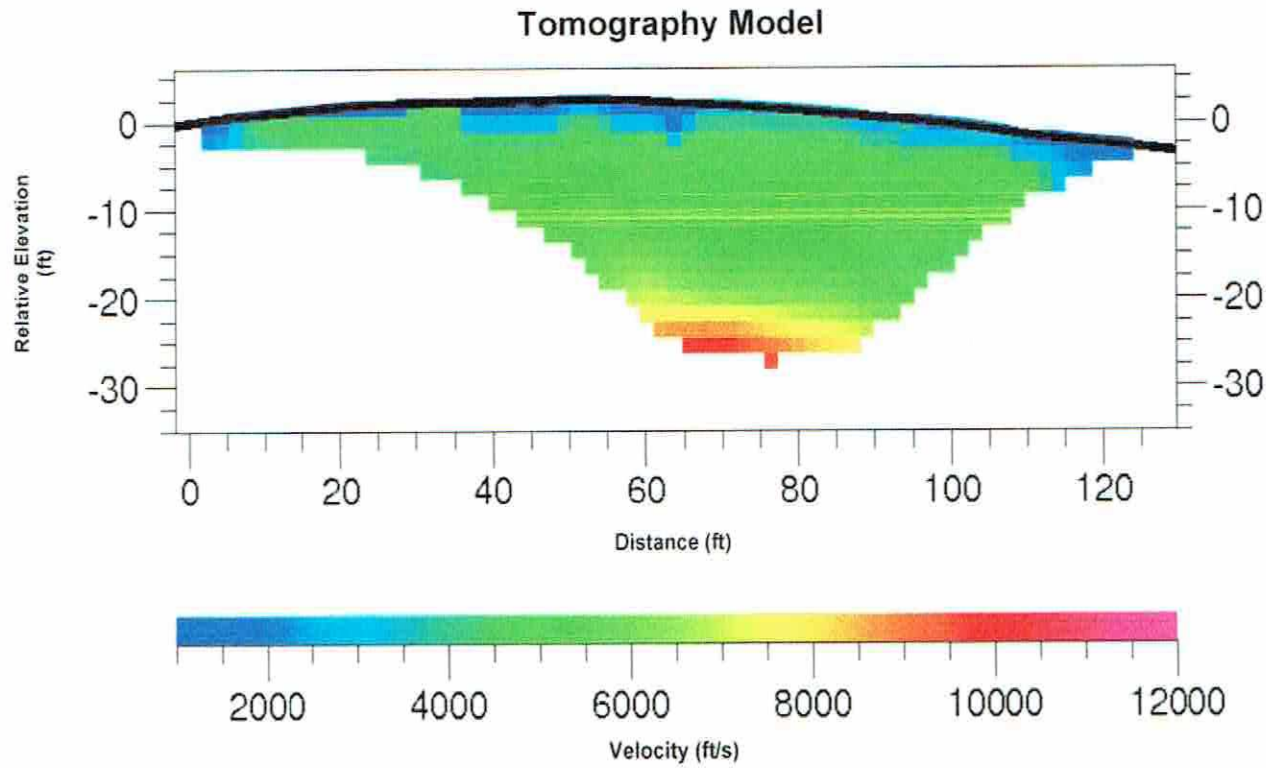
GEOCON



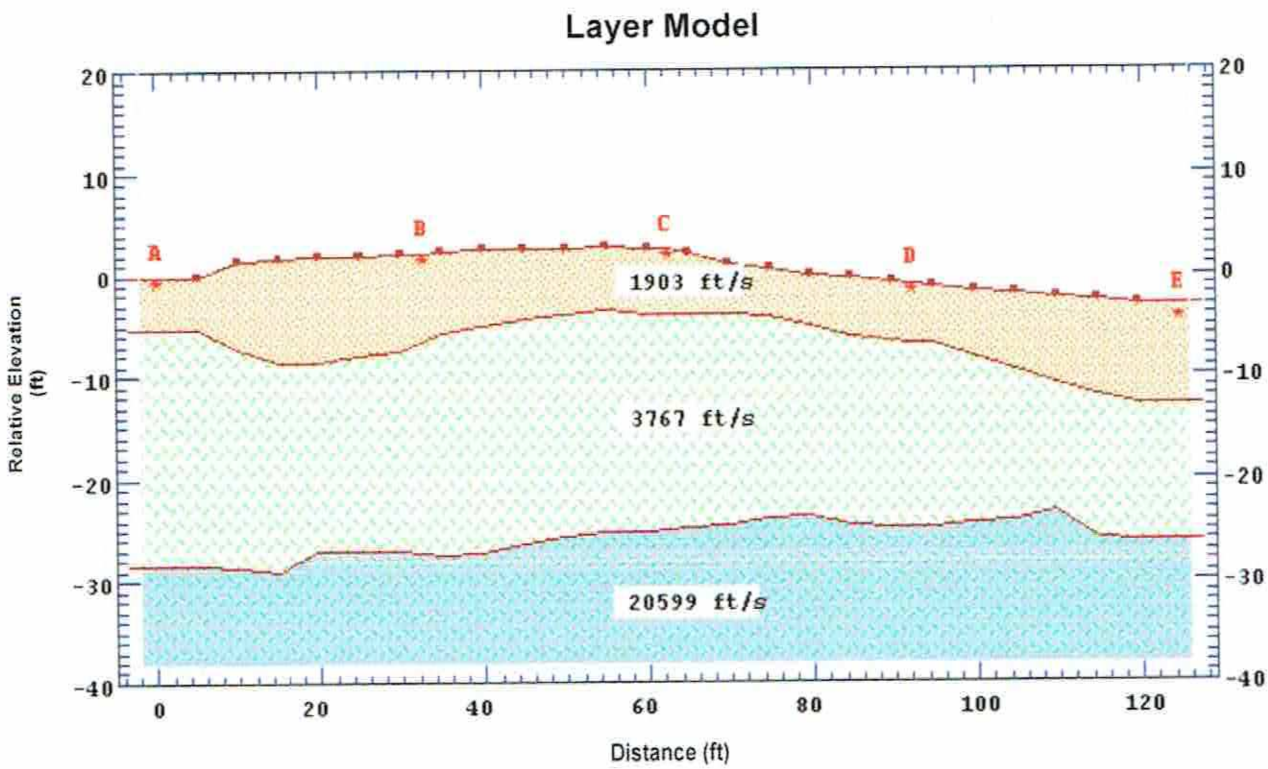


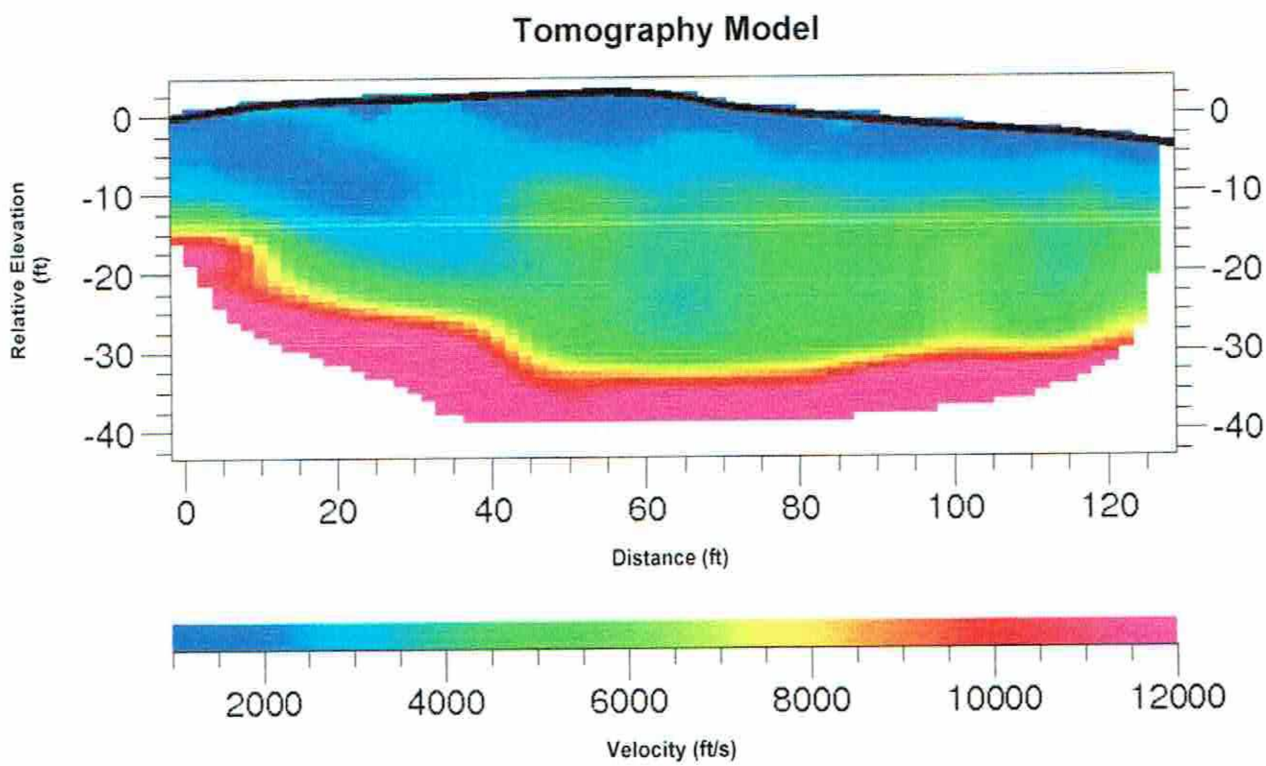
SEISMIC PROFILE SL-3	SDG&E Power Pole Replacement, TL 6961 Poway, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 112303 / Date: 08/12	Figure 4c





SEISMIC PROFILE SL-4	SDG&E Power Pole Replacement, TL 6961 Poway, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 112303 / Date: 08/12	Figure 4d





SEISMIC PROFILE SL-5	SDG&E Power Pole Replacement, TL 6961 Poway, California Project No.: 112303 Date: 08/12	SOUTHWEST GEOPHYSICS INC Figure 4e

P35, P36

S.D.G.&.E. 230 KV Mission – Escondido

JOB NAME

SUMMARY SHEET

TOWER NO. 81 P35

4' South of Tower Centerline

DEPTH/FEET	SAMPLE NUMBER	SOIL CLASSIFICATION SYMBOL	Description	Classification	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	
0–1			Brown, Dry, Loose, 30 Percent Rock Fragments, Topsoil	GRAVELLY FINE TO MEDIUM SAND					
1–6.5			Light Brown, Dry, Very Firm	HIGHLY FRACTURED VOLCANIC ROCK					

TOWER NO. 82 P36

4' North of Tower Centerline

DEPTH/FEET	SAMPLE NUMBER	SOIL CLASSIFICATION SYMBOL	Description	Classification	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	
0–1			Brown, Dry, Loose, Topsoil	CLAYEY FINE TO MEDIUM SAND					
1–2			Brown, Moist, Firm	FINE TO MEDIUM SANDY CLAY					
2–3.5			Light Brown, Slightly Moist, Very Firm, Granite, Decomposed In Place	CLAYEY FINE TO COARSE SAND (Merges)					
3.5–6.5	1		Light Brown, Slightly Moist, Very Firm, Granite, Decomposed In Place, Less Weathered With Depth	SLIGHTLY CLAYEY FINE TO COARSE SAND	38.2	5.8	131.3		

PROJECT NO.		DRAWING NO.
72-2-27A	BENTON ENGINEERING, INC.	5

JOB NAME San Diego Gas & Electric Co., Mission-Escondido Line

SUMMARY SHEET
TOWER NO. 82
Location: 5' South of Tower Centerline

DEPTH/FEET	SAMPLE NUMBER	SOIL CLASSIFICATION SYMBOL	Description	Classification	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	Sec./Foot *
0–1			Red-brown to Gray-brown, Dry, Compact, Topsoil and Loose Rock	CLAYEY FINE TO MEDIUM SANDY GRAVEL					37
1–11.5	1 (at ~3.5), 2 (at ~7.5)		Light Gray-brown, Dry, Very Compact, with Occasional Fractures; Becomes Fresher with Depth; Thin Fracture Zone (~8.5); Thin Fracture Zone (~10.5)	FRESH METAVOLCANIC BEDROCK					34 (to ~6); 35 (~6–8.5); 27 (~8.5–10.5); 30 (~10.5–11.5)

Stopped 11.5 feet

☐ - Loose bag sample taken for identification purposes by San Diego Gas & Electric Company Personnel.

* - Rate of penetration in seconds/foot, by "Air-Track" PAT-1 track-mounted drill rig. All holes were air-drilled with a 3 inch diameter double-jack drill.

NOTE: In general, fresh rock (granitic or metavolcanic) will drill to a white to light gray dust, and weathered rock or weathered fracture seams will drill to a yellow-brown to red-brown to brown dust.

PROJECT NO.		DRAWING NO.
72-2-27A	BENTON ENGINEERING, INC.	22

File No. D-3484-M01
July 23, 1985

BORING 5

DEPTH IN FEET	SAMPLE NO.	RUN NO.	NO. AND SIZE OF CORE PIECES	% RECOVERY	RQD
0–5		1	2 @ .3-4' 3 < .1'	20	16
5–8.5		2	1 @ .3' 2 @ .2' numerous fragments < .1'	30	12
8.5–10		3	1 .2' NF .1'	100	50
10–12.5		4	1 @ .4' numerous fragments < .1'	50	16
12.5–16		5	numerous fragments < .1'	47	0
16–17.5		6	5 > .1' numerous fragments < .1'	50	0
17.5–19.5		7	3 @ .2' NF <.1'	100	0
19.5–21.5	2	8	1 @ .4' 1 @ .3'NF <.2'	96	75
21.5–23.5	2	9	7 @ .2'-.4' NF <.1'	100	57
23.5–25.5	2	10	1 @ .5' 2 < .2'	100	88
25.5–27.5	2	11	13 @ .1'-.4'	100	67

MATERIAL DESCRIPTION

Soft to firm, very moist, red-brown, slightly Sandy CLAY
E_pEOE

to very hard, blue-green, fine- to medium-grained GRANITIC ROCK, stained, rough, fracture faces @ 40° & 55°
BADD

Loose to dense, brown, medium to coarse SAND
E_{np}EOD

to very hard, blue-green, fine-grained GRANITIC ROCK, clean, stained, slightly rough fracture face @ 20°
BBDC

@10.2' clean, stained, slightly rough fracture face @55°

@12.5' soft, very moist, brown, Sandy CLAY
E_pEOE

Loose to medium dense, orange-brown, medium to coarse SAND
E_{np}DOD

to hard, orange-brown, stained, highly fractured GRANITIC ROCK fracture faces at 15° & 30°

CCDC fracture frequency @ 1"-2"

BBEC very hard, blue-gray, fine-grained GRANITIC ROCK, fracture frequency @ 2'-4", clean, stained, smooth to slightly rough fracture faces @ 15°-25° & 45°-60°
BBEC

Fracture frequency @ 4"-6" clean, stained, smooth fracture faces @ 15°, 25°, 40° & 80°

BBEB

Figure A-9, Log of Core Boring 5

EQUIPMENT ______ ELEVATION 836 DATE DRILLED 6/25/85

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-3484-M01
July 23, 1985

BORING 5 CONTINUED

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	CORES: RUN NO.	CORES: NO. AND SIZE OF CORE PIECES	CORES: % RECOVERY	CORES: RQD	MATERIAL DESCRIPTION
30–31.3	2	+ + +	12	6 @ .4'-.6'	100	84	Very hard, blue-gray, medium- to fine-grained GRANITIC ROCK, fracture frequency @ 6"-8", clean, stained, smooth fracture faces @ 25°,50°-60° BAEB
31.3–34.9		+ + +	13	1 @ 1.7' 1 @ .8' 4 < .3'	100	100	Fracture frequency at 15", clean fracture faces @ 20°,40° & 70°
34.9–39.6		+ + +	14	1 @ 1.7' 2 @ 1.1' 1 @ .9' 1 @ .5'	100	100	Fracture frequency @ 10"-12", filled fracture faces @ 40°,50°-55° AAEB
39.6–44.6		+ + +	15	1 @ 3.2' 1 @ 1.7' few fragments < .1'	100	100	Fracture frequency @ 2.5'-3.0' filled, smooth fracture faces @ 10° & 25° AADB
44.6–49.5		+ + +	16	1 @ 2.5' 1 @ 1.7'	100	100	Fracture frequency @ 2.0', clean, stained, smooth fracture faces @ 20° & 55° AADB
49.5–51.5		+ + +	17	1 @ .7' 1 @ .5' 1 @ .2' NF <.1'	90	67	Fracture frequency @ 6", clean, stained, slightly rough fracture faces @ 20° & 30°-35° BADB
51.5–56.5		+ + +	18	1 @ 2.2' 1 @ .9' 1 @ .7' 3 @ .3'-.4'	100	100	Fracture frequency @ 2'-3', clean, stained, smooth fracture faces @ 50°-55° AADB
56.5–60		+ + +					

Figure A-10, Log of Core Boring 5 Continued

EQUIPMENT ______ ELEVATION ______ DATE DRILLED ______

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-3484-M01
July 23, 1985

BORING 5 CONTINUED

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	CORES: RUN NO.	CORES: NO. AND SIZE OF CORE PIECES	CORES: % RECOVERY	CORES: RQD	MATERIAL DESCRIPTION
60							
62			19	1 @ 1.8' 1 @ 1.4' 1 @ 1.1' 1 @ .3'	100	100	Very hard, blue-gray, fine-grained GRANITIC ROCK, fracture frequency @ 1.5'-2.0', clean, stained, smooth fracture faces @ 15° & 40°
64			20	1 @ 2.6' 1 @ 1.1' NF <.1'	100	97	
66							AADB
							BORING TERMINATED AT 65.0 FEET

Figure A-11, Log of Core Boring 5 Continued

EQUIPMENT ______ ELEVATION ______ DATE DRILLED ______

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 3

ELEV. (MSL.) 707' DATE COMPLETED 08-09-2012

EQUIPMENT CME 75 HOLLOW STEM RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Loose, damp, dark brown, Silty/Sandy CLAY			
1								
2								
3				ML	**MISSION VALLEY FORMATION** Stiff to very stiff, damp to moist, light brown and white, Clayey SILTSTONE, with abundant caliche; weathered from 3-8'			
4								
5	B3-1					33		
6	B3-2					20		
7								
8					-Becomes hard with less caliche below 8 feet			
9								
10	B3-3				-Becomes clayier with depth	75/11"		
11	B3-4					49		
12								
13								
14								
15	B3-5			SM	Dense, damp, gray, Silty, fine SANDSTONE	75/11"		
16	B3-6					49		
17								
18								
19					**SANTIAGO PEAK VOLCANIC** Completely to highly weathered, pale green and orange with red oxidation, weak, METAVOLCANIC ROCK; with remnant rock fabric and rock			
20	B3-7					50/6"		
21	B3-8					87		
					BORING TERMINATED AT 21.5 FEET			

Figure A-6,
Log of Boring B 3, Page 1 of 1

G1115-32-39.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

OWEN CONSULTANTS
ENGINEERS GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
10065 OLD GROVE ROAD
SAN DIEGO, CA 92131
TELE (619) 695-3160
FAX (619) 695-3163

August 21, 1990
Project No. 1044.1.2

TRS Consultants
7867 Convoy Court, Suite 312
San Diego, California 92111

Attention: Mr. Thure Stedt

Subject: RESPONSE TO CITY SAN DIEGO REVIEW
W.O. # 89-1180
MAY 1990, BY MASIH MAHER

Reference: "Geotechnical Evaluation for Environmental Impact Report, Evergreen Nursery, 70 Acre Site North of Black Mountain Road, San Diego, California," by Owen Consultants, Project No. 730.4.1, dated November 30, 1989 (Reissued).

INTRODUCTION

This report is intended to address the review comments from the City of San diego (May 1990) by Masih Maher (W.O. 89-1180). The review comments are as follows:

1. In order to protect existing or potential improvements on the neighboring properties and/or public right-of-away, the stability of all slopes which may adversely affect contiguous properties should be investigated and addressed by Geotechnical Consultants.

2. Stability of all on-site structures should be investigated and addressed in Geotechnical Report.

3. The total area of the site reported by Soil Engineer is 87 acres and 72 acres reported by Project Civil Engineer which figure is accurate.

4. Soil and geology conditions reported for the project site, by Owen Consultants dated November 30, 1989, are contradictory with as-built grading plan. Geotechnical Consultant did not report existence of any fill soils on the site. However, based on the grading plan, a major portion of the site is covered by fill soils. It is recommended that Geotechnical Consultant conduct a field exploration to verify location of fill soils.


MATCH LINE SEE SHEET NO.3
PAR I
PM 8387
PARCEL 2
PM 12927
PARCEL 1
PM 9371
PARCEL 2
PM 9371
PARCEL 3
PM 9371
PARCEL 4
PM 9371
Qaf
Tmv
B-3
B-1
B-1-1b
ng
16.' of Fill
GW @ 16.0 ft
19' of Fill
GW @ 10.5 ft
16' of Fill
PLATE 2
SCALE 1"=30'
LEGEND
ON SITE STRUCTURE
B-4 TEST BORING BY OWEN CONSULTANTS
Qaf FILL
Tmv MISSION VALLEY FORMATION
ALL DIMENSIONS AND LOCATIONS APPROXIMATE
GEOTECHNICAL MAP
EVERGREEN NURSERY
SAN DIEGO, CALIFORNIA
Franklin Engineering
1119 Russ Boulevard
San Diego, CA 92101
(619) 239-5588
• Civil Engineering • Site Planning • Surveying •
PLAN FILE NO.
ENGINEERING APPLICATION NO.
AS-BUILT GRADING PLAN FOR:
EVERGREEN NURSERY
(AS-BUILT)
CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
JN.8927

03 04 2004

DRILLING COMPANY: DIC II | RIG: LITTLE BEAVER | DATE: 7-24-90

BORING DIAMETER: 4 INCHES | DRIVE WEIGHT (S): 140 LBS. | DROP: 30 INCHES | ELEVATION: ±358'

TEST BORING NO. B-1

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					21.6	CL	FILL: Light brown to dark brown sandy clay, wet, soft
5	X	X	30	115.5	11.5	SC	@ 5.0 ft. Dark brown clayey sand, moist, loose to medium dense, fine- to medium-grained
	X						@ 6.0 ft. Light gray clayey sand, very moist, medium dense, fine- to medium-grained
					15.2		
10		X	70	101.0	12.6	SM	FORMATIONAL: @ 10.0 ft. Light gray to white sandstone, moist, dense to very dense (drive sample may be disturbed)
	X				14.7	SC	@ 11.0 ft. Light gray to light brown clayey sand, moist, medium dense to dense, fine- to medium-grained
							@ 13.0 ft. Yellowish dark brown clayey sand with gravels, moist, very dense
							@ 13.5 ft. End of boring due to refusal
15							Total Depth: 13.5 ft. No Water Encountered No Caving Backfilled: 7-24-90
20							
25							
30							

TEST BORING LOG

PROJECT NO. 1044.1.2 | EVERGREEN NURSERY | FIGURE NO. B-1

OWEN CONSULTANTS

03 04 2004

DRILLING COMPANY: DIG IT | RIG: LITTLE BEAVER | DATE: 7-24-90

BORING DIAMETER: 4 INCHES | DRIVE WEIGHT (S): 140 LBS. | DROP: 30 INCHES | ELEVATION: ±354'

TEST BORING NO.B-2

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0							FILL: Light brown clayey sand, moist, medium dense, fine- to medium-grained
	X				21.4	CL	@ 3.0 ft. Light brown sandy clay, wet, soft
5		X	20	101.0	22.5		
	X				19.7		
							@ 9.0 ft. Dark brown sandy clay, wet, soft
10	X				19.8		@ 10.0 ft. Light brown sandy clay, wet, soft
						▽	@ 10.5 ft. Groundwater encountered
		X	20	109.8	16.5		
	X				20.4	SC	@ 13.0 ft. Dark brown clayey sand, wet, loose to medium dense, fine-grained
15		X	70	108.6	11.0	SM	FORMATIONAL: @ 16.0 ft. Light brown sandstone, moist, medium dense to dense, fine-grained
20	X						@ 21.0 ft. Light brown to white sandstone, moist, dense to very dense, fine-grained
		X	120	109.3	8.6		@ 21.5 ft. End of boring due to refusal
25							Total Depth: 21.5 ft. Groundwater at 10.5 ft. No Caving Backfilled: 7-24-90
30							

B-2

TEST BORING LOG

PROJECT NO. 1044.1.2 | EVERGREEN NURSERY | FIGURE NO B-2

OWEN CONSULTANTS

03 04 2004

DRILLING COMPANY: DIG IT	RIG: LITTLE BEAVER	DATE: 7-25-90
BORING DIAMETER: 4 INCHES	DRIVE WEIGHT (S): 140 LBS. DROP: 30 INCHES	ELEVATION: ±356'

TEST BORING NO.B-3

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0						SC	FILL: Light brown clayey sand, very moist, loose, fine- to medium-grained
	X				19.9		
5		X	12	99.1	20.3	CL	@ 6.0 ft. Light brown to dark brown sandy clay, very moist, soft
	X						
10		X	23	107.2	17.3	SC	@ 10.0 ft. Light brown to dark brown clayey sand, very moist, loose to medium dense, fine-grained
	X						
15		X	20	105.5	18.9	▼	@ 16.0 ft. Groundwater encountered
	X				21.0	CL	@ 17.0 ft. Dark brown to light brown sandy clay, wet, soft
20		X	30	99.8	24.4	CL	COLLUVIUM: @ 19.0 ft. Dark brown to light brown, gravelly sandy clay, very moist, soft, lot of water in the bore hole
	X				16.5	SM	@ 24.0 ft. Light brown to white sandstone, very moist, fine-grained, wheathered
25							@ 25.0 ft. End of boring in sandstone
							Total Depth: 25.0 ft. Groundwater Encountered at 16.0 ft. No Caving Backfilled: 7-25-90
30							

TEST BORING LOG

PROJECT NO. 1044.1.2	EVERGREEN NURSERY	FIGURE NO. B-3

OWEN CONSULTANTS

DRILLING COMPANY: DIG IT | RIG: LITTLE BEAVER | DATE: 7-25-90

BORING DIAMETER: 4 INCHES | DRIVE WEIGHT (S): 140 LBS. | DROP: 30 INCHES | ELEVATION: ±364'

TEST BORING NO.B-4

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0						SC	FILL: Light brown clayey sand, very moist, loose, fine- to medium-grained
	X				17.6		
5		X	11	98.7	13.9		
	X				15.8		
10		X	22	102.3	21.8		@ 11.0 ft. Light brown to dark brown clayey sand with gravels, wet, loose, fine-grained
	X				16.9		
15		X	14	102.6	19.2	SM	@ 15.0 ft. Light gray to white silty sand, very moist, loose, fine-grained, with some dark brown to black sandy clay, wet, soft
	X				19.4	CL	COLLUVIUM: @ 16.0 ft. Black sandy clay, wet, soft to firm
20	X				19.4		@ 22.5 ft. End of boring in black sandy clay
25							Total Depth: 22.5 ft. No Groundwater Encountered No Caving Backfilled: 7-25-90
30							

TEST BORING LOG

PROJECT NO. 1044.1.2 | EVERGREEN NURSERY | FIGURE NO. B-4

OWEN CONSULTANTS

APPENDIX I

ASFE Information About Your Geotechnical Engineering Report

Important Information About Your
Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
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