**APPENDIX A**

# NOTICE OF PREPARTION

**NOTICE OF PREPARATION (NOP) OF A**
**DRAFT ENVIRONMENTAL IMPACT REPORT (EIR) FOR**
**ST JOHN'S EPISCOPAL CHURCH IMPROVEMENTS**

The Oakland Community and Economic Development Agency, Planning and Zoning Division, has determined that a Environmental Impact Report (EIR) must be prepared for St. John's Episcopal Church Parking and New Sanctuary Improvements (as identified in the Project Description below), and is requesting comments on the scope and content of the EIR. The EIR will address the potential physical, environmental effects of the project as identified in the Initial Study for each of the following environmental topics outlined in the California Environmental Quality Act (CEQA): Biological Resources, Hydrology/Water Quality, Transportation/Traffic, and Mandatory Findings of Significance.

The City has prepared an Initial Study that identified areas of probable environmental effects. The Initial Study is available at the Planning Division office, City of Oakland, Community and Economic Development Agency, 250 Frank H. Ogawa Plaza, Suite, Suite 3315 Oakland, CA 94612. The Initial Study may also be reviewed at the following website: www.oaklandnet.com under the Planning and Zoning website link for City Planning Commission and Environmental Impact Reports.

The City of Oakland is the Lead Agency for the Project and is the public agency with the greatest responsibility for approving the Project or carrying it out. This notice is being sent to Responsible Agencies and other interested parties. Responsible Agencies are those public agencies, besides the City of Oakland, that also have a role in approving or carrying out the Project. When the Draft EIR is published, it will be sent to all Responsible Agencies and to others who respond to this NOP or who otherwise indicate that they would like to receive a copy. Responses to this NOP and any questions or comments should be directed in writing to: Caesar Quitevis, Planner II, City of Oakland, Community and Economic Development Agency, 250 Frank H. Ogawa Plaza, Suite 2216, Oakland, CA 94612; (510) 238-6343 (phone); (510) 238-4730 (fax); or e-mailed to clquitevis@oaklandnet.com. Comments on the NOP must be received at the above mailing or e-mail address **by 5:00 p.m. April 10, 2008**. Please reference case number **ER08-0001** in all correspondence. In addition, comments may be provided at the EIR Scoping Meeting to be held before the City Planning Commission. Comments should focus on discussing possible impacts on the physical environment, ways in which potential adverse effects might be minimized, and alternatives to the project in light of the EIR's purpose to provide useful and accurate information about such factors.

**PUBLIC HEARINGS:** The City Planning Commission will conduct a public scoping hearing on the Draft EIR for the project on **April 2, 2008**, at or near **6:00** p.m. in **Hearing Room 1,** City Hall, 1 Frank H. Ogawa Plaza, Oakland, CA.

**PROJECT TITLE:** St John's Episcopal Church – Parking and New Sanctuary Improvements

**PROJECT LOCATION:** 5914 Thornhill Drive, 5928 Thornhill Drive, 1707 Gouldin Road, 1715 Gouldin Road, and 1676 Alhambra Lane

**PROJECT SPONSOR:** Jerry Moran, Project Liaison
St John's Episcopal Church
1707 Gouldin Road
Oakland, CA 94611

**EXISTING CONDITIONS:**
The project site and surrounding properties are designated as Hillside Residential in the City of Oakland General Plan and an R-30 One-Family Residential zoning. The existing site, which is 136,300 square feet or 3.13 acres, is located in a predominantly residential area of Oakland with substantial tree cover, some of which are subject to the City of Oakland tree preservation ordinance. Another natural feature of the site is an open stretch of Temescal Creek, approximately 200 feet in length and subject to the City of Oakland Creek Protection Ordinance.The site is bounded by Gouldin Road to the east, and single-family residential homes to the north, west, and south. The Church rectory is located on a separate parcel at 1715 Gouldin Road immediately southeast of the Church parcel. Thornhill Elementary School is located adjacent to a portion of the church property to the west at 5880 Thornhill Drive. Two additional parcels are owned by the Church, both single-family homes at 5914 Thornhill Road, and 1676 Alhambra Lane. The project site includes the existing sanctuary, offices, and two paved parking areas. The project site also includes a vacant single-family residential home at 5928 Thornhill Drive, which will be demolished as part of the project. The project site does not appear on the Cortese List.

**PROJECT DESCRIPTION:**
**Phase 1:** Reconfiguration of site circulation, parking, bridge and creek improvements

Phase 1 of the project, includes demolishing the house at 5928 Thornhill Road, abandoning a portion of the shared access road with the home at 5940 Thornhill Road, and constructing a new access bridge over Temescal Creek. Primary ingress and egress would be via a new lane leading from the new bridge to an auto circle, which would allow pick-up and drop-off activities as well as provide improved fire truck access to the sanctuary. Perpendicular parking spaces would be provided along the new lane, as well as a separate pedestrian path, which would run parallel to the new lane. Existing parking areas near the sanctuary would be retained, and the existing parking along the upper parking lot would be retained and resurfaced. The Alhambra Lane driveway would be retained to allow egress for people parking in this area. The number of parking spaces would be increased from 40 spaces plus 1 ADA space to 49 spaces plus 1 van and 1 ADA space. Phase 1 also includes the removal of 2,300 square feet of asphalt parking lot abutting the eastern side of the existing sanctuary building and abandonment and removal of paving at the current, steep Gouldin Road entry. This area would be landscaped under Phase 2.

As a separate project component, Temescal Creek would be restored along its reach of approximately 200 linear feet within the project site boundaries. The creek restoration design includes moving the toe of the steep bank along the north side 10 feet towards the opposite side. The bank would be filled with excavated material and regraded to a 50 percent slope. The south side of the creek bank would also be moved from between five to seven feet, and the slopes would be regraded to 50 percent or less. The small terrace that currently exists on the south side

of the creek would be removed. Trees and shrubs removed as part of the bank stabilization process will be replaced with native species to provide better habitat value. In total, the project proposes the removal of 46 trees, 44 of which fall under the City of Oakland tree preservation ordinance. All trees proposed for removal would be replaced with native species.

**Phase 2:** Construction of new 5,500 square-foot sanctuary

Phase 2 would involve construction of a new sanctuary building between 5,000 and 5,500 square feet and one story tall at the location of the current Gouldin Road entrance to the Church. Conceptual plans for the new sanctuary call for a 33-foot-high structure and a cupola with a bell. The new sanctuary would be constructed of wood, stucco and a composition roof material to match the style and materials of the existing sanctuary building. As part of this phase, the patio between the existing building and the new sanctuary would be renovated and expanded. Upon completion of the new sanctuary building, the existing building would be converted into a community hall, fellowship space.

**PROBABLE ENVIRONMENTAL EFFECTS:**

The Initial Study screened out environmental factors that will not be further studied in the Draft EIR. These factors include: **Aesthetics, Agricultural Resources, Air Quality, Cultural Resources, Geology/Soils, Hazards/Hazardous Materials, Land Use Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation,** and **Utilities/Service Systems.** The Draft EIR will address the potential environmental effects for **Transportation/Traffic, Biological Resources, Hydrology/Water Quality, and Mandatory Findings of Significance** only. All other impacts would be mitigated to less than significant levels and will not be further studied.

The Draft EIR will also examine a reasonable range of alternatives to the Project, including the CEQA-mandated No Project Alternative, and other potential alternatives that may be capable or reducing or avoiding potential environmental effects.

Scott Miller

March 6, 2008
File Number Enter **ER08-0001**

Scott Miller
Zoning Manager

Attachments:
Phasing Plan and Proposed Circulation Plan

**APPENDIX B**

# INITIAL STUDY

# ST. JOHNS EPISCOPAL CHURCH PROJECT INITIAL STUDY / ENVIRONMENTAL REVIEW CHECKLIST

Prepared for City of Oakland

File No. ER-080001

February 2008

Design, Community & Environment
1600 Shattuck Avenue, Suite 300
Berkeley, CA 94709
510.848.3815

# ST. JOHNS EPISCOPAL CHURCH PROJECT INITIAL STUDY / ENVIRONMENTAL REVIEW CHECKLIST

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City of Oakland
File No. ER-080001
Reference No. CMD06546, TPM9327, CP06151, T06141

# INITIAL STUDY AND ENVIRONMENTAL REVIEW CHECKLIST

California Environmental Quality Act (CEQA)

## Project Information

1. **Project Title:** St. John's Episcopal Church Parking and New Sanctuary Improvements

2. **Lead Agency Name and Address:** City of Oakland
Community and Economic Development Agency
Planning Division
250 Frank H. Ogawa Plaza, Suite 3315
Oakland, CA 94612

3. **Contact Person and Phone Number:** Cesar Quitevis, Planner II
(510) 238-6343

4. **Project Location:** 5914 Thornhill Drive, 5928 Thornhill Drive, 1707 Gouldin Road, 1715 Gouldin Road, 1676 Alhambra Lane

5. **Project Sponsor's Name and Address:** Jerry Moran, Project Liaison
St John's Episcopal Church
1707 Gouldin Road
Oakland, CA 94611

6. **General Plan Designation:** Hillside Residential

7. **Zoning:** R-30

8. **Description of Project:** Phase 1: Reconfiguration of site circulation and parking.
Phase 2: Construction of new 5,500 square-foot sanctuary building (A detailed project description is provided as Item 12 below).

9. **Surrounding Land Uses and Setting:** Single-family residential on sloped, vegetated terrain to the north, east, and south. Elementary school facility to the west.

10. **Actions/permits which may be required , and for which this document provides CEQA clearance, include without limitation:**
    - Conditional Use Permit

- Tree Removal Permit
- Creek Protection Permit
- Regular Design Review
- Tentative Parcel Map

11. **Other Public Agencies Interested in the Project:** California Department of Fish and Game, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers.

12. **Detailed Description of the Project:**

Regional and Local Setting

The project is located in the Montclair District of Oakland, California. Regional and local settings are shown on Figure 1 and Figure 2 respectively.

Existing Site Character

The existing site, which is 136,300 square feet or 3.13 acres, is located in a predominantly residential area of Oakland with substantial tree cover. Some of these trees fall under the City of Oakland tree preservation ordinance, including Coast Live Oak, Coast Redwood, Douglas Fir and Giant Redwood. The site is bounded by Gouldin Road to the east, and single-family residential homes to the north, west and south. The Church rectory is located on a separate parcel at 1715 Gouldin Road immediately southeast of the Church parcel. Thornhill Elementary School is located adjacent to a portion of the church property to the west at 5880 Thornhill Drive. Two additional parcels are owned by the Church; both single-family homes at 5914 Thornhill Road, and 1676 Alhambra Lane. Figure 3 shows existing land uses in the site vicinity. The project site includes the existing sanctuary, offices and two paved parking areas (which are currently non-compliant with current code regulations). The project site also includes a vacant single-family residential home at 5928 Thornhill, which will be demolished as part of the project.

Access to the site is from Gouldin Road, via a narrow driveway with a steep decline. Given the width and angle of the driveway, it is limited to ingress only. Egress is provided by a connection to Alhambra Lane, which terminates at Thornhill Road.

Project Characteristics

The section provides an overview of the proposed facilities and amenities included in the Project. Figures 4 through 7 provide information on the proposed land uses, site and landscape plan, phasing plan, and circulation plan respectively.

**Phase 1:** Phase 1 of the project, scheduled to begin in late-summer/early fall of 2008, includes demolishing the house at 5928 Thornhill Road, abandonment of a portion of the shared access road with the home at 5940 Thornhill Road, and construction of a new bridge over Temescal Creek that will connect to a new internal travel lane and parking area. The proposed bridge would be 25 feet wide, allowing for a 20 foot drive aisle and a 5-foot pedestrian walkway. The bridge would be constructed of steel and concrete.

As shown in Figure 7, primary ingress and egress would be via a new lane leading from the new bridge to an auto circle, that would allow pick-up and drop-off activities as well as provide improved fire truck access to the sanctuary. Perpendicular parking spaces would be provided along the new lane. A separate pedestrian path would run parallel to the lane. Existing parking areas near the sanctuary would be retained, and the existing parking along the upper parking lot would be retained and resurfaced. The Alhambra Lane driveway would be retained to allow egress for people parking in this area.

The Alhambra Lane driveway is currently proposed to remain at existing grade. However, the feasibility of smoothing the grade transition between the driveway and Alhambra Lane will be studied. The proposed auto circle would also be at existing grade. The existing parking lot would be lowered approximately seven feet to the same level as the existing sanctuary, at an elevation of 618 feet. The new lane leading from the proposed vehicular bridge to the proposed auto circle would be filled closest to the auto circle just north of Alhambra Court. The fill would meet the grade of the proposed auto circle and a three-foot retaining wall would be built on the southern edge of the perpendicular parking to be provided along the lane, holding the fill and leaving a gap for a pedestrian pathway that would cut across the lane to Alhambra Court. No public circulation is currently proposed for Alhambra Court, which is a privately maintained private access easement. The lane would slope down toward the proposed vehicular bridge.

In order to reduce the effect of adding increased impervious surfaces to the site, a variety of features would be incorporated into the proposed parking area, including use of crushed granite for parking spaces along the lane, use of pervious paving materials, and provision of stormwater detention facilities under the parking area.

The number of parking spaces would be increased from 40 spaces plus 1 ADA space to 49 spaces plus 1 van and 1 ADA space. The parking space dimensions, aisle widths and space layouts would all be in compliance with the City of Oakland standards.

Phase 1 also includes the removal of 2,300 square feet of asphalt parking lot abutting the eastern side of the existing sanctuary building and abandonment of and removal of paving at the current, steep Gouldin Road entry. This area (future Phase 2 site) would be landscaped.

As a separate project component, Temescal Creek would be restored along its reach of approximately 200 linear feet within the project site boundaries. The creek restoration design includes moving the toe of the steep bank along the north side 10 feet towards the opposite side. The bank would be filled with excavated material and regraded to a more stable 50 percent slope. The south side of the creek bank would also be moved from between five to seven feet, and the slopes would be regraded to 50 percent or less. The small terrace that currently exists on the south side of the creek would be removed. The stream channel, which is currently undermining the stability of Thornhill Road, would be moved seven to ten feet to the south, and straightened throughout the reach. Trees and shrubs removed as part of the bank stabilization will be replaced with native species to provide better habitat value.

The project proposes the removal of 46 trees, 44 of which fall under the City of Oakland tree preservation ordinance. Five of these trees are proposed to be removed for creek restoration, specifically re-alignment and revegetation with native plant species. The remaining trees are proposed to be removed for construction of the new bridge and the new lane to the existing sanctuary building and offices. All trees proposed for removal would be replaced with native species.

**Phase 2:** Phase 2 would entail construction of a new sanctuary building between 5,000 and 5,500 square feet and one story tall (shown in Figures 8, 9 and 10) at the location of the current Gouldin Road entrance to the Church. Conceptual plans for the new sanctuary call for a 33-feet-high structure and a cupola with a bell. The new sanctuary would be constructed of wood, stucco and a composition roof material, to match the style and materials of the existing sanctuary building. As part of this phase, the patio between the existing building and the new sanctuary would be renovated and expanded. Upon completion of the new sanctuary building, the existing building would be converted into a community hall, fellowship space. There would be no increase in capacity for parking when both buildings are in use. Both buildings would be in use only when adults are using one building and children (non-drivers) are using the other building. The timing of Phase 2 is not known at this time.

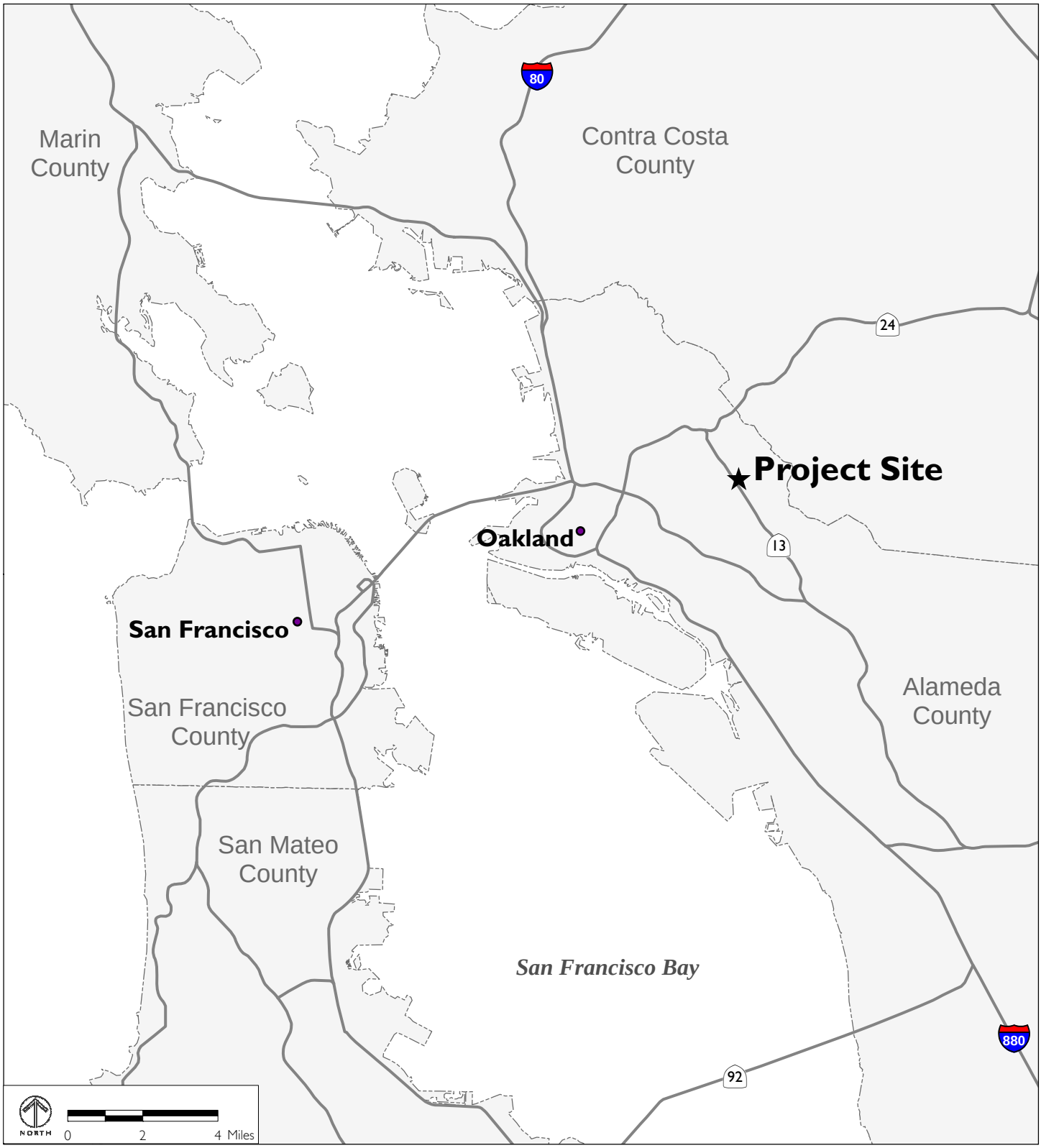



FIGURE I

**REGIONAL LOCATION**

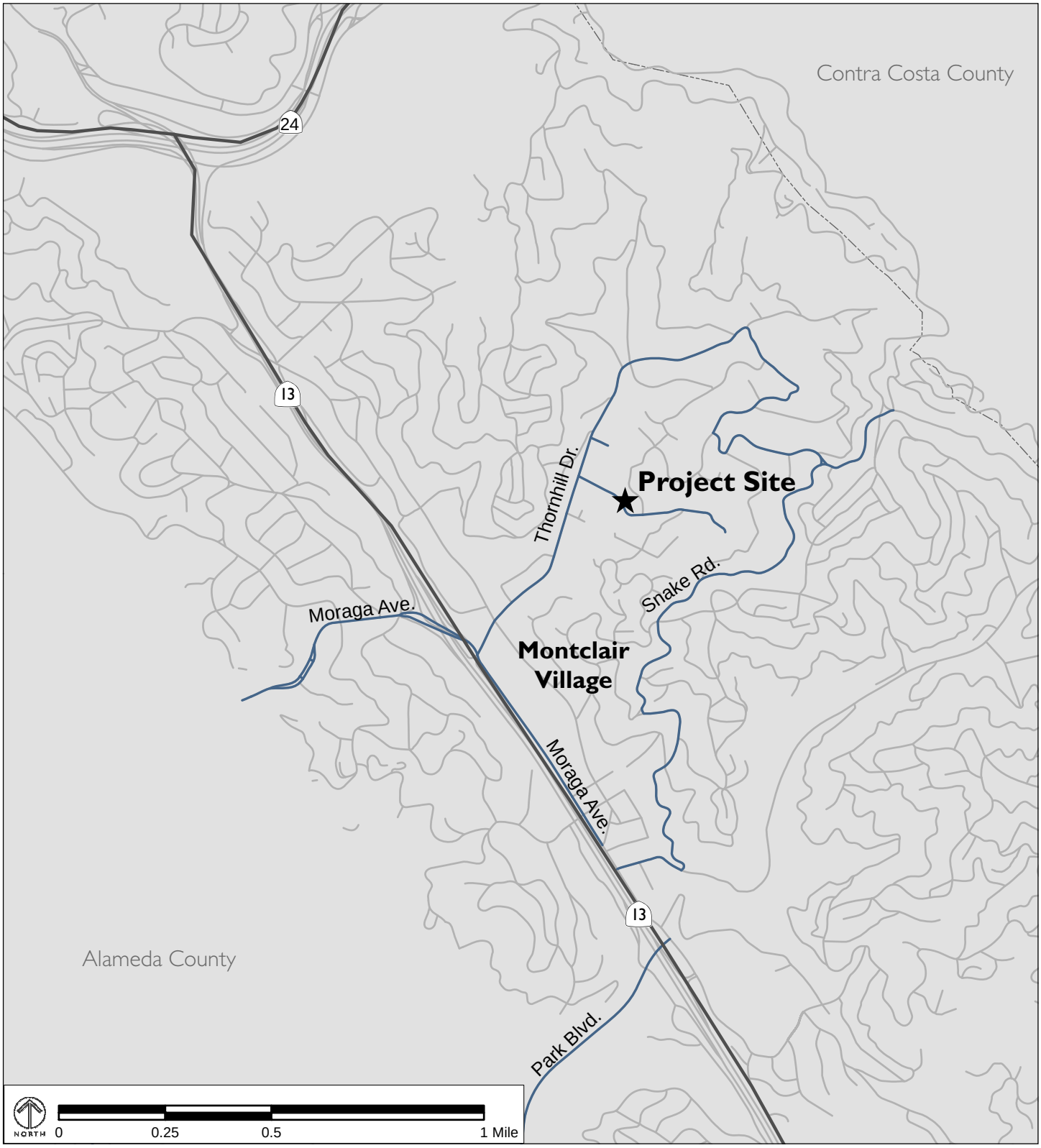



FIGURE 2

**LOCAL LOCATION**

**Property Line**
**Existing Structures**
**Streets**

FIGURE 3

**EXISTING LAND USE**

FIGURE 4

**PROPOSED LAND USE**

## MATERIAL LEGEND

- AC PAVING, S.C.D.
- PERVIOUS PAVING AT PARKING STALLS: GRAVEL PAVING WITH GRAVEL PAVE CELLS FOR STABILIZATION.
- OTHER PAVING, PHASE 2: DG PAVING
- PEDESTRIAN PATHWAY, STABALIIZED DECOMPOSED GRANITE FINES
- PEDESTRIAN PATHWAY, INTEGRAL COLORED CONCRETE
- BOLLARD LIGHT
- DOWNLIGHT PLACED IN EXISTING TREE
- LIGHT INTEGRATED INTO BRIDGE RAILING, S.A.D.
- PLANTING AREA: SEE L2–1: PLANTING PLAN
- EXISTING SHARED GRAVEL ACCESS DRIVE TO REMAIN

## KEY NOTE LEGEND

**A.** EXISTING REDWOOD GROVE

**B.** FIRE TRUCK TURNAROUND AND DROP–OFF

**C.** UPPER PARKING AREA: EXISTING PARKING AREA TO BE RESURFACED AND RESTRIPED. OAK COVERED HILLSIDE ABOVE TO REMAIN.

**D.** PARKING GROVE: SEE SHEET L1–2.

**E.** VEHICULAR AND PEDESTRIAN BRIDGE: 20 FOOT DRIVE AISLE WITH 5' PEDESTRIAN WALK, SEE SHEET A1.1

**F.** REHABILITATED CREEK RETAINING MANY OF THE EXISTING REDWOODS, SEE CREEK PLANTINGS.

**G.** ADA PARKING STALLS: 1 VAN , 1 CAR

## NOTES

1. ALL DIMENSIONS SHOWN ARE TYPICAL AND NOMINAL.

NORTH

0' 15' 30' 60'
FEET

FIGURE 5

**SITE PLAN**

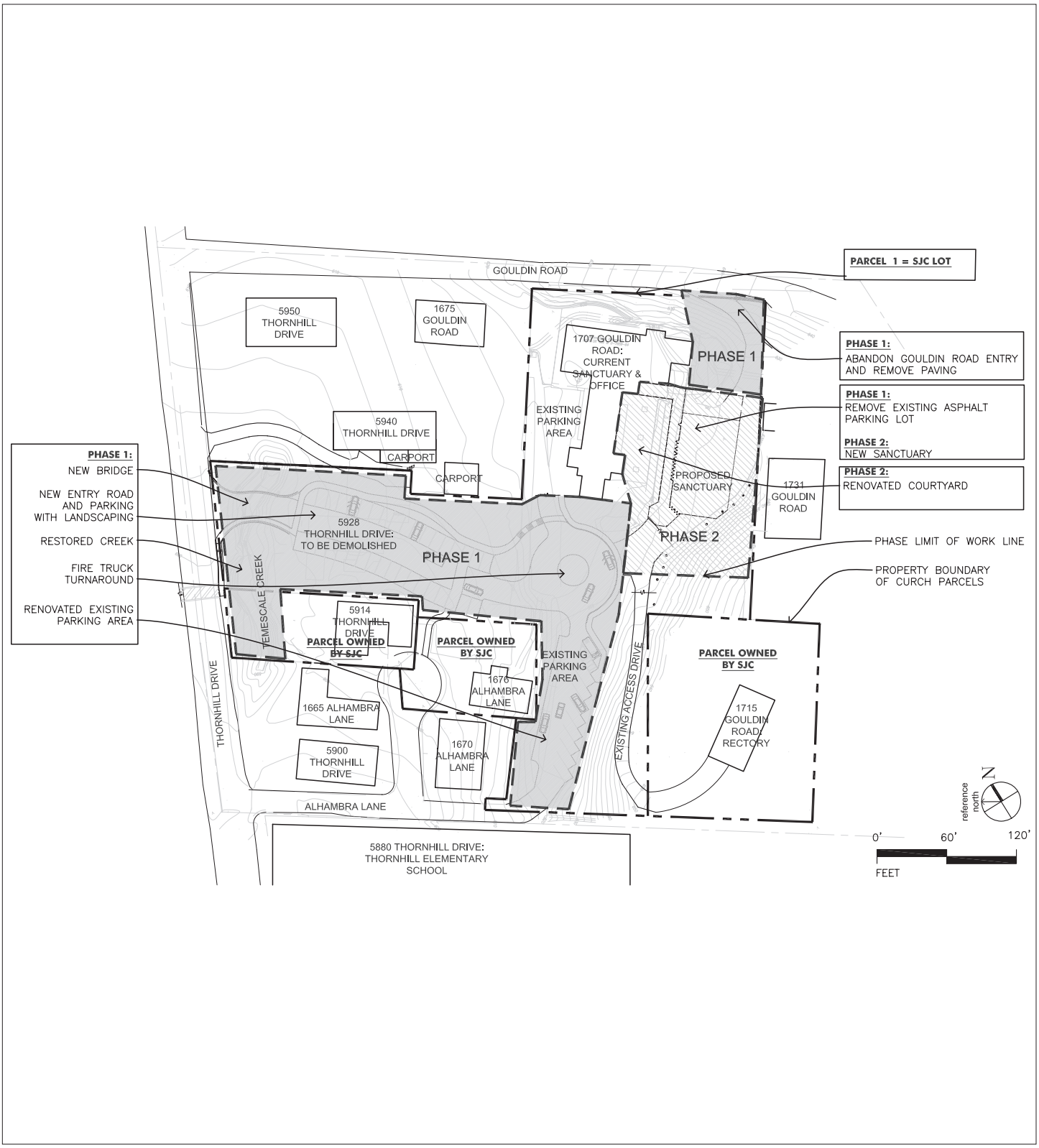



FIGURE 6

**PHASING PLAN**

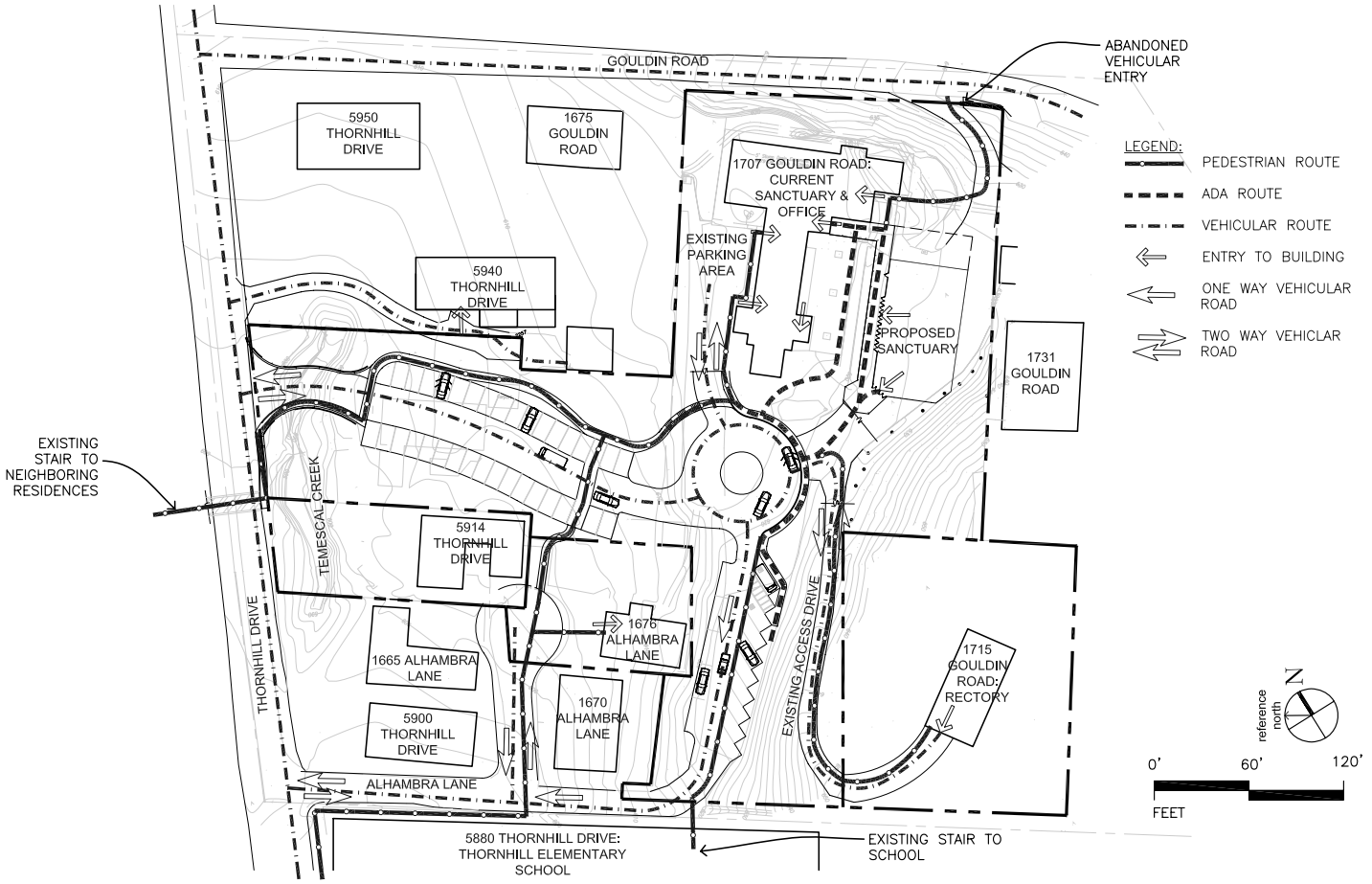
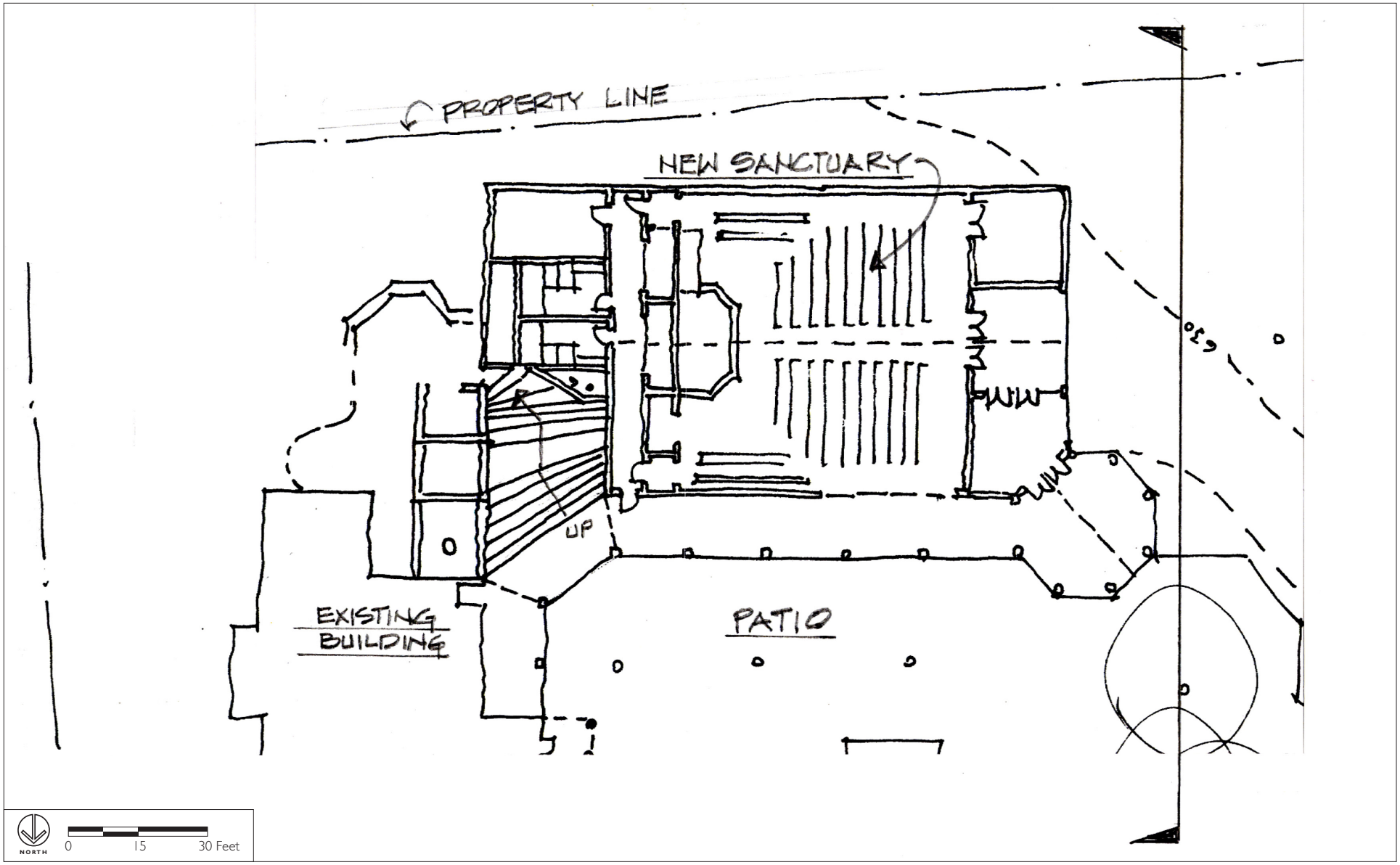



FIGURE 7

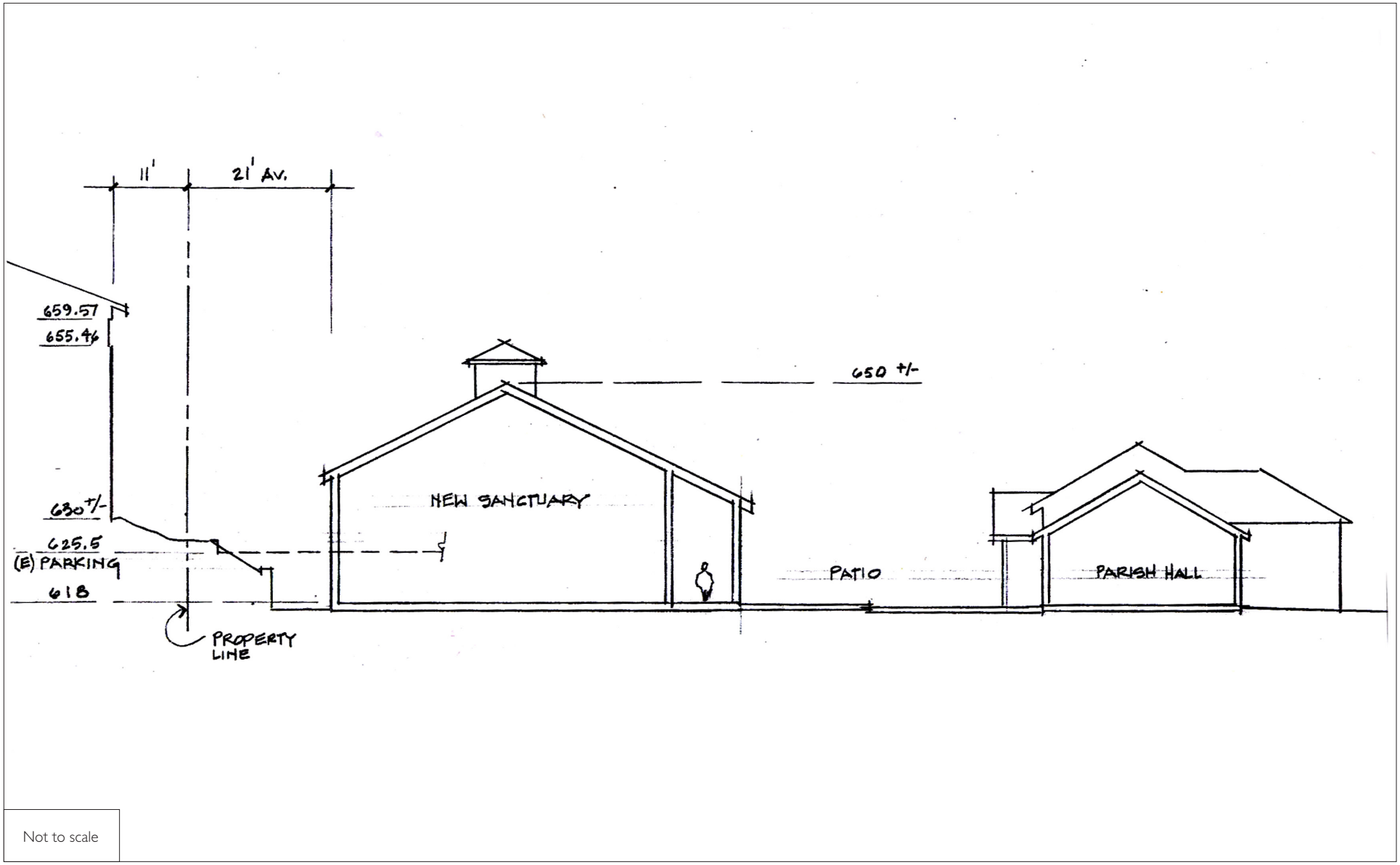
**PROPOSED CIRCULATION PLAN**




Source: Turnbull, Griffin & Haesloop Architects

FIGURE 8

**PHASE 2 SANCTUARY CONCEPTUAL PLAN - FLOOR PLAN**




Source: Turnbull, Griffin & Haesloop Architects

FIGURE 9

**PHASE 2 SANCTUARY CONCEPTUAL PLAN - WEST SECTION**

Source: Turnbull, Griffin & Haesloop Architects

FIGURE 10

**PHASE 2 SANCTUARY CONCEPTUAL PLAN - EAST SECTION**

## Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages, which will be further studied in the EIR. No other environmental factors will be further studied in the EIR.

| | | |
|---|---|---|
| ☐ Aesthetics | ☐ Agricultural Resources | ☐ Air Quality |
| ☒ Biological Resources | ☐ Cultural Resources | ☐ Geology/Soils |
| ☐ Hazards/Hazardous Materials | ☒ Hydrology/Water Quality | ☐ Land Use/Planning |
| ☐ Mineral Resources | ☐ Noise | ☐ Population/Housing |
| ☐ Public Services | ☐ Recreation | ☒ Transportation/Traffic |
| ☐ Utilities/Service Systems | ☒ Mandatory Findings of Significance | |

## Determination

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment with Uniformly Applied Development Standards imposed as conditions of approval, and a NEGATIVE DECLARATION will be prepared. ☐

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because mitigation measures and Uniformly Applied Development Standards have been imposed on the project. A MITIGATED NEGATIVE DECLARATION will be prepared. ☐

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required that will further study **Transportation and Traffic, Biological Resources and Hydrology and Water Quality.** No other environmental factors will be further studied. ☒

I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required. ☐

Caesar Quitevis
Signature

March 6, 2008
Date

Caesar Quitevis, Planner II
Planner Name
Title

Scott Miller
Scott Miller,
Zoning Manager

## Evaluation of Environmental Impacts

CEQA requires that an explanation of all answers be provided along with this checklist, including a discussion of ways to mitigate any significant effects identified.

Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, less than significant with development standards, or less than significant. As defined here, a "Potentially Significant Impact" is appropriate if the significant effect is considered to have a substantial or potentially substantial adverse effect on the environment. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

A "Less than Significant with Mitigation" answer applies where incorporation of a mitigation measure has reduced an effect from a "Potentially Significant Impact to a "Less than Significant Impact" The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level.

A "Less than Significant with Development Standard" answer applies where incorporation of a development standard has reduced an effect from a "Potentially Significant Impact to a "Less than Significant Impact." The City's Uniformly Applied Development Standards are incorporated into projects as conditions of approval regardless of a project's environmental determination. As applicable, the Uniformly Applied Development Standards are adopted as requirements of an individual project when it is approved by the City and are designed to, and will, substantially mitigate environmental effects. In reviewing project applications, the City determines which of the standard conditions are applied, based upon the zoning district, community plan, and the type(s) of permit(s)/approvals(s) required for the project. Depending on the specific characteristics of the project type and/or project site, the city will determine which Development Standards apply to each project; for example, Development Standards related to creek protection permits will only be applied projects on creekside properties.

The Development Standards incorporate development policies and standards from various adopted plans, policies, and ordinances (such as the Oakland Planning and Municipal Codes, Oakland Creek Protection, Stormwater Water Management and Discharge Control Ordinance, Oakland Tree Protection Ordinance, Oakland Grading Regulations, National Pollutant Discharge Elimination System (NPDES) permit requirements, Housing Element-related mitigation measures, California Building Code, and Uniform Fire Code, among others), which have been found to substantially mitigate environmental effects. Where there are peculiar circumstances associated with a project or project site that will result in significant environmental impacts despite implementation of the Development Standards, the City will determine whether there are feasible mitigation measures to reduce the impact to less than significant levels in the course of appropriate CEQA review (mitigated negative declarations or EIRs).

A "Less than Significant Impact" answer applies where the project creates no substantial or potentially substantial adverse effect on the environment.

A "No Impact" answer applies where a project does not create any impact in that category. A "No Impact" answer needs to be adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact answer is adequately supported if the referenced information sources show that the impact simply doesn't apply to projects like the one under involved. A "No Impact" answer should be explained where it is based on project –specific factors as well as general standards.

# Environmental Checklist

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **I. AESTHETICS** -- Would the project: | | | | | |
| a) Have a substantial adverse effect on a scenic vista? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state or locally designated scenic highway? | ☐ | ☐ | ☐ | ☒ | ☐ |
| c) Substantially degrade the existing visual character or quality of the site and its surroundings? | ☐ | ☐ | ☒ | ☐ | ☐ |
| d) Create a new source of substantial light or glare which would substantially and adversely affect day or nighttime views in the area? | ☐ | ☐ | ☐ | ☐ | ☒ |
| e) Introduce landscape that now or in the future cast substantial shadows on existing solar collectors (in conflict with California Public Resource Code Section 25980-25986)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| f) Cast shadows that substantially impairs the function of a building using passive solar heat collection, solar collectors or hot water heating, or photovoltaic solar collectors? | ☐ | ☐ | ☒ | ☐ | ☐ |
| g) Cast a shadow that substantially impairs the beneficial use of any public or quasi-public park, lawn, garden, or open space? | ☐ | ☐ | ☐ | ☒ | ☐ |
| h) Cast shadow on an historic resource, as defined by CEQA Section 15064.5(a), such that the shadow would materially impair the resource's historic significance by materially altering those physical characteristics of the resource that convey its historical significance and that justify its inclusion on or eligibility for listing in the National Register of Historic Places, California Register of Historical Resources, Local Register of Historic Resources or a historical resource survey form (DPR Form 523) with a rating of 1-5? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (a) through (h):**
There are no scenic vistas from the site; therefore, the project would not have a substantial adverse effect on a scenic vista, and there would be no impact. Also, because the site is not located within proximity of a state or locally designated scenic highway, there would be no impact associated with such designated highways. The project would be constructed in a wooded, residential neighborhood.

Both phases of the project would change the visual character of the site and its surroundings. Although the project would alter the visual character of the site and surroundings, the changes would be less than significant because the site is currently developed. Construction of the bridge and the access lane would require removal of trees which will increase the visibility to and from that section of Thornhill Drive and adjoining properties. However, recontouring the creek embankments and landscaping with native species would improve the visual character of what is now a heavily eroded creek. Although the parking lane would be visible from Thornhill, the landscaping and use of crushed granite would provide visual relief that would soften the view. In addition, because significant redwood and oak trees would be retained, the view would be filtered.

The proposed new sanctuary building would be built of wood and stucco, and the character of the building would be in harmony with the existing buildings so as to blend in with the existing environment. The planned height of the building of 33 feet would not impeded on the single-family residence to the south, whose living room window would be at an elevation five feet higher than the proposed height of the new sanctuary building.

The project will not introduce new landscape that now or in the future will cast substantial shadows on existing solar collectors. The proposed new sanctuary building is the only part of the project that may cast shadows; however, there are no existing solar collectors on the site that would be affected. The sanctuary building would be built in a portion of the property that is already shaded and sits near the bottom of a graded slope. As noted above, creek restoration, including new landscaping and native plant species, would increase sunlight access along Thornhill Drive. There are no buildings on the site that use passive solar heat collection, solar collectors, hot water heating or photovoltaic solar collectors; therefore, the project would not able to cast shadows that would impair the function of such buildings. Similarly, the proposed sanctuary would not cast shadows that substantially impair the beneficial use of any public or quasi-public space on the property because the proposed sanctuary is already located in a wooded, shaded area on the site.

As required for all development projects that will have new exterior lighting, the project applicant would be required to implement and comply with the following uniformly-applied standard condition of approval, which would help reduce the potential for aesthetic hazards associated with substantial light or glare which would substantially and adversely affect day or nighttime views in the area:

**STANDARD CONDITION AES-1: Lighting Plan**
***Prior to the issuance of an electrical or building permit***

**a) The proposed lighting fixtures shall be adequately shielded to a point below the light bulb and reflector and that prevent unnecessary glare onto adjacent properties.**

**b) Plans shall be submitted to the Planning and Zoning Division and the Electrical Services Division of the Public Works Agency for review and approval.**

**c) All lighting shall be architecturally integrated into the site.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| i) Require an exception (variance) to the policies and regulations in the General Plan, Planning Code, or Uniform Building Code, and the exception causes a fundamental conflict with policies and regulations in the General Plan, | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Planning Code, and Uniform Building Code addressing the Provision of adequate light related to appropriate uses? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (i):**
The project does not require exceptions to any of the documents referenced above. Therefore, there is no impact.

| | | | | | |
|---|---|---|---|---|---|
| j) Create winds exceeding 36 mph for more than 1 hour during daylight hours during the year. The wind analysis only needs to be done if the project's height is 100 feet or greater (measured to the roof) and one of the following conditions exist: a) the project is located adjacent to a substantial water body (i.e., Oakland Estuary, Lake Merritt or San Francisco Bay); or b) the project is located in Downtown? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (j):**
The project does not contain any components that would be over 100 feet in height, nor generate winds. Therefore, there is no impact.

**II. AGRICULTURAL RESOURCES** -- Would the project:

| | | | | | |
|---|---|---|---|---|---|
| a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resource Agency, to non-agricultural use? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Conflict with existing zoning for agricultural use, or a Williamson Act contract? | ☐ | ☐ | ☐ | ☒ | ☐ |
| c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (a) through (c):**
The project site, is not designated as farmland and is not used for agricultural purposes. There are no lands zoned for agricultural use, nor are there properties in the area under Williamson Act Contract. In addition, the project would not cause changes which could result in the conversion of Farmland. Therefore, there would be no impact.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **III. AIR QUALITY --** Would the project: | | | | | |
| Construction Period Impacts<br>a) Conflict with or obstruct implementation of the applicable air quality plan? | ☐ | ☐ | ☐ | ☐ | ☒ |

d) Expose sensitive receptors to substantial pollutant concentrations? ☐ ☐ ☐ ☐ ☒

**Discussion of questions (a) and (d):**
During construction, the project would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions. Project-related construction activities would include demolition, site preparation, earthmoving and general construction activities. Emissions generated from these activities include dust (including PM-10 and PM-2.5)[1] primarily from "fugitive" sources, such as soil disturbance; combustion emissions of criteria air pollutants (reactive organic gasses [ROG], nitrogen oxides [NOx], carbon monoxide [CO], sulfur oxides [SOx], and PM-10) primarily from operation of construction equipment and from worker vehicles; and evaporative emissions (ROG) from asphalt paving.

The Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines recognize that construction equipment emits ozone precursors, but indicate that such emissions are included in the emission inventory that is the basis for regional air quality plans. Therefore, construction emissions of ROG and NOx are not expected to impede attainment or maintenance of ozone standards in the Bay Area. The impact of construction equipment exhaust would therefore be less than significant.

Construction-related fugitive dust emissions would vary from day to day, depending on the level and type activity, silt content of the soil, and the weather. In the absence of controls, construction activities may result in significant quantities of dust, and as a result, local visibility and PM-10 and PM-2.5 concentrations may be adversely affected on a temporary and intermittent basis during the construction period. In addition, the fugitive dust generated by construction would include not only PM-10, but also larger particles, which would fall out of the atmosphere within several hundred feet of the site and could result in nuisance-type impacts. The BAAQMD's approach to analyses of fugitive emissions from construction is to emphasize implementation of effective and comprehensive dust control measures rather than detailed quantification of emissions. The District considers any project's construction-related impacts to be less than significant if the required dust-control measures are implemented. Without these measures, the impact is generally considered to be significant, particularly if sensitive land uses are located in the project vicinity. In the case of this project, residential land uses are located immediately adjacent to the boundaries of the project site. The proposed project would be subject to the measures recommended by the BAAQMD (listed below), which are uniformly applied by the City as standard conditions of approval, and which would reduce the impact of fugitive dust emissions to less than significant.

**STANDARD CONDITION AQ-1 (Dust Control): During construction, the project sponsor shall require the construction contractor to implement the following measures required as part of BAAQMD's basic dust control procedures required for construction sites. These include:**

**a) Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible.**

**b) Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).**

[1] Particles that are 10 microns or less in diameter and 2.5 microns or less in diameter, respectively

**c) Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.**

**d) Sweep daily (with water sweepers using reclaimed water if possible) all paved access roads, parking areas and staging areas at construction sites.**

**e) Sweep streets (with water sweepers using reclaimed water if possible) at the end of each day if visible soil material is carried onto adjacent paved roads.**

**f) Limit the amount of the disturbed area at any one time, where feasible.**

**g) Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.**

**h) Pave all roadways, driveways, sidewalks, etc. as soon as feasible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.**

**i) Replant vegetation in disturbed areas as quickly as feasible.**

**j) Enclose, cover, water twice daily or apply (non-toxic) soil stabilizers to exposed stockpiles (dirt, sand, etc.).**

**k) Limit traffic speeds on unpaved roads to 15 miles per hour.**

**l) Clean off the tires or tracks of all trucks and equipment leaving any unpaved construction areas.**

**STANDARD CONDITION AQ-2 (Construction Emissions): To minimize construction equipment emissions during construction, the project sponsor shall require the constructions contractor to:**

**a) Demonstrate compliance with Bay Area Air Quality Management District (BAAQMD) Regulation 2, Rule 1 (General Requirements) for all portable construction equipment subject to that rule. BAAQMD Regulation 2, Rule 1 provides the issuance of authorities to construct and permits to operate certain types of portable equipment used for construction purposes (e.g., gasoline or diesel-powered engines used in conjunction with power generation, pumps, compressors, and cranes) unless such equipment complies with all applicable requirements of the "CAPCOA" Portable Equipment Registration Rule" or with all applicable requirements of the Statewide Portable Equipment Registration Program. This exemption is provided in BAAQMD Rule 2-1-105.**

**b) Perform low- NOx tune-ups on all diesel-powered construction equipment greater than 50 horsepower (no more than 30 days prior to the start of use of that equipment). Periodic tune-ups (every 90 days) shall be performed for such equipment used continuously during the construction period.**

Demolition may also result in airborne entrainment of asbestos, a toxic air contaminant, particularly where structures built prior to 1980, such as the existing building on the project site, are being demolished. However, construction and demolition activities would not result in the release of any naturally-occurring asbestos due to soil composition and underlying geologic formations.[2] As required for all development

[2] Land/Marine Geotechnics, *Geotechnical Investigation: St. John's Episcopal Church Entry Road, Bridge Parking and New Sanctuary, Oakland, California*, May 2005.

projects involving demolition of existing buildings, the project applicant would be required to implement and comply with the following uniformly-applied standard condition of approval, which would help reduce the potential for public health hazards associated with airborne asbestos fibers or lead dust to a less than significant level:

**STANDARD CONDITION AQ-3: If asbestos-containing material (ACM) are found to be present in building materials to be removed, demolished or disposed of, the project applicant shall submit specifications signed by a certified asbestos consultant for the removal, encapsulation, or enclosure of the identified ACM in accordance with all applicable laws and regulations, including but not necessarily limited to: California Code of Regulations, Title 8; Business and professions Code; Division 3; California Health and Safety Code 25915-25919.7; and BAAQMD, Regulation 11, Rule 2 (Asbestos Demolition, Renovation and Manufacturing), as may be amended.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| Operational Impacts | | | | | |
| a) Conflict with or obstruct implementation of the applicable air quality plan? | ☐ | ☐ | ☒ | ☐ | ☐ |
| b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation? | ☐ | ☐ | ☒ | ☐ | ☐ |
| d) Expose sensitive receptors to substantial pollutant concentrations? | ☐ | ☐ | ☒ | ☐ | ☐ |
| f) Contribute to CO concentrations exceeding the State AAQS of 9 ppm averaged over 8 hours and 20 ppm for 1 hour. Pursuant to BAAQMD, localized carbon monoxide concentrations should be estimated for projects in which (1) vehicle emissions of CO would exceed 550 lb/day; (2) intersections or roadway links would decline to LOS E or F; (3) intersections operating at LOS E or F will have reduced LOS; or (4) traffic volume increase on nearby roadways by 10% or more unless the increase in traffic volume is less than 100 vehicles per hour? | ☐ | ☐ | ☒ | ☐ | ☐ |
| g) Result in total emissions of ROG, NOx, or PM10 of 15 tons per year or greater, or 80 pounds (36 kilograms) per day or greater. The Port of Oakland maintains PM10 and PM2.5 monitoring stations in West Oakland and data from these stations should be obtained and used? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (a), (b), (d), (f) and (g):**
After construction of the project, and the eventual construction of the Phase 2 Sanctuary, the projected increase in traffic volume is two vehicle trips during the weekday peak hour.[3] This small increase in peak hour traffic would generate criteria pollutant levels far below the significance criterion (g) (specifically, 80 lbs./day), which are the thresholds identified by the BAAQMD. Therefore, the project would not violate any air quality standard or contribute substantially to an existing or projected air quality violation.

[3] Dowling Associates, Inc., *Traffic Study – Renovation at St. John's Episcopal Church, Oakland,* April 9, 2007.

The small increase in peak hour traffic would also affect localized carbon monoxide (CO) concentrations at nearby intersections. However, CO levels have been declining for a number of years and are expected to continue to do so in the future, and the relatively few trips that the project would generate would not likely exceed the state CO standard at any local intersection.

As a result, the project would not expose sensitive receptors to substantial pollutant concentrations. The impact would be less than significant.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| Cumulative Impacts | | | | | |
| c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| k) A project's contribution to cumulative impacts is considered "considerable" (i.e., significant) when the project results in any individually significant impact? | ☐ | ☐ | ☒ | ☐ | ☐ |
| l) Result in a fundamental conflict with the local general plan, when the general plan is consistent with the regional air quality plan? When the general plan fundamentally conflicts with the regional air quality plan, then if the contribution of the proposed project is cumulatively considerable when analyzed the impact to air quality should be considered significant? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (c), (k) and (l)**
The Bay Area is currently in non-attainment for state standards for PM-10 and PM-2.5, and for state and federal ozone standards.[4] For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact is based on an evaluation of the consistency of the project with the local general plan with the regional air quality plan. The proposed project would not require a General Plan Amendment, therefore, it would be considered to be consistent with the General plan of the City of Oakland. The General Plan is consistent wit the recently adopted *2005 Bay Area Ozone Strategy*. Therefore, the project's effects are not considered cumulatively considerable, and are less than significant.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| e) Frequently create substantial objectionable odors affecting a substantial number of people? | ☐ | ☐ | ☐ | ☒ | ☐ |

[4] Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving ROG and NOx. ROG and NOx are known as ozone precursors.

**Discussion of Question (e):**
The buildings on site are used for religious and community purposes. There are no uses that would generate objectionable odors currently on site, or as a result of the proposed project. Therefore, there is no impact.

| | | | | | |
|---|---|---|---|---|---|
| h) Result in potential to expose persons to substantial levels of Toxic Air Contaminants (TAC), such that the probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million? | ☐ | ☐ | ☐ | ☒ | ☐ |
| i) Result in ground level concentrations of non-carcinogenic TACs such that the Hazard Index would be greater than 1 for the MEI? | ☐ | ☐ | ☐ | ☒ | ☐ |
| j) Result in a substantial increase in diesel emissions? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (h), (i) and (j):**
As a religious institution with no commercial space, the project would generate a limited number of truck trips, and would not be expected to result in a substantial increase in emissions of diesel particulate, identified by the California Air Resources Board as a toxic air contaminant. No other substantial emissions of air contaminants would result from the proposed project uses. In light of this conclusion, project operation impacts regarding toxic air contaminants and diesel emissions on air quality would be less than significant.

**Sources:**

Bay Area Air Quality Management District, Regulation 7 – *Odorous Substances,* March 1982.

City of Oakland, Oakland General Plan *Land Use and Transportation (LUTE*) Element, June 1998, as amended.

Bay Area Air Quality Management District, *BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plan,* December 1999.

Bay Area Air Quality Management District, *Air Quality Standards and Attainment*, July 2005.

Bay Area Air Quality Management District, *Bay Area 2005 Ozone Strategy,* January 4, 2006.

Dowling Associates, Inc., Traffic Study – Renovation at St. John's Episcopal Church, Oakland, April 9, 2007.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **IV. BIOLOGICAL RESOURCES** - - Would the project: | | | | | |
| a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (a):**
A site inspection determined that suitable habitat for special-status plant or animal species is generally absent from the project site. The extent of past disturbance precludes the occurrence of any special-status plant species on the site. Similarly, the potential for the occurrence of special-status animal species is considered unlikely or remote. This includes the potential for the occurrence of the federally-threatened California red legged frog (*Rana aurora draytonii*). There is, however, a remote possibility that individual frogs could move along the creek corridor and enter the site, and could be injured or destroyed during construction. For this reason, the project could have a potentially significant impact on special-status species; therefore, impacts associated with such special status species will be evaluated in greater detail in the EIR.

| | | | | | |
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| b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (b):**
As determined during the site inspection, the project site does not support any riparian habitat or other sensitive natural community types identified in local or regional plans, policies, regulations or by the California Department of Fish and Game. Most of the existing tree, shrub and groundcover along the creek and remainder of the site consists of non-native species. The mature native cottonwood located near the proposed footings of the new bridge does not constitute a sensitive natural community type. Thus, no impact on sensitive natural communities would occur.

| | | | | | |
|---|---|---|---|---|---|
| c) Have a substantial adverse effect on federally protected wetlands (as defined by Section 404 of the Clean Water Act) or state protected wetlands, through direct removal, filling, hydrological interruption, or other means? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (c):**
Temescal Creek is a regulated waterbody, and any modifications to the bed or bank would be subject to authorization from the U.S. Army Corps of Engineers, the California Regional Water Quality Control Board, and California Department of Fish and Game. As determined during the site inspection, wetlands are absent along the creek channel, but the active channel is a regulated "other waters of the U.S." Construction in or near the active creek channel would alter existing conditions, and must be carefully controlled to ensure that no degradation of downstream waters occurs as a result of construction. The proposed restoration and bridge improvements would be subject to review and approval by the regulatory agencies. For this reason, the project could have a potentially significant impact on jurisdictional waters, and this issue will be evaluated in greater detail in the EIR.

| | | | | | |
|---|---|---|---|---|---|
| d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (d):**
Although existing habitat values on the site are relatively low due to the dominance by non-native species, the Temescal Creek channel does serve as a movement corridor for wildlife. The impact associated with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or with the use of native wildlife nursery sites will be further studied in the EIR.

| | | | | | |
|---|---|---|---|---|---|
| e) Fundamentally conflict with any applicable habitat conservation plan or natural community conservation plan? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (e):**
The proposed project would not conflict with any applicable habitat conservation plan or natural community conservation plan. No adopted conservation plans encompass the site or vicinity, so no impact would occur.

| | | | | | |
|---|---|---|---|---|---|
| f) Fundamentally conflict with the City of Oakland Tree Preservation and Removal Ordinance (Oakland Municipal Code (OMC) Chapter 12.36) by removal of protected trees under certain circumstances? Factors to be considered in determining significance include: The number, type, size, location and condition of (a) the protected trees to be removed and/or impacted by construction and (b) the protected trees to remain, with special consideration given to native trees.<br><br>Protected trees include the following: Quercus agrifolia (California or coast live oak) measuring four inches diameter at breast height (dbh) or larger, and any other tree measuring nine inches dbh or larger except eucalyptus and pinus radiata (Monterey pine); provided, however, that Monterey pine trees on City property and in development-related situations where more than five Monterey pine trees per acre are proposed to be removed are considered to be Protected trees. | ☒ | ☐ | ☐ | ☐ | ☐ |

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| g) Fundamentally conflict with the City of Oakland Creek Protection Ordinance (OMC Chapter 13.16) intended to protect biological resources. Although there are no specific, numeric/quantitative criteria to assess impacts, factors to be considered in determining significance include whether there is substantial degradation of riparian and aquatic habitat through: (a) discharging a substantial amount of pollutants into a creek; (b) significantly modifying the natural flow of the water; (c) depositing substantial amounts of new material into a creek or causing substantial bank erosion or instability; or (d) adversely impacting the riparian corridor by significantly altering vegetation or wildlife habitat? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of questions (f) and (g):**
The proposed project includes an application for a tree removal permit as required under the City of Oakland Tree Preservation and Removal Ordinance. As indicated in the project description, an estimated 44 protected trees would be removed as part of the project. This has therefore been identified as a potentially significant impact, and this issue will be evaluated in greater detail in the EIR.

Although the project is significantly modifying the natural water flow in the creek, the proposed modifications include the replacement of removed trees with native plant species, restoration of natural habitat and bank stabilization, all of which will significantly improve the creek corridor and natural creek flow. While the overall design and intent is to improve the existing habitat values of the creek corridor on the site, substantial modifications to the existing degraded condition of the creek would occur as part of the project and this issue will be evaluated in greater detail in the EIR.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **V. CULTURAL RESOURCES** -- Would the project? | | | | | |
| a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines δ15064.5. Specifically, a substantial adverse change includes physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be "materially impaired." The significance of an historical resource is "materially impaired" when a project demolishes or materially alters, in an adverse manner, those physical characteristics of the resource that convey its historical significance and that justify its inclusion on, or eligibility for inclusion on an historical resource list (including the California Register of Historical Resources, the National Register of Historical Resources, Local Register, or historical resources survey form (DPR Form 523) with a rating of 1-5)? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (a):**
According to the City's Parcel Historic Data, there are no historic resources as defined by CEQA Guidelines δ15064.5 on the project site, including the single-family home (5928 Thornhill Drive). Therefore, the project would have no impact on their significance as an historical resource nor would the project materially alter any of their physical characteristics as to impact their eligibility or justification for potential inclusion on an historical resource list.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to δ15064.5? ☐ ☐ ☐ ☐ ☒

**Discussion of question (b):**
The project site is located within a developed area that has been previously disturbed through construction. However, there remains the potential for unidentified buried archaeological remains to be present at the site. Buried archaeological remains such as prehistoric middden deposits, flaked and ground stone artifacts, bone, shell, building foundations and walls, and other buried cultural resource materials could be damaged during excavation and other construction activities. Therefore, the potential exists for disturbance of archaeological resources (as identified in CEQA Guidelines Section 15064.4 or CEQA Section 21803(g)), which could cause substantial adverse change to the significance of such resources, thereby resulting in a significant impact. Accordingly, the project would be required to implement and comply with the following uniformly-applied standard condition of approval, and implementation of this standard condition would reduce the impact from potential discovery of subsurface cultural resources to less than significant.

**STANDARD CONDITION CUL-1 (Archaeological Resources):**
*On-going throughout demolition, grading, and/or construction*

**a) Pursuant to CEQA Guidelines section 15064.5 (f), "provisions for historical or unique archaeological resources accidentally discovered during construction" should be instituted. Therefore, in the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and the project applicant and/or lead agency shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of the project proponent and/or lead agency and the qualified archaeologist would meet to determine the appropriate avoidance measures or other appropriate measure, with the ultimate determination to be made by the City of Oakland. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.**

**b) In considering any suggested measure proposed by the consulting archaeologist in order to mitigate impacts to historical resources or unique archaeological resources, the project applicant shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If avoidance is unnecessary or infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while measure for historical resources or unique archaeological resources is carried out.**

**c) Should an archaeological artifact or feature be discovered on-site during project construction, all activities within a 50-foot radius of the find would be halted until the findings can be fully investigated by a qualified archaeologist to evaluate the find and assess the significance of the find according to the CEQA definition of a historical or unique archaeological resource. If the deposit is determined to be significant, the project applicant and the qualified archaeologist shall meet to determine the appropriate avoidance measures or other appropriate measure, subject to approval by the City of Oakland, which shall assure implementation of appropriate measure measures**

**recommended by the archaeologist. Should archaeologically-significant materials be recovered, the qualified archaeologist shall recommend appropriate analysis and treatment, and shall prepare a report on the findings for submittal to the Northwest Information Center.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of question (c):**
Paleontologic resources are the fossilized evidence of past life found in the geologic record. Despite the tremendous volume of sedimentary rock deposits preserved worldwide, and the enormous number of organisms that have lived through time, preservation of plant or animal remains is an extremely rare occurrence. Because of the infrequency of fossil preservation, fossils – particularly vertebrate fossils – are considered to be nonrenewable resources. Because of their rarity, and the scientific information they can provide, fossils are highly significant records of ancient life.

Given the relatively shallow grading activity associated with the parking lot, it is unlikely that fossils would be unearthed, however because significant fossil discoveries can be made even in areas of low sensitivity the potential for a significant effect remains. Accordingly, the project would be required to implement and comply with the following uniformly-applied standard condition of approval, and implementation of this standard condition would reduce the impact from potential discovery of paleontological resources to less than significant.

**STANDARD CONDITION CUL-2**: **In the event of an unanticipated discovery of a paleontological resource during construction, excavations within 50 feet of the find shall be temporarily halted or diverted until the discovery is examined by a qualified paleontologist (per Society of Vertebrate Paleontology standards (SVP 1995,1996)). The qualified paleontologist shall document the discovery as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in Section 15064.5 of the CEQA Guidelines. The paleontologist shall notify the appropriate agencies to determine procedures that would be followed before construction is allowed to resume at the location of the find. If the City determines that avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of the project on the qualities that make the resource important, and such plan shall be implemented. The plan shall be submitted to the City for review and approval.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| d) Disturb any human remains, including those interred outside of formal cemeteries? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of question (d):**
While it is unlikely that human remains would be encountered during project construction, the potential exists. In the event of the accidental discovery of any human remains, including those interred outside of

formal cemeteries, during project construction, the project would be required to implement and comply with the following uniformly-applied standard condition of approval, and implementation of this standard condition would reduce the impact from accidental discovery of human remains to less than significant.

**STANDARD CONDITION CUL-3**: **In the event that human skeletal remains are uncovered at the project site during construction or ground-breaking activities, all work shall immediately halt and the Alameda County Coroner shall be contacted to evaluate the remains, and following the procedures and protocols pursuant to Section 15064.5 (e)(1) of the CEQA Guidelines. If the County Coroner determines that the remains are Native American, the City shall contact the California Native American Heritage Commission (NAHC), pursuant to subdivision (c) of Section 7050.5 of the Health and Safety Code, and all excavation and site preparation activities shall cease within a 50-foot radius of the find until appropriate arrangements are made. If the agencies determine that avoidance is not feasible, then an alternative plan shall be prepared with specific steps and timeframe required to resume construction activities. Monitoring, data recovery, determination of significance and avoidance measures (if applicable) shall be completed expeditiously.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **VI. GEOLOGY AND SOILS** -- Would the project: | | | | | |
| a) Expose people or structures to substantial risk of loss, injury, or death involving: | | | | | |
| i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or Seismic Hazards Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publications 42 and 117 and PRC δ2690 et. Seq.)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| ii) Strong seismic ground shaking? | ☐ | ☐ | ☐ | ☐ | ☒ |
| iii) Seismic-related ground failure, including liquefaction, lateral spreading, subsidence, collapse? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of questions (a.i, a.ii, a.iii, and iv)**
The major active faults in the project area include the Hayward, Calaveras and San Andreas. For each of the active faults within 50 kilometers (km) of the site, the distance from the site and estimated maximum[5][6] Moment magnitude events are summarized in Table 1.

**Table 1 Active Faults Within 50KM of Project Site**

[5] Moment magnitude is an energy –based scale and provides a physically meaningful measure of eh size of a faulting event. Moment magnitude is directly related to average and fault rupture area.

[6] California Division of Mines and Geology, 1996, *probabilistic Seismic Hazard Assessment for the State of California,* CDMG Open-File Report 96-08.

| Fault Segment | Approximate Distance from Site (km) | Direction from Site | Maximum Magnitude |
|---|---|---|---|
| Northern Hayward | 0.7 | Southwest | 6.6 |
| Hayward-Total | 0.7 | Southwest | 7.1 |
| Southern Hayward | 6 | Southeast | 6.9 |
| Mount Diablo Thrust | 15 | East | 6.7 |
| Northern Calaveras | 16 | East | 7.0 |
| Concord | 21 | Northeast | 6.5 |
| Southern Green Valley | 27 | North | 6.5 |
| Northern Greenville | 28 | Northeast | 6.6 |
| Rodgers Creek | 30 | North | 7.1 |
| San Andreas – 1906 Rupture | 31 | Southwest | 7.9 |
| San Andreas – Peninsula | 31 | Southwest | 7.2 |
| San Andreas – North Coast South | 34 | West | 7.5 |

In 2002, the Working Group on California Earthquake Probabilities at the U.S. Geologic Survey predicted a 62 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2030.[7]

The liquefaction potential of soil layers on the project site (with the exception of the creek bed) are sufficiently dense or contain fine content such that they are not susceptible to liquefaction. As a result, the potential for lateral spreading and for sand boils and lurch cracking at the ground surface is nil. Soils within the creek bed are susceptible to strength loss during seismic shaking.

In accordance with standard City practices, complying with the California Building Code (CBC) standards, and incorporating a foundation design intended to minimize effects of ground shaking and seismically related ground failures, the applicant shall be required to submit and engineering analysis along with detailed engineering drawings to the Oakland Building Services Division prior to excavation, grading, or construction activities on the site. This is consistent with standard City of Oakland practices to ensure that all buildings are designed and built in conformance with the seismic requirements of the City of Oakland Building Code. The project sponsor will be required to submit an engineering analysis report along with detailed engineering drawings and relevant grading construction activities on the project site to address constraints and incorporate recommendations identified in the geotechnical investigations. In addition, the required submittals would ensure that the buildings are designed and constructed in conformance with the requirements of all applicable building code regulations, pursuant to standard City procedures. Considering that the proposed project would be constructed in conformance with the CBC and the City of Oakland Building Code, the risks of injury and structural damage from a known earthquake fault, ground shaking, or seismic-related ground failure would be reduced and the impacts would be less than significant. These requirements are imbedded in the following uniformly-applied standard condition of approval that would apply to the project.

**STANDARD CONDITION GEO-1: A site-specific, design level, Landslide or Liquefaction geotechnical investigation for each construction site within the project area shall be required as part if this project and submitted for review and approval by the Building Services Division. Specifically:**

[7] Working Group on California Earthquake Probabilities (WGCEP), 2002, *Earthquake Probabilities in the San Francisco Bay region; 2000 to 2032 – A Summary of Findings,* Open File Report 99-517.

**a) Each investigation shall include an analysis of expected ground motions at the site from identified faults. The analyses shall be accordance with applicable City ordinances and polices, and consistent with the most recent version of the California Building Code, which requires structural design that can accommodate ground accelerations expected from identified faults.**

**b) The investigations shall determine final design parameters for the walls, foundations, foundation slabs, surrounding related improvements, and infrastructure (utilities, roadways, parking lots, and sidewalks).**

**c) The investigations shall be reviewed and approved by a registered geotechnical engineer. All recommendations by the project engineer, geotechnical engineer, shall be included in the final design, as approved by the City of Oakland.**

**d) The geotechnical report shall include a map prepared by a land surveyor or civil engineer that shows all field work and location of the "No Build" zone. The map shall include a statement that the locations and limitations of the geologic features are accurate representations of said features as they exist on the ground, were placed on this map by the surveyor, the civil engineer or under their supervision, and are accurate to the best of their knowledge.**

**e) Recommendations that are applicable to foundation design, earthwork, and site preparation that were prepared prior to or during the projects design phase, shall be incorporated in the project.**

**f) Final seismic considerations for the site shall be submitted to and approved by the City of Oakland Building Services Division prior to commencement of the project.**

**g) A peer review is required for the Geotechnical Report. Personnel reviewing the geologic report shall approve the report, reject it, or withhold approval pending the submission by the applicant or subdivider of further geologic and engineering studies to more adequately define active fault traces.**

**h) Tentative Tract or Parcel Map approvals shall require, but not be limited to approval of the Geotechnical Report.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| iv) Landslides? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (a.iv):**
Landsliding, liquefaction ground failures including lateral spreading (a.i through a.iii), soil subsidence, and soil collapse have been determined to be less than significant because the project design would do the following: incorporate foundation recommendations of a project geotechnical evaluation, comply with applicable City regulations and standard conditions of approval, be constructed to applicable CBC standards, and would incorporate the proposed measures to address potential liquefaction hazards. Thus, the potential impacts associated with landslides, would be less than significant.

| | | | | | |
|---|---|---|---|---|---|
| b) Result in substantial soil erosion or the loss of topsoil, creating substantial risks to life, property, or creek/waterways? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (b):**
The creek and proposed bridge area is subject to some existing soil erosion because of the silty clay, sand and gravel layers on the south side of the creek.[8] These sandy soils are susceptible to erosion during seismic shaking. Existing erosion has resulted in a steep creek bank slope near the proposed west bridge abutment. The project proposes creek restoration activity, as described in the project description, which includes moving and regrading the slopes of the creek banks, leading to bank stabilization and habitat improvement. Creek bank instability would also be addressed in the design of the bridge and abutment walls. The bridge would have drilled pier foundations with vertical and lateral support from under potentially unstable soils. Abutment walls would be extended below an imaginary line inclined at 2.5 to 1 upwards from the creek bed.[9]

Southwest of the proposed sanctuary building is a hillside located at the edge of a regional landslide deposit. The hillside is subject to localized slope failures and ongoing downslope creep. However, based on a test boring on the hillside, the landsliding seems limited to approximately the upper ten feet of soil and rock. Installation of a site retaining wall would mitigate the risk of shallow landslide movements, and the additional subsurface drainage and support proposed would increase slope stability.[10]

Also, to minimize wind or water erosion on the site during construction or remediation activities that involve earthwork, the applicant shall be required, in accordance with standard City practices, to submit a construction period erosion control plan to the Building Services Division for approval prior to the issuance of grading and building permits, consistent with standard City practices. The plan shall be in effect for a period of time sufficient to stabilize the construction site throughout all phases of the project. Long-term erosion potential shall be addressed through installation of project landscaping and storm drainage facilities, both of which shall be designed to meet applicable regulations. Therefore, there would be a less-than-significant impact associated with soil erosion and/or loss of topsoil.

| | | | | | |
|---|---|---|---|---|---|
| c) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as it may be revised), creating substantial risks to life or property? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (c):**
As noted above under criteria a.i through a.iii, a geotechnical investigation, as required by the City, would evaluate the subsurface soils and determine the appropriate foundation system to mitigate unstable soils as is standard practice for the industry.[11] In accordance with standard City practices, and in conformance with current codes and regulations, the project sponsor shall be required to submit detailed engineering drawings and materials to the Building Services Division prior to excavation, grading, or construction on the site. This measure would ensure that the building is designed and built in conformance with the requirements of the City of Oakland Building Code and the applicable provisions of the CBC. Therefore, the proposed project would not result in substantial risks to life or property due to unstable or expansive soil, and application of Standard Condition GEO-1 will reduce the potential impacts associated with these conditions to less than significant.

[8] *Geotechnical Investigation*, *St John's Episcopal Church, Entry Road, Bridge, Parking and New Sanctuary*, Land/Marine Geotechnics, May 2005.
[9] *Geotechnical Investigation,* May 2005.
[10] *Geotechnical Investigation,* May 2005.
[11] *Geotechnical Investigation*, May 2005.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| d) Be located above a well, pit, swamp, mound, tank vault, or unmarked sewer line, creating substantial risks to life or property? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (d):**
The project site is not located on a well, pit, swamp, mound, tank vault or unmarked sewer line.

| | | | | | |
|---|---|---|---|---|---|
| e) Be located above landfills for which there is no approved closure and post-closure plan, or unknown fill soils, creating substantial risks to life or property? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (e):**
The north side of the existing parking lot was constructed on about 5 feet of fill, consisting of medium stiff clay and contains abundant rock fragments. An additional four feet of fill was found near the center of the proposed sanctuary addition site. This fill consists of medium dense clayey sand and medium stiff to silty clay fill.

As noted above under criteria a.i through a.iii, a geotechnical investigation, as required by the City, would evaluate the subsurface soils and determine the appropriate foundation system to mitigate unstable soils as is standard practice for the industry. In accordance with standard City practices, and in conformance with current codes and regulations, the project sponsor shall be required to submit detailed engineering drawings and materials to the Building Services Division prior to excavation, grading, or construction on the site. This measure would ensure that the building is designed and build in conformance with the requirements of the City of Oakland Building Code and the applicable provisions of the CBC. Therefore, the proposed project would not result in substantial risks to life or property due to construction on unstable fill, and application of Standard Condition GEO-1 will reduce the potential impacts associated with these conditions to less than significant.

| | | | | | |
|---|---|---|---|---|---|
| f) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of questions (f):**
The church is currently connected and would continue to be connected to the existing central sewer system which provides wastewater collection service for the City of Oakland. Therefore, the project would not require any of the systems described.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **VII. HAZARDS AND HAZARDOUS MATERIALS - -** Would the project: | | | | | |
| a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (a):**
As a religious institution, the project would not involve the routine transport, use storage, or disposal of hazardous materials, other than routine use of minor quantities of commercial products used in cleaning and maintenance of the buildings and potentially, pesticides and fertilizers for care of on-site landscaping. Also, the project would not produce emissions other than from natural gas for space and water heating. These materials and emissions would not pose a significant hazard, due to routine activities, to the public, including students or personnel at the adjacent Thornhill Elementary School.

| | | | | | |
|---|---|---|---|---|---|
| b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? | ☐ | ☐ | ☐ | ☒ | ☐ |
| c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? | ☐ | ☐ | ☐ | ☒ | ☐ |
| d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and as a result, would create a significant hazard to the public or the environment? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (b), (c), and (d):**
The construction of the 5,000 square foot addition to the Church's sanctuary, and the reconfiguration of the site parking and circulation will not create a significant hazard to the public or environment as there is no activity on the project site that would generate hazardous materials. Although the project site is adjacent to Thornhill Elementary School, the project would not emit hazardous emissions, nor handle hazardous materials. Lastly, the site is not on any list of any hazardous materials sites.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and would result in a safety hazard for people residing or working in the project area? | ☐ | ☐ | ☐ | ☒ | ☐ |
| f) Be located within the vicinity of a private airstrip, and would result in a safety hazard for people residing or working in the project area? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of (e) and (f):**
The project site is not located within an airport land use plan. The closest airport is Oakland International, which is approximately 15 miles from the site. There are no private air strips near the project site.

| | | | | | |
|---|---|---|---|---|---|
| g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of (g):**
Neither phase of the project would affect emergency response or an evacuation plan for the area. The improved site circulation and access would improve emergency egress from the church campus and would provide better emergency vehicle access to the project site.

| | | | | | |
|---|---|---|---|---|---|
| h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of (h):**
The project is located within the City of Oakland Wildfire Fire Assessment District.[12] The new sanctuary addition would be required to comply with all applicable Fire Code and fire suppression systems, as routinely required by the City. Given the location of the site in the Wildfire Assessment District, the project would be required to implement and comply with the following uniformly-applied standard condition of approval and implementing recommendations (which are consistent with and include elements from the City' uniformly-applied standard conditions) that would reduce the potential adverse impacts of exposing people to wildfires, to less than significant.

**STANDARD CONDITION HAZ-1: <u>Vegetation Management Plan on Creekside Properties</u>**
***Prior to issuance of a demolition, grading, and/or construction and Ongoing***

**a) The project applicant shall submit a vegetation management plan for review and approval by the Planning and Zoning Division, Fire Services Division, and Environmental Services Division of the Public Works Agency that includes, if deemed appropriate, the following measures:**

[12] http://www.oaklandnet.com/wildfirePrevention/WildfirePreventionAssessmentDistrictMap.pdf accessed on 12/26/07.

i. **Identify and leave" islands" of vegetation in order to prevent erosion and landslides and protect nesting habitat.**
ii. **Leave at least 6 inches of vegetation on the site.**
iii. **Trim tree branches from the ground up (limbing up) and leave tree canopy intact.**
iv. **Leave stumps and roots from cut down trees to prevent erosion.**
v. **Plant fire-appropriate, drought-tolerant, preferably native vegetation.**
vi. **Err on the side of caution. If you don't know if a plant, tree or area is sensitive, ask for a second opinion before you cut.**
vii. **Provide erosion and sediment control protection if cutting vegetation on a steep slope.**

**IX. Leave tall shrubbery at least 3-feet high.**

**X. Fence off sensitive plant habitats and creek areas to protect from goat grazing.**

**XI. Obtain a tree protection permit for a protected tree (includes all mature trees except eucalyptus and Monterey pine).**

**XII. Contact the City Tree Department (615-5850) for dead trees.**

**XIII. Do not clear-cut vegetation. This can lead to erosion and severe water quality problems and destroy important habitat.**

**XIV. Do not trim/prune branches that are larger than 4 inches in diameter.**

**XV. Do not dump cut vegetation in a creek.**

**XVI. Do not cut tall shrubbery to less than 3-feet high.**

**XVII. Do not cut off short vegetation (grasses, ground-cover) to less than 6-inches high.**

**STANDARD CONDITION HAZ-2: Fire Safety**
***Prior to and ongoing throughout demolition, grading, and/or construction***
**The project applicant and construction contractor will ensure that during project construction, all construction vehicles and equipment will be fitted with spark arrestors to minimize accidental ignition of dry construction debris and surrounding dry vegetation.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **VIII. HYDROLOGY AND WATER QUALITY** - - Would the project: | | | | | |
| a) Violate any water quality standards or waste discharge requirements? | ☐ | ☐ | ☒ | ☐ | ☐ |
| b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of (a) and (b):**

Hazardous materials associated with construction activities are likely to involve minor quantities of paint, solvents, oil and grease and petroleum hydrocarbons. Storage and use of hazardous materials at the project site during construction activities would comply with best management practices (BMPs) as required by the City of Oakland and Alameda County stormwater quality protection requirements, which would reduce potential impacts to groundwater quality associated with spills or leaks of hazardous materials used routinely during construction activities to a less-than-significant level.

In accordance with standard City practices, the project sponsor shall be required to comply with all applicable regulatory standards and regulations pertaining to potential contaminants and to project-related grading and excavation prior to issuance of grading and building permits (see Section VI, *Geology and Soils)*. Therefore, the project would not result in significant impacts on water quality or on groundwater supplies.

| | | | | | |
|---|---|---|---|---|---|
| c) Result in substantial erosion or siltation on- or off-site that would affect the quality of receiving waters? | ☐ | ☐ | ☐ | ☐ | ☒ |
| d) Result in substantial flooding on- or off-site? | ☐ | ☐ | ☒ | ☐ | ☐ |
| e) Create or contribute substantial runoff which would exceed the capacity of existing or planned stormwater drainage systems? | ☐ | ☐ | ☐ | ☐ | ☒ |
| f) Create or contribute substantial runoff which would be an additional source of polluted runoff? | ☐ | ☐ | ☐ | ☐ | ☒ |
| g) Otherwise substantially degrade water quality? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of (c) through (g):**

Under current conditions, approximately 33 percent of the 136,300 square foot (3.13-acre) site is covered by the existing structures and paving. With removal of the existing house, and construction of the Sanctuary addition, the total impervious area would increase from 44,745 square feet to 51,640 square feet, which represents an increase of 13 percent of impervious surface. Because the site is currently developed primarily with impervious surfaces, the proposed project would not significantly alter the pattern or volume of surface runoff, compared to existing conditions. Also, stormwater discharges from the site are not expected to significantly increase or result in substantial erosion or flooding onsite or offsite, since as noted, the project would not significantly increase the amount of impervious surface onsite. The project is not located in a 100-year floodplain zone, according to the Federal Emergency Management Agency (FEMA), and is therefore subject to an annual flooding probability of less than one percent. Furthermore, the parking area will incorporate a new stormwater drainage system, which will retain stormwater on site, further reducing runoff volume generated on the project site, and allowing percolation into the ground as opposed to flowing into Temescal Creek.

In accordance with standard City practices, and in order to minimize any short-term (construction-related) or long-term impacts on surface water quantity or quality, the applicant shall be required to comply with applicable City standards and regulations designed to maintain water quality. The project would be

required to implement the following uniformly-applied standard conditions of approval which the City would apply to the project and that would reduce impacts regarding water quality to less than significant:

**STANDARD CONDITION HYD-1: Stormwater Pollution Prevention Plan (SWPPP)**
***Prior to and ongoing throughout demolition, grading, and/or construction activities***
**The project applicant must obtain coverage under the General Construction Activity Storm Water Permit (General Construction Permit) issued by the State Water Resources Control Board (SWRCB). The project applicant must file a notice of intent (NOI) with the SWRCB. The project applicant will be required to prepare a stormwater pollution prevention plan (SWPPP) and submit the plan for review and approval by the Planning and Zoning Division and the Building Services Division. At a minimum, the SWPPP shall include a description of construction materials, practices, and equipment storage and maintenance; a list of pollutants likely to contact stormwater; site-specific erosion and sedimentation control practices; a list of provisions to eliminate or reduce discharge of materials to stormwater; Best Management Practices (BMPs), and an inspection and monitoring program. Prior to the issuance of any construction-related permits, the project applicant shall submit a copy of the SWPPP and evidence of approval of the SWPPP by the SWRCB to the Building Services Division. Implementation of the SWPPP shall start with the commencement of construction and continue though the completion of the project. After construction is completed, the project applicant shall submit a notice of termination to the SWRCB.**

**STANDARD CONDITION HYD-2: Drainage Plan for Projects on Slopes Greater than 20%**
***Prior to issuance of building permit (or other construction-related permit)***
**The project drawings submitted for a building permit (or other construction-related permit) shall contain a drainage plan to be reviewed and approved by the Building Services Division. The drainage plan shall include measures to reduce the post-construction volume and velocity of stormwater runoff to the maximum extent practicable. Stormwater runoff shall not be augmented to adjacent properties or creeks. The drainage plan shall include and identify the following:**

- **i. All proposed impervious surface on the site;**
- **ii. Anticipated directional flows of on-site stormwater runoff;**
- **iii. Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces;**
- **iv. Source control measures to limit the potential for stormwater pollution; and**
- **v. Stormwater treatment measures to remove pollutants from stormwater runoff.**

**STANDARD CONDITION HYD-3: Post-Construction Stormwater Pollution Management Plan http://www.cleanwaterprogram.com**
***Prior to issuance of building permit (or other construction-related permit)***
**The applicant shall comply with the requirements of Provision C.3 of the National Pollutant Discharge Elimination System (NPDES) permit issued to the Alameda Countywide Clean Water Program. The applicant shall submit with the application for a building permit (or other construction-related permit) a completed Stormwater Supplemental Form for the Building Services Division. The project drawings submitted for the building permit (or other construction-related permit) shall contain a stormwater pollution management plan, for review and approval by the City, to limit the discharge of pollutants in stormwater after construction of the project to the maximum extent practicable.**

**a) The post-construction stormwater pollution management plan shall include and identify the following:**
- **i. All proposed impervious surface on the site;**
- **ii. Anticipated directional flows of on-site stormwater runoff; and**

**iii. Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces; and**
**iv. Source control measures to limit the potential for stormwater pollution; and**
**v. Stormwater treatment measures to remove pollutants from stormwater runoff.**

**b) The following additional information shall be submitted with the post-construction stormwater pollution management plan:**
**i. Detailed hydraulic sizing calculations for each stormwater treatment measure proposed; and**
**ii. Pollutant removal information demonstrating that any proposed manufactured/ mechanical (i.e., non-landscape-based) stormwater treatment measure, when not used in combination with a landscape-based treatment measure, is capable or removing the range of pollutants typically removed by landscape-based treatment measures.**

**All proposed stormwater treatment measures shall incorporate appropriate planting materials for stormwater treatment (for landscape-based treatment measures) and shall be designed with considerations for vector/mosquito control. Proposed planting materials for all proposed landscape-based stormwater treatment measures shall be included on the landscape and irrigation plan for the project. The applicant is not required to include on-site stormwater treatment measures in the post-construction stormwater pollution management plan if he or she secures approval from Planning and Zoning of a proposal that demonstrates compliance with the requirements of the City's Alternative Compliance Program.**

***Prior to final permit inspection***
**The applicant shall implement the approved stormwater pollution management plan.**

**STANDARD CONDITION HYD-4: Maintenance Agreement for Stormwater Treatment Measures**
***Prior to final zoning inspection***
**For projects incorporating stormwater treatment measures, the applicant shall enter into the "Standard City of Oakland Stormwater Treatment Measures Maintenance Agreement," in accordance with Provision C.3.e of the NPDES permit, which provides, in part, for the following:**
**i. The applicant accepting responsibility for the adequate installation/construction, operation, maintenance, inspection, and reporting of any on-site stormwater treatment measures being incorporated into the project until the responsibility is legally transferred to another entity; and**
**ii. Legal access to the on-site stormwater treatment measures for representatives of the City, the local vector control district, and staff of the Regional Water Quality Control Board, San Francisco Region, for the purpose of verifying the implementation, operation, and maintenance of the on-site stormwater treatment measures and to take corrective action if necessary. The agreement shall be recorded at the County Recorder's Office at the applicant's expense.**

**STANDARD CONDITION HYD-5: Erosion, Sedimentation, and Debris Control Measures**
***Prior to issuance of demolition, grading, or construction-related permit***
**The project applicant shall submit an erosion and sedimentation control plan for review and approval by the Building Services Division. All work shall incorporate all applicable "Best Management Practices (BMPs) for the construction industry, and as outlined in the Alameda Countywide Clean Water Program pamphlets, including BMP's for dust, erosion and sedimentation abatement per Chapter Section 15.04 of the Oakland Municipal Code. The measures shall include, but are not limited to, the following:**

**a) On sloped properties, the downhill end of the construction area must be protected with silt fencing (such as sandbags, filter fabric, silt curtains, etc.) and hay bales oriented parallel to the contours of the slope (at a constant elevation) to prevent erosion into the creek.**

**b) In accordance with an approved erosion control plan, the project applicant shall implement mechanical and vegetative measures to reduce erosion and sedimentation, including appropriate seasonal maintenance. One hundred (100) percent degradable erosion control fabric shall be installed on all graded slopes to protect and stabilize the slopes during construction and before permanent vegetation gets established. All graded areas shall be temporarily protected from erosion by seeding with fast growing annual species. All bare slopes must be covered with staked tarps when rain is occurring or is expected.**

**c) Minimize the removal of natural vegetation or ground cover from the site in order to minimize the potential for erosion and sedimentation problems. Maximize the replanting of the area with native vegetation as soon as possible.**

**d) All work in or near creek channels must be performed with hand tools and by a minimum number of people. Immediately upon completion of this work, soil must be repacked and native vegetation planted.**

**e) Install filter materials (such as sandbags, filter fabric, etc.) at the storm drain inlets nearest to the creek side of the project site prior to the start of the wet weather season (October 15); site dewatering activities; street washing activities; saw cutting asphalt or concrete; and in order to retain any debris flowing into the City storm drain system. Filter materials shall be maintained and/or replaced as necessary to ensure effectiveness and prevent street flooding.**

**f) Ensure that concrete/granite supply trucks or concrete/plaster finishing operations do not discharge wash water into the creek, street gutters, or storm drains.**

**g) Direct and locate tool and equipment cleaning so that wash water does not discharge into the creek.**

**h) Create a contained and covered area on the site for storage of bags of cement, paints, flammables, oils, fertilizers, pesticides, or any other materials used on the project site that have the potential for being discharged to the storm drain system by the wind or in the event of a material spill. No hazardous waste material shall be stored on site.**

**i) Gather all construction debris on a regular basis and place them in a dumpster or other container which is emptied or removed on a weekly basis. When appropriate, use tarps on the ground to collect fallen debris or splatters that could contribute to stormwater pollution.**

**j) Remove all dirt, gravel, refuse, and green waste from the sidewalk, street pavement, and storm drain system adjoining the project site. During wet weather, avoid driving vehicles off paved areas and other outdoor work.**

**k) Broom sweep the street pavement adjoining the project site on a daily basis. Caked-on mud or dirt shall be scraped from these areas before sweeping. At the end of each workday, the entire site must be cleaned and secured against potential erosion, dumping, or discharge to the creek.**

**l) All erosion and sedimentation control measures implemented during construction activities, as well as construction site and materials management shall be in strict accordance with the control standards listed in the latest edition of the Erosion and Sediment Control Field Manual published by the Regional Water Quality Board (RWQB).**

**m) Temporary fencing is required for sites without existing fencing between the creek and the construction site and shall be placed along the side adjacent to construction (or both sides of the creek if applicable) at the maximum practical distance from the creek centerline. This area shall not be disturbed during construction without prior approval of Planning and Zoning.**

**n) All erosion and sedimentation control measures shall be monitored regularly by the project applicant. The City may require erosion and sedimentation control measures to be inspected by a qualified environmental consultant (paid for by the project applicant) during or after rain events. If measures are insufficient to control sedimentation and erosion then the project applicant shall develop and implement additional and more effective measures immediately.**

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| h) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map that would impede or redirect flood flows? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (h):**
The project does not involve construction of housing.

| | | | | | |
|---|---|---|---|---|---|
| i) Place within a 100-year flood hazard area structures which would impede or redirect flood flows? | ☐ | ☐ | ☒ | ☐ | ☐ |
| j) Expose people or structures to a substantial risk of loss, injury or death involving flooding? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (i) and (j):**
Current 100-year flood elevations are contained within the existing Temescal Creek channel. The simulated maximum 100-year flood water surface elevation at the bridge location is no higher than 598 feet in elevation under existing channel geometry. The proposed free-spanning bridge decking and roadway are designed for a 600-foot elevation, and the bridge footings are located outside of and above the 100-year flood water surface.[13] Therefore, as designed, the proposed bridge would be outside of the 100-year flood hazard area, and would not be exposed to substantial risk of loss, injury or death involving flooding. The impact is less than significant.

[13] Kamman Hydrology & Engineering, Inc., *Bridge Design review: St. John's Episcopal Church, Oakland, CA.* June 28, 2007.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| k) Result in inundation by seiche, tsunami, or mudflow? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (k):**
The project site is not within proximity of large water bodies in which seiches or tsunamis could be generated. The Phase 2 sanctuary site is located adjacent to a hillside which is located to the toe or a large regional landslide deposit.[14] The proposed building could be exposed to mudflows from the hillside during periods of heavy rain. At the time that the Church decides to proceed with the Phase 2 sanctuary, detailed plans would be developed, including the design of a site retaining wall which would help stabilize the hill, and which would be designed with freeboard to provide an area to catch mud and debris in the event of an upslope mudflow. The freeboard would be designed so that it can be cleaned out if mudflow occurs. In addition, the condition of the trees on the hillside, which are leaning as a result of hillside movement, will be evaluated for stability and if found to be unstable, the hillside would be re-landscaped in order to stabilize the hill. By incorporating these design and evaluation steps, the risk of mudflow inundation is less than significant.

| | | | | | |
|---|---|---|---|---|---|
| l) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course, or increasing the rate or amount of flow, of a Creek, river or stream in a manner that would result in substantial erosion, siltation, or flooding, both on- or off-site? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (l):**
Impacts associated with the existing drainage pattern, including alteration of the creek course or creek flow, will be further addressed in the EIR.

| | | | | | |
|---|---|---|---|---|---|
| m) Fundamentally conflict with elements of the City of Oakland Creek Protection (OMC Chapter 13.16) ordinance intended to protect hydrologic resources. Although there are no specific, numeric/quantitative criteria to assess impacts, factors to be considered in determining significance include whether there is substantial degradation of water quality through (a) discharging a substantial amount of pollutants into creek; (b) significantly modifying the natural flow of the water or capacity; (c) depositing substantial amounts of new material into a creek or causing substantial bank erosion or instability; or (d) substantially endangering public or private property or threatening public health or safety? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (m):**
Impacts associated with protecting hydrologic resources through the City of Oakland Creek Protection ordinance will be further addressed in the EIR.

[14] Land/Marine Geotechnics, *Geotechnical Investigation, St. John's Episcopal Church, Entry Road, Bridge, Parking and New Sanctuary.* May 2005.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **IX. LAND USE AND PLANNING** – Would the project: | | | | | |
| a) Physically divide an established community? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Result in a fundamental conflict between adjacent or nearby land uses? | ☐ | ☐ | ☐ | ☒ | ☐ |
| c) Fundamentally conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and actually result in a physical change in the environment? | ☐ | ☐ | ☐ | ☒ | ☐ |
| Fundamentally conflict with any applicable habitat conservation plan or natural community conservation plan? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a), (b), (c), and (d):**
Neither phase of the proposed project would change the existing use of the site as a religious institution. The proposed project would not divide an established community; result in fundamental conflict between adjacent land uses, or conflict with relevant plans and policies, as the existing General Plan designation and Zone remain unchanged. There are no habitat or conservation plans within the project area. Therefore, there are no land use impacts associated with the project.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **X. MINERAL RESOURCES** -- Would the project: | | | | | |
| a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a) and (b):**
The project site, located in a residential area, and is paved and developed with buildings. The project site has no known existing mineral resources. The project would not require quarrying, mining, dredging, or extraction of locally important mineral resources on site, nor would it deplete any nonrenewable natural resource. Therefore, the project would not impact any mineral resources.

| XI. **NOISE** -- Would the project result in: | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| a) Exposure of persons to or generate noise levels in excess of standards established in the Oakland general plan or applicable standards of other agencies (e.g., OSHA)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| b) Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding operational noise? | ☐ | ☐ | ☐ | ☒ | ☐ |
| f) Generate interior Ldn or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities (and may be extended by local legislative action to include single family dwellings) per California Noise Insulation Standards (CCR Part 2, Title 24): | ☐ | ☐ | ☐ | ☒ | ☐ |
| g) Result in a 5dBA permanent increase in ambient noise levels in the project vicinity above levels existing without the project? | ☐ | ☐ | ☐ | ☒ | ☐ |
| h) Conflicts with state land use compatibility guidelines for all specified land uses for determination of acceptability of noise (Source: State of California, Governor's Office of Planning and Research, General Plan Guidelines, 2003)? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (a), (b) and (f) through (h):**

Both phases of the project involve improvements to operational elements of the St. John's campus. Neither phase would result in exposing persons to, or generating noise levels over existing conditions which are primarily associated with traffic on Thornhill Drive (which is below the 60 Ldn[15] contour as shown on Figure 2, Roadway Contour map in the *City of Oakland Noise Element)*, Church services and associated activities, and use of the campus for Thornhill Elementary School drop-off and pick-up activities. The new parking area and driveway are 45 feet from the existing house at 5940 Thornhill Drive, and 15 feet from the house owned by the Church at 5914 Thornhill Drive. Given the slow speed of automobiles using the proposed Thornhill Drive access, the primary noise generation factor would be idling and accelerating engines from automobiles entering and leaving the site. Noise from ingress, parking and egress currently affects the same two dwellings from the existing parking lot, therefore the proposed changes from Phase 1 of the project would not be significant.

[15] Sound pressure is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 dB to 140 dB corresponding to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Owing to the vibration in sensitivity of the human ear to various frequencies, sound is "weighted" to emphasize frequencies to which the ear is more sensitive, in a method known as A-weighting and expressed in units of A-weighted decibels (dBA). The $L_{eq}$ is the constant sound level, which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period). The day-night noise level (DNL) is an average 24-hour noise level that accounts for the greater sensitivity of most people to nighttime noise by giving greater weight to nighttime noise.

Construction of the new sanctuary building under Phase 2 is projected to generate an additional 2 peak hour vehicle trips during the weekday and 22 vehicle trips on Sundays, which would be spread out over the three standard service times amounting to roughly 7 vehicles per service. Generally, traffic must double in volume to produce noticeable permanent increase in noise levels. The existing peak hour traffic on Sunday was observed to be 35 vehicles, therefore the additional traffic generated by Phase 2 would not generate a significant increase in noise levels. The new sanctuary building would also include a cupola with bell. The bell would not increase noise levels in the project area because it would replace the existing bell located in the existing sanctuary building.

Due to the nature of both phases of the project, there are no increases in operational noise over existing conditions. Therefore, there would be no impact.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| c) Violate the City of Oakland Noise Ordinance (Oakland Planning Section 17.120.050) regarding construction noise, except if an acoustical analysis is preformed and all noise – related Standard Conditions of Approval imposed: During the hours of 7 p.m. to 7 a.m. on weekdays and 8 p.m. to 9 a.m. on weekends and federal holidays, will noise levels received by any land use from construction or demolition exceed the applicable nighttime operational noise level standard? | ☐ | ☐ | ☐ | ☐ | ☒ |
| d) Violates the City of Oakland Noise Ordinance (Oakland Municipal Code Section 8.18.020) regarding nuisance of persistent construction-related noise? | ☐ | ☐ | ☐ | ☐ | ☒ |

**Discussion of question (c) and (d):**
Construction activities would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity. During the construction period, a wide variety of construction and demolition equipment would be used, and material would be transported to and from the site by truck. These activities would intermittently and temporarily increase ambient noise levels in the project vicinity over the duration of construction. Construction-related noise levels at and near locations on the project site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. The effect of construction noise would depend upon the level of construction activity on a given day and the related noise generated by that activity, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those uses. As would be required for all construction projects in Oakland, the project shall implement and comply with the following uniformly-applied standard conditions throughout the duration of construction activity:

**STANDARD CONDITION NOISE-1: Days/Hours of Construction Operation**
**The project applicant shall require construction contractors to limit standard construction activities as follows:**

**a) Construction activities are limited to between 7:00 AM and 7:00 PM Monday through Friday, except that pile driving and/or other extreme noise generating activities greater than 90 dBA shall be limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday.**

**b) Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities (such as concrete pouring which may require**

**more continuous amounts of time) shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened and such construction activities shall only be allowed with the prior written authorization of the Building Services Division.**

**c) Construction activity shall not occur on Saturdays, with the following possible exceptions:**

**i. Prior to the building being enclosed, requests for Saturday construction for special activities (such as concrete pouring which may require more continuous amounts of time), shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened. Such construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division.**

**ii. After the building is enclosed, requests for Saturday construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division, and only then within the interior of the building with the doors and windows closed.**

**d) No extreme noise generating activities (greater than 90 dBA) shall be allowed on Saturdays, with no exceptions.**

**e) No construction activity shall take place on Sundays or Federal holidays.**

**f) Construction activities include but are not limited to: truck idling, moving equipment (including trucks, elevators, etc) or materials, deliveries, and construction meetings held on-site in a non-enclosed area.**

**g) Applicant shall use temporary power poles instead of generators where feasible.**

**STANDARD CONDITION NOISE-2: Noise Control**
***Ongoing throughout demolition, grading, and/or construction***
**To reduce noise impacts due to construction, the project applicant shall require construction contractors to implement a site-specific noise reduction program, subject to the Planning and Zoning Division and the Building Services Division review and approval, which includes the following measures:**

**a) Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).**

**b) Except as provided herein, impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used if such jackets are commercially available, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.**

**c) Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures as determined by the City to provide equivalent noise reduction.**

**d) The noisiest phases of construction shall be limited to less than 10 days at a time. Exceptions may be allowed if the City determines an extension is necessary and all available noise reduction controls are implemented.**

**STANDARD CONDITION NOISE-3: Pile Driving and Other Extreme Noise Generators**
***Ongoing throughout demolition, grading, and/or construction***

**To further reduce potential pier drilling, pile driving and/or other extreme noise generating construction impacts greater than 90dBA, a set of site-specific noise attenuation measures shall be completed under the supervision of a qualified acoustical consultant. Prior to commencing construction, a plan for such measures shall be submitted for review and approval by the Planning and Zoning Division and the Building Services Division to ensure that maximum feasible noise attenuation will be achieved. This plan shall be based on the final design of the project. A third-party peer review, paid for by the project applicant, may be required to assist the City in evaluating the feasibility and effectiveness of the noise reduction plan submitted by the project applicant. The criterion for approving the plan shall be a determination that maximum feasible noise attenuation will be achieved. A special inspection deposit is required to ensure compliance with the noise reduction plan. The amount of the deposit shall be determined by the Building Official, and the deposit shall be submitted by the project applicant concurrent with submittal of the noise reduction plan. The noise reduction plan shall include, but not be limited to, an evaluation of implementing the following measures. These attenuation measures shall include as many of the following control strategies as applicable to the site and construction activity:**

**a) Erect temporary plywood noise barriers around the construction site, particularly along on sites adjacent to residential buildings;**

**b) Implement "quiet" pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration), where feasible, in consideration of geotechnical and structural requirements and conditions;**

**c) Utilize noise control blankets on the building structure as the building is erected to reduce noise emission from the site;**

**d) Evaluate the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings by the use of sound blankets for example and implement such measure if such measures are feasible and would noticeably reduce noise impacts; and**

**e) Monitor the effectiveness of noise attenuation measures by taking noise measurements.**

**STANDARD CONDITION NOISE-4: Noise Compliant Procedures**
***Ongoing throughout demolition, grading, and/or construction***

**Prior to the issuance of each building permit, along with the submission of construction documents, the project applicant shall submit to the Building Services Division a list of measures to respond to and track complaints pertaining to construction noise. These measures shall include:**

**a) A procedure and phone numbers for notifying the Building Services Division staff and Oakland Police Department; (during regular construction hours and off-hours);**

**b) A sign posted on-site pertaining with permitted construction days and hours and complaint procedures and who to notify in the event of a problem. The sign shall also include a listing of both the City and construction contractor's telephone numbers (during regular construction hours and off-hours);**

**c) The designation of an on-site construction complaint and enforcement manager for the project;**

**d) Notification of neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities about the estimated duration of the activity; and**

**e) A preconstruction meeting shall be held with the job inspectors and the general contractor/on-site project manager to confirm that noise measures and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.**

Implementation of Standard Conditions Noise-1 through Noise-4 would reduce construction noise levels from the project to the extent feasible, and thus project construction impacts would be considered less than significant.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| e) Create a vibration which is perceptible without instruments by the average person at or beyond any lot line containing vibration-causing activities not associated with motor vehicles, trains, and temporary construction or demolition work, except activities located within the (a) M-40 zone or (b) M-30 zone more than 400 feet from any legally occupied residential property (Oakland Planning Code Section 17.120.060)? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (e):**
Project construction activities could result in temporary vibration typical of activities and equipment used for site preparation and construction of the bridge. The project would not involve activities that would involve severe vibration, such as pile driving. As previously noted, there are no vibration impacts associated with the project.

| | | | | | |
|---|---|---|---|---|---|
| i) Be located within an airport land use plan and would expose people residing or working in the project area to excessive noise levels? | ☐ | ☐ | ☐ | ☒ | ☐ |
| j) Be located within the vicinity of a private airstrip, and would expose people residing or working in the project area to excessive noise levels? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (i) and (j):**
The proposed site is not located within two miles of a public airport, or in the vicinity of a private airstrip. The closest public airport is the Oakland International Airport located approximately 15 miles south of the project site. Therefore, the project would not expose persons residing at the project site to excessive noise levels as a result of proximity to an airport or land strip. No impact would occur.

Sources: Oakland General Plan, Noise Element, June 2005.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
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| **XII. POPULATION AND HOUSING** -- Would the project: | | | | | |
| a) Induce substantial population growth in a manner not contemplated in the General Plan either directly (for example by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure), such that additional infrastructure is required but the impacts of such were not previously considered or analyzed? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere in excess of that contained in the City's Housing Element? | ☐ | ☐ | ☐ | ☒ | ☐ |
| c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere in excess of that contained in the City's Housing Element? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a) through (c):**
Both phases of the project would not result in the generation of any new housing units, or jobs that would contribute to population growth. Therefore, there would be no impact.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
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| **XIII. PUBLIC SERVICES** - - Would the project: | | | | | |
| a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services: | | | | | |
| i) Fire protection? | ☐ | ☐ | ☐ | ☒ | ☐ |
| ii) Police protection? | ☐ | ☐ | ☐ | ☒ | ☐ |
| iii) Schools? | ☐ | ☐ | ☐ | ☒ | ☐ |
| iv) Other public facilities? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (a):**
Neither phase of the project would result in the provision of new or physically altered governmental facilities. Phase 1 of the project will result in improved emergency vehicle access, which under current conditions, is constrained by the slope and angle of access on Gouldin Road. Therefore, there are no impacts.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **XIV. RECREATION** - - Would the project: | | | | | |
| a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated? | ☐ | ☐ | ☐ | ☒ | ☐ |
| b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a) and (b):**
The project would not generate any use of neighborhood or regional parks, nor would either phase include recreational facilities. Therefore, there are no impacts to recreation facilities.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with/ Development Standards |
|---|---|---|---|---|---|
| **XV. TRANSPORTATION/TRAFFIC** - - Would the project: | | | | | |
| a) Cause an increase in traffic which is substantial in relation to the traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections), or change the condition of an existing street (i.e., street closures, changing direction of travel) in a manner that would substantially impact access or traffic load capacity of the street system? Specifically: | | | | | |
| i) At a study, signalized intersection which is located outside the Downtown area, the project would cause the level of service (LOS) to degrade to worse than LOS D (i.e., E)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| ii) At a study, signalized intersection which is located within the Downtown area, the project would cause the LOS to degrade to worse than LOS E (i.e., F)? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a.i) and (a.ii):**
The project would generate only two additional weekday and 25 additional Sunday peak hour trips. The additional trips generated during the weekday AM and PM peak hours would be very small and would have a less-than-significant impact on nearby intersections outside of the Downtown area. Because the project would not be located in a Downtown area, signalized intersections located within the Downtown area would not be affected.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| iii) At a study, signalized intersection outside the Downtown area where the level of service is LOS E, the project would cause the total intersection average vehicle delay to increase by four (4) or more seconds, or degrade to worse than LOS E (i.e., F)? | ☐ | ☐ | ☒ | ☐ | ☐ |
| iv) At a study, signalized intersection for all areas where the level of service is LOS E, the project would cause an increase in the average delay for any of the critical movements of six (6) seconds or more, or degrade to worse than LOS E (i.e., F), | ☐ | ☐ | ☒ | ☐ | ☐ |
| v) At a study, signalized intersection for all areas where the level of service is LOS F, the project would cause (a) the total intersection average vehicle delay to increase by two (2) or more seconds, or (b) an increase in average delay for any of the critical movements of four (4) seconds or more; or (c) the volume-to-capacity ("V/C") ratio exceeds three (3) percent (but only if the delay values cannot be measured accurately)? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (a.iii) through (a.v):**
Impacts associated with intersection average vehicle delay at signalized intersections would be considered less than significant, since the project contribution to traffic at the signalized intersections in the project vicinity would be less than two trips during each of the weekday peak hours and 25 trips during the Sunday peak hour.

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| vi) At a study, unsignalized intersection, the project would add ten (10) or more vehicles and after project completion satisfy the Caltrans peak hour volume warrant? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (a.vi):**
During the Sunday peak hour, when the additional trips generated by the project would be greatest at 25 trips, the unsignalized intersections serving the project site currently operate at LOS B. Based on traffic counts conducted in March 2007, the peak hour volumes would not satisfy Caltrans signal warrants. Therefore, the additional trips generated would have a less-than-significant impact.

b) A project's contribution to cumulative impacts is considered "considerable" (i.e., significant) when the project results in a

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| substantial increase in traffic. More specifically, the project must exceed at least one of the intersection-related thresholds listed above in threshold #i through #vi above for cumulative 2015 and 2030 conditions. | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (b):**
The project would generate an additional two trips during the weekday morning and evening peak hours and an additional 25 trips during the Sunday peak hour. This amount of traffic would not be considered a substantial increase in traffic. During the Sunday peak hour, the unsignalized intersections currently serving the project site operate at LOS B. Therefore, a less-than-significant impact would occur.

| | | | | | |
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| c) Cause a roadway segment on the Metropolitan transportation System to operate at LOS F or increase the V/C ratio by more than 3% for a roadway segment that would operate at LOS F without the project? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (c):**
Because the project is not located on a roadway segment on the Metropolitan Transportation System, there would be no impact on its LOS.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| d) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (d):**
The project would not affect air traffic patterns. Therefore, no impact would occur.

| | | | | | |
|---|---|---|---|---|---|
| e) Substantially increase hazards due to motor vehicles, bicycles, or pedestrians due to a design feature (e.g., sharp curves or dangerous intersections) that does not comply with Caltrans design standards or incompatible uses (e.g., farm equipment)? | ☒ | ☐ | ☐ | ☐ | ☐ |
| f) Result in less than two emergency access routes for streets exceeding 600 feet in length? | ☒ | ☐ | ☐ | ☐ | ☐ |
| g) Fundamentally conflict with adopted policies, plans, programs supporting alternative transportation (e.g. bus turnouts, bicycle routes)? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of question (e) through (g):**
Impacts associated with design of the project driveway and parking areas, including pedestrian safety and alternative transportation infrastructure will be further studied in the EIR. Specifically, the use of the parking by the adjacent Thornhill Elementary School and pedestrian and bicycle circulation along Thornhill will be addressed.

h) Generate added transit ridership that would:

| | | | | | |
|---|---|---|---|---|---|
| i) Increase the average ridership on AC Transit lines by three (3) percent at bus stops where the average load factor with the project in place would exceed 125% over a peak thirty minute period? | ☐ | ☐ | ☐ | ☒ | ☐ |
| ii) Increase the peak hour average ridership on BART by three (3) percent where the passenger volume would exceed the standing capacity of BART trains? | ☐ | ☐ | ☐ | ☒ | ☐ |
| iii) Increase the peak hour average ridership at a BART station by three (3) percent where average waiting time at fare gates would exceed one minute? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of question (h):**
The project would not significantly impact transit ridership. Therefore, no impact would occur.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| **XVI. UTILITIES AND SERVICE SYSTEMS** - - Would the project: | | | | | |
| a) Exceed wastewater treatment requirements of the San Francisco Bay Regional Water Quality Control Board? | ☐ | ☐ | ☐ | ☒ | ☐ |
| d) Result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the providers' existing commitments and require or result in construction of new wastewater treatment facilities or expansion of existing facilities, construction of which could cause significant environmental effects? | ☐ | ☐ | ☒ | ☐ | ☐ |
| e) Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and require or result in construction of landfill facilities or expansion of existing facilities, construction of which could cause significant environmental effects? | ☐ | ☐ | ☐ | ☒ | ☐ |
| f) Violate applicable federal, state, and local statutes and regulations related to solid waste? | ☐ | ☐ | ☐ | ☐ | ☒ |
| g) Violate applicable federal, state and local statutes and regulations relating to energy standards? | ☐ | ☐ | ☐ | ☒ | ☐ |

**Discussion of questions (a) and (d) through (g):**

The project site is located in an urban area already served by utilities and service systems. The Community services Analysis, prepared for the Land Use and Transportation Element (LUTE) of the General Plan stated that future in-fill development through the General Plan horizon year of 2015 would not be likely to exceed the capacity of existing utilities and service systems.

Phase 1 of the project would not result in increased generation of wastewater treatment, nor generate new solid waste. Phase 2 of the project could result in an increased attendance at church services, as projected in other sections of this report. Given the fact that the church is only heavily used once a week and on religious holidays, the potential increased demand would be insignificant. Neither phase of the project would violate any energy standards.

In accordance with standard City practices, and in order to minimize any short-term (construction-related) or long-term impacts on waste systems, including landfill capacity, the applicant shall be required to implement the following uniformly-applied standard conditions of approval, which the City would apply to the project and that would reduce impacts to waste systems to a less-than-significant level:

**STANDARD CONDITION UTIL-1: <u>Waste Reduction and Recycling</u>**
***Prior to issuance of demolition, grading, or building permit***
**The project applicant will submit a Construction & Demolition Waste Reduction and Recycling Plan (WRRP) and an Operational Diversion Plan (ODP) for review and approval by the Public Works Agency. The WRRP must specify the methods by which the development will divert C&D debris waste generated by the proposed project from landfill disposal in accordance with current City requirements. After approval of the plan, the project applicant shall implement the plan.**
**On an on-going basis, the ODP will identify how the project complies with the Recycling Space Allocation Ordinance, (Chapter 17.118 of the Oakland Municipal Code), including capacity calculations, and specify the methods by which the development will meet the current diversion of solid waste generated by operation of the proposed project from landfill disposal in accordance with current City requirements. The proposed program shall be in implemented and maintained for the duration of the proposed activity or facility. Changes to the plan may be re-submitted to the Environmental Services Division of the Public Works Agency for review and approval. Any incentive programs shall remain fully operational as long as residents and businesses exist at the project site.**

| | | | | | |
|---|---|---|---|---|---|
| b) Require or result in construction of new storm water drainage facilities or expansion of existing facilities, construction of which could cause significant environmental effects? | ☐ | ☐ | ☒ | ☐ | ☐ |

As noted in Section VIII, Hydrology and Water Quality, construction of both phases of the project would increase the amount of impervious surfaces by 13 percent compared to existing conditions. With the planned use of pervious surface areas and stormwater detention facilities on site, the overall volume would be less than the estimated increase. Given the minor increase in overall runoff volume, the amount would be negligible and would not require expansion of stormwater facilities.

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|
| c) Exceed water supplies available to serve the project from existing entitlements and resources, and require or result in construction of water facilities or expansion of existing facilities, construction of which could cause significant environmental effects? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of question (c):**

Construction of Phase 1 and 2 of the project would entail additional use of minor amounts of water for the additional landscape areas and for the new sanctuary building, but would not exceed water supplies or require expansion of existing facilities.

| | | | | | |
|---|---|---|---|---|---|
| h) Result in a determination by the energy provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the providers' existing commitments and require or result in construction of new energy facilities or expansion of existing facilities, construction of which could cause significant environmental effects? | ☐ | ☐ | ☒ | ☐ | ☐ |

**Discussion of questions (h):**
The increased energy demand from the project would be associated with new parking lot lighting in Phase 1, and the new sanctuary building in Phase 2. The project would increase energy consumption at the project site, but not to a degree that would require construction or expansion of new facilities. The project demand would be typical for a project of this scope and nature and would meet or exceed current state and local codes and standards concerning energy consumption, including Title 24 of the California Code of Regulations enforced by the City of Oakland through its building permit review process. The project would have a less than significant impact regarding energy.

_____

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact | Less Than Significant with Development Standards |
|---|---|---|---|---|---|

## XVII. MANDATORY FINDINGS OF SIGNIFICANCE

| | | | | | |
|---|---|---|---|---|---|
| a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory? | ☒ | ☐ | ☐ | ☐ | ☐ |

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable"

| | | | | | |
|---|---|---|---|---|---|
| means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.) | ☒ | ☐ | ☐ | ☐ | ☐ |
| c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | ☒ | ☐ | ☐ | ☐ | ☐ |

**Discussion of questions (a) through (c):**
Potential mandatory findings of significance impacts will be addressed in the EIR.

**APPENDIX C**

# COMMENTS ON NOTICE OF PREPARATION/INITIAL STUDY

ALAMEDA COUNTY
CONGESTION MANAGEMENT AGENCY

1333 BROADWAY, SUITE 220 • OAKLAND, CA 94612 • PHONE: (510) 836-2560 • FAX: (510) 836-2185
E-MAIL: mail@accma.ca.gov • WEB SITE: accma.ca.gov

RECEIVED
APR 14 2008
City of Oakland
Planning & Zoning Division

**AC Transit**
Director
Greg Harper

**Alameda County**
Supervisors
Nate Miley
Scott Haggerty
Chair

**City of Alameda**
Mayor
Beverly Johnson

**City of Albany**
Councilmember
Farid Javandel

**BART**
Director
Thomas Blalock

**City of Berkeley**
Councilmember
Kriss Worthington

**City of Dublin**
Mayor
Janet Lockhart

**City of Emeryville**
Vice-Mayor
Ruth Atkin

**City of Fremont**
Vice-Mayor
Robert Wieckowski

**City of Hayward**
Mayor
Michael Sweeney

**City of Livermore**
Mayor
Marshall Kamena

**City of Newark**
Councilmember
Luis Freitas

**City of Oakland**
Councilmember
Larry Reid

**City of Piedmont**
Councilmember
John Chiang

**City of Pleasanton**
Mayor
Jennifer Hosterman

**City of San Leandro**
Councilmember
Joyce R. Starosciak

**City of Union City**
Mayor
Mark Green
Vice Chair

**Executive Director**
Dennis R. Fay

April 10, 2008

Mr. Caesar Quitevis
Planner II
City of Oakland Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, CA 94612
cquitevis@oaklandnet.com

SUBJECT: Comments on the Notice of Preparation of a Draft Environmental Impact Report for St. John's Episcopal Church Improvements, File Number ER08-0001

Dear Mr. Quitevis:

Thank you for the opportunity to comment on the Notice of Preparation of a Draft Environmental Impact Report for St. John's Episcopal Church Improvements, located at 5914 Thornhill Drive, 5928 Thornhill Drive, 1707 Gouldin Road, 1715 Gouldin Road, and 1676 Alhambra Lane. The project would involve reconfiguration of the site circulation, and parking, bridge and creek improvements, as well as construction of a new 5,500 square-foot sanctuary.

The ACCMA respectfully submits the following comments:

- The City of Oakland adopted Resolution No. 69475 on November 19, 1992 establishing guidelines for reviewing the impacts of local land use decisions consistent with the Alameda County Congestion Management Program (CMP). Based on our review of the NOP, the proposed project appears that it may generate at least 100 p.m. peak hour trips over existing conditions. If this is the case, the CMP Land Use Analysis Program requires the City to conduct a traffic analysis of the project using the Countywide Transportation Demand Model for projection years 2015 and 2030 conditions. Please note the following paragraph as it discusses the responsibility for modeling.

- The CMA Board amended the CMP on March 26th, 1998 so that local jurisdictions are responsible for conducting the model runs themselves or through a consultant. The City of Oakland and the ACCMA have signed a Countywide Model Agreement on March 22, 1999. The Countywide model, which is based on Cube software and developed incorporating ABAG's socio-economic data for Projections 2005, is available to the local jurisdictions for this purpose. Before the model can be used for this project, a letter must be submitted to the ACCMA requesting use of the model and describing the project. A copy of a sample letter agreement is available upon request.

- Potential impacts of the project on the Metropolitan Transportation System (MTS) need to be addressed. (See 2005 CMP Figures E-2 and E-3 and Figure 2). The DEIR should address all potential impacts of the project on the MTS roadway and transit systems. These include SR 24, SR-13, and Broadway Terrace as well as BART and AC Transit. Potential impacts of the project must be addressed for 2015 and 2030 conditions.
  - Please note that the ACCMA does not have a policy for determining a threshold of significance for Level of Service for the Land Use Analysis Program of the CMP. Professional judgment should be applied to determine the significance of project impacts (Please see chapter 6 of 2005 CMP for more information).
  - In addition, the adopted 2005 CMP requires using 1985 Highway Capacity Manual for freeway capacity standards.

- The adequacy of any project mitigation measures should be discussed. On February 25, 1993, the CMA Board adopted three criteria for evaluating the adequacy of DEIR project mitigation measures:
  - Project mitigation measures must be adequate to sustain CMP service standards for roadways and transit;
  - Project mitigation measures must be fully funded to be considered adequate;
  - Project mitigation measures that rely on state or federal funds directed by or influenced by the CMA must be consistent with the project funding priorities established in the Capital Improvement Program (CIP) section of the CMP or the Regional Transportation Plan (RTP).

  The DEIR should include a discussion on the adequacy of proposed mitigation measures relative to these criteria. In particular, the DEIR should detail when proposed roadway or transit route improvements are expected to be completed, how they will be funded, and what would be the effect on LOS if only the funded portions of these projects were assumed to be built prior to project completion.

- Potential impacts of the project on CMP transit levels of service must be analyzed. (See 2005 CMP, Chapter 4). Transit service standards are 15-30 minute headways for bus service and 3.75-15 minute headways for BART during peak hours. The DEIR should address the issue of transit funding as a mitigation measure in the context of the CMA's policies as discussed above.

- The DEIR should also consider demand-related strategies that are designed to reduce the need for new roadway facilities over the long term and to make the most efficient use of existing facilities (see 2005 CMP, Chapter 5). The DEIR should consider the use of TDM measures, in conjunction with roadway and transit improvements, as a means of attaining acceptable levels of service. Whenever possible, mechanisms that encourage ridesharing, flextime, transit, bicycling, telecommuting and other means of reducing peak hour traffic trips should be considered. The Site Design Guidelines Checklist may be useful during the review of the development proposal. A copy of the checklist is enclosed.

- The EIR should consider opportunities to promote countywide bicycle routes identified in the Alameda Countywide Bicycle Plan, which was approved by the ACCMA Board on October 26, 2006. The approved Countywide Bike Plan is available at http://www.accma.ca.gov/pages/HomeBicyclePlan.aspx

- For projects adjacent to state roadway facilities, the analysis should address noise impacts of the project. If the analysis finds an impact, then mitigation measures (i.e., soundwalls) should be incorporated as part of the conditions of approval of the proposed project. It should not be assumed that federal or state funding is available.

Thank you for the opportunity to comment on this Notice of Preparation. Please do not hesitate to contact me at 510/836-2560 if you require additional information.

Sincerely,

Diane Stark

Diane Stark
Senior Transportation Planner

cc: file: CMP - Environmental Review Opinions - Responses - 2008

EAST BAY
MUNICIPAL UTILITY DISTRICT

April 8, 2008

RECEIVED
APR 14 2008
City of Oakland
Planning & Zoning Division

Caesar Quitevis, Planner II
City of Oakland
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2114
Oakland, CA 94612-2031

Re: Notice of Preparation of a Draft Environmental Impact Report – St. John's Episcopal Church Improvements, Oakland

Dear Mr. Quitevis:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Notice of Preparation of a Draft Environmental Impact Report (EIR) for the St. John's Episcopal Church Improvements project in Oakland. EBMUD has the following comments.

## WATER SERVICE

EBMUD's Dingee Pressure Zone, with a service elevation between 500 and 675 feet, and Joaquin Miller Pressure Zone, with a service elevation between 675 and 875 currently serve the existing parcels. If additional water service is needed, the project sponsor should contact EBMUD's New Business Office and request a water service estimate to determine costs and conditions for providing additional water service to the existing parcels. Engineering and installation of water services requires substantial lead-time, which should be provided for in the project sponsor's development schedule.

## WASTEWATER

EBMUD's Main Wastewater Treatment Plant is anticipated to have adequate dry weather capacity to treat the proposed wastewater flow from this project, provided this wastewater meets the standards of EBMUD's Environmental Services Division. However, the City of Oakland's Infiltration/Inflow (I/I) Correction Program set a maximum allowable peak wastewater flow from each subbasin within the City and EBMUD agreed to design and construct wet weather conveyance and treatment facilities to accommodate these flows. EBMUD prohibits discharge of wastewater flows above the allocated peak flow for a subbasin because conveyance and treatment capacity for wet weather flows may be adversely impacted by flows above this agreed limit. The developer for this project needs to confirm with the City of Oakland Public Works Department that there is available capacity within the subbasin flow allocation and that it



Recycled Paper

has not been allocated to other developments. The projected peak wet weather wastewater flows from this project need to be determined to assess the available capacity within the subbasin and confirmation included in the EIR. Suggested language to include in the EIR is as follows: "The City of Oakland Public Works Department has confirmed that there is available wastewater capacity within Subbasin …."

In general, the project should address the replacement or rehabilitation of the existing sanitary sewer collection system to prevent an increase in I/I. Please include a provision to control or reduce the amount of I/I in the environmental documentation for this project. The main concern is the increase in total wet weather flows, which could have an adverse impact if the flows are greater than the maximum allowable flows from this subbasin.

**WATER CONSERVATION**

The proposed project presents an opportunity to incorporate water conservation measures. EBMUD would request that the City include in its conditions of approval a requirement that the project sponsor comply with the Landscape Water Conservation Section, Article 10 of Chapter 7 of the Oakland Municipal Code.

If you have any questions concerning this response, please contact David J. Rehnstrom, Senior Civil Engineer, Water Service Planning at (510) 287-1365.

Sincerely,

William R. Kirkpatrick
Manager of Water Distribution Planning

WRK:TNS:sb
sb08_092.doc

cc: Jerry Moran, Project Liaison
St. John's Episcopal Church
1707 Gouldin Road
Oakland, CA 94611

State of California – The Resources Agency
ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov

POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

RECEIVED
MAR 20 2008
City of Oakland
Planning & Zoning Division

March 14, 2008

Mr. Cesar Quitevis
City of Oakland, CEDA Planning & Zoning
250 Frank H. Ogawa Plaza
Oakland, CA 94612

Dear Mr. Quitevis:

Subject: St. John's Episcopal Church-Parking and New Sanctuary Improvements
SCH #2008032031

The Department of Fish and Game (DFG) has reviewed the documents provided for the subject project, and we have the following comments.

Please provide a complete assessment (including but not limited to type, quantity and locations) of the habitats, flora and fauna within and adjacent to the project area, including endangered, threatened, and locally unique species and sensitive habitats. The assessment should include the reasonably foreseeable direct and indirect changes (temporary and permanent) that may occur with implementation of the project. Rare, threatened and endangered species to be addressed should include all those which meet the California Environmental Quality Act (CEQA) definition (see CEQA Guidelines, Section 15380). DFG recommended survey and monitoring protocols and guidelines are available at http://www.dfg.ca.gov/wildlife/species/survey_monitor.html.

For any activity that will divert or obstruct the natural flow, or change the bed, channel, or bank (which may include associated riparian resources) of a river or stream, or use material from a streambed, DFG may require a Streambed Alteration Agreement (SAA), pursuant to Section 1600 et seq. of the Fish and Game Code, with the applicant. Issuance of SAAs is subject to CEQA. DFG, as a responsible agency under CEQA, will consider the CEQA document for the project. The CEQA document should fully identify the potential impacts to the stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for completion of the agreement. To obtain information about the SAA notification process, please access our website at http://www.dfg.ca.gov/habcon/1600/; or to request a notification package, contact the Streambed Alteration Program at (707) 944-5520.

If you have any questions, please contact Ms. Marcia Grefsrud, Environmental Scientist, at (707) 644-2812; or Mr. Liam Davis, Habitat Conservation Supervisor, at (707) 944-5529.

Sincerely,

For

Charles Armor
Regional Manager
Bay Delta Region

cc: State Clearinghouse

*Conserving California's Wildlife Since 1870*

# California Regional Water Quality Control Board
## San Francisco Bay Region



Linda S. Adams
*Secretary for*
*Environmental Protection*

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
http://www.waterboards.ca.gov/sanfranciscobay

Arnold Schwarzenegger
*Governor*



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APR 0 8 2008
City of Oakland
Planning & Zoning Division


April 3, 2008
File No.: 2198.09 (BKW)

Caesar Quitevas, Planner II
City of Oakland
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, CA 94612

**Re: Comments on the Notice of Preparation of a Draft Environmental Impact Report for St John's Episcopal Church Improvements**
**SCH No. 2008032031**

Dear Mr. Quitevas:

Regional Water Quality Control Board (Water Board) staff have reviewed the *Notice of Preparation* (NOP) *of a Draft Environmental Impact Report (EIR) for St. John's Episcopal Church Improvements*. The EIR is intended to evaluate the potential environmental impacts that might reasonably be expected to result from the reconfiguration of site circulation, the reconfiguration of parking areas, and the construction of a new sanctuary at St. John's Episcopal Church at 1701 Gouldin Road in the City of Oakland. Water Board staff have the following comments on the NOP.

**Comment 1. Initial Study and Environmental Review Checklist (IS), Project Information, Section 12, Detailed Description of the Project, page 2.**
The project proposes construct a new bridge over Temescal Creek. Although free-span bridges are much less damaging to creek channels than culverted crossings or bridges with piers in the channel, bridges impact riparian habitat by creating shade that hinders the growth of riparian vegetation. The EIR should include an analysis of a site layout that avoids constructing a new crossing of Temescal Creek.

**Comment 2. Initial Study and Environmental Review Checklist (IS), Project Information, Section 12, Detailed Description of the Project, page 3.**
The project proposes to "restore" about 200 linear feet of Temescal Creek. This proposed "restoration" includes moving the toe of the north bank about 10 feet toward the south bank, moving the south bank about five to seven feet to the south, filling the north bank to create a 50 percent slope, excavating the south bank to create a 50 percent slope, removal of a small terrace on the south bank, and straightening the stream channel. All of these proposed actions have the potential to significantly destabilize the creek channel.

The geometry of a creek channel develops in response to the topography, geology, and rainfall patterns within the watershed. Any perturbation of the channel width, slope, or sinuosity is likely to disturb the equilibrium of the channel. The proposed "restored" channel would apparently narrow the width of the channel at the toe of the banks by between two and five feet over the "restored" reach.

Constriction of the channel cross-section usually in results in erosion of the channel banks and/or incision of the channel bed. Straightening a channel also increases the hydraulic energy of water in the channel, since less energy is dissipated in bends in the channel and the straightened channel has a steeper slope. Because of this, straightening a channel usually results in channel incision.

Re-alignment of the channel is not considered restoration, unless it can be demonstrated that the channel is being restored to an historic alignment. Similarly, regrading of the channel banks is not considered restoration unless historic records or relatively undisturbed reference reaches indicate that the banks originally had a gentler slope. The proposed removal of a terrace on the south bank is an especially problematic component of the proposed restoration. Terraces on creek banks often act as floodplains that reduce the erosive forces associated with high flows by allowing flow to spread over the surface of the terrace. The IS does not contain sufficient information to allow the function of this terrace on creek hydrology to be evaluated.

Material presented in the IS not sufficient to assess the likely outcome of this "restoration" project. The Draft EIR should include an analysis of the proposed "restoration" that has been prepared by a fluvial geomorphologist with experience in the restoration of stream channels in urbanized environments.

**Comment 3. Section IV, Biological Resources, Discussion of question (b), page 25.**
Text in this section of the IS states that, "the project site does not support any riparian habitat". This statement is incorrect. Any vegetation present along Temescal Creek is considered to be riparian habitat. Even if this riparian habitat is dominated by non-native trees and shrubs, it remains riparian habitat and, as such, is subject to the jurisdiction of the California Department of Fish and Game (CDFG) and the Water Board. CDFG jurisdiction extends to the outer dripline of vegetation contiguous with vegetation at the top of bank. Water Board jurisdiction extends to the top of bank.

As discussed above, the project also proposes to modify the banks, vegetation, and alignment of Temescal Creek at the project site. These actions will have a significant impact on riparian habitat present at the project site. The IS makes the finding that the project will have "no impact" on riparian habitat. This finding is completely in error.

**Comment 4. Section VIII, Hydrology and Water Quality, Discussion of questions (c) through (g), page 40.**
Text in the first full paragraph of page 40 states that, "[T]he applicant is not required to include on-site stormwater treatment measures in the post-construction stormwater pollution management plan if he or she secures approval from Planning and Zoning of a proposal that demonstrates compliance with the requirements of the City's Alternative Compliance Program." At a site that requires a permit from the Water Board, approval of alternative compliance would also be required from the Water Board.

If you have questions, please contact me at (510) 622-5680 or by email at bwines@waterboards.ca.gov.

Sincerely,

Brian Wines

Brian Wines
Water Resources Control Engineer
South/East Bay Section

cc: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044
CDFG, Bay Delta Region, Attn: Charles Armor, Acting Regional Manager, P.O. Box 47, Yountville CA 94599

**From:** Kent Lewandowski
**To:** Richard Cowan
**Date:** Friday, April 6, 2007 2:59:56 PM
**Cc:** Jean Quan
**Subject:** St. John's Church vs. Thornhill Neighbors

Hello Richard,

This Wednesday, I inspected St. John's Church on Thornhill Drive together with someone who belongs to that church. It turns out I actually had met a couple of the parishoners before at a Sierra Club event. They do a lot of good environmental work, including a water monitoring project that found E.Coli in Temescal Creek. I was introduced to the rector, Scott Denman. I am unclear on all the details of the building plan, but it seems to me this is more a case of neighbor vs. neighbor, and less an environmental issue.

However, that is just my personal opinion. Our group will reconsider its letter at our next monthly meeting. In case you had any questions, please call me.

p.s. St. John's website has information about their landscaping plan:

http://www.stjohnsoakland.org/ > "Building Plan Updates"

Sincerely,

Kent Lewandowski
Chair, Sierra Club, No. Alameda County
510-625-~~5813~~
5831

*Northern Alameda County Group*
*Oakland – Alameda – Berkeley – Emeryville –*
*Albany – San Leandro*

SIERRA CLUB
FOUNDED 1892

Honorable Jean Quan
Oakland City Council
City Hall
Oakland, CA 94612

February 27, 2007

**SUBJECT: St. John's Episcopal Church vs. Thornhill Creekside Neighbors**

Dear Councilwoman Quan,
Dear Planning Commissioners:

At the January meeting of the Northern Alameda Group of the Bay Chapter of the Sierra Club, Nancy Havassy of Thornhill Drive and of the Thornhill Creekside Neighbors and Friends informed us of the site development plans of the St. John's Episcopal Church at 1717 Gouldin Road which involves removing some trees, greatly altering their parking lot, and bridging the upper reaches of Temescal Creek to provide a new access to their property.

The proposed expansion of the church, the parking lot and the entry road are of concern to the Sierra Club because they will impact the surrounding environment in significant ways – removal of native plants and trees, asphalting of previous water retaining woodland, increasing traffic flow to and from the area, and impacting water quality and creek runoff. Sierra Club Northern Alameda County feels the plan as presently designed is inappropriate and not in keeping with the generally rustic character of that neighborhood. We were particularly concerned about the bridge over the creek.

We hope that you or some member of your staff could be helpful in assisting the church to develop a plan for their property that would be more in keeping with the existing development (and lack of it). We request that you contact us at 510-625-5831 to address our concerns. Thank you, and

Very truly yours,

Kent Lewandowski, Executive Chair
Arthur Boone, Conservation Chair
Northern Alameda County Group Executive Committee

cc. Caesar Quitevis
Planning and Zoning Division
250 Frank Ogawa Plaza, Suite 2114
Oakland, CA 94612-2031

cc. John Russo
City Attorney
Oakland City Hall
Oakland, CA 94612

cc. Nancy Havassy

OAKLAND DISTRICT

THORNHILL SCHOOL
5880 Thornhill Drive
Oakland, California 94611
(510) 879-1570
FAX (510) 879-1579

April 2, 2008

To: Ed Manassee, Planner IV, CEDA, Planning and Zoning
From: Sallyann Tomlin, Principal, Thornhill Elementary School

I am writing to you in order to make you aware of the long-standing, cooperative relationship that Thornhill Elementary and St. John's Church has had for many years, and of the more recent increase in collaboration on mutual issues.

First and foremost, St. John's has generously allowed our staff and parents to use their parking lot to both access our school and to park our cars both during the school week and during special events held during the weekends. Without use of their lot, we would not have enough parking places provided for our staff and parents, putting us in a very difficult situation of having them park quite far away from the school in order to come to work or volunteer, and to drop off kids.

In September of 2007, we began to work together to examine ways to improve safety for staff, parents and kids who use their lot, and St. John's was generous enough to take measures to improve safety based on our conversations.

This represents a new level of cooperation and communication, and we are now determined to continue to collaborate on issues that affect both of our communities, whether it be the site project planned by St. John's or our own plans to improve our school's site. We see this relationship as critical to supporting our mutual endeavors, and to being a truly inclusive community.

Thanks for your attention to this letter, and please don't hesitate to contact me for more information if needed.

Sincerely,
Sallyann Tomlin
Thornhill Elementary Principal

**From:** Pamm Drake [dance10dancers@hotmail.com]
**Sent:** Thursday, April 10, 2008 12:48 PM
**To:** Quitevis, Caesar
**Subject:** St. John's Episcopal Church Plans

Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland Ca. 94612
510 238 6343
email clquitevis@oaklandnet.com

April 9, 2008

Case number ER08-0001

COMMENTS FOR PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR ST. JOHN'S EPISCOPAL CHURCH IN OAKLAND, CA.

Dear Mr. Quitevis,

My name is Carl Eric Anderson and I live at 1675 Gouldin Rd in Oakland, adjacent to St. John's Episcopal Church and sharing a driveway with 5928 Thornhill Drive.

My comments on the Initial Study and Environmental Review Checklist prepared for St. John's Episcopal Church Project (ER08-0001) follow:

BIOLOGICAL RESOURCES: Would the project fundamentally conflict with the City of Oakland Tree Preservation and Removal Ordinance (Oakland Municipal Code (OMC) Chapter 12.36) by removal of protected trees under certain circumstances? Factors to be considered in determining significance include: The number, type, size, location and condition of (a) the protected trees to be removes and/or impacted by construction and (b) the protected trees to remain, with special consideration given to native trees.

The proposed project fundamentally conflicts with the City of Oakland Preservation and Removal Ordinance (Oakland Municipal Code (OMC) Chapter 12.36) for all the native trees designated as "protected."

The two largest redwoods and the largest oak are at particular risk due to:

- Damage to almost 50% of their roots
- Removal of 12 inches of topsoil and feeder roots
- A drainage system to reduce normal infiltration
- Compaction that will further reduce water infiltration
- Curb footing of 2 and 3 foot depths will effectively block roots from re-growth
- A path between trees that may damage their crowns

- ❑ Parking spaces under the drip line seem to violate the most critical area of tree protection

Where I work in Oakland, three large trees have fallen after trenching near their bases: one fell into an unpopulated patio, one crushed three cars in a parking lot, and one brushed a pedestrian to the ground. The large trees affected by the proposed plan will also be near buildings, cars and people. I am sure you can see why I am concerned.

The EIR should include a rigorous and thorough discussion of all procedures and methods which will be implemented to protect the large trees below ground level. On site supervision and documentation is critical to ensure compliance. Alternatives such as reducing the number of parking spaces and including wide "root corridors" should also be discussed.

Thanks you for your consideration of these matters.

Respectfully submitted,

Carl Eric Anderson
1675 Gouldin Rd
Oakland Ca 94611

RECEIVED
APR 1 0 2008
City of Oakland
Planning & Zoning Division

Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, Ca. 94612

Case number: ER08-0001

COMMENTS FOR PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR ST. JOHN'S EPISCOPAL CHURCH IN OAKLAND, CA.

Dear Mr. Quitevis:

March 30, 2008

My name is Nancy Havassy and I have lived at 5940 Thornhill Drive in Oakland, a creek side property next door to and sharing a driveway with 5928 Thornhill Drive, for almost thirty years.

My comments on the Initial Study and Environmental Review Checklist prepared for St. John's Episcopal Church Project (ER08-0001) follow:

I. AESTHETICS: Would the project –
a) Have a substantial adverse effect on a scenic vista?
c) Substantially degrade the existing visual character or quality of the site and its surroundings?

I believe that both **a) and c)** on the Environmental Checklist for Aesthetics should be checked as "Potentially Significant Impact."

It is impossible for me to imagine why this topic was excluded from the EIR. In fact, many see aesthetics as the number one and most adverse environmental effect this project will have on the community.

This project would most definitely have a significant adverse impact on the aesthetics of the neighborhood environment. The people who live in Montclair and in the hills of Oakland and neighboring cities do so for the aesthetic view. Realtors emphasize the "canyon views", the "Bay view", or the "serene wooded view." The residents who live in this Montclair neighborhood purchased or built their homes here because of the beautiful sylvan quality of the neighborhood. The people who live in this neighborhood chose to live here under the towering old Live Oaks and Redwoods. The project site at 5928 Thornhill is a single family home nestled between other single family homes with a shared access driveway. The amazing trees, the peace and serenity that they and the abundant wildlife provide are what are most important to the residents of this neighborhood. The community is very fortunate to have such sylvan beauty and the wildlife it supports to view on a daily basis.

From the Initial Study and Environmental Review Checklist:
"Discussion of questions (a) through…"
"There are no scenic vistas from the site; therefore, the project would not have a substantial adverse effect on a scenic vista, and there would be no impact… The project would be constructed in a wooded, residential neighborhood. Both phases of the project would change the visual character of the site and its surroundings. Although the project would alter the visual character of the site and surroundings, the changes would be less than significant because the site is currently developed. Construction of the bridge and the access lane would require removal of trees which will increase the visibility to and from that section of Thornhill Drive and adjoining properties. However, recontouring the creek embankments and landscaping with native species would improve the visual character of what is now a heavily eroded creek. Although the parking lane would be visible from Thornhill, the landscaping and use of crushed granite would provide visual relief that would soften the view. In addition, because significant redwood and oak trees would be retained, the view would be filtered."
Initial Study and Environmental Review Checklist
St. Johns Church Project DC&E
18 February 13, 2008

The scenic vista from the hills of Thornhill canyon would be substantially adversely impacted by viewing a parking lot instead of the sylvan wooded view. The aesthetic value of the properties that view this area from the hills on both sides of the Temescal Creek Watershed would without a doubt be negatively affected by the removal of so many mature trees.

The "significant redwood and oak trees" being "retained" are on the very periphery of the property and therefore would not "filter" the view. The bridge, lane and parking lot would be fully visible from the street or the hillside homes. People who travel up and down Thornhill, a main artery to the hills, by foot, bicycle or auto would certainly be adversely affected by the lost sylvan view and instead see a huge two-lane bridge and an ugly public parking lot planted with immature non-native trees (Ginkgo and Flowering Pear). The proposed native plantings on the creek banks would not mitigate the loss of the many mature native trees and sylvan view. The trees that would be "retained" are being treated as if they were structures instead of valuable living organisms. The way the plan is now, several at 5928 Thornhill and 1676 Alhambra Lane would have significant root damage from the construction which may result in the death of these majestic trees.

The removal of trees due to the "construction of the bridge and the access lane will increase visibility to and from that section of Thornhill Drive and adjoining properties." Yes and this new view would degrade the existing visual character of the site. "Recontouring the creek embankments and landscaping with native species" would not mitigate the degrading of the existing visual character of the site caused by the removal of the many large trees.

These mature trees have an undeniably important aesthetic value.
There is a website dedicated to the trees threatened by this project and located on St. John's 5928 and 5914 Thornhill Drive and 1676 Alhambra Lane rental properties. Two hundred thirty-five people in our community who value these mature trees have signed the online petition at www.ThornhillTreelovers.com .

My sincere hope is that in fairness to the community the DEIR will be amended to include Aesthetics.

IX. LAND USE AND PLANNING

a) Would the project physically divide an established community?
b) Would the project result in a fundamental conflict between adjacent or nearby land uses?

The answer to both (a) and (b) is yes.

The closure of the Gouldin Road entrance to 1707 Gouldin Road would physically divide an established community. Access to 1707 Gouldin Road from Gouldin Road has been in use for close to 100 years. The route created by the driveway parking lot and exit has been used continuously since for several decades (50 to 60 years) by the general public to travel to and fro through the neighborhood by foot or vehicle and connects Alhambra Lane to its Gouldin Road neighbors. It would be a significant change to cut off neighbors and community from each other.

The existing use of the site of the proposed bridge and parking lot (5928 Thornhill Drive) is a singe family residence purchased by St. John's in the late 1990's. This area is Zone R30. The properties on Thornhill Drive from Alhambra Lane up are single family homes, including Gouldin Road (with the exception of St. John's Church), Aspinwall Road, Merriewood Drive, Mardin Lane, etc. This is a quiet residential neighborhood with relatively small homes. To remove a house and replace it with a busy public parking lot is most definitely a conflict of adjacent land use.

XI. NOISE

From the Initial Study and Environmental Review Checklist:
"Discussion of question (a), (b) and (f) through (h):
Both phases of the project involve improvements to operational elements of the St. John's campus. Neither phase would result in exposing persons to, or generating noise levels over existing conditions which are primarily associated with traffic on Thornhill Drive (which is below the 60 Ldn15 contour as shown on Figure 2, Roadway Contour map in the *City of Oakland Noise Element)*, Church services and associated activities, and use of the campus for Thornhill Elementary School drop-off and pick-up activities. The new parking area and driveway are 45 feet from the existing house at 5940 Thornhill Drive, and 15 feet from the house owned by the Church at 5914 Thornhill Drive. Given the slow speed of automobiles using the proposed Thornhill Drive access, the primary noise generation factor would be idling and accelerating engines from automobiles entering and leaving the site. **Noise from ingress, parking and egress currently affects the same two dwellings from the existing parking lot, therefore the proposed changes from Phase 1 of the project would not be significant."**

To set the record straight, the above highlighted statement is false. The home at 5940 is currently <u>not</u> affected by noise from the existing parking lot. It is surrounded on three sides by single family homes and is not adjacent to the church parking lot. With the proposed project, the noise from the combined activity of church, special events and school parking and pick- up and drop-off would be 180 degrees opposite to the existing conditions at 5940 Thornhill and <u>extremely</u> significant. Other than the traffic on Thornhill Drive which is over 120 feet from the house, what one hears at 5940 Thornhill Drive is the song of birds, the chattering of squirrels and the music of the creek.

## XV. TRANSPORTATION/TRAFFIC

Since there are no **Sources** listed for TRANSPORTATION/TRAFFIC it is unclear to me where the numbers of vehicular trips come from.

"The project would generate an additional two trips during the weekday morning and evening peak hours and an additional 25 trips during the Sunday peak hour."

The Dowling Associates, Inc., *Traffic Study – Renovation at St. John's Episcopal Church, Oakland,* April 9, 2007 was sited as the source for III. AIR QUALITY.
Are we to assume the Dowling study is the source for Transportation/Traffic? To my knowledge the Dowling study took place on a Sunday.

St. John's currently uses their parking lot in a non-conforming manner and can accommodate approximately 70 cars. Thornhill School's playground is used for overflow. In the proposed new parking lot there will be 48 - 49 spaces. Where will the other 20 or so cars park every Sunday? Thornhill School is part of the Oakland Unified School District. Parking on the playground is controversial and permission can be revoked at any time.

Figure 5 shows a path from the parking lot leading to nowhere:
"...a pedestrian pathway that would cut across the lane to Alhambra Court. No public circulation is currently proposed for Alhambra Court, which is a privately maintained private access easement."(p. 3, DC&E).
At the request of the Alhambra Court neighbors, the briefly used gate has been permanently closed due to liability concerns. Why would St. John's want to build an expensive path to nowhere?

I would point out that in Figures 3 and 4 the driveway at 5940 Thornhill is completely misrepresented and Figure 5 shows the "existing gravel drive to remain," but cuts both neighbors at 5940 Thornhill and 1675 Gouldin Road off from accessing their garage and carports.

There would be substantially more traffic to go along with the more frequent use of the facilities when Phase II is completed and the newly renovated meeting hall is rented out for public use by the community at large. Although St. John's Vestry members informed the neighbors of this intended use at the first meeting in 2002, the rental use is not considered in the Initial Study. This additional use would more frequently clog up nearby streets with people parking for these rental events. This is a quiet residential neighborhood with modest homes and a church with an existing large two-story building with offices, classrooms and conference rooms. The additional traffic from a new larger church and meeting hall would be inappropriate and a further burden on the neighborhood.

Thank you for your consideration of these matters.

Respectfully submitted,

Nancy Havassy
Co-Chair, Thornhill Creekside Neighbors & Friends
5940 Thornhill Drive
Oakland, Ca 94611

Attachment: Sierra Club Letter

ADDENDUM
Notes from April 2, 2008 Scoping Session:

The Senior Warden of the Vestry of St. John's speech contained several important inaccuracies. The subject of the erosion of the creek being one I can address as a Bay-Friendly Landscaper and having lived creekside for over fifty years. He stated that Temescal Creek is eroded due to upstream neighbors putting concrete riprap or pieces in the creek. This is preposterous. The creek bank nearer to 5914 Thornhill and the crosswalk has been eroding for decades as the volume of water in the creek has steadily increased during the seasonal rains. The cause of the ever increasing volume of water in the creek is due to the continuous building of large homes farther up in the Temescal Creek Watershed and the increased runoff that creates. The previous owners of 5928 Thornhill Drive mitigated this erosion by building up the creek bank (all of which has been washed away). Since St. John's purchased the property over ten years ago they have done nothing to mitigate the erosion of the creek bank and now tout this project as an improvement for the community.

The Senior Warden spoke of four meetings with the neighbors. Three were required by the process and the forth was insisted upon by a neighbor at the third meeting who challenged the meetings as presentations only and years apart with no changes to the plan. Put on the spot, they agreed. I attended all four meetings. Any input from the neighbors was, by all indications, promptly disregarded. Rev. Denman requested an "individual" meeting in 2007 and I consented. Nothing of substance was discussed.

The Senior Warden spoke about St. John's meetings with Thornhill School officials. When the school was built there was a dedicated school bus that picked up and dropped off the students. Now there is no school bus and many students live outside the neighborhood, hence school traffic and parking is an issue in the neighborhood. (Please see: http://www.thornhillschool.org/?id=about/gettinghere ). Although St. John's would like to appear to be part of the solution, neither Thronhill School officials nor the Parent Faculty Club have indorsed this plan.
NH

Cc: JEAN QUAN, DOUGLAS BOXER, MICHAEL COLBRUNO, SANDRA GALVEZ, C. BLAKE HUNTSMAN, SUZIE W. LEE, ANNIE E. MUDGE, MADELEINE ZAYAS-MART, LEILA MONCHARSH

Caesar Quitevis
Community and Economic Development Agency
250 Frank H Ogawa Plaza, suite 2216
Oakland , Ca 94612

Case number :ER08-0001

Comments form preparation of a draft environmental impact report for St John's Episcopal Church in Oakland, Ca.

Pamm Drake Anderson
1675 Gouldin Rd
Oakland Ca 94611

Dear Mr. Quievis,

Our family has lived at this property for seventy years. We have been devoted to the natural beauty and character of this property for that many years. Webster's Dictionary defines aesthetics as the branch of philosophy dealing with the beautiful and its relation to the human mind, the sensations and emotions. That beauty and peace of mind is what our family and the neighbors derive from this land.

How can and EIR exclude one of the most important factors of this project? Aesthetics! And how can the fact that there is a paradise here in the foothills of Oakland be overlooked for the paving of a parking lot?

Yours truly,
Pamm Drake

Todd Freter
Roger Saut
5900 Thornhill Drive
Oakland, CA 94611-2149
April 2, 2008

Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, CA 94612

Re: Case number ER08-0001

Dear Mr. Quitevis:

We are residents of the Montclair neighborhood, and we live in close proximity to Saint John's Episcopal Church (SCJ). We have been aware of the SJC expansion project since 2002. We understand that a Notice of Preparation (NOP) of an Environmental Impact Report (EIR) has been filed for this project. We wish to comment on the NOP and in particular on the scope of the EIR as described in the NOP.

We understand that the currently planned EIR will include these required subjects among the range of potentially required subjects:

- Biological Resources
- Hydrology/Water Quality
- Mandatory Findings of Significance
- Transportation/Traffic

We believe that two additional subjects also need to be required in the EIR:

- Aesthetics
- Geology/Soils

Our reasoning for requesting these two additions follow.

## Aesthetics

There should be no doubt that the SJC plan will have a major visual impact on many Montclair residents due to these project components and their results:

- ***Extensive tree removal***: Many mature trees will be removed in Phase 1, with replacement vegetation likely to take decades to attain the stature and density of the trees that will be cut down.
- ***A new, spired sanctuary***: By erecting a new sanctuary between Alhambra Lane and Gouldin Road, Phase 2 the SJC project increases this non-residential, institutional aesthetic and reduces the sylvan, residential aesthetic of lower Thornhill Drive.
- ***Increased institutional use (cars and people) on a formerly residential parcel***: The large, new sanctuary and a wide paved entry for cars will open the parcel at 5928 Thornhill to increased non-residential use by hundreds of people on a weekly basis.

These effects of the SJC plan will have a major visual and aesthetic impact for many people. Thornhill Drive is a principal street in and out of Montclair, and the SJC project site will be visible to all pedestrians and drivers on Thornhill Drive. The impact will also be visible to homes overlooking the SJC project site on Marden Lane and Merriewood Drive to the north and from Alhambra Drive, upper Alhambra Lane and Mazuela Drive to the south.

Lower Thornhill Drive already has a large Presbyterian church and its structures amidst the residences. Thornhill Elementary School also imposes a major institutional footprint on the residential character of Thornhill Drive. These structures already have a major institutional impact on their residential neighbors.

For these reasons we favor a required section on Aesthetics in the EIR for the SJC project.

## Geology/Soils

We are not confident that the uphill land adjacent to the project site is sufficiently stable to withstand the effects of extensive excavation.

Reports have been circulating for years about earth movement and the stability of the hillside land under 1715 Gouldin Road (the SJC rectory property) and 1731 Gouldin Road (a residential neighbor to SJC). We believe that, at a minimum, independent geological studies need to assure that planned excavation will not weaken the hillside and encourage slides, particularly in the event of seismic activity on the nearby Hayward fault. Thus we believe that the EIR should include a section on Geology and Soils.

We hope that you and the Planning Commission will take these important factors into account in the EIR for the SJC plan. While the four topics originally identified for the EIR are valid and justified, we believe that sufficient justification exists to require an environmental analysis of plan's impact on Aesthetics and Geology/Soils.

Thank you for your consideration.

Sincerely,

/s/ Todd Freter

/s/ Roger Saut

From: M.M. Singleton [mmsfolly@earthlink.net]
Sent: Monday, March 24, 2008 6:27 PM
To: Quitevis, Caesar
Cc: Quan, Jean; nhavassy@comcast.net
Subject: St John's Episcopal Church - ER08-001

March 24, 2008
Re: ER08-0001

Dear Mr. Quitevis:

I am writing about the pending EIR for St. John's Episcopal church. I understand that the City has not required St. John's to address the issue of aesthetics in the EIR.

Aesthetics is one reason homeowners live in the neighborhoods that they have chosen. The neighborhood in which I live is zoned single-family/residential. Granted, Oakland's General Plan for Hillside Residential areas is not specific, one can assume that single family areas should not be burdened by large complexes. Although Thornhill Drive is a main street for getting to Skyline Drive, it significantly narrows beyond Thornhill School. This seems to indicate that the neighborhood beyond the school is not meant to incorporate major crowds and an industrial atmosphere.

St. John's proposed parking lot is beyond Thornhill School and on one of the narrowest parts of Thornhill Drive and has no existing sidewalks to widen the road. Additionally the proposed parking lot is directly across from the City's Merriewood access stairway and pedestrian crossing. St. John's proposed church (Phase II) is a 33 foot structure in the midst of one-story homes.

St. John's plans to remove 46 mature trees for the proposed parking lot. These trees would be gone before their time -- not by an act of God, i.e., the Oakland fire -- but an unnecessary act of man. A medium-sized church is not an eye-sore, however a large parking lot and a 33 foot structure (Phase II of the project) in the middle of single story homes in a wooded area is unpalatable.

Sadly, an incredibly small few of St. John's parishioners live in the neighborhood. The parishioners come into our neighborhood once a week for 1 hour. We would have to live with St. John's overly ambitious plans on a daily basis. Would the parishioners want their property values to possibly further decline or have some commercial-appearing complex across the street from their homes? I doubt it. I guess it's easy to destroy someone else's view, peace, and tranquility.

Sincerely,
Marilyn M. Singleton
1666 Gouldin Rd
Oakland, CA

1725 Holland Circle
Walnut Creek, CA 94597

VIA email: clquitevis@oaklandnet.com
cc: jquan@oaklandnet.com
cc: nhavassy@comcast.net

April 8, 2008

City of Oakland

Subject: ER08-0001: 5928 Thornhill Drive, Montclair Village, Oakland, CA

Dear Madams and Sirs:

I am writing this letter to appeal to the City Planners to stop the possible destruction of a special creekside property and potentially turn this property into a parking lot. I grew up on Thornhill Drive and there are very few areas in Oakland that you can still call "wooded", but the Thornhill Drive Community in Montclair is one of the last, real wooded creek areas in the great city of Oakland. This is an area that is coveted by the residents that live there, and by those wanting to move there, where neighbors know each other yet enjoy their privacy without having to put up six foot fences, and where resident's share in the preservation of a lush, green area that is aesthetically pleasing and that hasn't changed much in the last 50 years.

This area is certainly not a place for a church to expand its presence. Any church "footprint" in this lovely area should be seen as innocuous and not encroaching on the neighborhood surrounding the area. If the congregation of St. John's Episcopal Church is growing, it should move to an area that is better suited for its larger congregation, rather than degrade the properties in, around, and overlooking this area with its sense of charm and quietude.

Down the street from the subject property, there is still a neighborhood school and small village with one gas station, one general food store, and a few small businesses, just like it was 50 years ago. The two churches in the area, St. John's Episcopal and Montclair Presbyterian, were also there 50 years ago. In this time of larger malls and suburban sprawl, I implore you to not let a "neighborhood" church turn this quaint wooded creek property into asphalt and an undesirable eyesore that degrades a creekside community life that has been sustained for the past 50 years and that hopefully will be there for the next 50 years.

Please contact me during the day at (925) 460-5556 if you have any questions or comments on this letter. Thank you.

Cordially,

Joanne E. Hill

**From:** Nancy Havassy [nhavassy@comcast.net]
**Sent:** Monday, April 07, 2008 10:07 AM
**To:** Quitevis, Caesar
**Cc:** Eric Kawakami; Elaine Kawakami; George Moestue; Leila Moncharsh; Pamm and Eric; Todd Freter; Tyler and Alice; Quan, Jean; Cowan, Richard; Piper, Susan
**Subject:** Scoping comment for ER08-0001 DEIR
March 26, 2008

To Whom It May Concern:

My name is Jan Hamilton. I am the granddaughter of Dr. Mark Emerson and his wife, Alice. My mother and I lived with my grandparents from 1935 to 1943 in a rambling house located where the Episcopal Church now stands. My earliest memories were of the magnificent gardens. Pathways wound through an astounding collection of trees, plants and flowers of every description, creating a perfect wonderland for a young and imaginative child. The property, covering approximately four acres, and intersected by a year-round creek, had at one time been an elegant estate, carefully tended by a multitude of gardeners. Now, the towering rhododendrons and rambling wisteria, the huge trees and tiny creeping ground covers presented quite a challenge to my grandmother.

Alice Emerson was a very interesting lady. She was working as a nurse when she met her future husband, and later, after the birth of her six children, earned her degree in Botany from the University of California. She kept up a lively correspondence with Luther Burbank over the ensuing years and was most interested in his research. She often asked his advice about plant varieties with which she was unfamiliar as she tended her treasured garden.

Years after my mother and I had moved away and my Grandmother Alice had died, my Grandfather sold his home to the Episcopal Church. It has turned out to be a sad burden for the heirs, especially those who have built their own homes on the remaining property.

Over the years, as I have visited Montclair from time to time, I have noticed that it has gradually become more congested. It seems as if every square inch must be used for structures or driveways, as Bay Area residents flee to the beauty of the verdant hill country. In their fervor to enjoy a quiet, beautiful neighborhood, the newcomers are inadvertently destroying it. A sprawling school stands where there used to be an orchard; I am not sure it would be safe for a young child to walk unescorted along Thornhill Drive( as I used to) because of the traffic congestion.

It is my understanding that The Episcopal Church wants to increase its parking space areas and provide safe ingress and egress to them. They view this as a natural consequence of a growing congregation's needs. Unfortunately, their perceived needs would most certainly impact the property adversely. More asphalt and cement, more cars, more exhaust fumes, and more foot traffic will certainly take their toll.

It seems to me that this goes further toward impacting the existing environment than my Grandfather could have imagined at the time. I am confident that he did not envision such invasive future changes to the rest of the property. He trusted the church to be good stewards of the beautiful gift he

offered.

I hope that the Environmental Impact Report will take these thoughts into consideration.

Sincerely,

Jan Hamilton

**From:** George Moestue [moestue@sbcglobal.net]
**Sent:** Sunday, April 06, 2008 12:20 PM
**To:** Quitevis, Caesar
**Cc:** Leila H. Moncharsh
**Subject:** St. John's geotechnical report.
Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, Ca. 94612
Case number ER08-0001

Dear Caesar
The attached report in section 9.8.4 on pages 27 and 28 explains the impervious nature of soils beneath the permeable storage layer and that piping will be required to drain the storage layer to the storm drain system which in this case is the creek. Please seek clarification of this systems relevance in the EIR.
Sincerely,
George Moestue

LAW OFFICES
VENERUSO & MONCHARSH
5707 REDWOOD RD., SUITE 10
DONNA M. VENERUSO, P.C. OAKLAND, CALIFORNIA 94619
LEILA H. MONCHARSH, P.C. TELEPHONE (510) 482-0390
FACSIMILE (510) 482-0391

April 9, 2008

Via email:
Ms. Lesley Estes
Watershed Program Supervisor
Environmental Services
Public Works Agency
Oakland, CA 94612

Caesar Quitevis
Planner II, City of Oakland
Community and Economic Development Agency
250 Frank H. Ogawa Plaza
Oakland, CA 94612

Re: ER08-0001

Dear Mr. Quitevis and Ms. Estes:

This is to request that the city employee(s) assigned to review and enforce the Oakland Creek Ordinance review the St. John's proposed project given its noncompliance with the ordinance. I understand that there is a department or individual who is responsible for making sure that the Creek Ordinance is complied with. Thus far, the neighbors have not heard from that person or persons in charge of making sure that all projects comply with the ordinance. Without review by the proper person or persons, this project could go forward despite its obvious violation of the ordinance.

Specifically, quoting from The City of Oakland's Guide to the Creek Ordinance, here are some of the activities that are typically not allowed that this project is in conflict with:

**"What is typically NOT allowed?**

Projects and activities that would generally **not** meet the criteria in the ordinance:

- removal of riparian vegetation zones (even if in a fire area, fire abatement guidelines are available at the building and engineering services counter)
- changing or moving the location of the creek
- structures spanning the creek (such as bridge, house, garage, or deck)
- removal of tree canopies over creeks
- grading of creek banks
- filling, pile driving, or deposition of any new material to creek bank or bed"

St. John's **has access** to 5928 Thornhill Drive, the site of the proposed parking lot and bridge over Temescal Creek, from their 1707 Gouldin Road property and existing parking lot.

There are alternatives to building a vehicular bridge across the creek and St. John's will not "be deprived of the economically viable use of their property."

Please see the attached letter dated 3/24/08 submitted by George Moestue. In the last section of his letter, Alternative to the Expansion Plan, he suggests their existing Gouldin Road entrance can be modified by widening and grading to allow two-way traffic, a traffic circle to allow for fire truck egress, and improved parking. (Drawing also attached)

St. John's wants to increase their visibility by creating a grand new entrance on Thornhill Drive. The section of the creek at 5928 Thornhill Drive is a day-lighted and wild creek. It doesn't need to be restored to a natural state. **The new entrance and bridge have nothing to do with creek restoration.** Moving the creek does not restore the creek. Increased runoff from impervious surfaces causes erosion. The creek has been neglected and is overgrown with weeds, but basic maintenance and stewardship would go a long way to improving the site**.**

St. John's bridge plan is an unnecessary intrusion on the creek and neighborhood. No home owner with access to their property would be allowed to build a bridge over the creek. Please do not allow St. John's to violate and weaken the Oakland Creek Protection Ordinance.

I am also copying Council member Quan's office and the Planning Commission to assure that the City does not lose sight of enforcing the Creek Ordinance. City employees, elected officials and Oakland's citizens all worked very hard to make sure that we had an ordinance to protect our valuable creeks. Everyone agreed that Oakland's creeks are biological and aesthetic gems throughout our city. They are a unique asset to our quality of life and very few cities can boast of having this particular attribute.

Please notify me regarding the proper person or persons who will be reviewing this project and determining whether I am correct and the project violates the ordinance. Thank you for your attention to my correspondence.

Very truly yours,

Leila H. Moncharsh

April 1, 2008

Caesar Quitevis
Planner II, City of Oakland
Community and Economic Development Agency
250 Frank H. Ogawa Plaza
Suite 2216
Oakland, CA 94612

RE: Case # ER08-0001

Dear Mr. Quitevis,

We are residents of Montclair and have lived at 5950 Thornhill Drive for nearly 25 years. We are writing to express our concern about the scope and content of the proposed EIR for the St. John's Episcopal Church improvements. We do not believe that the proposal is adequate in the areas described below:

1. Aesthetics

It is clear that under CEQA aesthetics are to be considered as part of an EIR where appropriate. Here, this important topic has been dismissed as insignificant. The initial study states that although the project would change the visual character of the site and surroundings, the changes would be less than significant because "the site is currently developed." This implies that a large parking lot is the equivalent of the existing single family home and wooded site. This is simply not true. From our home we look out across our neighbor's driveway at 5940 towards the proposed parking lot. We can see many of the tall trees that are proposed for removal. St. John's proposal will literally cut a hole in the middle of our neighborhood and forever alter its wooded, residential character. We are not the only ones to be affected by this project, however. Montclair residents driving down Thornhill will clearly see the parking lot through the large opening created by the bridge, instead of the tree-lined street that exists today. The many pedestrians who walk along this section of Thornhill, enjoying the wooded, residential character of the neighborhood, will now be confronted by a parking lot filled with as many as 30 cars. The crushed granite surface can do nothing to soften the impact of this profound change, despite what the initial study states. The many views of this property from homes and streets surrounding the site will also be adversely affected.

The proposed project description inaccurately states that the property at 5928 is unoccupied. To our knowledge the home on that site continues to be occupied as it has been for all of the years that we have lived in Montclair. The destruction of this house would remove one of the residences in the neighborhood and reduce the number of

residents in our community. The initial study also mentions two other properties owned by St. John's, located at 5914 Thornhill Drive and 1676 Alhambra Lane. The plan, however, is silent as to future development of these parcels. In fact, it is possible that the current proposal already encroaches on these properties; the initial study does not show the existing property lines so it is unclear whether this is the case. The EIR should be required to address this. The EIR should also be required to include a discussion of future development of these parcels, and whether the church's current proposal is just the first step in a larger plan to significantly change the character of the neighborhood by reducing the number of homes in the immediate area by three. The EIR should also require a detailed discussion of the projected uses of the new facilities. Current use of the church property is, for the most part, limited to Sunday services and a few weekly meetings. Use of the property for more frequent and larger events, however, would have a substantial impact on the ability of other residents of the community to peacefully enjoy their property.

The impact of the new sanctuary building is also treated inadequately in the proposal. This building is simply much too large to fit into the existing residential neighborhood. The initial study dismisses concerns by noting that the living room windows of the house to the south would be five feet higher than the roof of the new sanctuary. This is not an acceptable analysis of such an important issue. It ignores the tall bell tower and the overall bulk of the structure. The diagrams included in the initial study show that the new structure dwarfs the existing parish hall building, which sits on a lower part of the site and has a much more modest profile. The new building will be clearly visible from homes and streets that overlook the site, and will be seen by all who drive or walk by on Gouldin.

Replacing a wooded property with a parking lot, and building an elaborate new sanctuary building, will seriously damage the visual quality of our neighborhood and fundamentally change its residential, sylvan character. To dismiss our concerns about the aesthetic impact of these proposals as superficially as the initial study does violates the protections afforded by CEQA. Surely it is the purpose of the CEQA process to ensure that aesthetic impacts are fully examined and that all sides have the chance to present evidence. To have this important issue dismissed at the outset, with no opportunity for us to gather input from the wider neighborhood, especially from residents outside the very limited "official notice" area, is simply unfair. The remedy is quite obvious, however. All that we ask is that the aesthetic impact of the St. John's proposals be added to the scope of the draft EIR. If this is done, then all sides will be afforded an equal opportunity to make their case.

2. Transportation/Traffic

Although this topic is within the announced scope of the draft EIR, we want to make certain that all aspects are considered. During the time that we have lived in our home, we have peacefully coexisted with St. John's. Cars entering their existing parking lot are directed around the perimeter of our neighborhood, leaving our part of the canyon in a typical rustic Montclair state. Of course there have been traffic problems over the years, especially on major religious occasions such as Easter or Christmas. The proposed plan, however, will do nothing to alleviate these problems; it will simply move them

around the corner onto Thornhill, a street that can ill afford additional cars. Any study of the traffic impact must take into account the fact that for many years the St. John's parking lot has been shared with Thornhill School. Teachers park in the lot, as do parents visiting the school for various daytime and evening events. All of this school traffic will now be driving through our neighborhood instead of around it. Any traffic study must also address the impact of this project on children walking to school along Thornhill, as my children did when they were in elementary school. Cars entering and exiting this lot will drive across the walkway, further endangering pedestrians and snarling traffic along Thornhill. Also, we anticipate that the addition of the new sanctuary to the St. John's complex will mean that many more events will be held in the facility; such events cannot now be accommodated in the existing parish hall. This increased traffic will have a serious negative impact on the neighborhood and must be addressed.

3. Geology and Soils

We are uneasy about the cursory treatment of this issue in the initial study document. The changes proposed for the creek, the changes in the grade of the existing parking lot and the construction of a large new building near a hillside of uncertain stability must all be fully explored. Here again, we need to be given the opportunity to seek input on a very important topic. Geology and soils, along with aesthetics, should be added to the scope of the draft EIR.

4. Biological Resources

Although this topic is included in the scope of the draft EIR, we have some particular concerns that we would like to see addressed. The proposed parking lot is immediately adjacent to Temescal Creek. The creek runs many miles upstream from the project site into the Oakland Hills and downstream to Lake Temescal. It is a major riparian corridor for deer, raccoon, opossum, skunk, wild turkey and many species of birds. The project may have a dramatic impact on wildlife in the area because of the proposed changes to the creek. The use of the property, particularly the parking lot, may also result in degradation of the creek due to storm water runoff and other pollutants that end up in the creek. We ask that the EIR include careful consideration of all possible effects of the project, not just in the immediate vicinity but in all adjoining areas as well. The EIR should, for example, contain a discussion of possible runoff into the creek and the effect that runoff would have on fish and wildlife in Lake Temescal.

5. Alternatives

We see from the NOP that the draft EIR must examine reasonable alternatives to the project, including the no-project alternative required by CEQA. We are very concerned, however, about these topics being adequately covered in the EIR. From the time this project was first announced, St. John's has been unwilling to address any of the alternatives suggested by neighbors. The project as it exists today is unchanged in any significant way from what was presented to us at the first community meeting several years ago. It is essential that the EIR contain a detailed discussion and analysis of project

alternatives that will allow St. John's to fulfill its objectives while at the same time preserving the character of the existing neighborhood. Careful consideration should also be given to onsite development that would avoid the drastic changes to the neighborhood proposed in the current plan.

Thank you for your attention.

Sincerely

Alice I. Youmans

Tyler B. Pon
5950 Thornhill Drive
(510)339-2234
tylerpon@comcast.net

**Dan J. Brown**
3871 Piedmont Ave., PMB #351
Oakland, CA 94611
Home: 510-339-2673
Mobil: 916-275-3229
Fax: 510-339-3211
Email: danb@airtechsales.com

RECEIVED
APR 0 3 2008
City of Oakland
Planning & Zoning Division

March 30, 2008

Mr. Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, CA 94612

Re: Case #ER08-001
St. John's Church

Dear Mr. Quitevis:

I composed the attached draft letter several months ago in hopes of further discussions with St. John's Church.

It addresses the proposed parking lot design and how it would adversely affect the traffic flow and parking on both Thornhill Drive and Gouldin Road.

I respectfully submit the attached draft letter for your review.

Thank you,

Dan Brown

Dan Brown
1666 Gouldin Rd.
Oakland, CA 94611

cc: Council Member Jean Quan
City Hall
One Frank H. Ogawa Plaza, 2nd Floor
Oakland, CA 94612

Nancy Havassy
5940 Thornhill Drive
Oakland, CA 94611

Date

To the parishioners of St. John's Church,

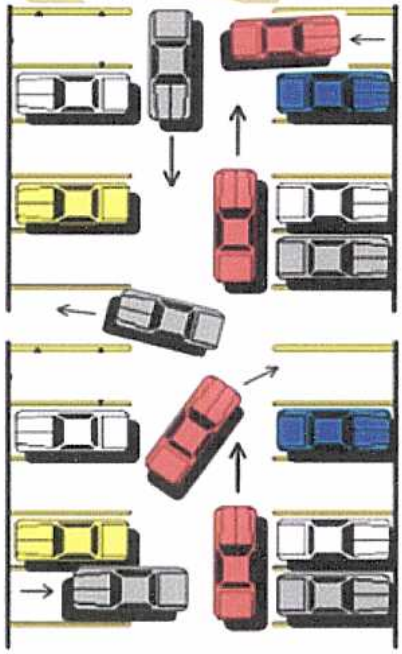
The St. John's Church architect has presented a beautiful rendition of a tree-lined parking lot with large parking stalls and a wide driveway. But, have you wondered what your proposed parking lot will actually look like when it is finished?

To get a real good idea of what the proposed parking lot will look like visit the Montclair Safeway at 2096 Mountain Blvd. It has similar traffic flow to the church's proposed lot with 2-way traffic and straight-in parking. Please note, Safeway's lot actually has a wider driveway and longer parking stalls then St. John's proposed lot. Two photos of the Safeway parking lot are attached that show how inconvenient this type of parking lot is. Nothing was staged, just regular people trying to park and back-up. With 90-degree parking all traffic in both directions stops for those parking and backing-out.

#1. Parking

#2. Backing-up

Your lot will look more like the drawing below with a narrow driveway and very short stalls:



DRAFT

Other details you should also be aware of shown on St. John's drawing:

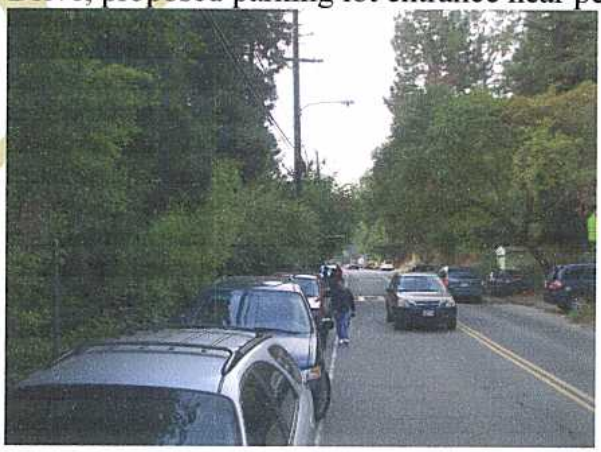
1. All vehicles are longer then the proposed parking stalls. Recommended stall lengths for 90-degree parking is 18 to 19 feet, the proposed stalls are only 16'-6" which will just be long enough to accommodate economy size vehicles.
2. One of the vehicles shown parked in a stall actually extends into the walkway because the stall is too short. This intrusion will affect pedestrian traffic on the walkway and if moved away from the walkway the rear of the vehicle will extend into the driveway.
3. The walkway narrows to only 5 feet when it crosses the driveway near the creek. It continues at 5 feet wide across the bridge. This will be one of the highest pedestrian and automobile traffic in the proposed parking lot. Five feet is too narrow for adults and children to pass safely in opposite directions.
4. The other crosswalk in the driveway is 9'-0" wide, a much safer width, but it does not accommodate pedestrian traffic for those parking on the south side because there is no walkway there. So, people parking on that side must cross the driveway against the traffic.

Why you should expect gridlock:

1. Vehicles making a right turn into any parking stall must move into oncoming traffic to park. This will stop traffic in both directions.
2. Vehicles making left turns into any parking stalls will stops traffic in both directions.
3. Vehicles backing-out of any parking stall will stop traffic in both directions.
4. Traffic in both directions will stop for pedestrians in the two parking lot cross walks, for those walking to and from cars parked on the south side of the lot and for pedestrians crossing at the entrance on Thornhill Drive.

Those walking in from the north on Thronhill Drive will have to cross the driveway twice, once on Thornhill Drive and once on the 5-foot wide driveway crosswalk. When the parking lot traffic stops, for any reason, those wishing to enter the proposed parking lot will have to wait on Thornhill Drive. This could stop traffic in both directions on Thornhill Drive. When this happens even emergency vehicles will not be able get through because the parking lot entrance happens to be located at one of the narrowest sections of Thornhill Drive, see photo #3.

#3. Thornhill Drive, proposed parking lot entrance near pedestrian on left.



The proposed parking lot has <u>22 fewer parking spaces</u> then the current lot. If this lot is built you will only have 48 parking stalls. With a current occupancy of over 300 people competing for 48 parking

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spaces, what will it be like if Phase II is approved and the total occupancy grows to 500 or 600 people? More parishioners will have to be dropped off at the parking lot turn-around area. That means more traffic in the parking lot and more parking and pedestrian traffic in our neighborhood.

If the church has more then one service per day major gridlock will take place. How will those coming to a later service find a parking place and how will those leave an earlier service ever get out? To make things worse, soon parishioners will not be allowed to park on the Thronhill School playground. You will have to compete with members of the Montclair Presbyterian Church for the few parking spaces in our neighborhood.

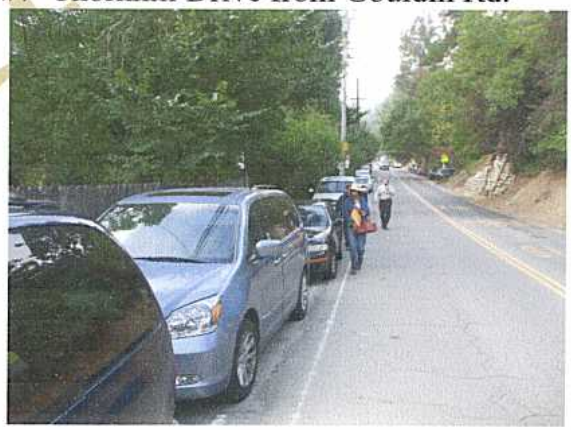
As a neighbor, I am concerned that the proposed parking lot will increase street parking and danger to the pedestrians. Take a look at the following pictures:

#4. Gouldin Rd. looking east.

#5. Gouldin Rd. looking west.

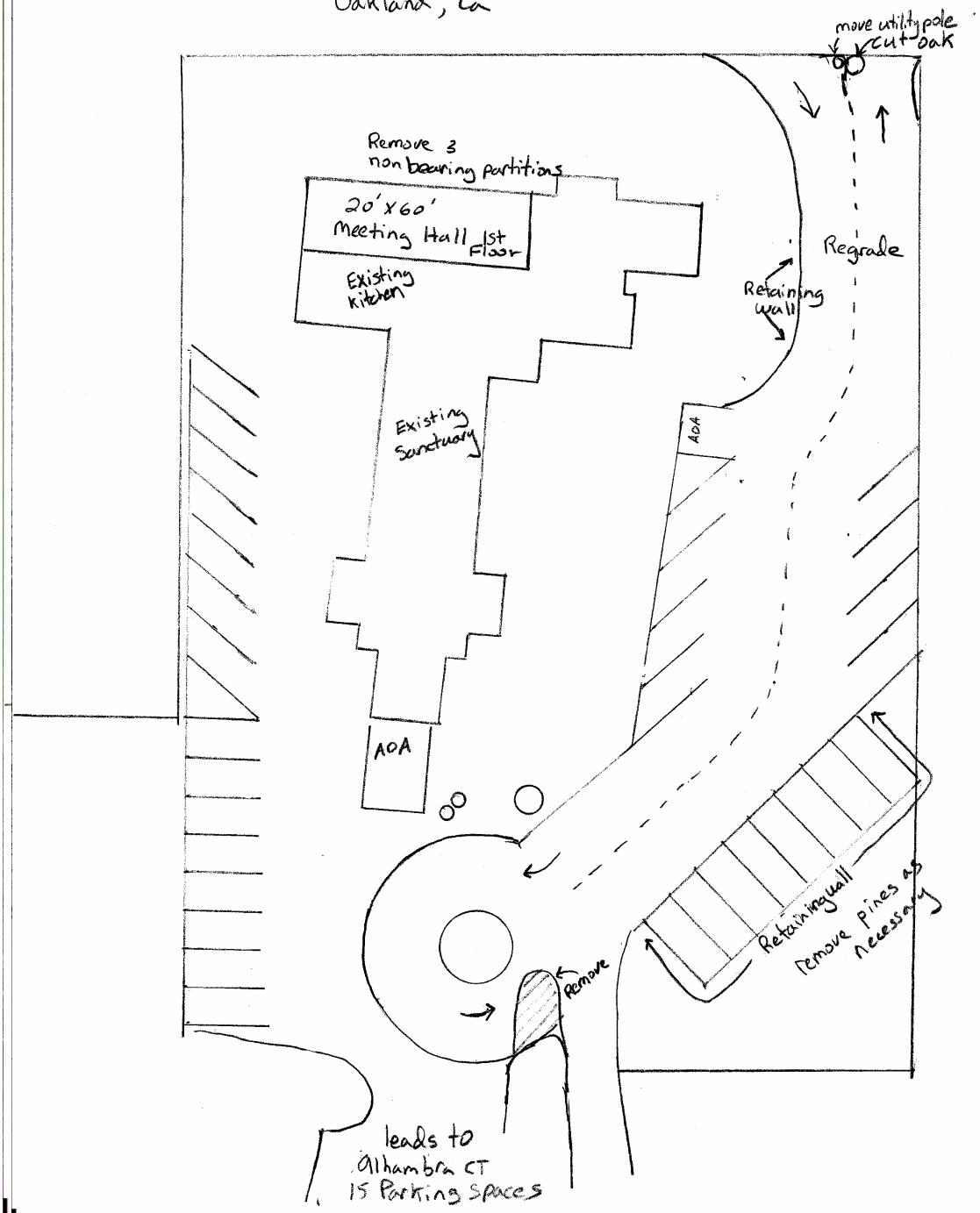
#6. Thornhill Drive & Gouldin Rd.

#7 Thornhill Drive from Gouldin Rd.



I ask that you re-evaluate this parking lot design and consider improving your existing entrance on Gouldin Road.

Alteration to: St. Johns Episcopal Church
1707 Gouldin Road
Oakland, Ca



# COMMENTS FOR PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR ST. JOHN'S EPISCOPAL CHURCH IN OAKLAND, CA.

Caesar Quitevis
Community and Economic Development Agency
250 Frank H. Ogawa Plaza, Suite 2216
Oakland, Ca. 94612
Case number ER08-0001

Dear Caesar 3/24/08

Aesthetics:
Please reconsider including this important aspect to the environmental study. In the checklist discussion of aesthetics it says, " There are no scenic vistas from the site; therefore, the project would not have a substantial adverse effect on a scenic vista." Although there is not a scenic vista *from* the proposed site of the parking lot and bridge, I would suggest for many people in the Thornhill canyon, for people driving on Thornhill Dr., for surrounding home owners who look down onto this site and for neighbors with abutting properties this site is a part of their scenic view.

Removing the house and substituting a large parking lot and bridge will substantially degrade the existing visual character or quality of the site and it's surroundings.

There is currently an unbroken vista of green along the frontage of 5928 Thornhill. Approximately 60 ft. of the 100 ft. frontage of the proposed parking lot site would become paving in order to access the proposed bridge. Instead of green the view through this large hole will be of parked cars.

This site is on a creek in a valley that is surrounded by Oakland homeowners. Looking down from their residences they see trees, residences, a large church and parking lot. The aerial view of the proposed land use provided with the Initial Study and Environmental Review Checklist does not reflect the removal of the trees to build the parking lot and bridge. In fact, the roof of the house and an exhaust vent are still visible in the proposed land use figure 4. I also point out that the private drive and carports at 5940 Thornhill are completely misrepresented. If this project is built, the existing parking lot becomes another big church while a small residence becomes a big parking lot. This an aesthetic change that degrades the view of the surrounding community.

For the adjacent neighbors to this site, the parking lot and bridge are more than an aesthetic umbrage. It is a division of their community by an ever-growing footprint of an institution in their neighborhood. It is majestic mature native trees being replaced by asphalt and non native ginkgo trees in 2 foot by 2 foot squares surrounded by paving. The change of a home into a parking lot is a significant aesthetic change to the visual character of their community.

Biological Resources:
The Removal of 44 protected mature trees may take decades to replace. Many of these trees are at the 5928 Thornhill house site. The replacement trees are spread out over the entire St. John's campus. Redwood trees will be removed for "creek restoration", but willows will be used instead of redwoods during the restoration. If you go down and view the creek, it winds around the redwoods and they stabilize the banks. Stabilize with willows, but don't move the creek or cut the redwoods.

I'm most concerned about the trees that won't be removed that are close to the construction. There are over 70 trees listed on the preservation inventory. There are two Coast Redwood trees one with a diameter of 54" the other 66". These trees are towering majestic trees. They are on the edge of the construction. The Oakland Developmental standards require that "protected trees be surrounded by a chain link fence with a diameter of four feet outside the drip line during construction. This may be determined otherwise by the tree reviewer or the owner's representative. This fence may be removed for construction." The 54" Coast Redwood will have excavation for a retaining wall within 3' of its trunk to effect a grade change for a parking place. The 66" tree is one of a pair of redwoods growing 4 ½ feet apart along the southwest side of the site. The second tree is 38" in diameter. Redwoods grow together and it is part of the reason that these trees can grow so tall. The 6 foot wide path that follows the edge of the parking lot on the same side of the site goes between these two trees. The 38" tree is within 6 feet of the parking excavation. If these tree roots are damaged and the trees die it will take at least a hundred years to replace them.

The creek and big trees attract many birds and mammals and amphibians. I have personally witnessed deer, skunks, opossum, raccoon, squirrels, red tail hawks, cooper hawks, many wrens, juncos, warblers, robins, jays, rufous-sided towhees, varied thrush, acorn wood peckers, yellow bellied sapsuckers, wild turkey, snakes and salamanders on the property at 5940 Thornhill Dr. At my residence, 6708 Pinehaven Rd., which is less than a mile up the Thornhill canyon, I have personally witnessed coyote, red foxes, a swainson's hawk, great horned owls and one amazing dusk evening in 2007 a ringtail cat. The fact that this canyon has incredible wildlife within the City of Oakland's borders is an asset I would like to see well protected.

Hydrology/ Water Quality;
I have concerns about how storm water detention can be accomplished under the parking lot. In the report, prepared for St. John's by Land and Marine Geotechnics, Bill Rudolph talks about the permeability of the soil beneath the parking lot. "The test results indicated permeability varying from1.4 E-08 to 5.0 E-07 centimeters per second. These relatively low values indicating a very slow infiltration rate from pavement components into the subgrade soils." The parking lot is pitched to the creek and drainage piping in the sub grade water storage will run into the creek, because water will not be absorbed into the clay beneath the gravel effectually. Any water that does not run off the asphalt or compacted granite will find itself quickly in the creek. This condition makes this area part of the total impervious area. The run off has no place to go except directly into the creek unlike other areas where distance from the creek creates a buffer.

After the demolition of the house at 5928 Thornhill the church plans to abandon the existing shared driveway. This driveway crosses the creek over a culvert. I measured the distance that the driveway is above the creek at the south east side of the culvert. On 3/24/08 the creek was 9 feet below and three feet away from the driveway edge. This is a 300% grade, nearly vertical at the very edge of the driveway. I am concerned that large trucks carrying tons of debris and excavators may damage the fragile edge of this nine foot wide gravel driveway and it may collapse into the creek.

The other section of the Temescal Creek that is on the church's property is the branch that runs under the asphalt that will be removed in phase 1 when the Gouldin road entrance is abandoned. This section was paved over well before the Oakland Creek ordinance was written. It daylights at the north west corner of the education building and then it joins the main branch of the creek.

If the creek is moved large amounts of soil will be disturbed. The creek goes underground at Alhambra Ct. and mitigating soil that washes underground so close to the construction site will be difficult to control. I would hope bank stabilization near Thornhill Dr. could be accomplished without moving the creek.

Noise
The addition of a meeting hall to the site may add evening or day events such as lectures, wedding receptions with music, anniversary parties with music, concerts and other events that have amplification as part of the event. The canyon and site are fairly quiet. Sound travels well. Amplified events may exceed noise limitations.

There are teenage revelers who are partying in the existing parking lot at night.

Transportation/Traffic
I am concerned about the traffic load that comes from the shared usage of the new entrance to St. John's by Thornhill School parents. The planned in and out at the same location on Thornhill drive may back up traffic in the morning and afternoon as parents use this egress to access the school.

The two school busses that drop special education children at the side entrance may be affected.

The children dropped off in the parking area closest to Thornhill Dr. may be endangered as they walk along Thornhill where there are no sidewalks.

The parking format of parking straight in with short spaces could back up traffic on Thornhill as parents or parishioners try to all leave or enter at once. There are events at the school on the weekend or sometimes during the week (the first day of school, back to school night, school carnival, the walkathon, the Halloween parade, the science fair, graduation) that create heavy traffic and parking now. Every available parking space, legal or otherwise on the street or in the church lot is filled during these special events. This new circulation plan may add to this problem.

The church as well has events that crowd the parking lots beyond the average additional 25 trips on Sunday.

The intersection of Gouldin Rd. and Thornhill Dr. is a dangerous one. Traffic turning left from Gouldin onto Thornhill has a blind view of approaching southbound Thornhill traffic. Some drivers prefer to go through the church parking lot and turn out of Alhambra Court in order to see traffic coming from a longer distance.

The new large meeting hall, the converted sanctuary, may be rented out for events. This revenue would be hard for the church to pass up considering the debt acquired from this large expansion. Events could include wedding receptions, lectures, anniversary parties, concerts and similar events that the Montclair Woman's Cultural Center at Thornhill and Mountain now holds. These events would add to traffic and parking load.

The Oakland Unified School District may have issued a policy that parking will not be allowed on any school grounds that is not for school related events. This is a liability issue for the school even if it is against community interest. If this is true then parking for both Montclair Presbyterian and St. John's Episcopal churches would be much restricted. It would be important to know if this is in fact Oakland District policy and when it would be put into effect. Would St. John's reciprocate by closing its parking to Thornhill parents?

Alternative to the Expansion Plan
The City of Oakland Guide to the Creek Ordinance has a section called "What is typically not allowed". This project includes at least four of these not allowed categories. Here is one plan that may meet the parameters that will not require a bridge across the creek, removing a residence, or cutting down 44 protected trees.

Three partitions can be removed from the current education building's first floor on the northwest end. This would give the church a meeting hall with the dimensions of 20 feet by 60 feet. This meeting hall would be right off the existing kitchen and on the same level as the sanctuary. In order to allow two-way traffic into the existing parking lot, the entrance could be widened and graded. A traffic circle, retaining walls to create additional parking and using the existing Alhambra Court exit would be all that is required. Except for the grade change at the entrance, this project is at existing grade. Only one protected tree would have to be removed. The site would have forty-eight parking spaces. Existing asphalt could be removed in parking areas to decrease the effect of impervious paving. Project costs would be greatly reduced. The house not being demolished, the soil not removed for sub-surface drainage and the soil from the grading for the new sanctuary would not end up in the landfill. Traffic would be unaffected. Fire safety by providing a fire truck turn around would be improved. The creek would flow at its choosing as creeks do. The riparian corridor would not be changed.

See attached drawing.

Sincerely
George Moestue
Secretary and Treasurer
Thornhill Creekside Neighbors and Friends

6708 Pinehaven Rd.
Oakland, Ca. 94611
510 339-1093

**APPENDIX D**

# RESPONSE TO COMMENTS ON NOTICE OF PREPARATION/INITIAL STUDY AND SCOPING SESSION

## RESPONSE TO COMMENTS ON NOTICE OF PREPARATION/INITIAL STUDY AND SCOPING SESSION

The Notice of Preparation (NOP) for the St. John's Church Project EIR was released on March 8, 2008. Based on the NOP (included in Appendix A), and the Initial Study (included in Appendix B), comments letters were received from the following agencies and individuals.

**State Agencies**

- California Department of Fish and Game
- Regional Agencies
- California Regional Water Quality Control Board-San Francisco Bay Region
- East Bay Municipal Utilities District
- Alameda County Congestion Management Agency

**Schools**

- Thornhill Elementary School

**Interest Groups**

- Sierra Club
- Thornhill Creekside Neighbors and Friends

**Legal Counsel**

- Veneruso & Moncharsh

**Individuals**

- Pamm Drake
- Todd Freter & Roger Saut
- Joanne E. Hill
- Carl Eric Anderson
- Alice I. Youmans & Tyler B. Pon
- Dan J. Brown
- Nancy Havassy
- Marilyn M. Singleton
- George Moestue

The City of Oakland Planning Commission held a scoping session on April 2, 2008 to solicit comments from the public and the planning commissioners regarding the content of the EIR, including environmental issues to be addressed and the range of alternatives to the project to be evaluated. The following individuals provided verbal comments.

**Planning Commissioner**

- Ann E. Mudge

**Legal Counsel**

- Veneruso & Moncharsh

**Individuals**

- George Moestue
- Nancy Havassy
- Alice I. Youmans
- Todd Freter
- Tyler B. Pon
- Marilyn M. Singleton
- Dan J. Brown

The primary concerns expressed in the comment letters and at the public scoping session included the need to evaluate aesthetic impacts, land use, noise, biology, geology and soils and specific provisions of the City's creek protection ordinance. In particular, concerns were raised about the following environmental issues:

- **Aesthetics**. Concerns have been raised about the impacts to visual resources and the visual character of the project site.
- **Effects on biological resources.** Concerns have been raised about the impacts to plant and animal species within the project site, along Temescal Creek.

- **Hydrology.** Concerns have been raised about grading the banks of Temescal Creek, construction of a bridge over the creek, and changing or moving the location of the creek.
- **Traffic congestion and circulation.** Concerns have been raised about available parking supply, and the increase in traffic congestion resulting from vehicles entering and exiting the project site on Thornhill Road.

Several topic areas including noise, slope stability, and geology were not evaluated within this EIR as the evaluation within the Initial Study determined that the project would result in less-than-significant impacts.

Although the Initial Study determined that the project would result in less-than-significant impacts with respect to aesthetics, due to the concern expressed in comment letters, an evaluation of aesthetic resources was included within this EIR.

**APPENDIX E**

# BIOLOGICAL RESOURCE CONDITIONS

ENVIRONMENTAL COLLABORATIVE

Consultation • Documentation • Restoration
1268 64th Street • Emeryville, CA 94608
Phone 510/654-4444 • FAX 510/655-4444

MEMORANDUM

TO: Kyle Simpson
Design Community & Environment
1625 Shattuck Avenue, Suite 300
Berkeley, CA 94709

FROM: Jim Martin
ENVIRONMENTAL COLLABORATIVE

DATE: 18 October 2010

SUBJECT: Biological Resource Conditions
St. John's Church Site
Oakland, California

As you requested, I have prepared this memo to provide additional information on existing biological resources and habitat conditions on the St. John's Church site, and to clarify the assessment methodology used in preparing the Biological Resources section of the Draft Environmental Impact Report (EIR) on the project. The proposed project involves a new bridge crossing over Temescal Creek, demolition of an existing residence and construction of a new parking lot, and other improvements located further from the creek corridor that are of less concern from a biological standpoint. A primary concern expressed by staff of the City of Oakland is the potential impact of the new bridge and other improvements on the creek, and the associated riparian vegetation and wildlife habitat. The project has gone through a series of refinements over the past few years in addressing concerns over modifications to the creek, the direct impacts of the new bridge, anticipated tree loss and effects on shading to the creek, and appropriate replacement plantings and compensatory mitigation. This memo provides a description of methodology used in the assessment, together with a summary of existing conditions on the site. I have reviewed and provided input into the Biological Resource section of the EIR, which contains a detailed assessment of potential impacts according to the significance criteria identified in Appendix G of the California Environmental Quality Act (CEQA) Guidelines.

## BIOLOGICAL RESOURCES

### Background and Methods

Biological resources associated with the site were identified through a review of available background information and field reconnaissance surveys of the site. Available documentation was reviewed to provide information on general resources in the Montclair area of Oakland, presence of sensitive natural communities, the distribution and habitat requirements of special-status species which have been recorded from or are suspected to occur in the project vicinity,

and wildlife habitat values of the site. An initial field reconnaissance survey was conducted by James Martin, biologist and principal of Environmental Collaborative, on July 27, 2006 to identify existing conditions, presence of any sensitive habitat features or potentially suitable habitat for special-status species, and an assessment of wildlife habitat conditions. Detailed protocol surveys for special-status species were not considered necessary to confirm presence or absence because of the extent of past disturbance and development on the site and adjacent lands, the dominance of the creek corridor by non-native invasive species, and the lack of suitable habitat characteristics necessary to support special-status species. A field visit to the site was conducted with staff from the City of Oakland and the Regional Water Quality Control Board on May 28, 2008 during which review and input on the proposed plans at the time were reviewed. Review of the tree survey data from the updated 2009 *Tree Report* by HortSciences[1] was performed during the subsequent field visit.

**Vegetation and Wildlife Habitat Conditions**

The site is located in a predominately residential neighborhood in the Montclair area of Oakland. Thornhill Drive forms the northwestern boundary of the site. Temescal Creek bisects the western edge of the site, with and existing residence and poorly maintained landscaped yard on the south side of the creek, and structures, parking and landscaping around the existing sanctuary and offices. Existing wildlife habitat is typical of suburban areas, with the creek providing a source of surface water during the dry summer and fall months and is most likely attracts terrestrial wildlife to the site reach and other locations of Temescal Creek that are still accessible. Aquatic habitat values of this reach of the creek are extremely limited given the shallow depth, lack of emergent vegetation, and dense shade overstory to much of the creek channel.

Vegetation along the creek corridor is dominated by native and non-native tree plantings, with an understory of scattered shrubs and open to dense tangle of non-native English ivy (*Hedera helix*), periwinkle (*Vinca major*), and Himalayan blackberry (*Rubus discolor*). English ivy and periwinkle form the dominant ground cover over most of the portion of the site along the creek. With the exception of a few horsetail (*Equisetum* sp.) plants along an unshaded reach of the south bank, native groundcover species are completely absent in this reach because of the dense shade, past disturbance, and competition with the invasive species. Tree species along this reach of the creek include a single Fremont cottonwood (*Populus fremontii*), big-leaf maple (*Acer macrophyllum*), coast redwoods (*Sequoia sempervirens*), coast live oaks (*Quercus agrifolia*), wild plums *(Prunus sp*.), Douglas fir (*Pseudotsuga menziesii*), sycamore (*Platanus sp*.), Deodar cedar (*Cedrus deodara*), Monterey pine (*Pinus radiata*), among others. No emergent vegetation or aquatic life was observed in the creek channel itself.

Wildlife use in the site vicinity is generally low because of the lack of protective cover and developed condition in the area. Species typical of urbanized and ruderal habitat occur in the vicinity, including birds and mammals common in the Montclair area of Oakland. Typical species observed or suspected include: house finch, house sparrow, mourning dove, northern mocking bird, pocket gopher, house mouse, Norway rat, and western fence lizard. Raccoon and opossum most likely forage through locations where protective cover is present. Several species of raptors most likely occasionally forage in the remaining natural areas on the hillsides, and may occasionally perch or roost in trees on the site, including Cooper's hawk, red-tailed hawk, and American kestrel. But no signs of any active raptor nesting or other nests were observed during the field reconnaissance surveys. The lack of any groundcover and grassland

1 HortScience, 2009, *Tree Report, St. John's Episcopal Church, Oakland, CA*, March.

habitat on the site and immediate vicinity limits the importance of the site as even occasional foraging habitat for raptors. Suitable foraging habitat for burrowing owl is absent, and no evidence of nesting by other species of raptors was observed during the field reconnaissance surveys, and seems unlikely given the intensity of surrounding development. The surface waters of Temescal Creek are most likely an attractive source of drinking water to deer and other terrestrial wildlife common in the area, but no aquatic life was observed within the creek itself, as noted above. The concrete box culvert and drop structure immediately upstream from the site precludes use of the creek channel bottom and banks as a continuous movement corridor for both terrestrial and aquatic species, and Temescal Creek enters a culvert downstream of the site as Alhambra Road, about 80 feet downstream of the St. John's Church reach. Major drop structures and the dam at Lake Temescal preclude this segment of Temescal Creek being used by anadromous fish such as steelhead in the future.

**Special-Status Species**

Review of records maintained by the California Natural Diversity Data Base (CNDDB) indicate that a number of special-status plant and animal species have been reported from the surrounding area of Oakland and the Berkeley Hills. Special-status species are plants and animals that are legally protected under the state and/or federal Endangered Species Acts or other regulations, as well as other species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or denning locations, communal roosts and other essential habitat. Species with legal protection under the Endangered Species Acts often represent major constraints to development, particularly when they are wide ranging or highly sensitive to habitat disturbance and where proposed development would result in a "take" of these species.

Figure 1 shows the known distribution of sensitive natural communities and special-status plant and animal occurrences within about two miles of the site. No sensitive natural communities recognized by the CNDDB have been reported from the site or occur on the property based on the field inspection conducted in July of 2006, and followup site visits. The CNDDB records show a general occurrence of fragrant fritillary (*Fritillaria liliacea*) extending to the edge of the site vicinity, but no other occurrences have specifically been reported from the site.

Numerous special-status plant species are known from the Oakland Hills, such as Diablo helianthella (*Helianthella castenea*), robust monardella (*Monardella villosa* ssp *globosa*), Santa Cruz tarplant (*Holocarpha macradenia*), western leatherwood (*Dirca occidentalis*), bent-flowered fiddleneck (*Amsinkia lunaris*), pallid manzanita (*Arctostaphylos pallida*), most-beautiful jewel-flower (*Streptanthus albidus* ssp. *peramoenus*), alkali milk-vetch (*Astragalus tener* var. *tener*), Persidio clarkia (*Clarkia franciscana*), and fragrant fritillary. These species have varied legal status, and most are considered rare in California (list 1B) by the CNPS. The closest known occurrence is for western leatherwood, which occurs in the hillsides further up the watershed. However, the extent of past disturbance of the site from grading, landscaping, and spread of invasive groundcover species precludes the occurrence of any special-status plant species along the Temescal Creek corridor on the site.

Special-status animal species known or suspected from the Oakland Hills include: Alameda whipsnake (*Masticophis lateralis euryxanthus*), California red-legged frog (*Rana aurora draytonii*), Berkeley kangaroo rat (*Dipodomys heermanni berkeleyensis*), bay checkerspot butterfly (*Euphydryes editha bayensis*), callippe silverspot butterfly (*Speyeria callippe callippee*), monarch butterfly (*Danaus plexippus*), northwestern pond turtle (*Clemmys marmorata*), and

several species of raptors and bats. Suitable habitat for special-status animal species is generally absent from the site due to the extent of past disturbance, surrounding development and human activity, and the absence of conditions necessary to support these species. This includes absence of freshwater marsh and riparian habitat necessary for breeding by California red-legged frog, native grassland and scrub habitat necessary to support Berkeley kangaroo rat, native serpentine grassland and larval host plant species for bay checkerspot butterfly, native grassland with larval host plant species for callippe silverspot butterfly, scrub/chaparral habitat with sunning areas and prey species necessary to support Alameda whipsnake, eucalyptus necessary to support overwintering areas for monarch butterfly, and nesting/roosting habitat for raptors and bats. Steelhead (*Oncorhynchus kisutch*) were historically known from the streams of the East Bay, and Temescal Creek most likely once served as habitat for native runs of this federally-threatened species. But downstream culverts, drop structures, and the dam at Temescal Lake preclude this species and northwestern pond turtle from migrating this far up Temescal Creek.

One species of particular concern in creek habitats is the potential for occurrence of the federally-threatened California red-legged frog. According to the CNNDB, an occurrence of California red-legged frog has been identified about half a mile east of the site, reported from "Thornhill Pond" sometime in the 1940's. It is unknown whether a population of California red-legged frog still occurs in that pond, which is on private property. The creek across the site may have previously served as a dispersal corridor for this species when accessible breeding habitat once occurred downstream and would have encouraged individuals to move along the creek corridor. However, suitable habitat for this species is generally absent on the site given the absence of emergent vegetation, native willow cover, or pools suitable for breeding. The intervening reach of Temescal Creek between this 1940's-reported occurrence and the site has been extensively developed, with segments of creek having been culverted above and below the site. Heavy predation by raccoons most likely precludes the survival of any dispersing California red-legged frogs that may be dispersing from the historic occurrence, if the population remains intact. A preconstruction survey by a qualified biologist would ensure that any dispersing California red-legged frogs are avoided and protected in the remote instance that one were to move through the project reach of the creek during construction.

**Jurisdictional Waters**

Although definitions vary to some degree, wetlands are generally considered to be areas that are periodically or permanently inundated by surface or ground water, and support vegetation adapted to life in saturated soil. Wetlands are recognized as important features on a regional and national level due to their high inherent value to fish and wildlife, use as storage areas for storm and flood waters, and water recharge, filtration and purification functions.

The California Department of Fish and Game (CDFG), the U.S. Army Corps of Engineers (Corps) and California Regional Water Quality Control Boards (RWQCB) have jurisdiction over modifications to wetlands and other "waters of the United States", and the City of Oakland regulates modifications to creeks under its municipal code. Jurisdiction of the Corps is established through provisions of Section 404 of the Clean Water Act, which prohibits the discharge of dredged or fill material without a permit. The RWQCB jurisdiction is established through Section 401 of the Clean Water Act, which requires certification or waiver to control discharges in water quality. Jurisdictional authority of the CDFG over wetland areas is established under Sections 1600 of the State Fish and Game Code, which pertains to activities that would disrupt the natural flow or alter the channel, bed or bank of any lake, river or stream. Chapter 13.16 of the City of Oakland Municipal Code establishes a number of guidelines to

protect Oakland's creeks by reducing and controlling stormwater pollution, preserving and enhancing creekside vegetation and wildlife, and controlling erosion and sedimentation. The ordinance includes specific measures applicable to parking lots, gas stations, industrial and commercial activities, as well as to properties that contain creeks. The ordinance includes provisions that address discharge regulations and requirements as well as inspection and enforcement.

The open drainage of Temescal Creek qualifies as a regulated jurisdictional waters by the Corps, RWQCB, CDFG, and City of Oakland. This drainage forms a well defined channel with a conspicuous Ordinary High Water Mark (OHWM) of about 20 feet in width along this reach of Temescal Creek. Wetland vegetation is generally absent, although the unvegetated "other waters of the U.S." are still regulated by jurisdictional agencies. Existing vegetation in the immediate vicinity of the proposed bridge footprint is characterized by a densely shaded overstory of mature non-native and native trees, with an understory of non-native English ivy and periwinkle. No wetland vegetation occurs within the channel bottom in the immediate vicinity of the proposed bridge footprint.

Proposed bridge, channel bank, and restoration activities may have to secure permit authorization depending on the extent of channel modifications. If bank stabilization or bridge abutments extend below the OHWM, or a temporary coffer dam will be required to accomplish bridge construction, a permit would be required from the Corps under Section 404, and Water Quality Certification required under Section 401 of the Clean Water Act from the RWQCB. Any bank modifications, including removal of invasive exotics and replanting with native species, would require a Streambed Alteration Agreement from CDFG. Conditions of agency authorizations typically include avoiding impacts to established native vegetation, minimizing disturbance to in-channel habitat and the potential for sedimentation and water quality degradation, and providing replacement mitigation to ensure no net loss of habitat functions or values.

**CONCLUSIONS**

As currently proposed, the project would include construction of a new bridge crossing to Temescal Creek, removal of invasive species along the creek corridor, and replanting with native riparian and upland species, demolition of the existing residence and removal of associated ornamental landscape plantings, construction of a new parking lot, and replacement landscape plantings throughout the upland portions of the site. The new bridge would be 22 feet wide, and according to the arborist's 2009 *Tree Report* for the project, an estimated 13 trees would be removed to accommodate the structure. All of these have trunk diameters under 21 inches, and only two are native – a coast live oak with an 11 inch trunk diameter at breast height (DBH) and a twin trunk big leaf maple with a 14 and 13 DBH.

Of the 155 trees mapped on the site 2009 *Tree Report*, an estimated 66 were recommended for removal. These include the 13 trees within the construction impact area of the new bridge, and others to be removed to accommodate new parking and roadway improvements, or because of their poor condition. Of the 66 trees recommended for removal, 57 qualify as "protected trees" under the City of Oakland Municipal Code (Title 12, Chapter 36). According to the ordinance, a tree permit must be obtained to remove coast live oaks measuring 4 inches or greater DBH or to remove any other tree measuring 9 inches DBH or larger, except Eucalyptus (*Eucalyptus* sp.) and Monterey Pine (*Pinus radiata*) or if any protected tree on the property might be damaged by construction activity. A total of 19 trees are to be removed to accommodate development and the remaining were recommended for removal because of their poor condition and unsuitability

for preservation. The *Tree Report* includes "Tree Preservation Guidelines" that should be adequate to ensure protection of trees to be retained, and replacement plantings would be required for all trees to be removed, consistent with the City's ordinance. Of the 66 trees to be removed, 13 or less than 20 percent are native species indigenous to the area (coast live oak and big leaf maple), all of these are relatively young trees (with trunk diameters under 15 inch DBH), and most are sapling trees. While the trees on the site do provide perching, foraging and potential nesting opportunities for birds, most of the mature and important trees in terms of their habitat functions and values would be preserved. The enhancement native plantings along the Temescal Creek corridor and replacement tree plantings throughout the site required for conformance with the City's ordinance would serve to address the impact of proposed tree removal on existing wildlife habitat values of the site. Wildlife would continue to have access along the creek channel bottom and across the new roadway and no major disruption of wildlife movement opportunities is anticipated given the upstream and downstream culverts.

The Temescal Creek channel is a regulated waters, and any modifications to this feature will most likely require authorization from several agencies, including the Corps, RWQCB, CDFG, and the City of Oakland. Adequate controls must be taken to prevent degradation of downstream receiving waters during construction and revegetation through implementation of Best Management Practices (BMPs) defined as part of the Restoration Plans and the required Stormwater Pollution Prevention Plan. Conditions associated with authorization from jurisdictional agencies will ensure adequate protection of existing resources and appropriate replacement and enhancement of existing habitat values.

Construction of the new bridge would require removal of 13 trees and the non-native groundcover within the footprint of the structure and roadway, would result in short-term disturbance to the creek channel and associated aquatic habitat during construction, and would result in permanent shading to a portion of the currently open creek corridor. The estimated 13 trees removed in the vicinity of the bridge consist of a single native coast live oak with a trunk diameter of 12 inches and a single native big leaf maple with a trunk diameter 12 inches. The remaining 11 tree species consisting of non-native cherry plum, common yew, and Deodar cedar, and non-indigenous coast redwood, and Douglas fir which were also planted as part of the ornamental landscaping along the creek corridor and yard of the existing residence at 5928 Thornhill Drive. Non-native English ivy and periwinkle are the only groundcover species on this reach of the creek channel, and affected wildlife habitat values are relatively low because of the dominance by non-native species, limited foraging opportunities, and dense shade. Bridge construction would most likely require dewatering of the construction reach through installation of a coffer dam, together with use of mechanical equipment during construction of the bridge abutments and structure. However, adherence to BMPs defined as part of the Restoration Plans and the required Stormwater Pollution Prevention Plan, together with any additional conditions specified as part of the agency permit authorizations would serve to prevent any significant impacts on water quality and limited aquatic habitat associated with this reach of the creek.

Based on the shadow study conducted as part of the CEQA document, an estimated 476 square feet under the bridge would be so continuously shaded that it would not support native replacement plantings. While the creek channel area encompassed by the bridge footprint has only limited habitat value, bridge construction would permanently eliminate any potential for future restoration or revegetation within the approximately 476 square foot area. Dense shading from overstory trees and the extensive ground cover of English ivy currently prevents the growth of any native understory vegetation within the existing footprint of the proposed bridge. Although the existing habitat values of the affected reach of the creek corridor of low, the

permanent loss of even 476 square feet of low quality habitat dominated by non-native species would be considered a significant impact. The proposed removal of invasive exotics and native enhancement plantings would serve to partially address this permanent loss of existing habitat. However, off-site mitigation would be required to provide a minimum 1:1 replacement for the permanent loss of 476 square feet of riparian habitat.

Removal of invasive exotics and replanting of the creek corridor would generally serve to improve existing habitat values of the riparian corridor on the site, but compensatory mitigation would be required for the permanent loss of approximately 476 square feet of low quality riparian habitat. Options for achieving this off-site mitigation requirements consist of either:

1) Preparing and implementing an off-site creek restoration program funded by the applicant that would serve to restore a minimum of 476 square feet of currently culverted creek corridor in Oakland. The program would be developed by a qualified creek restoration specialist that meets with the approval of the City, CDFG, RWQCB, and Corps, and secures any required permits as part of program implementation. The off-site restoration program shall specify performance criteria, maintenance and long-term management responsibilities, monitoring requirements, and contingency measures. Monitoring shall be conducted by the qualified creek restoration specialist for a minimum of five years and continue until the identified success criteria are met.
2) Having the applicant make an in-lieu contribution to cover the costs of restoring a minimum of 476 square feet of riparian habitat at an off-site location as specified by the City of Oakland.

No impacts on special-status species are anticipated due to the lack of suitable habitat. A preconstruction survey by a qualified biologist would ensure that any dispersing California red-legged frog are avoided and protected in the remote instance that one were to move through the project reach during construction.

Please feel free to contact me at 510/654-4444 if you have any questions regarding this updated assessment on the St. John's site.

**APPENDIX F**

# TREE REPORT

# TREE REPORT

St. John's Episcopal Church
Oakland CA

**PREPARED FOR**

St. John's Episcopal Church
1770 Gouldin Road
Oakland CA 94611

**PREPARED BY**

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March 2009

# Tree Report
## St. John's Episcopal Church
## Oakland CA

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### Attachments


***Tree Survey Forms***

***Tree Survey Map***

## *Introduction and Overview*

St. John's Episcopal Church is planning to construct a new parking area, bridge, landscaping and other improvements as part of a Phase I development within the Montclair Village of the City of Oakland. Current site use includes an existing sanctuary, office, parking, landscaping, and a house located at 5928 Thornhill Drive. Temescal Creek borders the site on the west. There are existing trees on the site. HortScience, Inc. was asked to prepare a Tree Report as part of the approval process to the City of Oakland.

This report provides the following information:

1. A survey of trees within and adjacent to the proposed project area.
2. An evaluation of the condition of each tree included in the survey.
3. An assessment of the impacts of constructing the proposed project on the trees.
4. Guidelines for tree preservation during the design and construction phases of development for trees eligible for preservation.

## *Survey Methods*

Trees were surveyed on September 3 and 11, 2008. The survey included coast live oaks 4" and greater in diameter and other species 9" and larger in diameter. The survey procedure consisted of the following steps:

1. Identifying the tree as to species;
2. Tagging each tree with an identifying number or letter and recording its location on a map. The existing numbering system established by PGA Design Inc. was used;
3. Measuring the trunk diameter at a point 54" above grade;
4. Evaluating the health and structural condition using a scale of 1 – 5:
   - ***5*** - A healthy, vigorous tree, reasonably free of signs and symptoms of disease, with good structure and form typical of the species.
   - ***4*** - Tree with slight decline in vigor, small amount of twig dieback, minor structural defects that could be corrected.
   - ***3*** - Tree with moderate vigor, moderate twig and small branch dieback, thinning of crown, poor leaf color, moderate structural defects that might be mitigated with regular care.
   - ***2*** - Tree in decline, epicormic growth, extensive dieback of medium to large branches, significant structural defects that cannot be abated.
   - ***1*** - Tree in severe decline, dieback of scaffold branches and/or trunk; most of foliage from epicormics; extensive structural defects that cannot be abated;
5. Rating the suitability for preservation as "good", "moderate" or "poor". Suitability for preservation considers the health, age and structural condition of the tree, and its potential to remain an asset to the site for years to come.

   ***Good***: Trees with good health and structural stability that have the potential for longevity at the site.

   ***Moderate***: Trees with somewhat declining health and/or structural defects than can be abated with treatment. The tree will require more intense management and monitoring, and may have shorter life span than those in 'good' category.

   ***Poor*** : Tree in poor health or with significant structural defects that cannot be mitigated. Tree is expected to continue to decline, regardless of treatment. The species or individual may have characteristics that are undesirable for landscapes, and generally are unsuited for use areas.

## *Description of Trees*

One hundred fifty-five (155) trees were evaluated representing 32 species (Table 1, page 4). Descriptions of individual trees are found in the ***Tree Survey*** and locations are plotted on the ***Tree Survey Map*** (see Attachments). SIx (6) trees (#AL, BK, BL, CI, D and I) were off-site but were near the property line. One hundred thirty-eight (138) trees met the City's criteria for "Protected tree"; coast live oaks with a 4" diameter trunk or larger, and any tree with a 9" diameter trunk or larger.

The most frequently occurring species was coast live oak with 50 trees (32%). Plum with 16 trees (10%), coast redwood with 15 trees (10%), and apple with 11 trees (7%) were also present. The remaining 28 species were represented by five or fewer trees. The coast live oaks, coast redwoods, a bigleaf maple and a Fremont cottonwood are native to the Oakland area and maybe indigenous to the site. The remaining species were planted exotics. Tree size ranged from 4" to 67" diameter for single-trunked trees. Fifty-seven (57) trees had multiple trunks.

Coast live oaks were scattered throughout the site, but the majority were concentrated near the existing parking lot and entrance at Gouldin Rd. The oaks varied from young to mature in development. Condition was almost evenly divided between trees that were good and fair. Trees in good condition had good form and structure, and a full crown (photo 1). Trees that were fair were characterized by leans, thin canopies, suppressed form, and branch dieback. Trees in poor condition were in decline, had sparse canopies and more extensive branch dieback (photo 2).

**Photo 1**

**Photo 2**

**Photo 1, left.** Example of a coast live oak, (#J), in good condition.

**Photo 2, above.** Oaks mostly in fair-poor condition w/ lean, suppressed form and branch dieback due to tight spacing.

Coast redwoods were largely located on the 5928 Thornhill Dr. parcel, Temescal Creek, and the south side of the sanctuary building. Redwoods were semi-mature to mature in form and character, and were mostly in good condition (photo 3). Trees that were good had full crowns and good form. Some had multiple stems that arose several feet above ground that were fused together (photo 4). Trees in fair condition had narrow small crowns, suppressed form, and were either-side pruned or topped for utility lines. No redwoods were poor. Redwood #B was the largest tree surveyed with a 67" diameter trunk.

**Photo 3**. Redwood #E

**Photo 4**. Redwood #B

Plums and apples were present at 5928 Thornhill Dr. in an orchard-like planting (photo 4). The fruit trees were young to semi-mature in their growth. Plums were about evenly divided between trees in fair and poor condition. Trees in fair condition had thinning crowns, branch dieback, epicormic sprouts and included bark between attachments. Those in poor condition had poor form and structure, suppressed crowns, and greater branch dieback. Apples were largely in fair condition with an upright form, a low canopy, and included bark between attachments. Most showed symptoms of fireblight, a bacterial disease.

**Photo 4**

**Photo 4 above.** Mixed orchard of plums and apples in fair to poor condition.

Among the remaining species three significant trees stood out. All were in good condition.

- Deodar cedar #D was located offsite, near the property line west of the sanctuary. It had a 36" diameter trunk and a good pyramidal form that is characteristic of the species (photo 5).
- London plane #K was located east of Temescal Creek near the top of the bank. The plane tree had an open spreading form, high crown and a 27" diameter trunk.
- Canary Island pine #L was located south of the house at 5928 Thornhill Dr. It had good form and structure, full crown and a 32" diameter trunk (photo 6).

**Photo 5**. Deodar cedar #D

**Photo 6**. Canary Island pine #L

**Table 1: Condition ratings and frequency of occurrence of trees.**

| Common Name | Scientific Name | Condition Rating | | | No. of Trees |
|---|---|---|---|---|---|
| | | Good (4-5) | Fair (3) | Poor (1-2) | |
| Ovens wattle | *Acacia pravissma* | -- | 1 | -- | 1 |
| Bigleaf maple | *Acer macrophyllum* | -- | 1 | -- | 1 |
| Japanese maple | *Acer palmatum* | 1 | -- | -- | 1 |
| Red horse chestnut | *Aesculus x carnea* | 3 | -- | -- | 3 |
| Incense cedar | *Calocedrus decurrens* | 1 | 3 | 1 | 5 |
| Deodar cedar | *Cedrus deodara* | 1 | 1 | 1 | 3 |
| English hawthorn | *Crataegus laevigata* | -- | 2 | -- | 2 |
| Japanese cryptomeria | *Cryptomeria japonica* | -- | -- | 1 | 1 |
| Smooth cypress | *Cupressus glabra* | 1 | -- | -- | 1 |
| Monterey cypress | *Cupressus macrocarpa* | 1 | -- | -- | 1 |
| Loquat | *Eriobotrya japonica* | -- | 1 | -- | 1 |
| Hollywood juniper | *Juniperus chinensis* 'Torulosa' | 1 | -- | -- | 1 |
| Glossy privet | *Ligustrum lucidum* | -- | -- | 5 | 5 |
| Saucer magnolia | *Magnolia soulangeana* | 1 | -- | -- | 1 |
| Apple | *Malus domestica* | 3 | 8 | -- | 11 |
| Canary Island pine | *Pinus canariensis* | 1 | -- | -- | 1 |
| Monterey pine | *Pinus radiata* | -- | 7 | 1 | 8 |
| London plane | *Platanus x acerifolia* | 1 | -- | -- | 1 |
| Fremont cottonwood | *Populus fremontii* | 1 | 1 | -- | 2 |
| Cherry | *Prunus avium* | -- | 3 | 1 | 4 |
| Purple-leaf plum | *Prunus x blireiana* | -- | 1 | -- | 1 |
| Plum | *Prunus domestica* | -- | 6 | 10 | 16 |
| English laurel | *Prunus laurocerasus* | 1 | 3 | 1 | 5 |
| Douglas-fir | *Pseudotsuga menzies*ii | 1 | 2 | -- | 3 |
| Pyracantha | *Pyracantha coccinea* | -- | -- | 1 | 1 |
| Coast live oak | *Quercus agrifolia* | 17 | 22 | 11 | 50 |
| Coast redwood | *Sequoia sempervirens* | 10 | 5 | -- | 15 |
| Giant sequoia | *Sequoiadendron giganteum* | -- | *3* | -- | *3* |
| Irish yew | *Taxus baccata* 'Stricta' | *2* | -- | -- | *2* |
| American elm | *Ulmus americana* | -- | 3 | -- | 3 |
| Chinese elm | *Ulmus parvifolia* | -- | -- | 1 | 1 |
| Unknown | | -- | -- | 1 | 1 |
| **Total** | | **47** 30% | **73** 47% | **35** 23% | **155** 100% |

## *Suitability for Preservation*

Before evaluating the impacts that will occur during development, it is important to consider the quality of the tree resource itself, and the potential for individual trees to function well over an extended length of time. Trees that are preserved on development sites must be carefully selected to make sure that they may survive development impacts, adapt to a new environment and perform well in the landscape.

Our goal is to identify trees that have the potential for long-term health, structural stability and longevity. For trees growing in open fields, away from areas where people and property are present, structural defects and/or poor health presents a low risk of damage or injury if they fail. However, we must be concerned about safety in use areas. Therefore, where development encroaches into existing plantings, we must consider their structural stability as well as their potential to grow and thrive in a new environment. Where development will not occur, the normal life cycles of decline, structural failure and death should be allowed to continue.

Evaluation of suitability for preservation considers several factors:

- **Tree health**
  Healthy, vigorous trees are better able to tolerate impacts such as root injury, demolition of existing structures, changes in soil grade and moisture, and soil compaction than are non-vigorous trees.

- **Structural integrity**
  Trees with significant amounts of wood decay and other structural defects that cannot be corrected are likely to fail. Such trees should not be preserved in areas where damage to people or property is likely.

- **Species response**
  There is a wide variation in the response of individual species to construction impacts and changes in the environment. In our experience, for example, Fremont cottonwood and Monterey cypress have a poor tolerance to construction impacts. Monterey pine and incense cedar have a moderate tolerance to construction activities. Coast live oak and coast redwood have a good tolerance to site disturbance.

- **Tree age and longevity**
  Old trees, while having significant emotional and aesthetic appeal, have limited physiological capacity to adjust to an altered environment. Young trees are better able to generate new tissue and respond to change.

- **Species invasiveness**
  Species which spread across a site and displace desired vegetation are not always appropriate for retention. This is particularly true when indigenous species are displaced. Plum and glossy privet have the potential to spread across the site.

Each tree was rated for suitability for preservation based upon its age, health, structural condition and ability to safely coexist within a development environment (Table 2). We consider trees with good suitability for preservation to be the best candidates for preservation. We do not recommend retention of trees with poor suitability for preservation in areas where people or property will be present. Retention of trees with moderate suitability for preservation depends upon the intensity of proposed site changes.

**Table 2: Tree Suitability for Preservation**

| | |
|---|---|
| **Good** | These are trees with good health and structural stability that have the potential for longevity at the site. Thirty-two (32) trees were rated as having good suitability for preservation including 11 coast live oaks, 8 coast redwoods and 3 red horse chestnuts. |
| **Moderate** | Trees in this category have fair health and/or structural defects that may be abated with treatment. Trees in this category require more intense management and monitoring, and may have shorter life-spans than those in the "good" category. Seventy-two (72) trees were rated as having moderate suitability for preservation including 27 coast live oaks, 6 coast redwoods, 5 plums, 5 Monterey pines, 3 American elm and 3 incense cedars. |
| **Poor** | Trees in this category are in poor health or have significant defects in structure that cannot be abated with treatment. These trees can be expected to decline regardless of management. The species or individual tree may possess either characteristics that are undesirable in landscape settings or be unsuited for use areas. Fifty-one (51) trees were rated as having low suitability for preservation including 12 coast live oaks, 11 plum, 7 apple, 5 glossy privet and 3 Monterey pines. |

## *Evaluation of Impacts and Recommendations for Action*

Appropriate tree retention develops a practical match between the location and intensity of construction activities and the quality and health of trees. The ***Tree Survey Form*** was the reference point for tree condition and quality. Potential impacts from construction were evaluated using the Demolition, Site and Landscape Plans by PGD designs (August 8, 2008 and October 17, 2008), and the Grading, Drainage, Paving and Bridge plans by Sandis Engineers (September 2, 2007).

The plan depicted the proposed new parking area, bridge, utilities, landscaping and other improvements for the Phase I development. Tree locations, trunk elevations and driplines were shown on the plans.

Impacts to trees will occur in several ways. Demolition of existing site improvements such as the house, carport, concrete, and hidden features may damage both tree roots and crowns. Providing access for construction equipment may require pruning of tree crowns. Excavation and grading to construct the proposed parking area, bridge, utilities, and landscaping may damage tree roots both directly through mechanical injury, and indirectly by altering soil structure, drainage, and biology.

Potential impacts from construction were assessed for each tree. The most significant impacts to the trees would occur from the demolition, grading and construction for parking, the bridge, underground utilities, and hardscape.

Based upon my evaluation of the Plans, I recommend that 89 trees be considered eligible for preservation, eighty-one (81) of which were "Protected trees' (Table 3, next page). Three trees (#BH, DA and DK) are recommended for preservation, but have poor suitability for preservation. These trees are away from construction, proposed use areas and can be retained for screening value. Preservation of these trees is predicated on the impacts being within the tolerances of the trees and on the implementations of specific recommendations in the ***Tree Preservation Guidelines***. If the recommendations in the ***Tree Preservation Guidelines*** cannot be followed, or there are unexpected changes in construction related to grading, utility conflicts and location of improvements selected trees may require removal.

I recommend removal of the remaining sixty-five (65) trees including fifty-six (56) "Protected trees' (Table 3, next page). Forty-seven (47) trees (72%) would be removed because of their poor suitability for preservation. Good management practices would dictate selective tree removal to eliminate weaker trees, trees in poor condition and to reduce competition for more desirable trees. Nineteen (18) trees (28%) would be removed due to development impacts. Twenty-six (26) trees (40%) were fruit trees.

Six trees rated suitable for preservation had defects in their structure that warrant further evaluation. I recommend the following evaluation for the trees.

- Coast live oak #AO —Decay evaluation in lower trunk.
- Coast live oak #AU —Aerial inspection and decay evaluation in trunk.
- Monterey pines #DL, DM and DN —Consult with geotechnical engineer as trees may be in a slide area. There was evidence that at least one pine had uprooted and several had been removed. Based on discussion with engineer a decision can be made to remove the trees if soil is unstable, or preserve trees if soil is determined to be stable, pending an aerial inspection and root collar excavation.
- Coast live oak #F —Aerial inspection and decay evaluation in pruning wounds.
- Coast live oak #Q —Aerial inspection, decay evaluation in pruning wounds, and root collar excavation.

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| 1 | Incense cedar | 18,9,7,6 | Remove | Development impacts; Thornhill driveway. |
| 2 | Coast live oak | 11 | Remove | Poor suitability for preservation. |
| 3 | Incense cedar | 21 | Remove | Development impacts; Thornhill driveway. |
| 4 | Incense cedar | 18 | Remove | Poor suitability for preservation. |
| 5 | Douglas-fir | 20 | Remove | Development impacts; Thornhill parking. |
| 6 | Pyracantha | 7,2,2 | Remove | Poor suitability for preservation. |
| 7 | Bigleaf maple | 14,13 | Remove | Development impacts; Thornhill driveway and bridge. |
| 9 | Unknown | | Remove | Poor suitability for preservation; high stump. |
| 10 | Coast redwood | 12 | Remove | Development impacts; Thornhill bridge. |
| 11 | Plum | 10 | Remove | Development impacts; Thornhill bridge. |
| 12 | Plum | 10 | Remove | Poor suitability for preservation. |
| 15 | Cherry | 9 | Remove | Dead. |
| 20 | Incense cedar | 21,21 | Remove | Development impacts; Thornhill parking. |
| 21 | Hollywood juniper | 14 | Remove | Development impacts; Thornhill parking. |
| 24 | Deodar cedar | 13 | Remove | Poor suitability for preservation. |
| 25 | Plum | 10,6 | Remove | Poor suitability for preservation. |
| 26 | English laurel | 8,6,5 | Remove | Poor suitability for preservation. |
| 27 | American elm | 16 | Remove | Development impacts; Thornhill driveway. |
| 28 | American elm | 15 | Remove | Development impacts; Thornhill driveway. |
| 29 | American elm | 14 | Remove | Development impacts; Thornhill driveway. |
| 30 | Plum | 6,5 | Remove | Poor suitability for preservation. |
| 31 | Plum | 8,4.4 | Remove | Poor suitability for preservation. |
| 32 | Apple | 5,4 | Remove | Development impacts; landscape treatment. |
| 33 | Apple | 4,4,4 | Remove | Poor suitability for preservation. |
| 34 | Apple | 6,3,3 | Remove | Poor suitability for preservation. |
| 35 | Apple | 3,3,3 | Remove | Poor suitability for preservation. |
| 36 | Apple | 6,3 | Remove | Poor suitability for preservation. |
| 37 | Cherry | 4,4,4 | Remove | Development impacts; in pathway. |

(continued, next page)

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| 38 | Plum | 4,2 | Remove | Poor suitability for preservation. |
| 39 | Loquat | 5,3 | Remove | Development impacts; landscape treatment. |
| 40 | Plum | 4,3,2,2,2 | Remove | Poor suitability for preservation. |
| 41 | Plum | 7,4 | Remove | Development impacts; Thornhill parking. |
| 42 | Apple | 5,4,3 | Remove | Development impacts; Thornhill driveway. |
| 43 | Plum | 4,4,3,3 | Remove | Poor suitability for preservation. |
| 44 | Plum | 6,3 | Remove | Poor suitability for preservation. |
| 45 | Apple | 5,4,3 | Remove | Poor suitability for preservation. |
| 46 | Apple | 6,5 | Remove | Development impacts; Thornhill parking. |
| 47 | Apple | 8,8,6,6 | Remove | Poor suitability for preservation. |
| 48 | Apple | 10,7,6,4 | Remove | Development impacts; Thornhill parking. |
| 49 | Apple | 5,3,2 | Remove | Poor suitability for preservation. |
| 50 | Monterey pine | 20 | Remove | Poor suitability for preservation. |
| 51 | Coast live oak | 8 | Remove | Poor suitability for preservation. |
| 52 | Coast live oak | 7 | Remove | Poor suitability for preservation. |
| 53 | Hawthorne | 4,4 | Remove | Poor suitability for preservation. |
| 54 | Plum | 9 | Remove | Poor suitability for preservation. |
| 55 | Monterey pine | 15 | Remove | Poor suitability for preservation. |
| 56 | Plum | 9,8 | Remove | Poor suitability for preservation. |
| 57 | Glossy privet | 3,3,2,2,2 | Remove | Poor suitability for preservation. |
| 58 | Glossy privet | 3,3,3,2,2,2,2 | Remove | Poor suitability for preservation. |
| 59 | Glossy privet | 3,3,2,2 | Remove | Poor suitability for preservation. |
| 60 | Glossy privet | 7,6 | Remove | Poor suitability for preservation. |
| 61 | Chinese elm | 7 | Remove | Poor suitability for preservation. |
| 62 | Hawthorne | 6 | Remove | Poor suitability for preservation. |
| 63 | Glossy privet | 4,3,2,2 | Remove | Poor suitability for preservation. |
| 64 | Coast live oak | 4 | Remove | Poor suitability for preservation. |
| 65 | Coast live oak | 6 | Remove | Poor suitability for preservation. |
| 66 | Coast live oak | 10,6 | Remove | Poor suitability for preservation. |
| 67 | Coast live oak | 5,5 | Remove | Poor suitability for preservation. |
| 68 | Coast live oak | 8 | Remove | Poor suitability for preservation. |
| 69 | Coast live oak | 5 | Remove | Poor suitability for preservation. |
| 70 | Coast live oak | 7 | Remove | Poor suitability for preservation. |
| 71 | Crytomeria | 13 | Remove | Poor suitability for preservation. |
| 72 | Monterey pine | 28 | Remove | Poor suitability for preservation. |
| 73 | Douglas-fir | 20 | Remove | Poor suitability for preservation. |
| 74 | Coast live oak | 10 | Remove | Poor suitability for preservation. |
| 75 | Coast live oak | 14 | Preserve | Development impacts; west of existing parking lot. |

(continued, next page)

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| A | Coast redwood | 42 | Preserve | Located north of circular driveway. |
| AA | Coast live oak | 14 | Preserve | Located on slope east of circular driveway. |
| AC | Coast live oak | 15 | Preserve | Located on slope east of existing parking. |
| AF | Coast live oak | 15 | Preserve | Located on slope east of existing parking. |
| AG | Coast live oak | 11 | Preserve | Located on slope east of existing parking. |
| AI | Coast live oak | 10,6 | Preserve | Located on slope east of existing parking. |
| AJ | Coast live oak | 8 | Preserve | Located on slope east of existing parking. |
| AK | Coast live oak | 7 | Preserve | Located on slope east of existing parking. |
| AL | Coast live oak | 20 | Preserve | Located offsite west of sanctuary. |
| AN | Coast live oak | 10 | Preserve | Located on slope east of existing parking. |
| AO | Coast live oak | 24,20,20 | Preserve | Located west of existing parking. |
| AP | Coast live oak | 10,9 | Preserve | Located west of existing parking. |
| AR | Coast live oak | 9 | Preserve | Located on slope east of existing parking. |
| AT | Coast live oak | 19 | Preserve | Located west of existing parking. |
| AU | Coast live oak | 28 | Preserve | Located next to sanctuary, east side. |
| AV | Red horse chestnut | 17 | Preserve | Located near sanctuary, east side. |
| AW | Red horse chestnut | 20 | Preserve | Located near sanctuary, east side. |
| AX | Red horse chestnut | 9 | Preserve | Located near sanctuary, east side. |
| AY | Coast live oak | 15 | Preserve | Located between sanctuary and parking, east side. |
| AZ | Cherry | 7,4 | Preserve | Located between sanctuary and parking, east side. |
| B | Coast redwood | 67 | Preserve | Located north of circular driveway. |
| BB | Saucer magnolia | 6,6,6,4,3 | Preserve | Located between sanctuary and parking, east side. |
| BD | Coast redwood | 36 | Preserve | Located north of Thornhill parking near pathway. |
| BE | Cherry | 9 | Preserve | Located south of Thornhill parking. |

(continued, next page)

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| BG | English laurel | 8,6,6 | Preserve | Located north of Thornhill parking and bridge. |
| BH | English laurel | 6 | Preserve | Poor suitability for preservation; saved for screening; north of Thornhill parking and bridge. |
| BI | English laurel | 8,8 | Preserve | Located north of Thornhill parking near pathway. |
| BJ | English laurel | 9,7,7,6,5,5,4,4,4,3 | Preserve | Located north of Thornhill parking near pathway. |
| BK | Coast live oak | 19 | Preserve | Located west of existing parking. |
| BL | Purple leaf plum | 16 | Preserve | Located west of existing parking. |
| BR | Coast redwood | 32 | Preserve | Located west of Temescal Creek. |
| BV | Douglas-fir | 14 | Preserve | Located next to sanctuary, west side. |
| BW | Plum | 9,5 | Preserve | Located west of sanctuary near existing parking. |
| BX | Plum | 10,8,8 | Preserve | Located west of sanctuary near existing parking area. |
| BY | Japanese maple | 10,9 | Preserve | Located next to sanctuary, west side. |
| C | Coast redwood | 26 | Preserve | Located north of circular driveway. |
| CA | Plum | 6,5 | Preserve | Located on slope east of existing parking. |
| CB | Monterey pine | 24 | Preserve | Located east of Temescal Creek. |
| CC | Monterey pine | 27 | Preserve | Located east of Temescal Creek. |
| CD | Giant sequoia | 19 | Preserve | Located east of Temescal Creek. |
| CE | Giant sequoia | 30 | Preserve | Located east of Temescal Creek. |
| CF | Giant sequoia | 7 | Preserve | Located east of Temescal Creek. |
| CG | Fremont cottonwood | 15 | Preserve | Located east of Temescal Creek. |
| CH | Monterey cypress | 18 | Preserve | Located north of Thornhill entrance. |
| CI | Incense cedar | 18 | Preserve | Located offsite north of Thornhill entrance. |
| CL | Coast live oak | 5 | Preserve | Located on slope east of existing parking. |
| CM | Ovens wattle | 10 | Preserve | Located on slope east of existing parking. |
| CN | Coast live oak | 20,18 | Preserve | Located on slope east of existing parking. |
| CP | Coast live oak | 14,14,12 | Preserve | Located on slope east of existing parking. |

(continued, next page)

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| CQ | Coast live oak | 10 | Preserve | Located on slope east of existing parking. |
| CT | Coast live oak | 13 | Preserve | Located on slope east of existing parking. |
| CU | Coast live oak | 8 | Preserve | Located on slope east of existing parking. |
| CV | Coast live oak | 10 | Preserve | Located on slope east of existing parking. |
| CW | Coast live oak | 6 | Preserve | Located on slope east of existing parking. |
| CZ | Coast live oak | 10 | Preserve | Located on slope east of existing parking. |
| D | Deodar cedar | 36 | Preserve | Located offsite west of sanctuary near existing parking. |
| DA | Coast redwood | 40,18,14,13,11,10,7 | Preserve | Poor suitability for preservation; saved for screening; located under utility lines Gouldin Rd. |
| DB | Coast live oak | 8 | Preserve | Located near Gouldin Rd. |
| DC | Coast live oak | 12,6 | Preserve | Located at entrance from Gouldin Rd. |
| DD | Coast live oak | 9 | Preserve | Located at Gouldin Rd. entrance. |
| DE | Coast live oak | 22 | Preserve | Located near Gouldin Rd. |
| DF | Coast live oak | 8 | Preserve | Located west of entrance from Gouldin Rd. |
| DG | Coast live oak | 8,3 | Preserve | Located west of entrance from Gouldin Rd. |
| DH | Plum | 5,5,5 | Preserve | Located west of entrance from Gouldin Rd. |
| DI | Coast live oak | 9 | Preserve | Located west of entrance from Gouldin Rd. |
| DJ | Coast live oak | 16,13 | Preserve | Located on slope south of sanctuary and existing parking. |
| DK | Coast live oak | 6 | Preserve | Poor suitability for preservation; saved for screening; located on slope south of sanctuary and existing parking. |
| DL | Monterey pine | 27 | Preserve | Located on slope south of sanctuary and existing parking. |
| DM | Monterey pine | 27 | Preserve | Located on slope south of sanctuary and existing parking. |
| DN | Monterey pine | 11 | Preserve | Located on slope south of sanctuary and existing parking. |

(continued, next page)

**Table 3: Recommended action. St. John's Episcopal Church. Oakland CA.**

| Tree # | Species | Trunk Diameter (in.) | Action | Comments |
|---|---|---|---|---|
| DO | Irish yew | 9 | Preserve | Located south of Thornhill parking. |
| DP | Coast live oak | 21 | Preserve | Located west of circular driveway. |
| E | Coast redwood | 32 | Preserve | Located west of circular driveway. |
| F | Coast live oak | 25 | Preserve | Located north of Thornhill parking and pathway. |
| H | Coast redwood | 61 | Preserve | Located north of Thornhill parking near pathway. |
| I | Irish yew | multi | Preserve | Located offsite west of sanctuary near existing parking. |
| J | Coast live oak | 35 | Preserve | Located north of Thornhill parking near pathway. |
| K | London plane | 27 | Preserve | Located north of Thornhill parking and bridge. |
| L | Canary Island pine | 32 | Preserve | Located south of Thornhill parking. |
| M | Fremont cottonwood | 36 | Preserve | Located east of Temescal Creek and south of bridge. |
| N | Deodar cedar | 16 | Preserve | Located east of Temescal Creek and south of bridge. |
| O | Coast redwood | 22,7 | Preserve | Located west of Temescal Creek and south of bridge. |
| P | Coast redwood | 27 | Preserve | Located west of Temescal Creek and south of bridge. |
| Q | Coast live oak | 23 | Preserve | Located south of Thornhill parking. |
| T | Coast redwood | 28 | Preserve | Located west of Temescal Creek. |
| U | Coast redwood | 15 | Preserve | Located west of Temescal Creek. |
| V | Coast redwood | 30 | Preserve | Located west of Temescal Creek. |
| X | Coast redwood | 56 | Preserve | Located south of Thornhill parking. |
| Y | Smooth cypress | 7 | Preserve | Located on slope east of existing parking. |

## *Tree Preservation Guidelines*

The goal of tree preservation is not merely tree survival during development but maintenance of tree health and beauty for many years. Trees retained on sites that are either subject to extensive injury during construction or are inadequately maintained become a liability rather than an asset. The response of individual trees will depend on the amount of excavation and grading, the care with which demolition is undertaken, and the construction methods. Coordinating any construction activity inside the **TREE PROTECTION ZONE** can minimize these impacts.

The following recommendations will help reduce impacts to trees from development and maintain and improve their health and vitality through the clearing, grading and construction phases.

**Design recommendations**

1. **Tree Preservation Guidelines**, prepared by the Consulting Arborist, should be included on all plans.

2. Any changes to the plans affecting the trees should be reviewed by the consulting arborist with regard to tree impacts. These include, but are not limited to, improvement plans, utility and drainage plans, grading plans, lighting, landscape and irrigation plans, and demolition.

3. Sheets L1-1 &2-1 Site and Planting Plan, and C2.1 Grading, Drainage and Paving Plan:
   a. Tree #A, B, C, E, H, F, J, K, L, M, N, Q, T, U, V, X, AO, AP, AT, BK, BR, CB, CC, CD, CE, CF, CG, CH, DP—Eliminate planting and irrigation within 10' of trees.
   b. Tree #O—Bridge foundation and piers, driveway and walkway should be at least 9' north and west of tree.
   c. Tree #X—Maintain existing grade within dripline of tree. Transition grade with use of pier and grade beam retaining wall with beam just above existing grade. Locate wall no closer than dripline.
   d. Tree #BD and H—Construct pathway on top of existing grade or limit depth of excavation to a maximum of 4" below existing grade
   e. Tree #BE and DO—Eliminate planting and irrigation within 5' of tree.
   f. Tree #BI—Reduce width of DG pathway to maximum 5'. Construct pathway on top of existing grade or limit depth of excavation to a maximum of 4" below existing grade.
   g. Tree #BV—Relocate accent tree a minimum of 10' south of #BV.
   h. Tree #BY—Keep concrete walkway at least 3' south of trunk.
   i. Tree #CH—Keep driveway at least 10' south of trunk.
   j. Tree #DP—Maintain edge of circular driveway no closer then 7' east of trunk and 10' south of trunk. Transition grade with use of pier and grade beam retaining wall

with beam just above existing grade. Eliminate fill soil and maintain existing grade within planting area between driveway and pathway.

k. Bridge—Design the foundation, structural members and piers with the least amount of soil disturbance to reduce impacts on trees.

l. Lighting—Bollard lights and down lights in trees were shown on the plans. Keep bollard lights, splice boxes and conduits 10' from existing trees where possible. Consider changing down lights in trees to up lights or bollard lights to reduce impacts (eg. root system and attachment to trunk) to trees.

4. All grading shall be withheld to outside the **TREE PROTECTION ZONE** (next page). Minor grading by hand to provide proper drainage, for landscaping and walkways may be acceptable, if approved by the Consulting Arborist. Design grading plan so that water drains away from the trunk.

5. Design the Thornhill Dr. driveway and parking area (Sheet C4.1 pervious pavement detail #6) to require the minimum amount of cuts and fills to reduce impacts to tree roots. Scarification of subgrade to a minimum depth of 12" was shown. Consider the use of geotextile fabric to possibly reduce grading, scarification and amount of compaction.

6. Design the utility plan (eg. wet and dry utilities, electrical, including irrigation, low voltage wiring and landscape lighting) such that they are located outside the **TREE PROTECTION ZONE** (next page), to the extent possible. Specify by note on the plans the following: if roots 2" and larger are encountered leave the root in place and thread pipe under the roots; roots less then 2" in diameter may be pruned clean and square at undamaged tissue.

7. Design walkways within the dripline so that no excavation into the existing grade is required, if possible. Walkway and base material shall be placed on top of existing grade. Consider the use of geotextile fabric under the walk to avoid compacting the soil.

8. Design new irrigation system so no irrigation lines or components (eg. controller, water meter, backflow, valve boxes, wires, heads or quick coupler) are located within 10' of the trunk to the extent possible. Where components must be installed 10' from the trunk but within the dripline dig the trench by hand, air or water excavation. If roots 2" and larger are encountered leave the root in place and thread pipe under the roots; roots less then 2" in diameter may be pruned clean and square at undamaged tissue Design the system to avoid wetting within 10' from the trunk to the extent possible.

9. Specify by note on the plans the following: a rototiller or trencher shall not be used within 10' of the trunk of an existing tree; rototilling or trenching 10' from the tree to edge of dripline shall be limited to a depth of 12".

10. **TREE PROTECTION ZONE** shall be established around each tree. No grading, excavation, construction, or storage of materials shall occur within the **TREE PROTECTION ZONE**, except as noted above for certain improvements (eg. walkways, fine hand grading, landscaping, and irrigation). No underground services including utilities, sub-drains, water or sewer shall be placed in the **TREE PROTECTION ZONE**, except as approved for selected utilities. Spoil from trench, footing, utility or other excavation shall not be placed within the **TREE PROTECTION ZONE**, either temporarily or permanently.
The limits of the **TREE PROTECTION ZONE** will be adjusted following design changes. The tree protection zones shall be defined as follows.

    a. #M, N, P, BE, BG, BH, BL, DB, DC, DF, DG, DH, DO— dripline on all sides.
    b. #A, B, C—edge of existing planter. After demolition expand fence to edge of new planter.
    c. #D—10' east, 20' north and south.
    d. #E—20' west, 17' east, 10' south, 13' north to fence.
    e. #F—20' west and east, 15' south, fence on north.
    f. #H—20' west, east and south, 8' north to fence.
    g. #I, BW, BX—edge of existing paving on east.
    h. #J—30' west and east, 9' south, fence on north.
    i. #K—20' west and east, 10' south, 13' to property line on north.
    j. #L—20' on west, east and north; fence on south.
    k. #O—10' north and dripline on all other sides.
    l. #Q—15' north of existing fence.
    m. #T, U, V, BR, CD, CE, CF,CG—property line on north.
    n. #X, BD—20' on all sides.
    o. #AA, AC, AF, AG, AI, AJ, AK, AN, AR, CA, CL, CM, CN, CP, CQ, CT, CU, CV, CW, CZ—edge of existing paving on west and north.
    p. #AL— existing fence on south.
    q. #AO, AP, AT, BK—edge of existing paving on east, south and north.
    r. #AU, AV, AW, DA— no tree protection required.
    s. #AY, AZ, BB, DD, DE, DI— dripline or edge of proposed paving.
    t. #AX—dripline on south.
    u. #BI, BJ—new pathway on south, dripline on all other sides.
    v. #BV—10' south and edge of new walkway on west.
    w. #BY—3' south, dripline on all other sides.
    x. #CH—15' west and east, 10' north and south.
    y. #CI—north edge of the existing gravel driveway.
    z. #DJ, DK, DL, DM, DN—existing retaining wall on west.
    aa. #DP—23' west, 8' east, 20' north and 10' south.

    *Note*: During demolition and construction **TREE PROTECTION ZONES** may need to be temporarily modified to accommodate construction activities. Where trees are clustered together create one continuous **TREE PROTECTION ZONE**. This will

improve tree protection by eliminating cut through traffic between trees, and will be less expensive then individually fencing each tree.

11. As trees withdraw water from the soil, expansive soils may shrink within the root area. Therefore, foundations, footings and pavements on expansive soils near trees should be designed to withstand differential displacement.

12. All trees—do not lime soil within 50' of trees. Lime is toxic to tree roots.

13. Any herbicides placed under paving materials must be safe for use around trees and labeled for that use.

**Pre-construction treatments and recommendations**

1. The construction superintendent shall meet with the Consulting Arborist before beginning work to discuss work procedures and tree protection fencing.

2. Fence all trees to be retained to completely enclose the **TREE PROTECTION ZONE** prior to demolition, grubbing or grading. Fences shall be 6 ft. chain link fence on posts driven into the ground. Fences are to remain until all grading, construction and landscaping is completed. We suggest placing weather proof signs on the fencing that read **"TREE PROTECTION ZONE KEEP OUT"** (eg. one sign every 50-75' for trees fenced as a group, and one sign for each of the four compass points for single trees).

3. Some off-site private trees may require pruning for clearance for construction equipment. Pruning offsite trees should be done with the property owner's permission. Prune trees to provide clearance for demolition and construction, clean the crown to 1" diameter branches and reduce the weight at the end of heavy branches, especially on trees located next to the existing parking areas, as required. Any crown raising shall be minimal and approved by the Consulting Arborist. All pruning shall be done by a State of California Licensed Tree Contractor (C61/D49). All pruning shall be done by Certified Arborist or Certified Tree Worker in accordance with the Best Management Practices for Pruning (International Society of Arboriculture, 2002) and adhere to the most recent editions of the American National Standard for Tree Care Operations (Z133.1) and Pruning (A300).

4. Tree(s) to be removed that have branches extending into the canopy of tree(s) to remain shall be removed by a Certified Arborist or Certified Tree Worker and not by the demolition contractor. The Certified Arborist or Certified Tree Worker shall remove the trees in a manner that causes no damage to the tree(s) and understory to remain.

5. Remove all ivy from tree trunks and remove it for a minimum distance of 5' form base of trunk. The work shall be done hand to avoid injuring the trunk tissue.

6. Apply and maintain a 4-6"-deep layer of wood chip mulch (gorilla hair mulch is not acceptable) within the **TREE PROTECTION ZONE** of trees. Keep mulch 2-3' from the trunk.

**Recommendations for tree protection during construction**

1. No grading, excavation, construction or storage of materials shall occur within that **TREE PROTECTION ZONE** unless approved and monitored by the Consulting Arborist. No underground services including utilities, sub-drains, water, sewer or irrigation shall be

placed in the **TREE PROTECTION ZONE** unless approved and monitored by the Consulting Arborist. Spoil from trench, footing, utility or other excavation shall not be placed within the **TREE PROTECTION ZONE**, either temporarily or permanently. Any modifications must be approved and monitored by the Consulting Arborist.

2. All demolition, grading and construction within the dripline of trees shall be done using the smallest equipment possible. The Consulting Arborist will identify where hand grading will be required. The equipment shall operate perpendicular to the tree and operate from outside the **TREE PROTECTION ZONE**. Motorized compaction equipment shall not be used within the **TREE PROTECTION ZONE**.

3. Prior to excavation for the grading or construction trees may require root pruning outside the **TREE PROTECTION ZONE** by cutting all roots cleanly to the depth of construction. Roots will be exposed by either: pulling soil away from the tree with a small back hoe; digging by hand; using an air spade; or water evacuation. The Consulting Arborist should monitor the excavation and root pruning. Roots shall be pruned at undamaged tissue and perpendicular to the root, with a saw or other approved root pruning equipment. The Consulting Arborist will identify in the field where root pruning is to occur, if required.

4. Prior to renovation of the asphalt parking areas the trunks of selected trees (eg. A-C, BB, AZ, DA-DE, DH, DI, DP and possible others) may require protection. Stack bales of hay on the construction side of the tree to keep falling debris from damaging the trunk. Stack bales to a height of 6-8'. The Consulting Arborist will identify in the field where the bales will be used and at what height depending on the construction activity.

5. All construction, landscaping and irrigation work within the **TREE PROTECTION ZONE** of trees shall be done by hand unless approved and monitored by the Consulting Arborist.

6. Supplemental irrigation shall be applied as determined by the Consulting Arborist. The coast redwood trees located in the existing parking area and at 5928 Thornhill Dr. will require regular irrigation during the construction period

7. If injury should occur to any tree during construction, it should be evaluated as soon as possible by the Consulting Arborist so that appropriate treatments can be applied.

8. No excess soil, chemicals, debris, equipment or other materials shall be dumped or stored within the **TREE PROTECTION ZONE**.

9. Any additional tree pruning needed for clearance during construction must be performed by a Certified Arborist and not by construction personnel.

**Maintenance of impacted trees**
Trees preserved at the St. John's site will experience physical environment different from that pre-development. As a result, tree health and structural stability should be monitored. Occasional pruning, fertilization, mulch, pest management, replanting and irrigation may be required. In addition, provisions for monitoring both tree health and structural stability following construction must be made a priority. As trees age, the likelihood of failure of branches or entire trees increases. Therefore, annual inspection for hazard potential is recommended.

**HortScience, Inc.**

Michael D. Santos
Certified Arborist #WC-3877
Registered Consulting Arborist #430

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 1 | Incense cedar | 18,9,7,6 | Yes | 3 | Moderate | Codominant at base with included bark between trunks; thin crown; small trunks with suppressed crowns. |
| 2 | Coast live oak | 11 | Yes | 2 | Poor | Tree in decline; thin crown; trunk leans south; branch dieback. |
| 3 | Incense cedar | 21 | Yes | 3 | Moderate | Narrow upright form; thin high crown. |
| 4 | Incense cedar | 18 | Yes | 2 | Poor | High crown bows over house; high potential to fail; remove tree. |
| 5 | Douglas-fir | 20 | Yes | 4 | Good | Good form and structure; full high crown. |
| 6 | Pyracantha | 7,2,2 | Yes | 2 | Poor | Suppressed crown; branch dieback; large shrub form. |
| 7 | Bigleaf maple | 14,13 | Yes | 3 | Moderate | Codominant at 2'; 14" stem bows west; twig dieback. |
| 9 | Unknown | | No | 0 | Poor | High stump with ivy. |
| 10 | Coast redwood | 12 | Yes | 3 | Moderate | High thin crown; top of creek. |
| 11 | Plum | 10 | Yes | 3 | Poor | Branch dieback; branch failures; epicormic sprouts; top of creek. |
| 12 | Plum | 10 | Yes | 2 | Poor | Trunk engulfed in ivy; epicormic sprouts. |
| 15 | Cherry | 9 | Yes | 0 | Poor | Dead. |
| 20 | Incense cedar | 21,21 | Yes | 3 | Moderate | Codominant at base with included bark between trunks; full crown; stems maybe separating. |
| 21 | Hollywood juniper | 14 | Yes | 4 | Moderate | Crown flat on north; trunk growing into porch. |
| 24 | Deodar cedar | 13 | Yes | 1 | Poor | Trunk and crown engulfed in ivy; small crown; |
| 25 | Plum | 10,6 | Yes | 2 | Poor | Codominant at 6' with included bark between attachments. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 26 | English laurel | 8,6,5 | Yes | 3 | Poor | Partial root failure; trunk leans north; low crown. |
| 27 | American elm | 16 | Yes | 3 | Moderate | High crown; branch failures; trunks engulfed in ivy. |
| 28 | American elm | 15 | Yes | 3 | Moderate | High crown; branch failures; trunks engulfed in ivy. |
| 29 | American elm | 14 | Yes | 3 | Moderate | High crown; branch failures; trunks engulfed in ivy. |
| 30 | Plum | 6,5 | Yes | 1 | Poor | Poor form and structure; suppressed crown. |
| 31 | Plum | 8,4.4 | Yes | 2 | Poor | Extensive sprouting; included bark between attachments. |
| 32 | Apple | 5,4 | Yes | 3 | Moderate | Trunks divide at 3' with included bark; upright form; low crown; fireblight. |
| 33 | Apple | 4,4,4 | Yes | 3 | Poor | Trunks divide at 1' with included bark; upright form; low crown; fireblight. |
| 34 | Apple | 6,3,3 | Yes | 3 | Poor | Partial root failure; trunk leans west low crown; fireblight. |
| 35 | Apple | 3,3,3 | Yes | 3 | Poor | Trunks divide at ground with included bark; upright form; fireblight. |
| 36 | Apple | 6,3 | Yes | 3 | Poor | Suppressed crown; crown bows southwest; fireblight. |
| 37 | Cherry | 4,4,4 | Yes | 3 | Moderate | Trunks divide at 1' with included bark; upright narrow form; twig dieback. |
| 38 | Plum | 4,2 | No | 2 | Poor | Trunks stem from base with included bark between attachments; twig dieback. |
| 39 | Loquat | 5,3 | No | 3 | Moderate | Previously topped; full crown; trunks stem from base within included bark. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 40 | Plum | 4,3,2,2,2 | Yes | 1 | Poor | Thin crown; extensive branch dieback. |
| 41 | Plum | 7,4 | Yes | 3 | Moderate | Good form and structure; crown somewhat thin; branch dieback. |
| 42 | Apple | 5,4,3 | Yes | 3 | Moderate | Trunks divide at 2'; upright form; low crown; fireblight. |
| 43 | Plum | 4,4,3,3 | Yes | 2 | Poor | Trunks stem from base with included bark between attachments; twig dieback. |
| 44 | Plum | 6,3 | Yes | 2 | Poor | Crown leans west; trunks stem from base with included bark between attachments; twig |
| 45 | Apple | 5,4,3 | Yes | 2 | Poor | Partial root failure; trunk leans west; suppressed crown. |
| 46 | Apple | 6,5 | Yes | 3 | Moderate | Upright form; twig dieback; fireblight. |
| 47 | Apple | 8,8,6,6 | Yes | 2 | Poor | Tree in decline; extensive branch dieback. |
| 48 | Apple | 10,7,6,4 | Yes | 3 | Moderate | Trunks divide at 2'; good form; low crown; 4" west facing stem was dead; fireblight. |
| 49 | Apple | 5,3,2 | Yes | 2 | Poor | Tree in decline; extensive branch dieback. |
| 50 | Monterey pine | 20 | No | 3 | Poor | Codominant at 18' with included bark; high potential to fail; crown somewhat thin; chlorotic needles. |
| 51 | Coast live oak | 8 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 52 | Coast live oak | 7 | Yes | 2 | Poor | Suppressed crown in grove; crook in trunk at 4'. |
| 53 | Hawthorne | 4,4 | No | 3 | Poor | Poor form and structure; tree leans west. |
| 54 | Plum | 9 | Yes | 2 | Poor | Topped at 7'; extensive sprouting; included bark between attachments. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 55 | Monterey pine | 15 | No | 2 | Poor | Poor narrow form; crook in trunk; ivy on trunk. |
| 56 | Plum | 9,8 | Yes | 2 | Poor | Extensive branch dieback; included bark between attachments. |
| 57 | Glossy privet | 3,3,2,2,2 | Yes | 2 | Poor | Trunks stem from base; shrub form. |
| 58 | Glossy privet | 3,3,3,2,2,2,2 | Yes | 2 | Poor | Trunks stem from base; shrub form. |
| 59 | Glossy privet | 3,3,2,2 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 60 | Glossy privet | 7,6 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 61 | Chinese elm | 7 | No | 2 | Poor | Poor form and structure; large trunk wound. |
| 62 | Hawthorne | 6 | No | 3 | Poor | Narrow upright form; branch failure; trunk wound on east. |
| 63 | Glossy privet | 4,3,2,2 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 64 | Coast live oak | 4 | Yes | 1 | Poor | Suppressed crown in grove. |
| 65 | Coast live oak | 6 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 66 | Coast live oak | 10,6 | Yes | 2 | Poor | Trunk divides at 2' with included bark; decay in 6" trunk; trunk and crown leans north; suppressed form. |
| 67 | Coast live oak | 5,5 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |

HORTSCIENCE TREE SURVEY

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**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 68 | Coast live oak | 8 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 69 | Coast live oak | 5 | Yes | 2 | Poor | Suppressed crown in grove; trunk leans north; branch dieback. |
| 70 | Coast live oak | 7 | Yes | 2 | Poor | Suppressed crown in grove; upright form; branch dieback. |
| 71 | Crytomeria | 13 | Yes | 2 | Poor | Tree in decline; narrow form. |
| 72 | Monterey pine | 28 | No | 3 | Poor | Poor form; one-sided crown; branch dieback. |
| 73 | Douglas-fir | 20 | Yes | 3 | Poor | Poor form; crook in trunk at 40'; one sided crown. |
| 74 | Coast live oak | 10 | Yes | 3 | Poor | Suppressed crown to west; tree bows over parking lot . |
| 75 | Coast live oak | 14 | Yes | 3 | Moderate | Trunk and crown leans west over parking lot. |
| A | Coast redwood | 42 | Yes | 4 | Good | Good form and structure; full crown. |
| AA | Coast live oak | 14 | Yes | 3 | Moderate | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| AC | Coast live oak | 15 | Yes | 4 | Good | Good form and structure; crown somewhat thin. |
| AF | Coast live oak | 15 | Yes | 3 | Moderate | Tree leans west towards parking lot; good form and structure; crown somewhat thin. |
| AG | Coast live oak | 11 | Yes | 3 | Moderate | Good form; branch dieback; suppressed crown in grove. |
| AI | Coast live oak | 10,6 | Yes | 3 | Moderate | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| AJ | Coast live oak | 8 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| AK | Coast live oak | 7 | Yes | 3 | Moderate | Suppressed crown in grove; trunk leans north; branch dieback. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| AL | Coast live oak | 20 | Yes | 4 | Good | Untagged and offsite; good form and structure; crown extended 24' south from edge of property into project site. |
| AN | Coast live oak | 10 | Yes | 3 | Moderate | Trunk and crown leans north; branch dieback. |
| AO | Coast live oak | 24,20,20 | Yes | 3 | Moderate | Trunks divide at 1.5'; cavity in trunk at attachments; decay in pruning wound; two stems over house and rear yard with heavy weight; epicormic sprouts. |
| AP | Coast live oak | 10,9 | Yes | 3 | Moderate | Trunk divides at 1'; crook in-trunk. |
| AR | Coast live oak | 9 | Yes | 3 | Moderate | Suppressed crown; thin crown. |
| AT | Coast live oak | 19 | Yes | 4 | Moderate | Good form; trunk divides at 15'; decay in pruning wounds. |
| AU | Coast live oak | 28 | Yes | 3 | Moderate | Trunk divides at 15' into two stems; decay in pruning wound; crown somewhat thin; branch on east propped with steel post. |
| AV | Red horse chestnut | 17 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well; raised concrete. |
| AW | Red horse chestnut | 20 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well; raised concrete. |
| AX | Red horse chestnut | 9 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well. |
| AY | Coast live oak | 15 | Yes | 4 | Good | Good young tree; remove 5"-stem with included bark. |
| AZ | Cherry | 7,4 | Yes | 3 | Moderate | Overtopped by BB; thin crown; branch dieback. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| B | Coast redwood | 67 | Yes | 4 | Good | Good form; full crown; trunk divides into multiple stems at 5' with included bark; trunks fused together. |
| BB | Saucer magnolia | 6,6,6,4,3 | Yes | 4 | Good | Trunks stem from base; good form; full crown. |
| BD | Coast redwood | 36 | Yes | 4 | Good | Good form; full crown; codominant at 6' with trunks fused together. |
| BE | Cherry | 9 | Yes | 3 | Moderate | Trunks divide at 4'; twig dieback; crown somewhat thin. |
| BG | English laurel | 8,6,6 | Yes | 4 | Good | Trunks stem from base; upright form; full crown. |
| BH | English laurel | 6 | No | 2 | Poor | Partial root failure; suppressed crown. |
| BI | English laurel | 8,8 | Yes | 3 | Moderate | Trunk divides at 3' with wide attachment; low crown. |
| BJ | English laurel | 9,7,7,6,5,5,4,4,4,3 | Yes | 3 | Moderate | Partial root failure; trunks stem from base; some trunks on ground. |
| BK | Coast live oak | 19 | Yes | 4 | Good | Offsite; codominant at 5'; good form; crown somewhat thin; canopy extends east over parking lot 23'. |
| BL | Purple leaf plum | 16 | Yes | 3 | Moderate | Offsite; branch dieback; epicormic sprouts; canopy extends to edge of parking lot. |
| BR | Coast redwood | 32 | Yes | 4 | Moderate | Narrow crown; side pruned for utility line; top of creek. |
| BV | Douglas-fir | 14 | Yes | 3 | Moderate | High crown, first branch at 20'; 3' from church building. |
| BW | Plum | 9,5 | Yes | 3 | Moderate | Extensive sprouting; included bark between attachments. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| BX | Plum | 10,8,8 | Yes | 3 | Moderate | Trunks stem from base; extensive sprouting; included bark between attachments. |
| BY | Japanese maple | 10,9 | Yes | 4 | Good | Trunks stem from base; full crown; branches touch at 4'. |
| C | Coast redwood | 26 | Yes | 3 | Moderate | Narrow upright form; suppressed crown on |
| CA | Plum | 6,5 | Yes | 3 | Moderate | Good upright form; twig dieback. |
| CB | Monterey pine | 24 | No | 3 | Moderate | Thin crown; branch dieback. |
| CC | Monterey pine | 27 | No | 3 | Moderate | Thin crown; branch dieback; ivy on trunk; top of creek. |
| CD | Giant sequoia | 19 | Yes | 3 | Moderate | Good form and structure; crown somewhat thin; browning needles; ivy on trunk. |
| CE | Giant sequoia | 30 | Yes | 3 | Moderate | Suppressed crown on creek side; crown somewhat thin; browning needles; ivy on trunk. |
| CF | Giant sequoia | 7 | No | 3 | Moderate | One sided form; browning needles; top of creek. |
| CG | Fremont cottonwood | 15 | Yes | 3 | Moderate | Codominant at 35' with wide attachment; branch dieback; ivy on trunk. |
| CH | Monterey cypress | 18 | Yes | 5 | Good | Excellent form and structure; full low crown. |
| CI | Incense cedar | 18 | Yes | 4 | Good | Untagged and offsite; full crown; codominant at 10' with included bark between attachment. |
| CL | Coast live oak | 5 | Yes | 3 | Moderate | Good form; suppressed crown in grove; branch dieback. |
| CM | Ovens wattle | 10 | Yes | 3 | Moderate | Good form; thin crown; branch dieback; suppressed crown in grove. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
**1770 Gouldin Road**
Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| CN | Coast live oak | 20,18 | Yes | 3 | Moderate | Trunk divides at 2' with included bark; trunk and crown leans north; suppressed form. |
| CP | Coast live oak | 14,14,12 | Yes | 4 | Moderate | Trunks divides at 2'; good form; tree under utility lines. |
| CQ | Coast live oak | 10 | Yes | 3 | Moderate | Trunk and crown leans east; suppressed form. |
| CT | Coast live oak | 13 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| CU | Coast live oak | 8 | Yes | 3 | Moderate | Suppressed crown in grove; trunk leans north; branch dieback. |
| CV | Coast live oak | 10 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| CW | Coast live oak | 6 | Yes | 3 | Moderate | Suppressed crown in grove; upright form; branch dieback. |
| CZ | Coast live oak | 10 | Yes | 3 | Moderate | Upright form; high crown; in grove; branch dieback. |
| D | Deodar cedar | 36 | Yes | 4 | Moderate | Offsite; narrow form; codominant at 30'; two stems touch at 33'; branch failure. |
| DA | Coast redwood | 40,18,14,13,1,10,7 | Yes | 3 | Poor | Topped; wide crown; under utility lines. |
| DB | Coast live oak | 8 | Yes | 4 | Moderate | Good young tree; codominant at 18'; under utility lines. |
| DC | Coast live oak | 12,6 | Yes | 4 | Moderate | Good young tree; trunks stem from base; under utility lines. |
| DD | Coast live oak | 9 | Yes | 4 | Good | Good young tree; codominant at 15'. |
| DE | Coast live oak | 22 | Yes | 4 | Moderate | Good form; trunk divides at 5'; corner of Goulidn Rd. and driveway; under utility lines. |
| DF | Coast live oak | 8 | Yes | 4 | Good | Good young tree; codominant at 6'; remove small stem. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
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Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| DG | Coast live oak | 8,3 | Yes | 4 | Good | Good young tree; full crown; codominant at 6' with included bark. |
| DH | Plum | 5,5,5 | Yes | 3 | Moderate | Multiple attachments at 2'; branch dieback. |
| DI | Coast live oak | 9 | Yes | 5 | Good | Good young tree; excellent form and structure. |
| DJ | Coast live oak | 16,13 | Yes | 4 | Moderate | Good form; full crown; trunk divides at 1' with included bark; seam below attachment. |
| DK | Coast live oak | 6 | Yes | 2 | Poor | Poor form; lost central leader; suppressed crown. |
| DL | Monterey pine | 27 | No | 3 | Moderate | High crown; trunk leans north; weight heavier on north. |
| DM | Monterey pine | 27 | No | 3 | Moderate | High crown; crown bows southeast; weight heavier on southeast; ivy on trunk. |
| DN | Monterey pine | 11 | No | 3 | Moderate | Young tree; crook in trunk at 30'. |
| DO | Irish yew | 9 | Yes | 4 | Moderate | Oval form; full crown. |
| DP | Coast live oak | 21 | Yes | 4 | Good | Good form; codominant at 6' with included bark; ivy on trunk. |
| E | Coast redwood | 32 | Yes | 5 | Good | Excellent form and structure; full low crown. |
| F | Coast live oak | 25 | Yes | 4 | Good | Good form; decay in pruning wound on south; cable north facing stem towards carport. |
| H | Coast redwood | 61 | Yes | 4 | Good | Good form; codominant at 6-10' with several stems fused together; full crown. |
| I | Irish yew | multi | Yes | 4 | Good | Offsite; eight stems 7" and under; trunks divide at 2'; full crown. |
| J | Coast live oak | 35 | Yes | 4 | Good | Good form and structure; northwest facing scaffold horizontal and heavy; large pruning wound on south was closed. |

HORTSCIENCE TREE SURVEY

**St. John's Episcopal Church**
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Oakland, CA
September 3 & 11, 2008

| TREE No. | SPECIES | SIZE DIAMETER (in inches) | PROTECTED TREE? | CONDITION 1=POOR 5=EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| K | London plane | 27 | Yes | 4 | Good | Open spreading form; high crown; top of creek. |
| L | Canary Island pine | 32 | Yes | 4 | Good | Good form and structure; full crown; ivy on trunk. |
| M | Fremont cottonwood | 36 | Yes | 4 | Moderate | High crown; branch failures; ivy on trunk. |
| N | Deodar cedar | 16 | Yes | 3 | Moderate | Thin crown; branch dieback; at top of creek. |
| O | Coast redwood | 22,7 | Yes | 4 | Moderate | Narrow crown; side pruned for utility line. |
| P | Coast redwood | 27 | Yes | 3 | Moderate | Narrow small crown; side pruned for utility line. |
| Q | Coast live oak | 23 | Yes | 3 | Moderate | Topped; trunk leans northwest touching wood shed; cavity in pruning wound on west; trunk maybe in fill soil. |
| T | Coast redwood | 28 | Yes | 4 | Good | Narrow crown; side of creek. |
| U | Coast redwood | 15 | Yes | 3 | Moderate | Narrow suppressed crown; side of creek. |
| V | Coast redwood | 30 | Yes | 4 | Good | Good form; full crown; side of creek. |
| X | Coast redwood | 56 | Yes | 4 | Good | Good form; full crown; codominant at 50'; consider removing one of the codominant trunks. |
| Y | Smooth cypress | 7 | No | 4 | Good | Good young tree. |

Gouldin Road
Alhambra Lane
Thornhill Drive
Monument Line
Centerline
Gravel Driveway
Asphalt
Concrete
House
Patio
Deck
Carport
Church
Shed
Barn
Concrete Wall
Rock Wall
Storm Drain Easement
2 - Story Building
A.C. Berm
Water Well
Chain Link Fence
Wood Fence
Redwood Hedge
Oak Tree Canopy
STUMP
S63°25'05"E 144.79
S63°43'18"E 60.00
S26°36'52"E 105.00
S85°00'48"E 47.85
N63°25'05"W 144.79
N26°36'52"W 105.00
S63°25'05"E 398.59
N18°37'32"E 34.64
S62°24'39"E 98.19
N25°37'28"E 20.00
S25°37'28"E 609.16
S64°22'39"E 813.64
S64°22'39"E 1013.64
S64°22'39"E 1083.40
S64°22'39"E 1029.40
S63°43'18"E 661.26
S85°00'48"E 607.78
S85°00'48"E 612.22
S63°25'05"E 601.91
S63°25'05"E 612.84
S63°25'05"E 610.88
S63°25'05"E 1393.00
S63°25'05"E 1398.59
S63°25'05"E 1049.40
S63°25'05"E 1028.40
S63°25'05"E 1108.40
S63°25'05"E 1133.40
S63°25'05"E 1083.40
S63°25'05"E 1029.40
S63°25'05"E 1013.40
S63°25'05"E 1049.40
S63°25'05"E 1028.40
S63°25'05"E 1108.40
S63°25'05"E 1133.40
set 1i ip LS4583
set nail and tag LS4583
set 5/8 rb LS4583
set nail and tag LS4583
set 60d+tg
set 1i ip LS4583
set 1i ip LS4583
set 1i ip LS4583

**APPENDIX G**

# HYDROLOGY

- Bridge Design Review, June 28, 2007
- Hydrology Report, May 3, 2010
- Peer Review Comments on Hydrology Report, May 18, 2010

# MEMORANDUM

Kamman Hydrology & Engineering, Inc.
7 Mt. Lassen Drive, Suite B-250, San Rafael, CA 94903
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: Greg@KHE-Inc.com

Date: June 28, 2007

To: Sara Sutton, DCE

From: Greg Kamman

Subject: Bridge Design Review: St. Johns Episcopal Church, Oakland, CA

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You've requested that I review available project plans and comment on the suitability of the preliminary bridge design for the St. Johns Episcopal Church in Oakland, California. I have obtained and reviewed the project design sheets with focused review of the following: A1.1 and S1 (both dated November 1, 2006 but revised June 15, 2007); Sheet L1-1 dated November 1, 2006; and the preliminary creek grading plan (received June 28, 2007). I have not completed a comprehensive hydraulic analysis incorporating the preliminary bridge design and creek realignment grading plan. However, based on the findings from previous hydraulic modeling analyses completed for existing conditions (see attached report dated December 27, 2004) and a preliminary creek alignment alternative (see attached report dated July 20, 2005), I believe it is feasible to construct a project bridge that will not adversely impact existing flood hazards upstream or downstream of the project site. Please note that although several cross-sections are labeled the same in the attached reports (e.g., XS-1), these sections do not correlate between reports and represent completely different and unrelated creek cross-sectional profiles.

Based on previous hydraulic modeling analyses of Temescal Creek through the project area, the following assumptions, design criteria and pertinent findings were made with respect to the current preliminary bridge crossing design.

- We assume the bridge is to be designed to safely pass a flood flow having a 100-year recurrence interval.

- The simulated maximum 100-year flood water surface elevation at the bridge location is no higher than 598-feet in elevation under existing channel geometry. Assuming 2-feet of freeboard, this equates to a minimum bridge bottom elevation of 600-feet.

- The current bridge design indicates that the proposed free-spanning bridge decking and roadway are at least 2-feet above the 100-year flood water level.

- Design drawings also indicate that bridge footings are outside of and above the 100-year flood water surface.

- Simulation results indicate that realigning and/or widening the creek per prior realignment/widening alternatives will effectively reduce water surface elevations at the bridge site as compared to existing conditions. At a minimum, we do not expect flood water surface elevations to increase above existing and comparable flood levels at the bridge in response to any proposed creek realignment work identified on the design drawings.

- We strongly recommend that a hydraulic analysis be completed on the final creek realignment and bridge design to confirm that the bridge and creek corridor will function as desired as well as fine-tune final bridge installation elevations.

Kamman Hydrology & Engineering, Inc.
101 Lucas Valley Road, Suite 120, San Rafael, CA 94903
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: info@KammanHydrology.com

December 27, 2004

Sarah Sutton
Wolfe Mason Associates/Design, Community & Environment
1600 Shattuck Ave., Suite 222
Berkeley, CA 94709

Subject: Survey and Hydraulic Analysis of St. Johns Property Project
Temescal Creek, Oakland, CA

Dear Sarah:

This letter presents the results of the December 13, 2004 survey and subsequent hydraulic analysis of the portion of Temescal Creek that flows through the St. Johns Episcopal Church Property (the Site) that is slated for bridge construction. The purpose and objective of this report is two-fold and includes; a) to provide the necessary hydrologic analysis to satisfy the technical requirements of the City of Oakland's Creek Protection Ordinance, and b) to assist in background analyses that will assist with the design the St. Johns property bridge. Included within this letter report are the survey and field methods, results of field observations and existing channel observations, and hydrologic analysis results.

**Field Methods**

A total of six channel cross-sections and one longitudinal channel profile were surveyed at the Site on December 13, 2004. Cross-sectional and longitudinal profile locations are indicated on the attached site plan (Figure 1). Six cross-sections (X-Sections 1 through 6) were completed downstream of the culvert that crosses under the tenant driveway accessing Thornhill Drive (the driveway borders the Eastern end of the St. Johns property). A 196-foot longitudinal profile of the channel thalweg[1] was completed centered on the upstream culvert (Figures 2-7).

To complete cross-sections, a measuring tape was stretched horizontally between monuments on either side of the channel and floodplain, perpendicular to the local channel alignment. End points were located to capture the full extent of floodplain/terrace features. Station distances were measured in feet from the left bank[2] end point. Vertical leveling was completed at intervals along each cross-section using a TOPCON-brand auto-level and staff rod. Intervals were selected to capture breaks in slope and important channel morphologic features along each cross-section and the longitudinal profile. All surveys were completed on a common vertical datum but not tied into any standard vertical control (e.g., NAVD83).

**Results of Field Surveys and Existing Channel Observations**

Cross-sectional and longitudinal profiles are presented in Figures 2 through 7. The horizontal and vertical scales on these plots (except for the long profile) are consistent to aid in the comparison between cross-sections. X-Sections 2 and 3 exhibit a lower bank terrace on the right hand bank of the Creek with an elevation of 3-6 feet below the upper right hand bank.

[1] A channel thalweg is defined as a line connecting the lowest (deepest) points along a streambed.
[2] The left bank is the channel bank on an observer's left-hand side as they face in a downstream direction.

Based on these field observations, channel bank/bed stability can be summarized as follows:

- The bed and bank materials are a mix of mud-stone and aggregate clay materials;
- Due to the above-mentioned soil structure, the observed lower terraced bank may be a result of soil slump;
- Near vertical bank sections were observed in X-Sections 1, 4 and 5 signifying an unstable and erosion prone right bank; and
- A tree fall below X-Section 3 was observed and acts as a flow control structure, likely increasing erosion during high flow events.

Although observations are provided here, design and engineering of the proposed bridge by a qualified geotechnical consultant are recommended in order to accurately define the properties of the soils and technical feasibility of bridge construction at this site.

**Hydraulic Modeling Results**

Pursuant to the City of Oakland's Creek Protection Ordinance-Hydrology Report requirements, the profile data obtained in the stream survey was used to model flood flow through the stream reach using the Army Corp of Engineers HEC-RAS modeling suite. The flood flows used were cited or derived from the Federal Emergency Management Agency (FEMA) Flood Insurance study (FIS) of September 30,1982, Community-Panel Number 065048 0020. The values (flow expressed in cubic feet per second – CFS) are presented in the table below:

**Table 1: FEMA Flood Analysis for Temescal creek**

| | *5-year* | *10-year* | *25-year* | *50-year* | *100-year* |
|---|---|---|---|---|---|
| Flow (CFS) | 150* | 180 | 300* | 380 | 520 |

* Extrapolated from FEMA values

Water surface profiles for the 5-, 10-, 25-,50- and 100-year flood events were calculated for Temescal creek for each X-Section along the longitudinal profile. These results are plotted in Figures 2 through7, 9 and 10. Simulation results indicate overtopping of the culvert and driveway (Figure 10) during 10-year and higher flows. Unfortunately, due to property access denial, survey measurements of the stream channel upstream of the culvert were not possible during the survey of December 13, 2004. However, based on review of standard culvert capacity curves for a 4-foot diameter pipe, the maximum culvert flow capacity is approximated at 180-CFS with 12-feet of backwater behind the bridge structure. Therefore, it is reasonable to expect that overtopping may occur during the 10-year (and greater) flood events. A summary of assumptions and limitations of the hydraulic analysis follow.

- Due to non-accessibility of the upstream side of the culvert bridge on the eastern portion of the St. Johns Property, stream channel X-Sections and longitudinal profiles are unknown - estimates based on field observations were used for model geometry of this approach reach.

- For flows equal to or under the 10-year flood, the dimensions of the culvert were used in the hydraulic model.

- For flows over the 10-year flood, the current estimated upstream culvert dimensions result in an overtopping of the bridge, thus the driveway acts as weir on Temescal creek during these flow events.

- As a result of the upstream channel unknowns, the model was also run with the culvert bridge removed for the 25-, 50- and 100-year flows in order to predict the most conservative water surface elevation along the property reach with unimpeded storm flows.

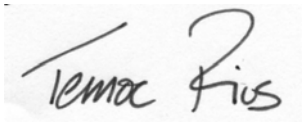
The simulated water surface profiles indicated on Figures 2 through 7 indicate the areas inundated by 100-year and lesser flood flows. This information can be used to locate bridge footings that will lie outside of the 100-year flood zone and active creek channel, eliminating changes in existing flow conditions and channel conveyance. Based on these design assumptions, it appears from Figures 2 and 3 (X-sections that bound the proposed bridge location) that a minimum 30-foot bridge span will be required to avoid impacting the existing 100-year flood capacity.

In conclusion, work presented in this letter characterizes the "pre-development/work" conditions required by the City's Hydrology Report. We anticipate that the next step in the project design and permitting process will be the engineering design of the bridge. Once a preferred project design is selected, we will finalize the required "post-project/work" analyses and descriptions of potential impacts, bank stability and other mitigation measures, if needed.

If you have any questions, please do not hesitate to call.

Sincerely,

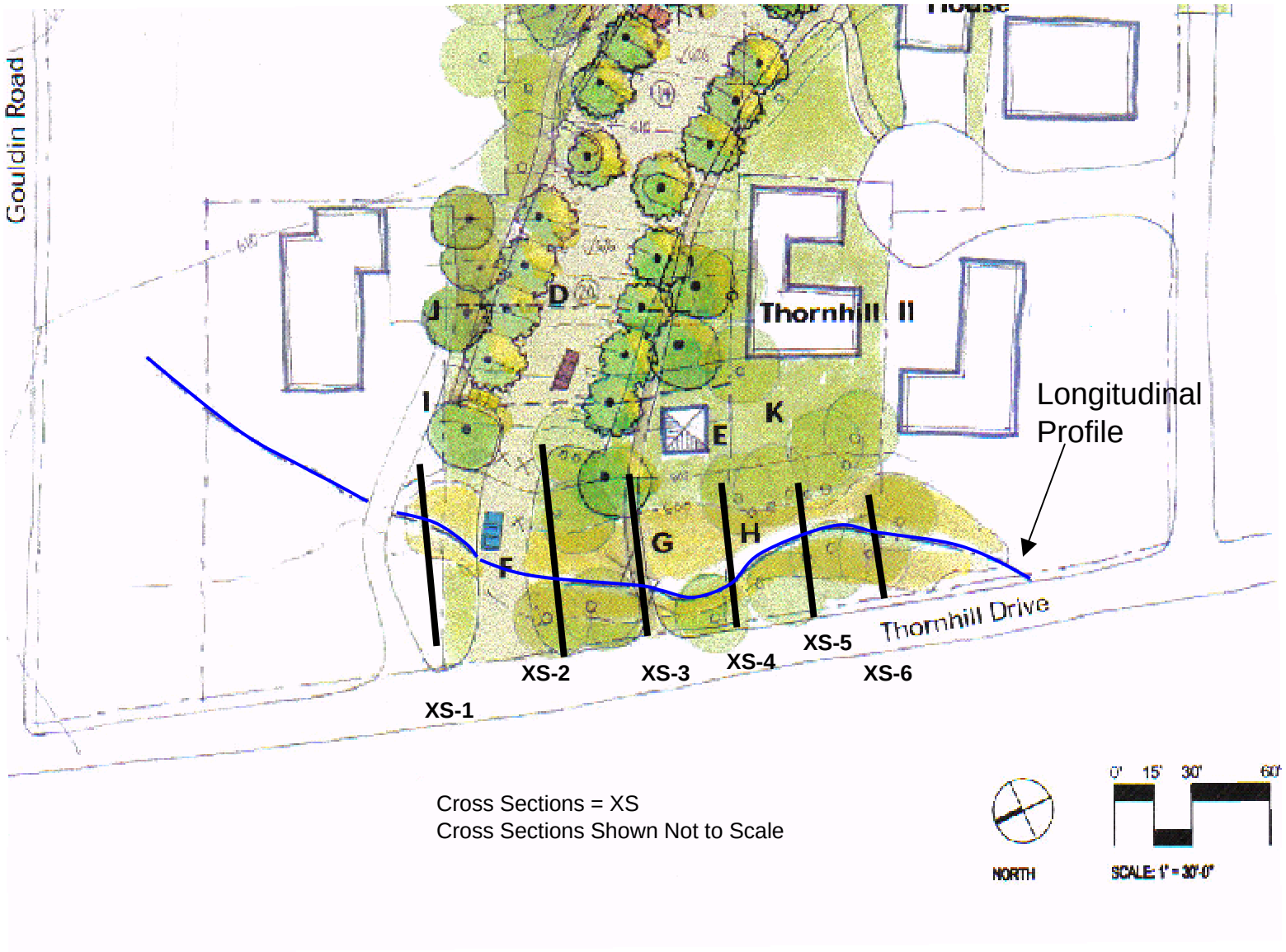
Greg Kamman
Principal Hydrologist



Temoc Rios
Hydraulic Engineer

Attachments:
Exhibit A: Site Plan, Figures 1-10

CC: John Seals, Davidson & Seals Architects



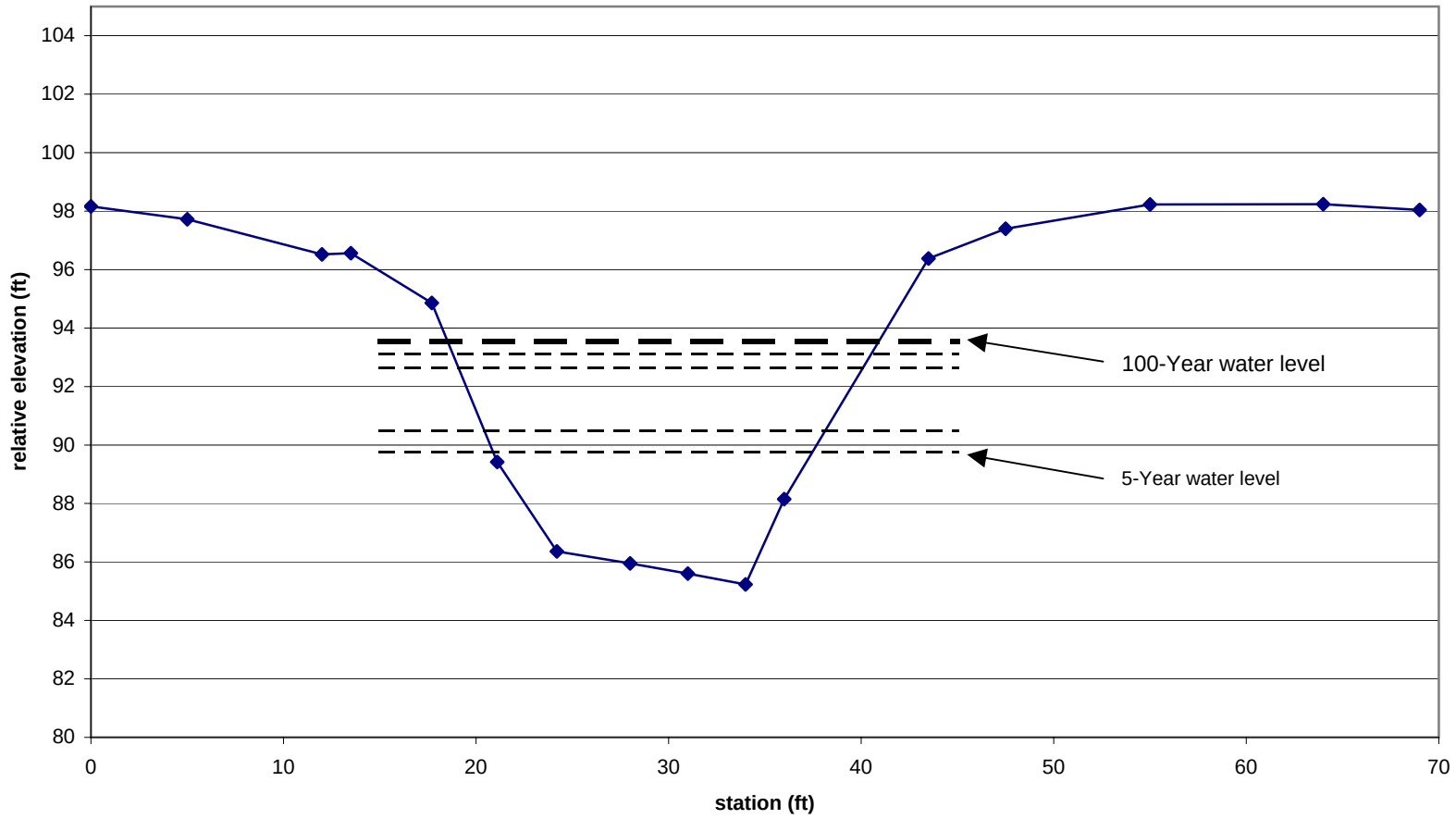

Kamman Hydrology & Engineering, Inc.

# Site Plan With Cross Sections

## Temescal Creek, at St Johns Property, Oakland, CA

Figure 1

xsections_survey121304.xls,Figure 1

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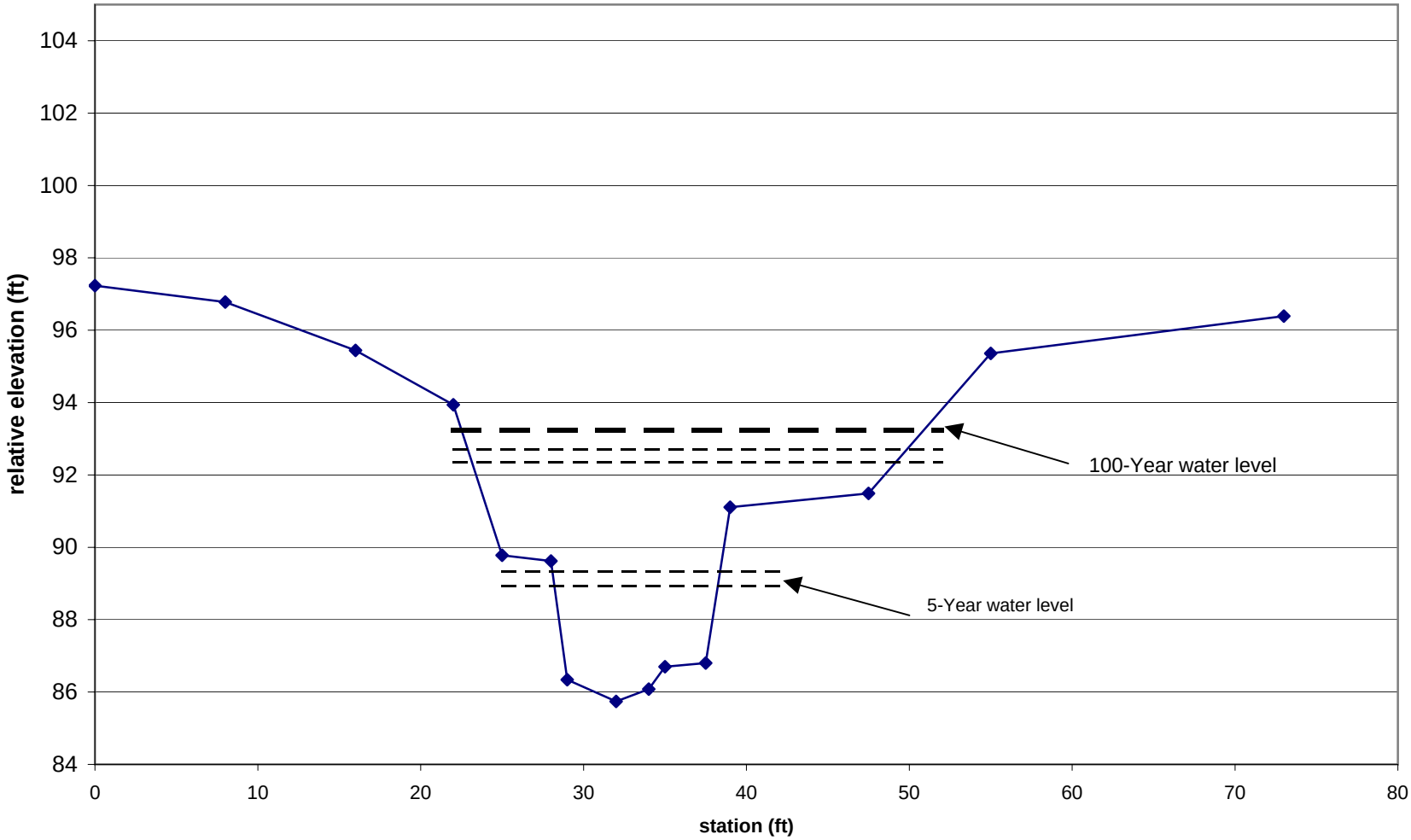
Ground Surface Elevation: Cross-Section 1

Temescal Creek, at St Johns Property, Oakland, CA

FIGURE

2

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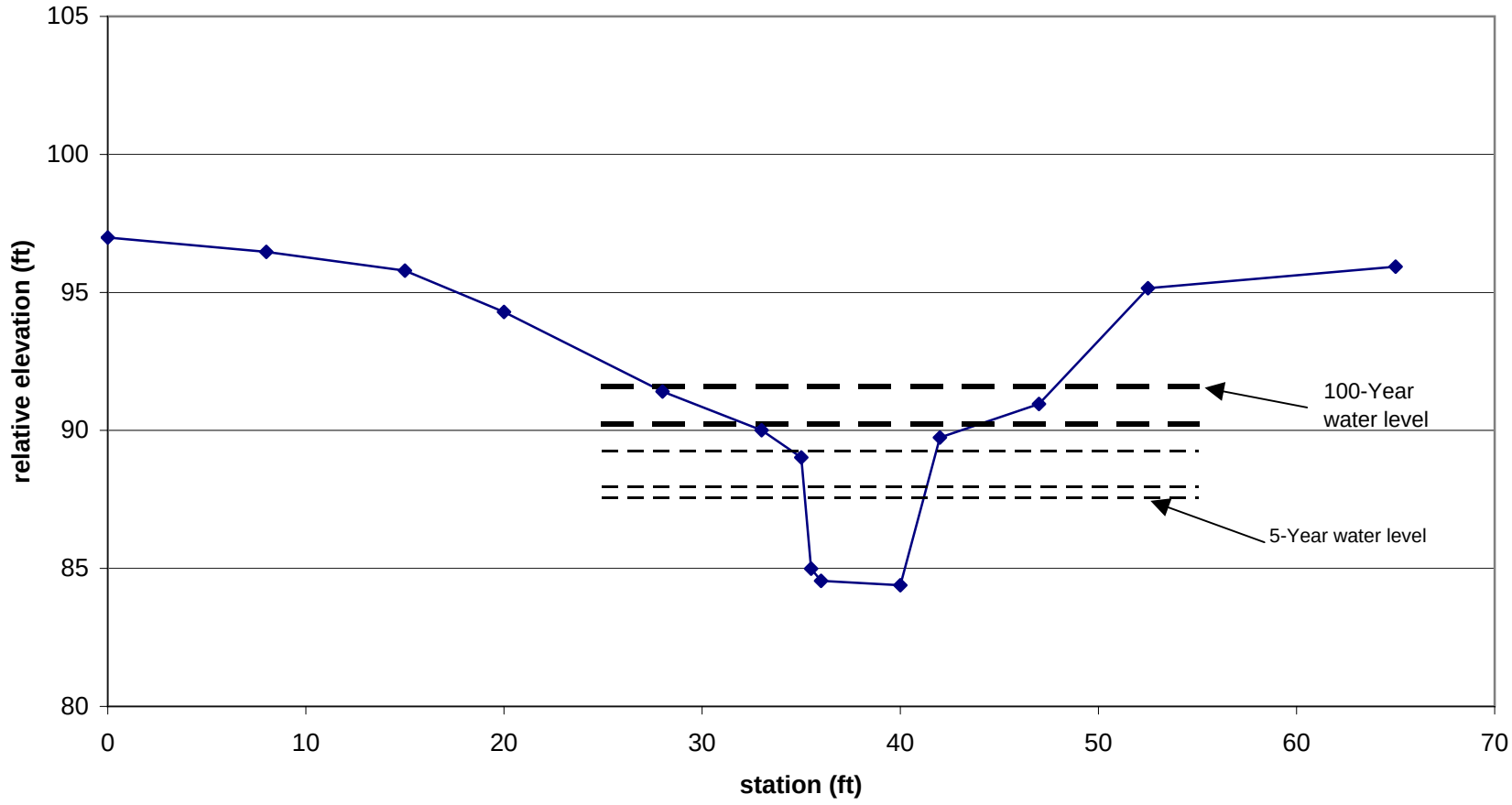
# Ground Surface Elevation: Cross-Section 2
# Temescal Creek, at St Johns Property, Oakland, CA

FIGURE 3

xsections_survey121304.xls,Figure 3

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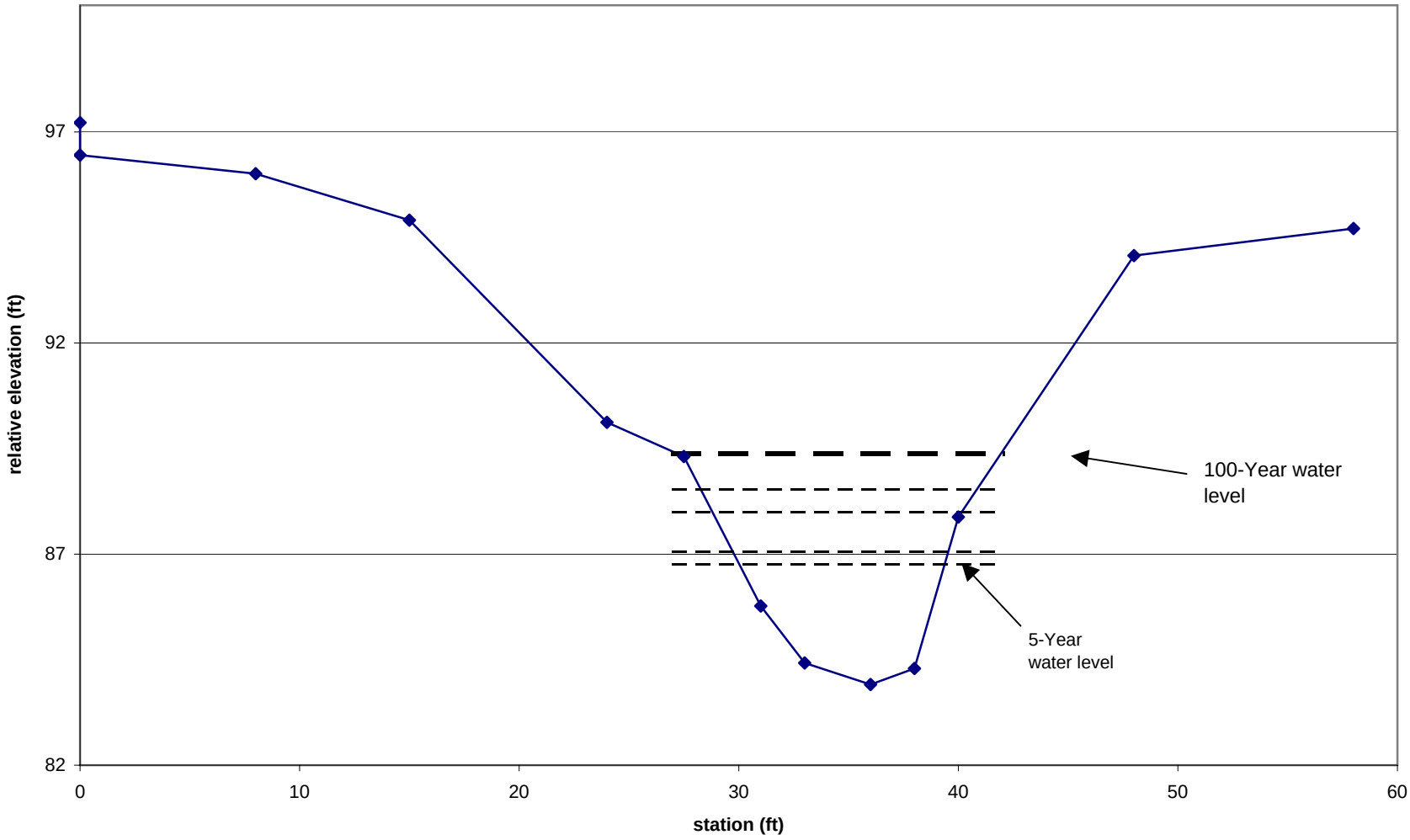
& Engineering, Inc.

Ground Surface Elevation: Cross-Section 3
Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
4

xsections_survey121304.xls,Figure 4

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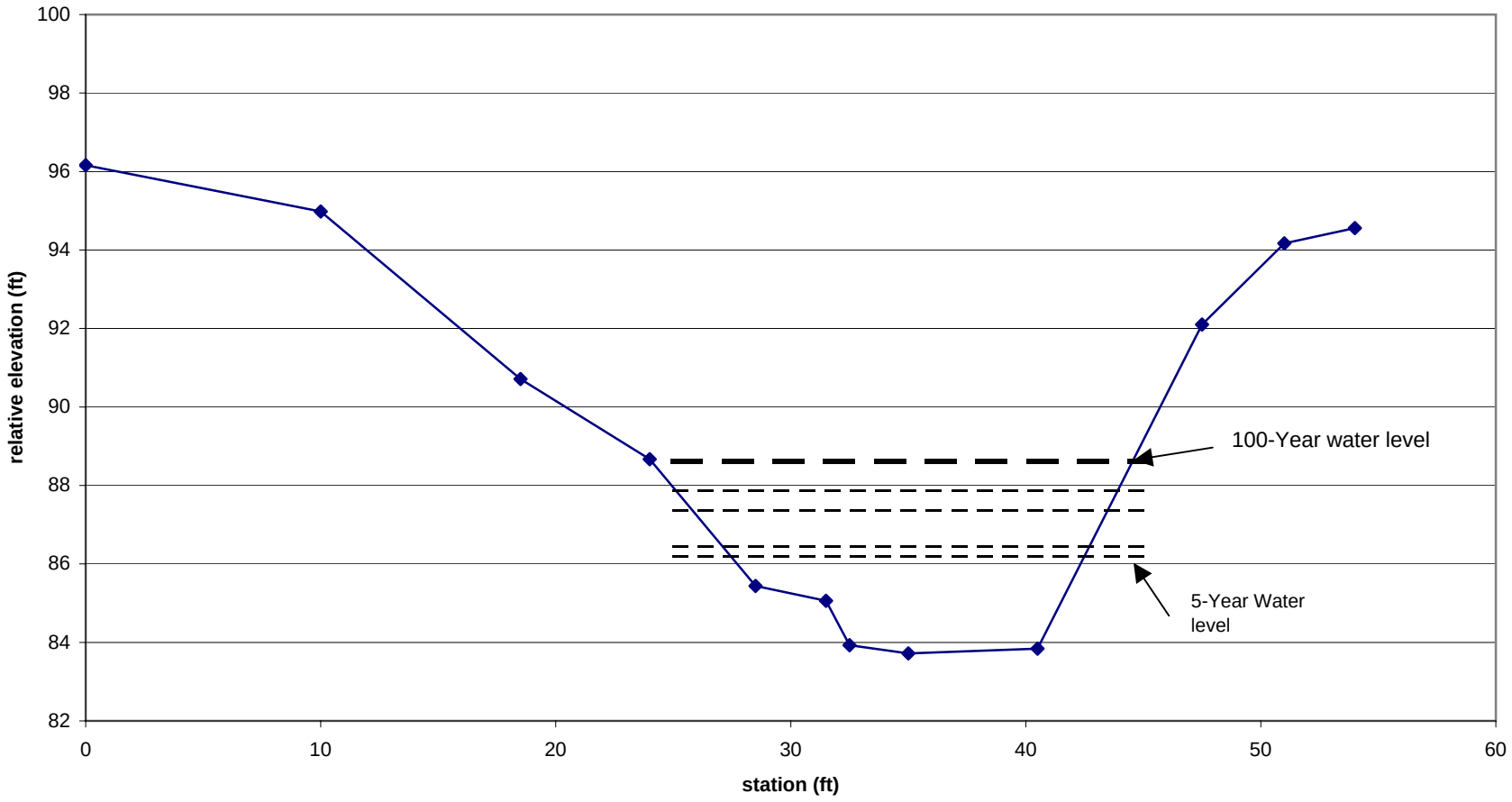
# Ground Surface Elevation: Cross-Section 4
## Temescal Creek, at St Johns Property, Oakland, CA

FIGURE 5

xsections_survey121304.xls,Figure 5 XS-4

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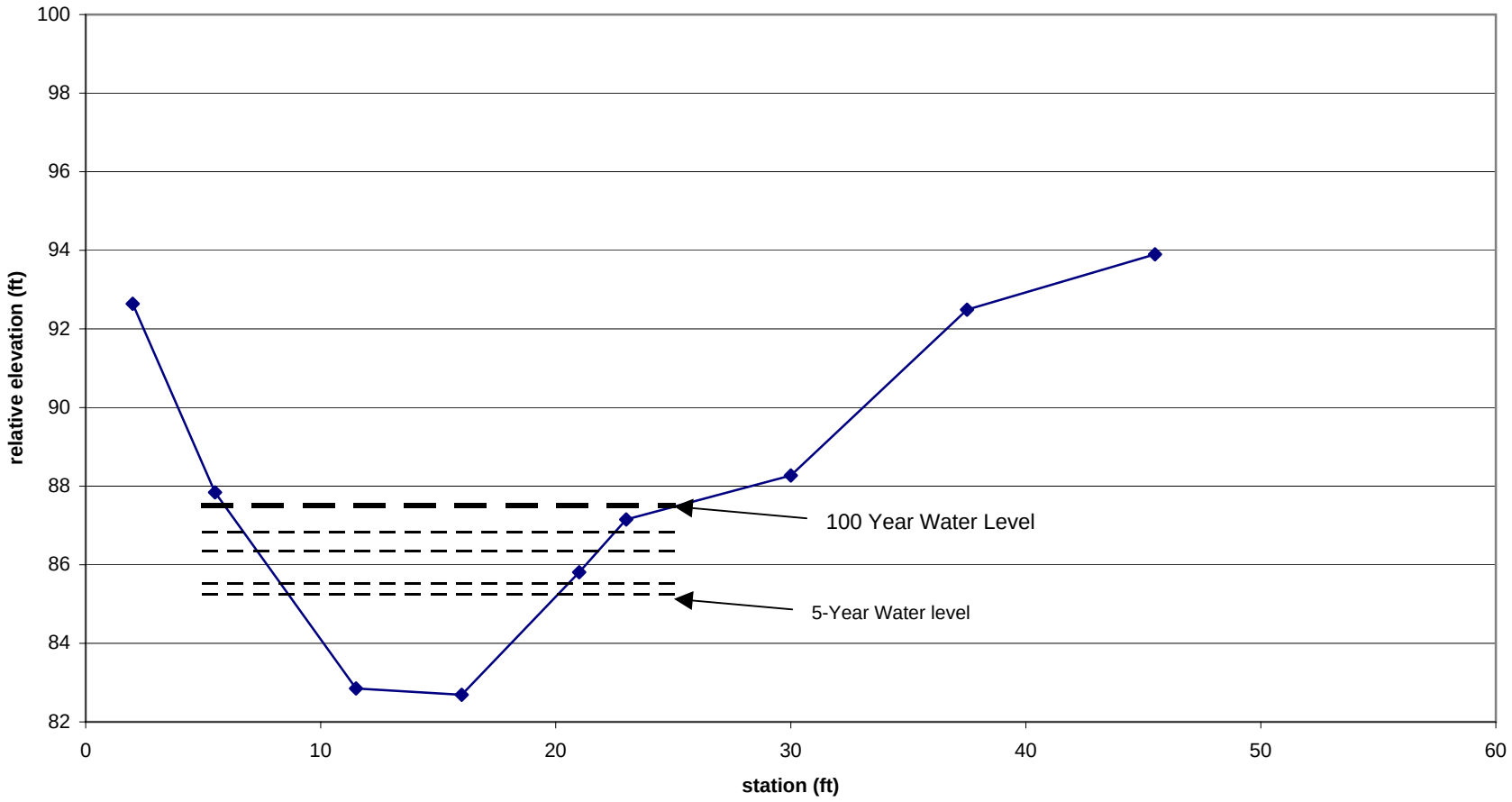
# Ground Surface Elevation: Cross-Section 5
## Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
6

xsections_survey121304.xls,Figure 6 XS-5

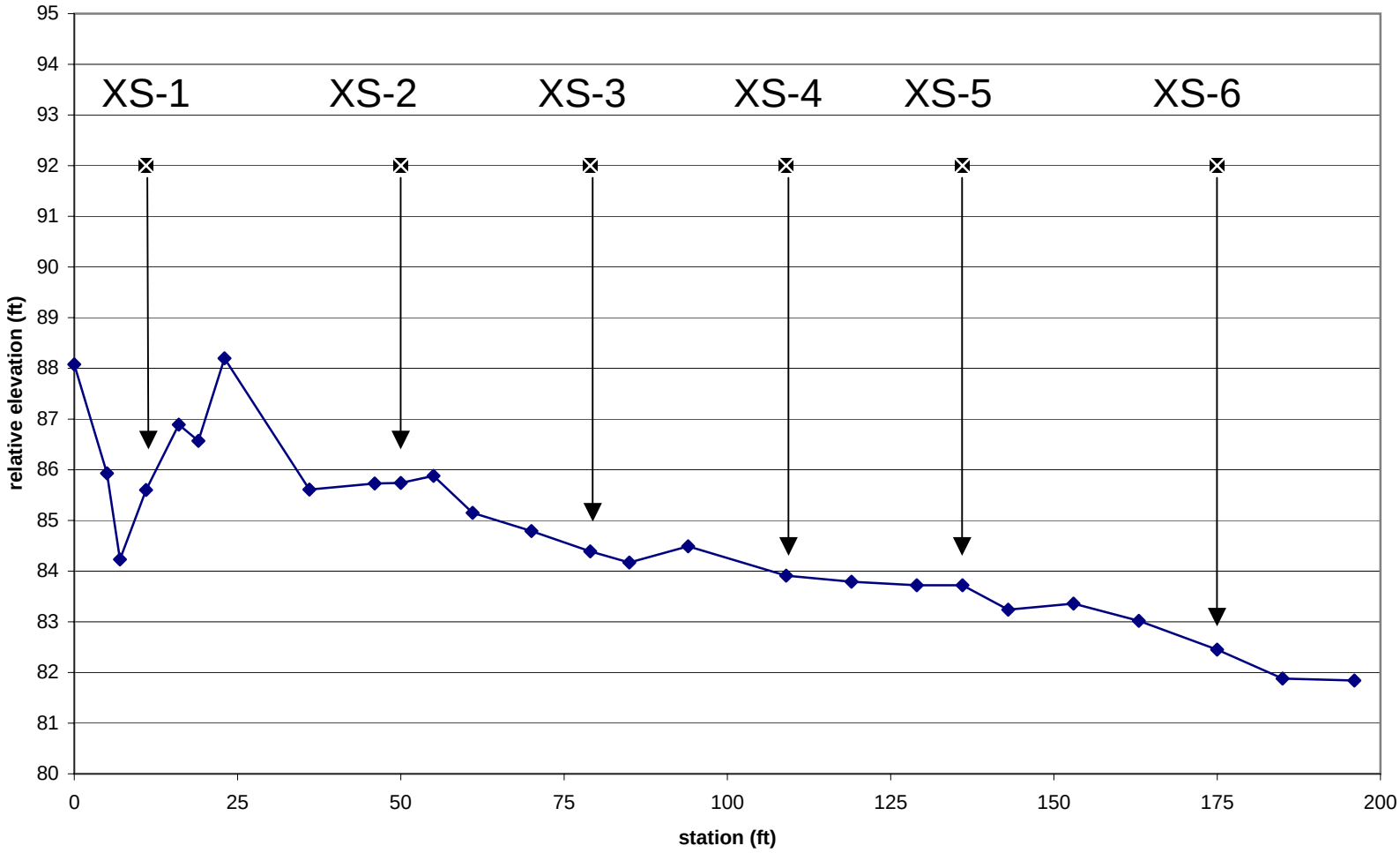



Kamman Hydrology & Engineering, Inc.

# Ground Surface Elevation: Cross-Section 6
## Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
7

xsections_survey121304.xls,Figure 7 XS-6

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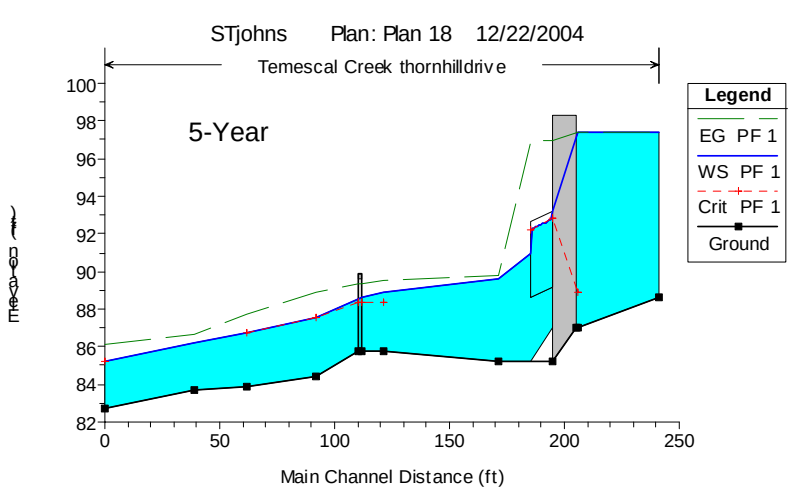
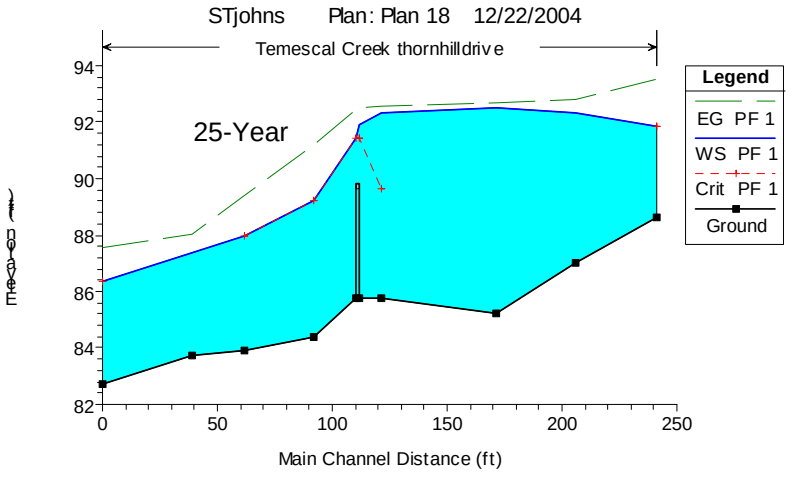
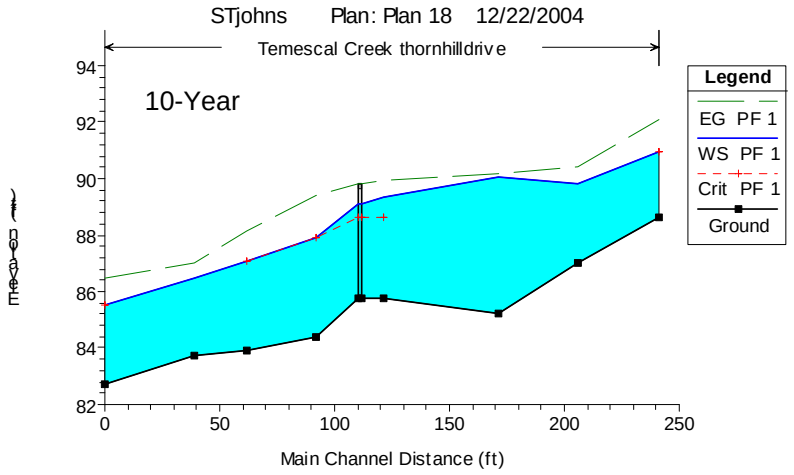
# Channel Thalweg Profile
## Temescal Creek, at St Johns Property, Oakland, CA

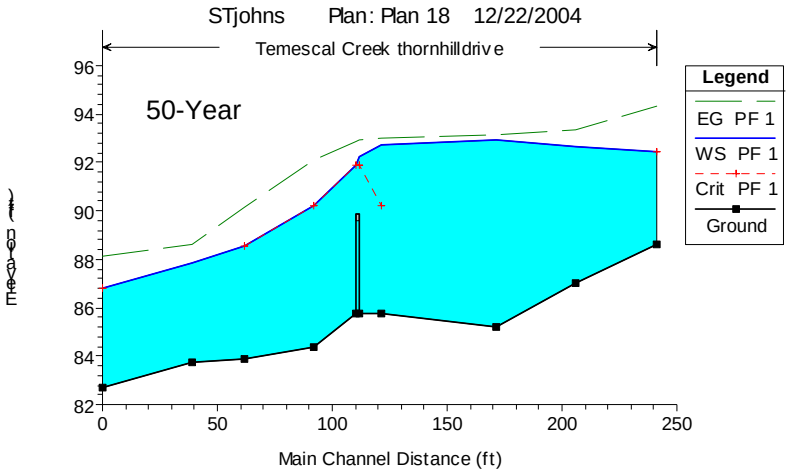
FIGURE 8

xsections_survey121304.xls,Figure 8



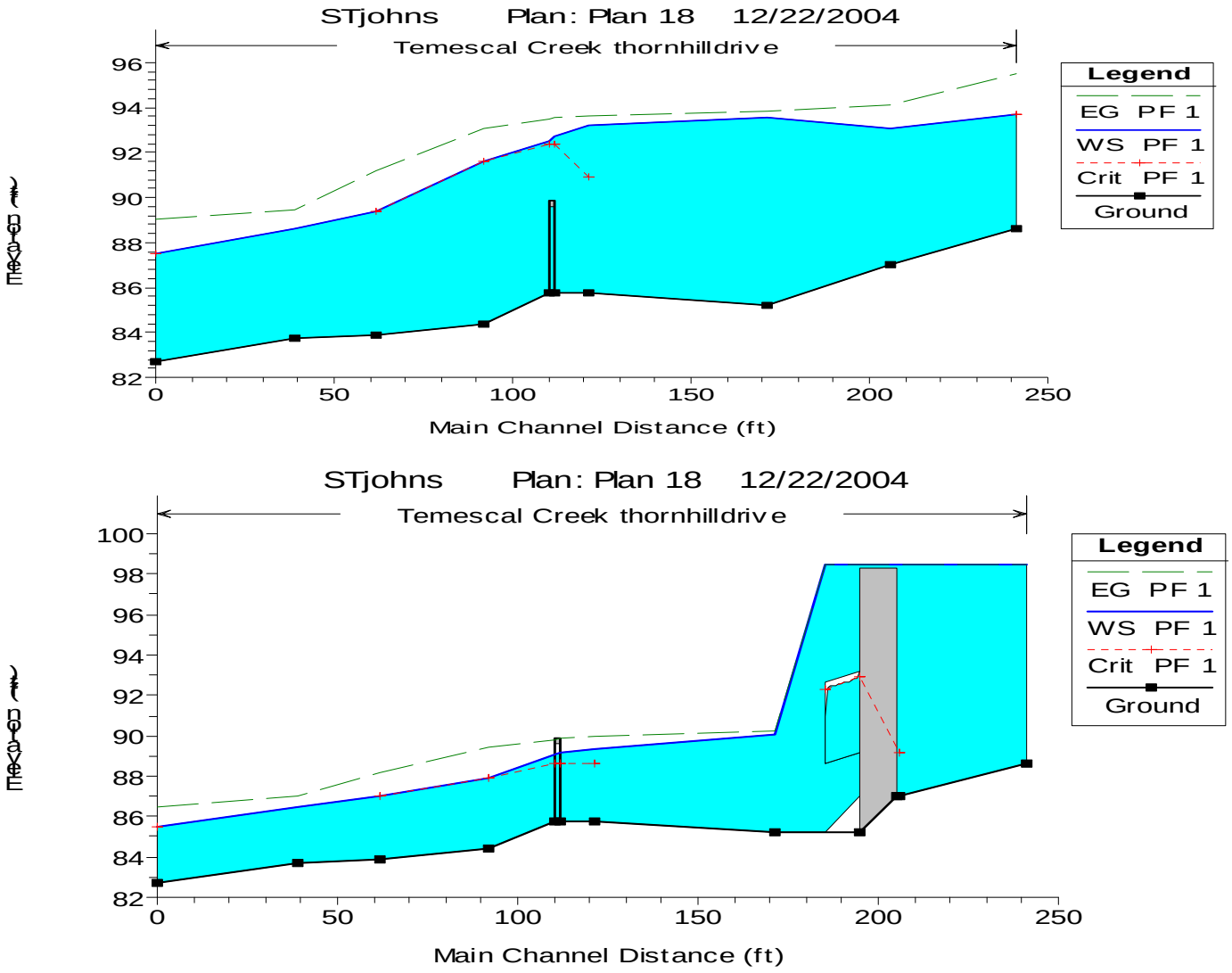




Kamman Hydrology & Engineering, Inc.

# Water Surface Elevations for 5,10,25, 50-year flows
# Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
9

xsections_survey121304.xls,Figure 9




Kamman Hydrology & Engineering, Inc.

Water Surface Elevations for 100-year Flows and 10-Year Flow With Culvert
Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
10

xsections_survey121304.xls,Figure 10

DESIGN, COMMUNITY & ENVIRONMENT

1600 SHATTUCK
AVENUE
SUITE 222
BERKELEY, CA 94709
TEL: 510 848 3815
FAX: 510 848 4315

# MEMORANDUM

DATE July 20, 2005

TO John Seals, Davidson + Seals

FROM Sarah Sutton, Isabelle Minn, Design, Community & Environment/Wolfe Mason Associates

RE **St John's Episcopal Church Creek Study**

Design, Community & Environment/Wolfe Mason Associates (DC&E/WMA) has completed a preliminary evaluation of Temescal Creek and proposed improvements for the St. John's Episcopal Church Entry Road, Bridge, Parking and New Sanctuary project. We have reviewed the Geotechnical Investigation by Land/Marin Geotechnics, and have completed a site visit with the hydrology consultants Kamman Hydrology & Engineering (KHE). This memorandum summarizes our findings to date and provides options for next steps in regard to the creek restoration and planning work.

We understand that as part of the proposed project, there will be a vehicular bridge from Thornhill Drive crossing Temescal Creek to a proposed parking grove. DC&E/WMA and KHE have explored the possibility of realigning and stabilizing the creek in order to reduce the erosion along Thornhill Drive on the northern side of the creek, and to improve the creek's function and habitat value in the project area. Please find attached the following:

- Description of current conditions as part of the City of Oakland's Early Consultation and Creek Assessment Report
- Preliminary concept for creek realignment and associated figures
- City of Oakland Early Consultation and Creek Assessment Report (form)

Figure A shows a plan view of the proposed creek realignment. The existing and proposed creek center lines are shown. Figure B shows the locations of three cross section through the creek channel, Figures 1-3. They depict both the existing creek channel and the proposed relocation. The proposed realignment would move the creek channel up to a maximum of 25 feet south of its current location. This will bring the new top of bank within X' of the existing structure. The realignment will also result in the removal of all tress along the south bank, and will remove approximately 580 cubic yards of soil, with 280 cubic yards used as fill for the north bank. Figure 4 shows the elevation of the channel thalweg

downstream of the culvert. The inflection point indicates the location of a pool just below the culvert.

Please review the enclosed material. Should you agree to move forward with the creek restoration concept, we would propose the following next steps:

- Acquire complete basemap in Auto CAD showing all relevant information (exiting survey, proposed site plan). We would need this information in order to complete the restoration plan.
- Complete restoration plan and creek protection report based on proposed realignment.

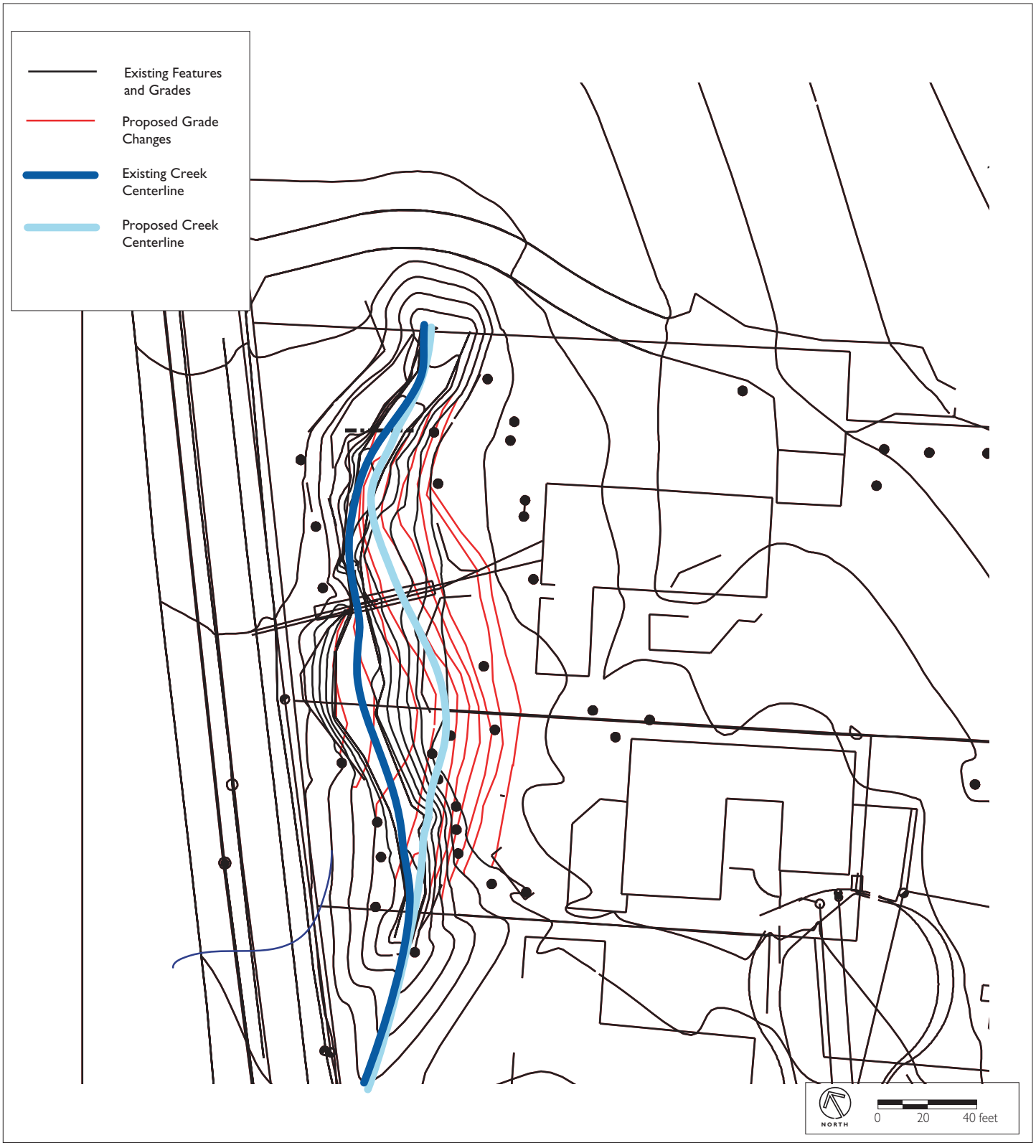



FIGURE A

**PROPOSED CREEK REALIGNMENT**

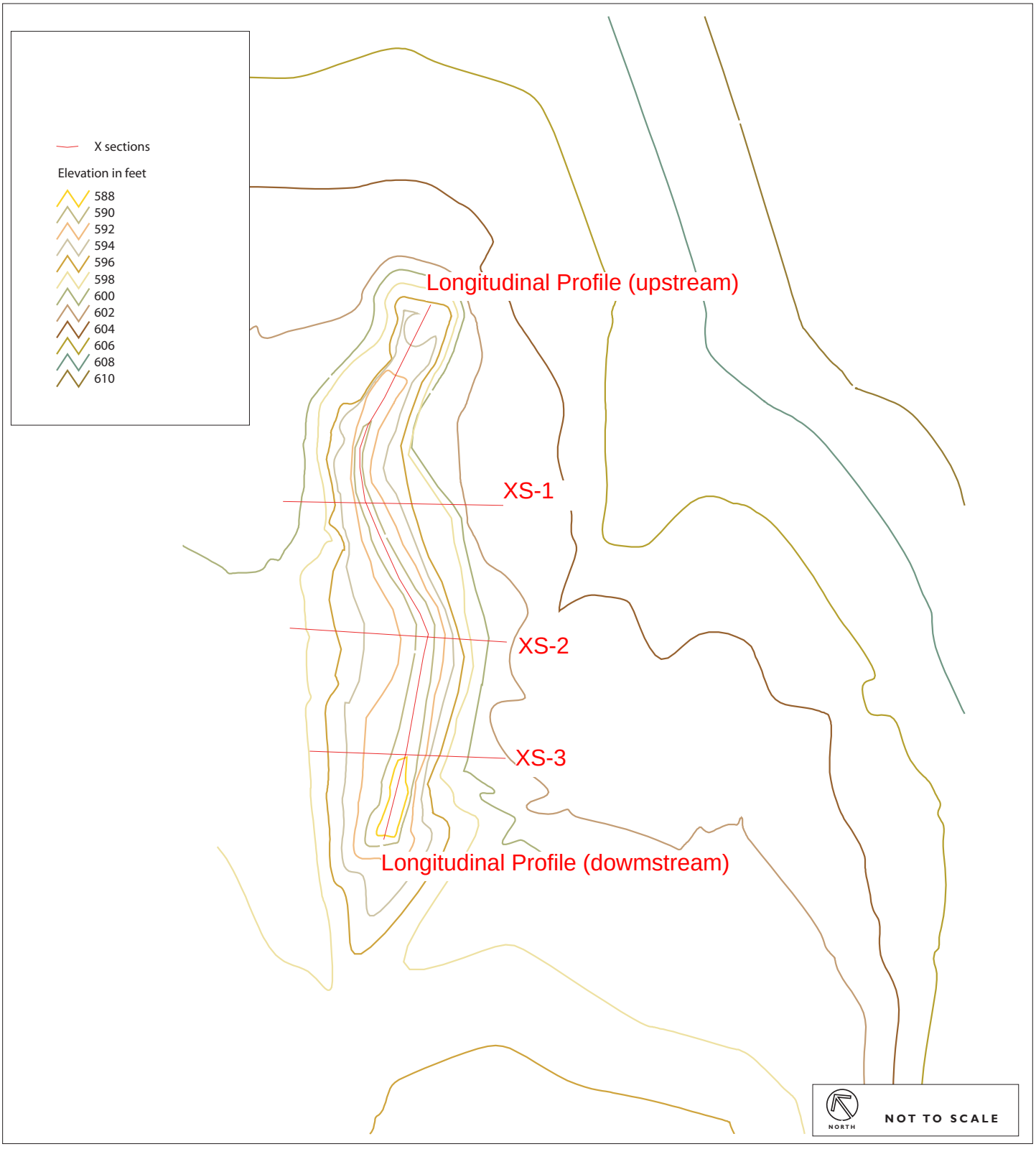
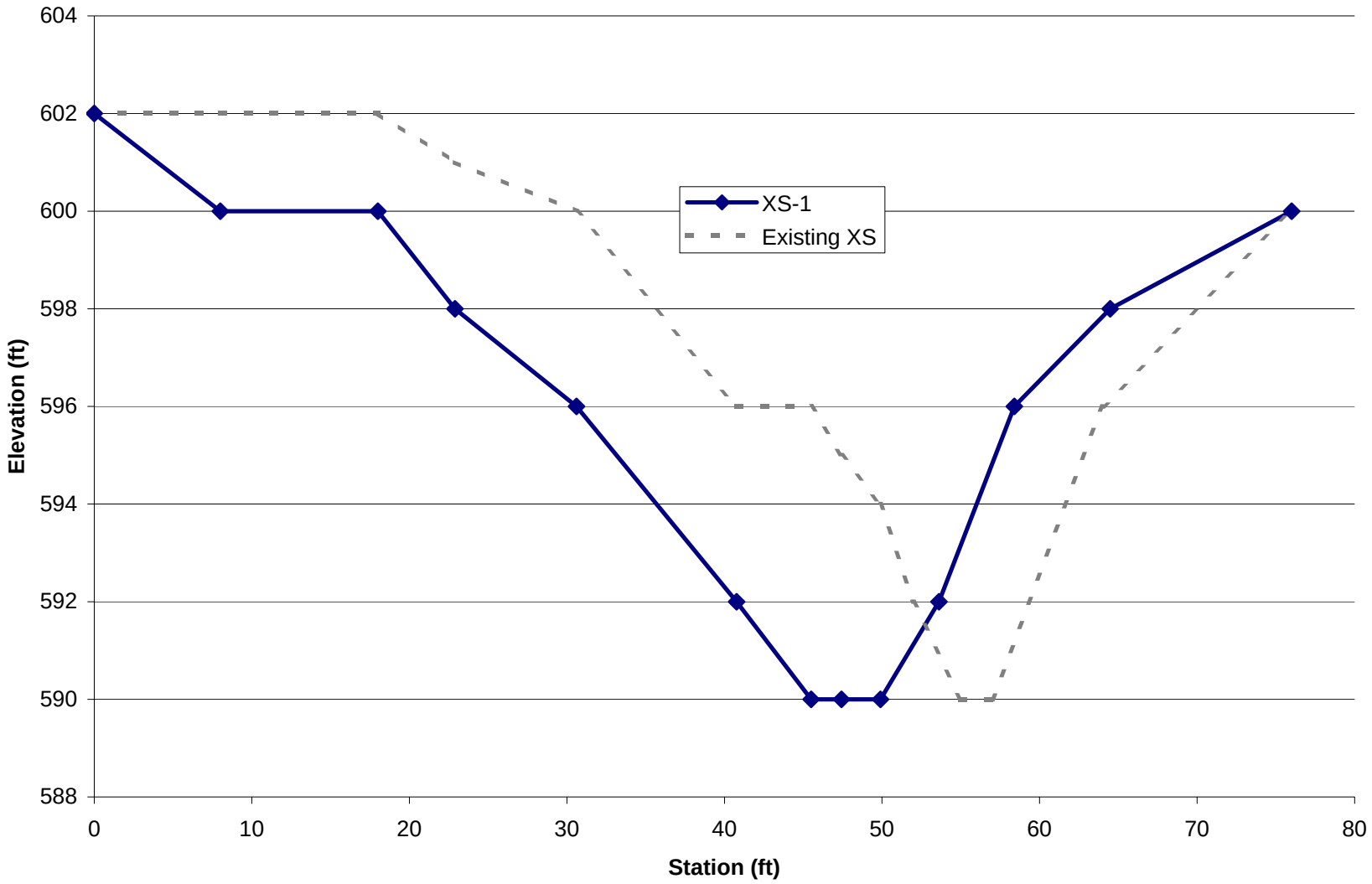



FIGURE B

**PROPOSED CREEK REALIGNMENT CROSS SECTION LOCATIONS**



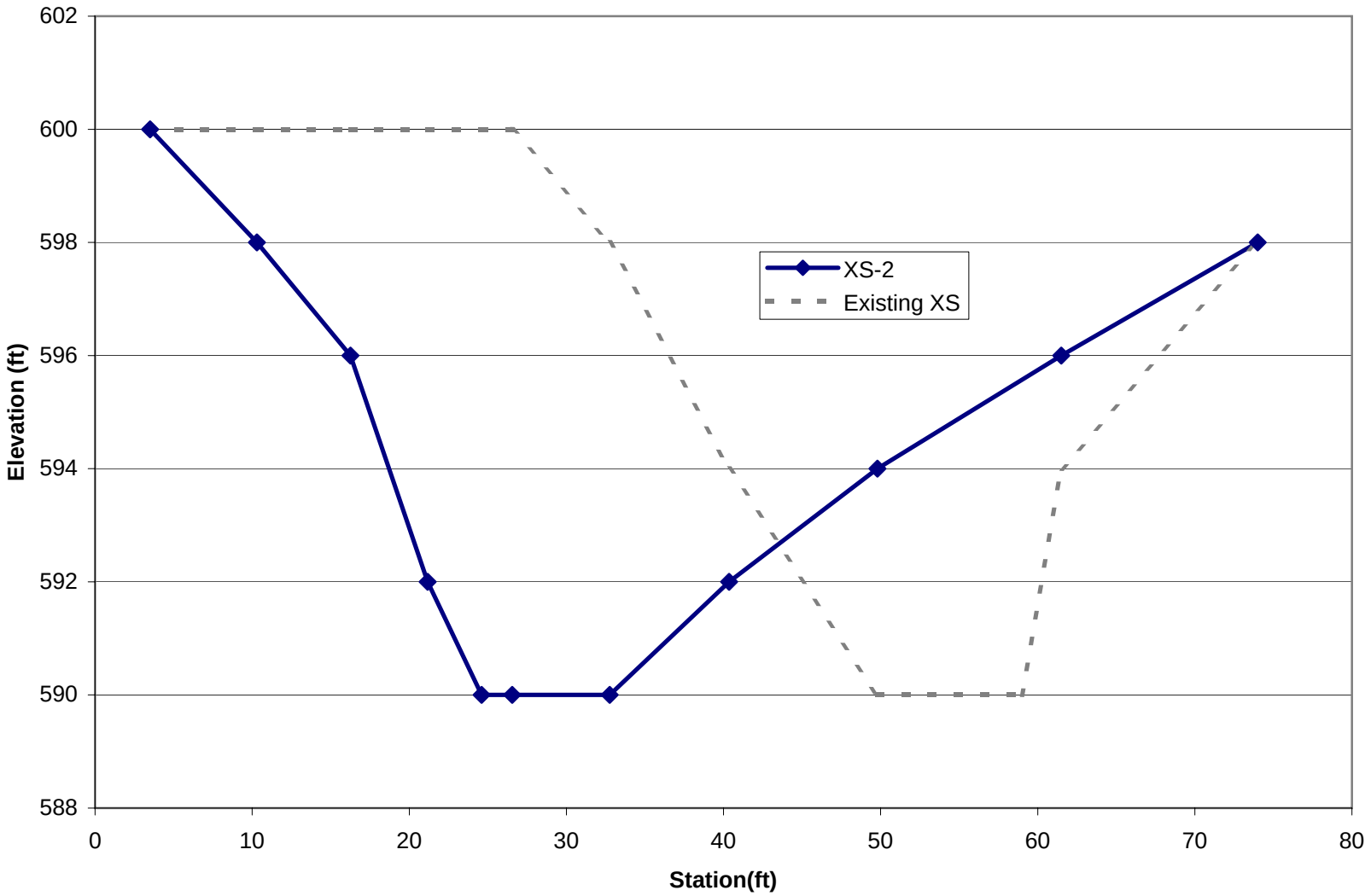

Kamman Hydrology & Engineering, Inc.

Proposed Creek Alignment: Cross-Section 1

Temescal Creek, at St Johns Property, Oakland, CA

FIGURE

1



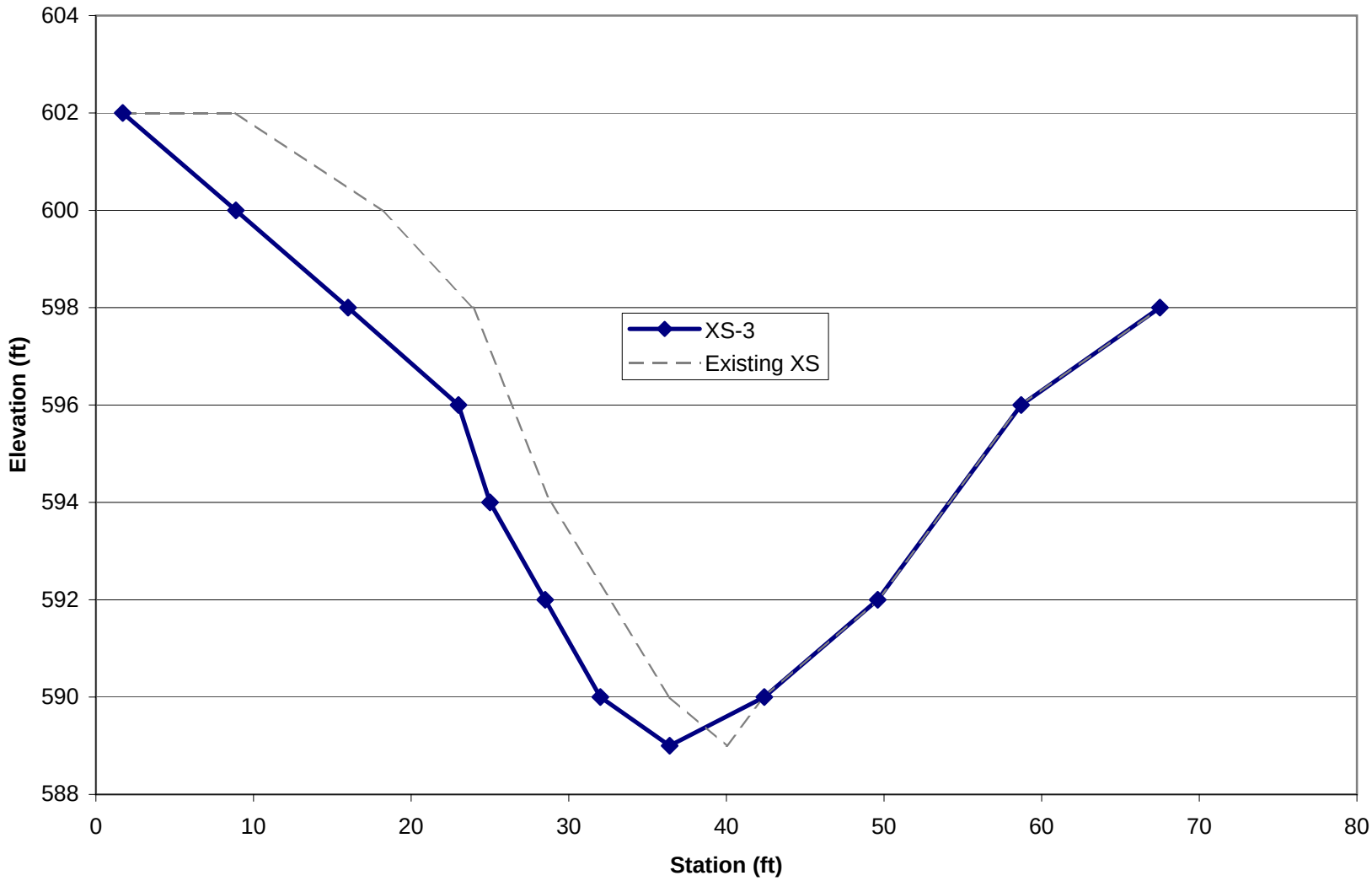

Kamman Hydrology & Engineering, Inc.

Proposed Creek Alignment: Cross-Section 2

Temescal Creek, at St Johns Property, Oakland, CA

FIGURE

2



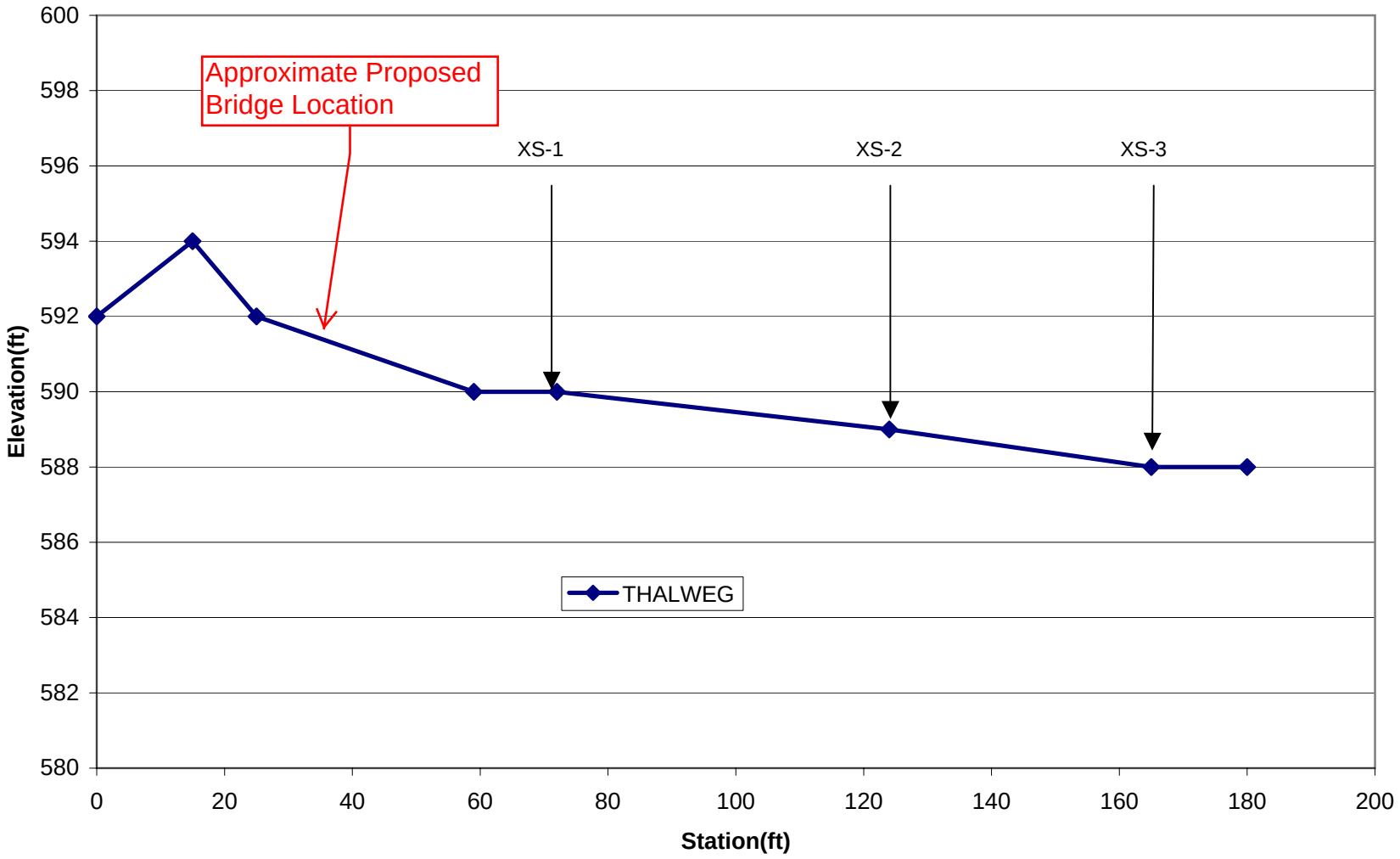

Kamman Hydrology & Engineering, Inc.

Proposed Creek Alignment: Cross-Section 3

Temescal Creek, at St Johns Property, Oakland, CA

FIGURE

3




Kamman Hydrology
& Engineering, Inc.

Proposed Creek Alignment: Long Profile
Temescal Creek, at St Johns Property, Oakland, CA

FIGURE
4

# HYDROLOGY REPORT

Revised May 3, 2010

Prepared by Kamman Hydrology & Engineering, Inc.

---

**Applicant/Property Owner:** St. John's Episcopal Church
**Job Address:** 1707 Gouldin Road, Oakland, CA
**Assessor's Parcel #:** 48F-7390-4-9

**Description of Work:** The project involves the construction of a new entry road and bridge across Temescal Creek, to provide access to the Church property from Thornhill Boulevard. Additional parking will be provided along the new entry road. The entry road and additional parking will be located on property that was recently acquired by the Church. The existing house on the property will be demolished and moderated cuts and fill are anticipated to grade the new entry road and parking area. The project will incorporate permeable pavements and onsite infiltration of storm water to the extent practical. The new vehicular bridge will be about 22 feet wide with a 5 foot pedestrian walkway and will clear span about 25 feet across the creek. As part of the project, only the new bridge-crossing portions of Temescal Creek will be disturbed. Creek banks beneath the bridge will be improved as described below to reduce future erosion and slope instability.

As a future phase of construction, a new Sanctuary building will be constructed southeast of the existing Parish Hall. The Sanctuary will likely be a tall single story structure. The south wall of the Sanctuary will be cut into the hillside. As a result, a site retaining wall may be needed along the south side of the new building. The hillside shows indications of historic instability that will need to be mitigated during site development.

---

**Department of Fish and Game approvals:**
Coordination with Department of Fish and Game is to occur after the project has been approved by the City of Oakland.

**Alameda County Flood Control approvals:**
Coordination with Alameda County Flood Control is to occur after the project has been approved by the City of Oakland.

## 1.0 EXISTING AND FUTURE PROJECT FLOWS

A prior version of this hydrology study was submitted in September 2009. The prior study utilized flow rates for Temescal Creek as documented by FEMA in the *City of Oakland Flood Insurance Study* (FEMA, 1982) and the newly released *Alameda County and Incorporated Areas Flood Insurance Study* (FEMA, 2009). Upon receipt of comments regarding the prior study (Lesley Estes, October 29, 2009; Caesar Quitevis, November 12, 2009), a meeting to clarify the comments was held in Oakland on December 10, 2009, including members of the City of Oakland CEDA Planning & Zoning and Watershed and Stormwater Management departments; Design Community & Environment (DCE); and Kamman Hydrology & Engineering (KHE). Based on discussions during this meeting, the hydrology and hydraulic analysis was reconducted utilizing zoning and parcel map data provided by the City of Oakland.

Pursuant to the County guidelines, the St. Johns project is characterized as a Primary facility as it has a drainage area of 563-acres, which falls within the fifty acres to ten square mile requirement. The project watershed also lies within the County's designated Flood Zone 12. The County stipulated design storm for a Primary facility within Flood Zone 12 is a 25-year storm. The corresponding County freeboard requirements indicate that the design storm water surface should provide 1-foot of freeboard from the top of bank. In addition, there are two County alternative requirements associated with bridge freeboard: a) the design (25-year) storm provides 2-feet of freeboard from bridge soffit (top of underside of bridge) or b) the bridge provide 100-year storm capacity.

A suite of design storms were utilized to estimate peak flow rates expected in Temescal Creek for the 563 acre watershed draining to the site (Figure 1). The design storms represent rainfall events with 24-hour precipitation totals that correspond to annual return frequencies of 2, 5, 10, 25, 50, and 100 years. Rainfall depths for the design storms were estimated using regression equations developed for the San Francisco Bay Area (Rantz, 1971). Mean annual precipitation of 23.1 inches was recorded at the NOAA weather station located at the Oakland Museum six miles from the site (Station 046336).

Storm runoff totals generated from the design storms were estimated by the USDA Natural Resources Conservation Service (NRCS) TR-55 curve number (CN) method (USDA, 1986). Peak Flow estimates were then derived for the design storms using the Graphical Peak Discharge method described in TR-55. The rationale for using the NRCS methods presented in TR-55 is that they are well suited to the estimation of runoff and peak discharge in small, ungaged watersheds. The approach is particularly effective at evaluating the expected impacts of land use changes associated with anticipated development in an urban or urbanizing watershed. KHE was asked to evaluate hydrologic conditions under both existing and fully developed conditions. This request directed us to select the SCS methods in TR-55.

Determination of CN depends on the watershed's soil and land cover conditions. Runoff estimates were made for both existing and fully developed (full build-out) conditions. Soil characteristics were evaluated from NRCS soil survey data and maps. The soil maps divide the watershed into three discrete soil map units, all of which are categorized as hydrologic soil group D, indicating high runoff potential.

Land cover was categorized from a GIS assessment of the zoning information and the parcel map using Alameda County Assessor's Use Codes (data provided by City of Oakland; see Figure 2).

Runoff estimates were completed for both existing and fully developed land use conditions. The runoff curve number (CN) was developed separately for each condition using an area weighted average for the division of land cover types within the watershed.

Table 1 summarizes the distribution of Assessor's Use codes within the watershed. The parcel data were then classified into four land cover types: Residential, Undeveloped (zoned residential), Open Space, and Streets and Roads (see Figure 3). The Residential class was composed of parcels with Use Codes 1100-6600. CN values were determined for the land cover classes using Tables 2-2a and 2-2c of the NRCS TR-55 publication (NRCS, 1986). Residential areas were assigned a CN value for residential districts with an average lot size of ¼ acre. Undeveloped land (zoned residential) and open space lands were assigned a CN value for woods.

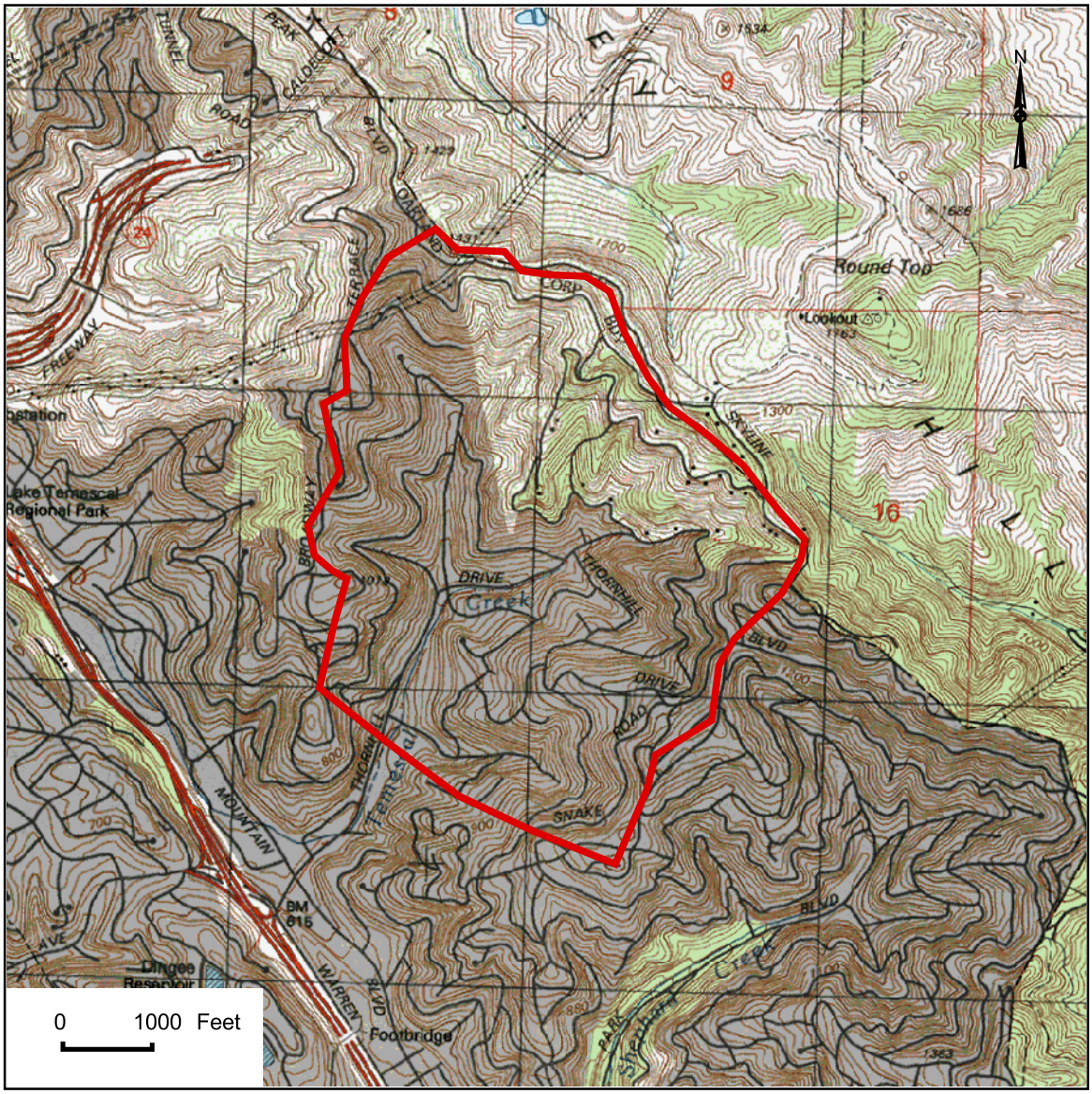



**Figure 1. Map of the watershed boundary, Temescal Creek upstream from St. John's Church.**

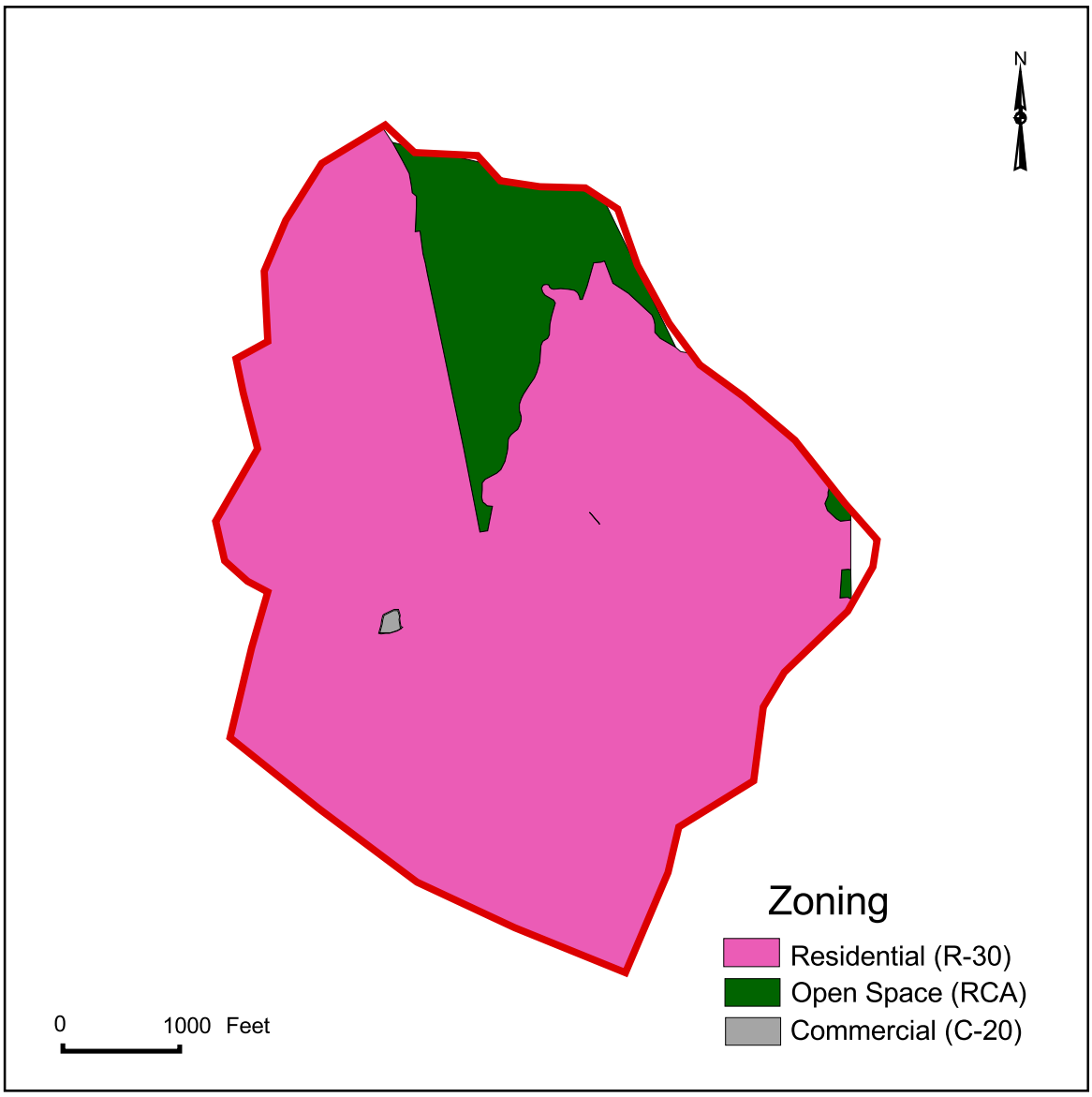



**Figure 2. Zoning map of watershed area.**

**Figure 3. Map of land cover types for the existing (top) and fully developed conditions (bottom).**

Data in Table 1 were utilized to compute the composite CN for the existing conditions. Next, the 96 acres of undeveloped parcels (zoned residential) were assumed to be converted to residential lands and the composite CN was recomputed for fully developed conditions (Figure 3). Results are summarized in Tables 2 and 3.

Peak discharge estimates for Temescal Creek at St. John's Church were developed using the NRCS Graphical Peak Discharge method (USDA, 1986). Temescal Creek peak flow rates representative of the 563 acre watershed are presented in Table 4. The peak discharge equation is:

$$q_p = q_u A_m Q$$

where:
$q_p$ = peak discharge (cfs)
$q_u$ = unit peak discharge (peak discharge per square mile per inch of runoff)
$A_m$ = drainage area ($mi^2$)
Q = storm runoff (in.), determined by CN method

**Table 1. Summary of Assessor's Use Codes for parcels in the study watershed.**

| Use Code | Description | Zoning | Acres |
|---|---|---|---|
| 300 | Exempt public agencies | Residential | 5.8 |
| 300 | Exempt public agencies | Open Space | 59.2 |
| 500 | Property owned by a public utility | Residential | 4.0 |
| 1000 | Vacant residential land | Residential | 89.2 |
| 1100 | Single family residential homes | Residential | 302.4 |
| 1200 | SFR home with non-economic 2nd unit | Residential | 1.2 |
| 2100 | 2, 3, or 4 single family homes | Residential | 0.8 |
| 2200 | Double or duplex | Residential | 0.3 |
| 2500 | Triplex | Residential | 0.4 |
| 4500 | Nurseries | Commercial | 0.5 |
| 6600 | Churches | Residential | 1.3 |
| 9900 | Other recreational activity | Residential | 2.4 |
| NA | Watershed area not covered by parcel data | | 3.3 |
| | | | |
| | Subtotal | | 470.8 |
| | Streets and Roads | | 92.4 |
| | | | |
| | Total Watershed Area | | 563 |

**Table 2. Land cover type classification of parcel data in the study watershed.**

| Land Cover Type | CN | Existing Conditions (Acres) | Fully Developed Conditions (Full Build-out) (Acres) |
|---|---|---|---|
| Residential | 87 | 307 | 403 |
| Undeveloped (zoned residential) | 77 | 96 | 0 |
| Open Space | 77 | 68 | 68 |
| Streets and Roads | 98 | 92 | 92 |
| | | | |
| Total | | 563 | 563 |

**Table 3. Composite CN for existing and fully developed conditions.**

| | Composite CN |
|---|---|
| Existing Conditions | 86 |
| Fully Developed | 88 |

**Table 4. Rainfall and peak discharge estimates for Temescal Creek at project site.**

| Return Frequency (years) | 24-hour Rainfall (inches) | Existing Conditions | | Full Build-out Conditions | | Increase in Peak Discharge (%) | Run A SCS CN 6-Storm Peak Discharge (cfs) | Run B City 6-Hr Storm Peak Discharge (cfs) | FEMA Peak Discharge[1] (cfs) | USGS Peak Discharge[2] (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SCS 24-Hr Storm Runoff (inches) | SCS 24-Hr Storm Peak Discharge (cfs) | SCS 24-Hr Storm Runoff (inches) | SCS 24-Hr StormPeak Discharge (cfs) | | | | | |
| 2 | 2.51 | 1.25 | 139 | 1.39 | 161 | 16 | n/a | n/a | n/a | 22 |
| 5 | 3.30 | 1.92 | 231 | 2.09 | 264 | 14 | 183 | 262 | 139 | 61 |
| 10 | 3.87 | 2.42 | 306 | 2.61 | 337 | 10 | 263 | 390 | 180 | 99 |
| 25 | 4.54 | 3.04 | 392 | 3.23 | 431 | 10 | 355 | 509 | 275 | 158 |
| 50 | 5.09 | 3.55 | 474 | 3.75 | 511 | 8 | n/a | n/a | 380 | 210 |
| 100 | 5.54 | 3.97 | 530 | 4.18 | 569 | 7 | 503 | 683 | 520 | 272 |

Under the full build-out conditions within the watershed, peak flow rates at the project site increase between 7 and 16 percent. The impact of additional development is greatest for the lowest magnitude, high frequency flood event and decreases for the less frequent, higher magnitude events (e.g., 16-percent increase in discharge for 2-year flood to 7-percent increase in discharge for the 100-year event). For comparison, FEMA (1982, 2009) peak flow estimates are also included in Table 4. For all floods, the FEMA estimates are less than the NRCS method estimates. One contributing factor for the lower FEMA estimates is that they were generated

[1] The 5- and 25-year events were estimated via power function applied to the FEMA 10, 50, 100, and 500 year recurrence interval peak flow values.
[2] The 5- and 25-year events were estimated via power function applied to the FEMA 10, 50, 100, and 500 year recurrence interval peak flow values.

almost 30-years ago and likely reflect a less developed watershed. Thus, the NRCS estimates were used in all model simulations over the FEMA estimates.

Onsite storm water peak flows were generated by the project engineers (Sandis Engineers) for existing conditions and for Phases I and II developed conditions. The Rational Method was utilized for these calculations, a method applicable to small areas less than several hundred acres (Sandis Engineers, Sept. 4, 2009; see Appendix A).

Existing onsite conditions reflect the building and landscape configuration of Church property since 1954. Phase I entails reconfiguration of the onsite roadway and parking system on Church property, including a bridge crossing Temescal Creek. Phase II incorporates a new sanctuary facility for the Church, built upon the location of an existing paved area.

Through the use of low runoff-producing materials for parking and pathways, including packed gravel and decomposed granite base, and reconfiguration of the existing paved surfaces, onsite post-development conditions will produce slightly lower peak runoff values than existing conditions, as shown in Table 5. Based on these calculations, no increase to the current peak flow rates within Temescal Creek are expected due to the project.

**Table 5. Onsite peak flow rates estimated by Sandis Engineers.**

| Return Frequency (years) | Onsite Existing-Conditions Peak Runoff[3] (cfs) | Onsite Proposed-Conditions Peak Runoff (Phase I) (cfs) | Onsite Proposed-Conditions Peak Runoff (Phase II) (cfs) |
|---|---|---|---|
| 2 | 2.0 | 2.0 | 1.9 |
| 5 | 2.4 | 2.4 | 2.4 |
| 10 | 3.3 | 3.3 | 3.2 |
| 25 | 4.1 | 4.1 | 4.0 |
| 50 | 4.6 | 4.6 | 4.5 |
| 100 | 5.2 | 5.2 | 5.1 |

In order to evaluate the design flow estimates, KHE also estimated the peak discharge using the guidelines in the City of Oakland Storm Drainage Design Guidelines for comparison (these guidelines are consistent with Alameda County Hydrology and Hydraulics Criteria). The guidelines present an approach that is very similar to the method used by KHE. It is similar in that it abstracts a design rainfall event to evaluate the amount of rainfall which contributes to surface runoff. There are two primary differences: (1) the design storm recommended by the City of Oakland guidelines is a 6-hour storm as opposed to the 24-hour storm evaluated by the SCS method; and (2) The City of Oakland's guidelines estimate loss rates, or the proportion of rainfall that does not result in runoff, using the "Initial and Uniform Loss Rate" method as opposed to the SCS CN method.

The effect of the different loss rate methods was evaluated using the HEC-HMS rainfall-runoff modeling computer program. A suite of 6-hour design storms were developed using the method presented in the City of Oakland guidelines. The method uses an equation to estimate the total

[3] Existing and proposed flows from Sandis Engineering (September 4, 2009).

rainfall depth based on the mean annual precipitation and distributes the storm rainfall into 15-minute increments using the rainfall distribution presented by the Alameda County Hydrology and Hydraulics Manual.

Runoff was simulated in the HEC-HMS model using SCS CN method to estimate losses (Run A; Table 4). A second suite of model runs was then performed using the initial and uniform loss rate method and parameters presented in the City of Oakland guidelines (Run B; Table 4).

The City-based model runs using the SCS method were compared to the initial peak discharge estimates to assess the effect of using a 6-hour design storm instead of a 24-hour design storm. The City SCS CN method estimates using the 6-hour design storm yielded peak discharge estimates that ranged from 16- to 13-percent lower than the initial estimates using a 24-hour storm (Table 4). The model results for the runs that used the initial and uniform loss rate method suggested by the City of Oakland guidelines (Run B, City of Oakland guidelines) yield peak discharge estimates that range from 13- to 30- percent higher than the initial 24-hour storm estimates (Table 4).

The variability displayed in these estimates indicates that inherent uncertainty in generating peak flow estimates. For further comparison, the FEMA flood estimates for Temescal Creek a short distance downstream of the project site and USGS estimates based on regional regression equations are also presented on Table 4. Both the FEMA and USGS estimates are lower than those generated using the original 24-hour storm SCS CN method. Regardless of method used to estimate project design flows, KHE's original estimates using the 24-hour storm SCS CN method bracket the County required design storm estimate for the project facility.

## 2.0 PRE- & POST-PROJECT SIMULATED CREEK HYDRAULIC CONDITIONS

In order to evaluate potential changes in creek hydraulic conditions in association with the proposed project, a full suite of hydraulic model simulations were completed reflecting a variety of flow and site setting conditions. Model simulations included:

- Simulation A: Existing site and flow conditions;
- Simulation B: Project (developed) site conditions with existing flows (circa 2009);
- Simulation C: Existing site and flow conditions with upstream and off-site 48-inch reinforced concrete pipe (RCP) removed;
- Simulation D: Project site conditions under existing flows and 48-inch RCP removed;
- Simulation E: Future full watershed build-out flows under existing site conditions;
- Simulation F: Full build-out flows with project conditions;
- Simulation G: Full build-out flows under existing site conditions and removal of 48-inch RCP; and
- Simulation H: Full build-out flows under project site conditions and removal of 48-inch RCP.

A matrix summarizing the site and flow conditions for Simulations A through H is presented as Table 6. The 48-inch culvert is located off-site, immediately upstream of the St. John's project site. Because the RCP is in poor condition it will likely need to be replaced during the lifetime of the proposed downstream project bridge. Observations in early May 2010 indicate that the outfall of the culvert is being undermined due to erosion and the eastern headwall bank is experiencing active erosion to the extent that the slope was covered in heavy plastic. Therefore, simulations were completed that considered removing the RCP and associated channel fill constriction in order to evaluate how this would affect the downstream project reach. We are not aware of when and how the culvert will be replaced. For purposes of this analysis, we simply assume the culvert is removed and replaced with an earthen channel having a similar channel geometry to the up- and down-stream conditions. No other technical analysis of this RCP replacement is plausible as part of this investigation.

**Table 6. Hydraulic model simulation matrix.**

| Simulation | Site Condition | | Flow Condition | | Upstream 48-inch RCP Condition | |
|---|---|---|---|---|---|---|
| | Existing | Project | Existing | Full-Build-out | In-place | Removed |
| **A** | X | | X | | X | |
| **B** | | X | X | | X | |
| **C** | X | | X | | | X |
| **D** | | X | X | | | X |
| **E** | X | | | X | X | |
| **F** | | X | | X | X | |
| **G** | X | | | X | | X |
| **H** | | X | | X | | X |

## 2.1 Model Development

Hydraulic simulations of Temescal Creek were completed using the U. S. Army Corps of Engineers HEC-RAS hydraulic model. The hydraulic model requires input parameters of channel geometry, channel roughness, channel slope, and flow rates. A detailed survey of this reach provided model input geometry and cross-sections within the creek channel. On December 13, 2004, KHE surveyed six channel cross-sections and the longitudinal channel profile within Temescal Creek adjacent to St. John's Church property. Surveyed cross-sections are located downstream of the 48-inch reinforced concrete culvert (RCP) beneath a private driveway accessing Thornhill Drive near the northeastern end of the Church property. The creek was inaccessible upstream of the culvert, so cross-section geometry was estimated based on the rectangular concrete form of the channel at this location. Information provided by the City of Oakland indicates a tributary drainage channel joins the creek along the south bank approximately 100-feet upstream of the 48-inch RCP.[4] Based on field reconnaissance in 2009 by KHE, there does not appear to be any change in channel and site conditions since the 2004 survey. Geometry for the project model is presented in Figure 4.

In order to accurately locate the 25-foot wide proposed bridge deck into the hydraulic model, surveyed cross-sections closest to the upstream and downstream edges of the bridge were duplicated at those locations. Surveyed cross-section 2 at Station 146 was duplicated 10 feet upstream to create Station 156 (upstream edge of bridge). Surveyed cross-section 3 at Station 117 was duplicated 3 feet and 13 feet upstream to create Stations 130 (downstream edge of bridge) and 120. The proposed project model geometry includes creek widening and slope stabilization efforts at Stations 156 and 130 to account for the bioengineering modifications to the banks beneath the bridge (see Figure 6).

Manning's roughness estimates ranged from 0.017 to 0.1. Values were based on: roughness estimate values recommended in the County's hydrology and hydraulics criteria manual; field observations and manning roughness estimate methods outlined by Arcement and Schneider (1989); comparison to published values in a available reports (Barnes, 1967; Chow, 1959; Limerinos, 1970; and Coon, 1998); and KHE staff field and hydraulic modeling experience. No data was available to calibrate the model although there was examination of model sensitivity to roughness coefficients. Roughness coefficients are summarized in Appendix B.

Model simulations were performed under a subcritical flow regime. There is insufficient information available to evaluate flow under a mixed subcritical/super critical flow regime because of prohibited access to the upstream property (upstream of 48-inch RCP) to collect the necessary channel survey information. A normal depth slope of 0.025 was used as the downstream model boundary condition.

## 2.2 Model Simulation Results

The results of hydraulic model simulations are provided in the following text and figures. A more complete tabulation of model simulation results are provided in Appendix B. Following a full discussion of all Simulation A design flow results, text will focus on simulation results for the 2- and 100-year floods. Not only do these events bracket the simulation flow extremes; a) the 2-year flood is commonly believed to represent the dominant channel discharge and represents the single flow magnitude that best controls long term channel evolution and form;

[4] This tributary channel drainage area is included in the estimate of all peak flows as described in Section 1.0 of this report. This tributary drainage imparts no other influence on the study reach.

and b) the 100-year flow represents the bridge design flow (estimated bride life-span), which should be passed without impacting the bridge or surrounding channel. Also, discussions of results for Simulations B through H are compared to Simulation A, existing conditions.

***Simulation A - Existing Conditions:***

Model results indicate that all floods, including the 100-year event, are contained within the channel banks through the project reach (see Figure 5). Water levels for each of the simulated flood flows at each model cross-section are also presented in Figure 6. Upstream of the project, peak flows from the 5-year and greater floods submerge the existing 48-inch RCP and overtop the existing driveway before re-entering the creek downstream.

Because of the backwater conditions created by the RCP constriction, velocities immediately upstream of driveway are about 1-foot per second (ft/s) during the 2-year flood and about 2-ft/s during the 100-year event. Exiting the RCP, velocities range from 6- to 9-ft/s and quickly slow to 3- to 4.5-ft/s, likely in response to energy losses as water flows into the large scoured out plunge pool that has formed downstream of the RCP. Flow velocities accelerate downstream of the plunge pool and RCP, increasing to a maximum ranging from approximately 9- to 11-ft/s at station 117 (cross-section 3) where the channel is a relatively narrow slot, likely controlled by a downstream constriction created by footings supporting a small utility crossing at station 93 (see Figure 5 and Figure 6). Downstream of station 117, simulated flow velocities range from 5.5- to 9-ft/s during the 2-year flood and 7.5- to 11-ft/s during the 100-year flood.

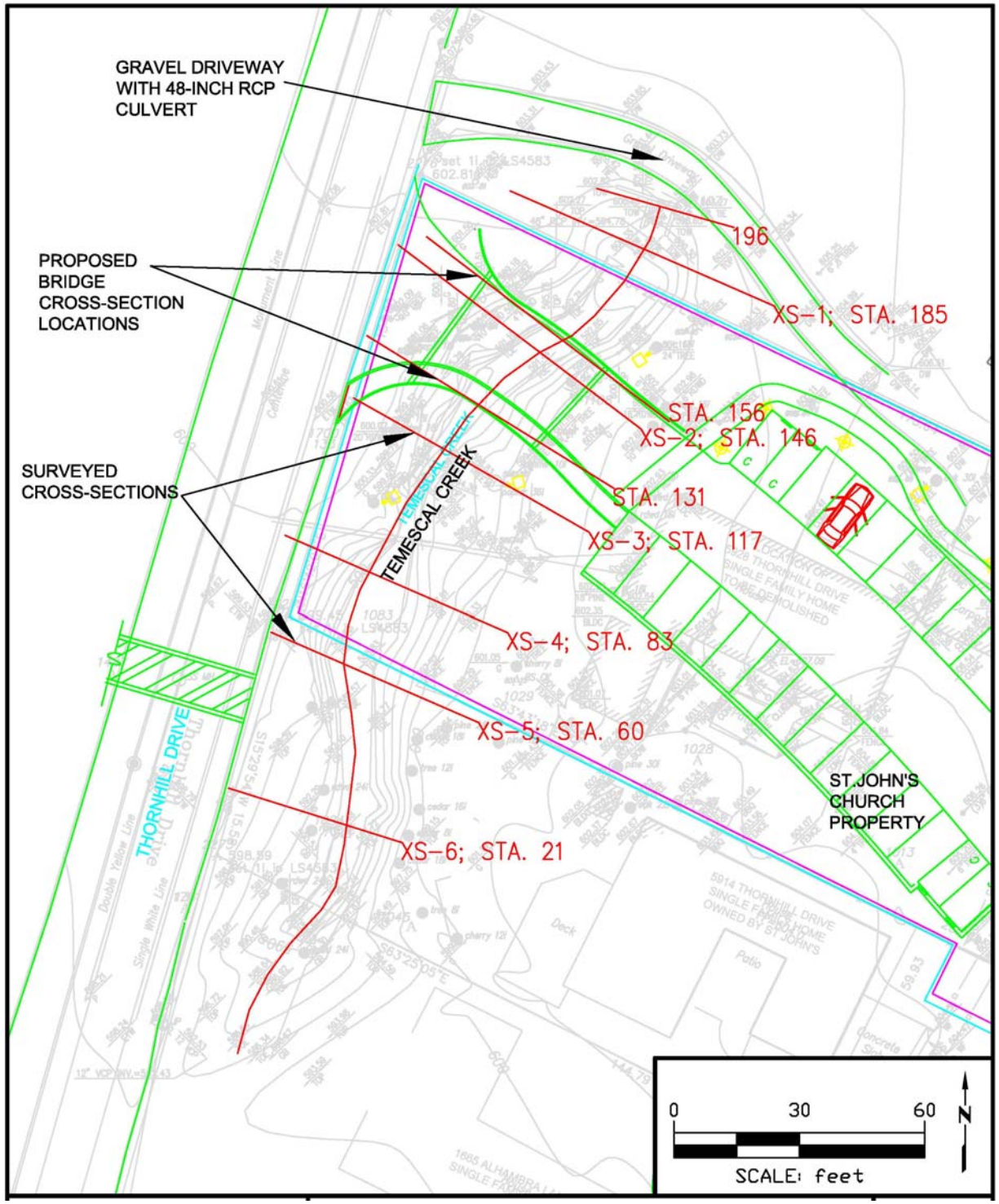



**Figure 4. Site plan and model geometry.**

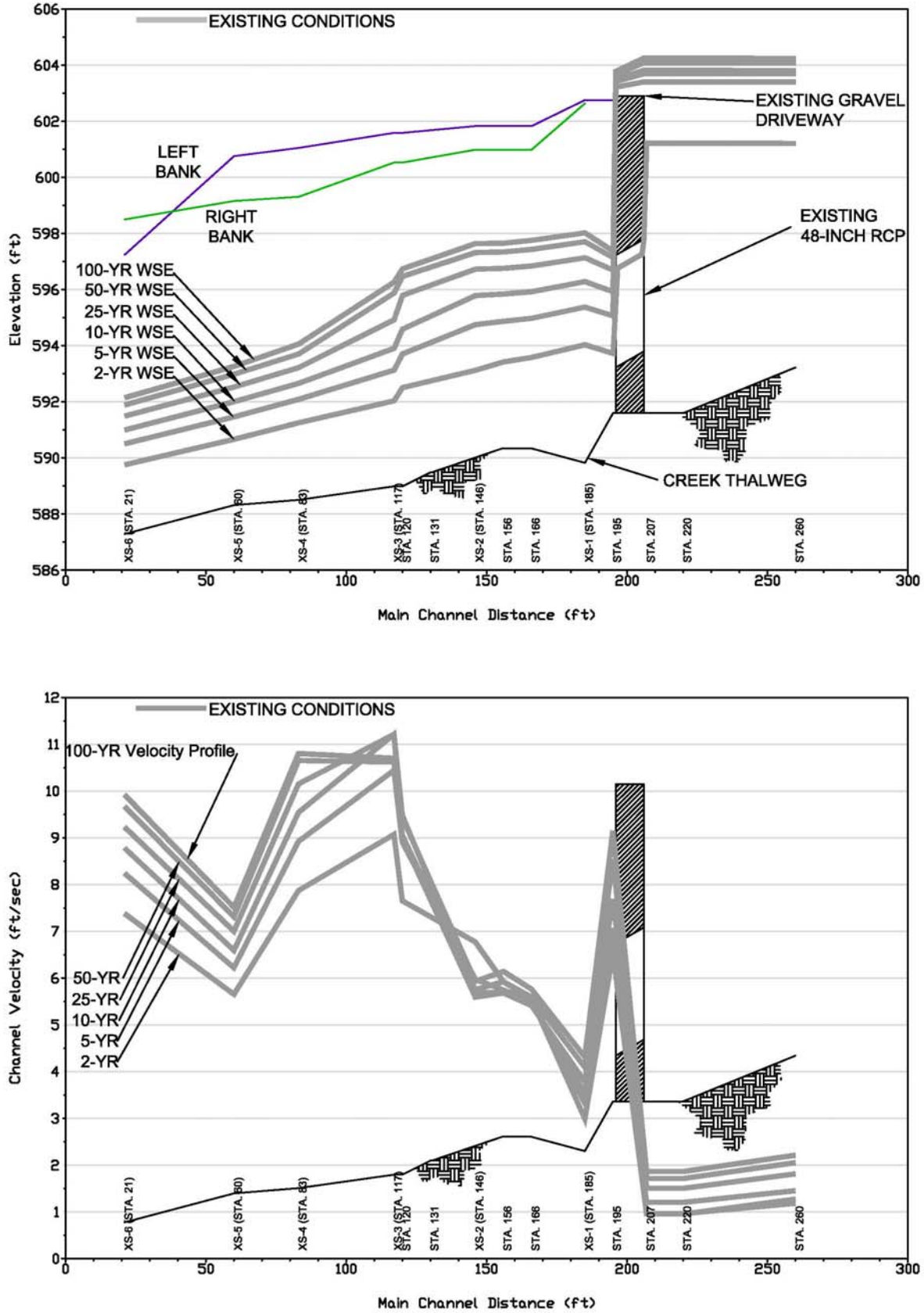



**Figure 5. Simulation A: Graphics comparing simulated 2- through 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions.**

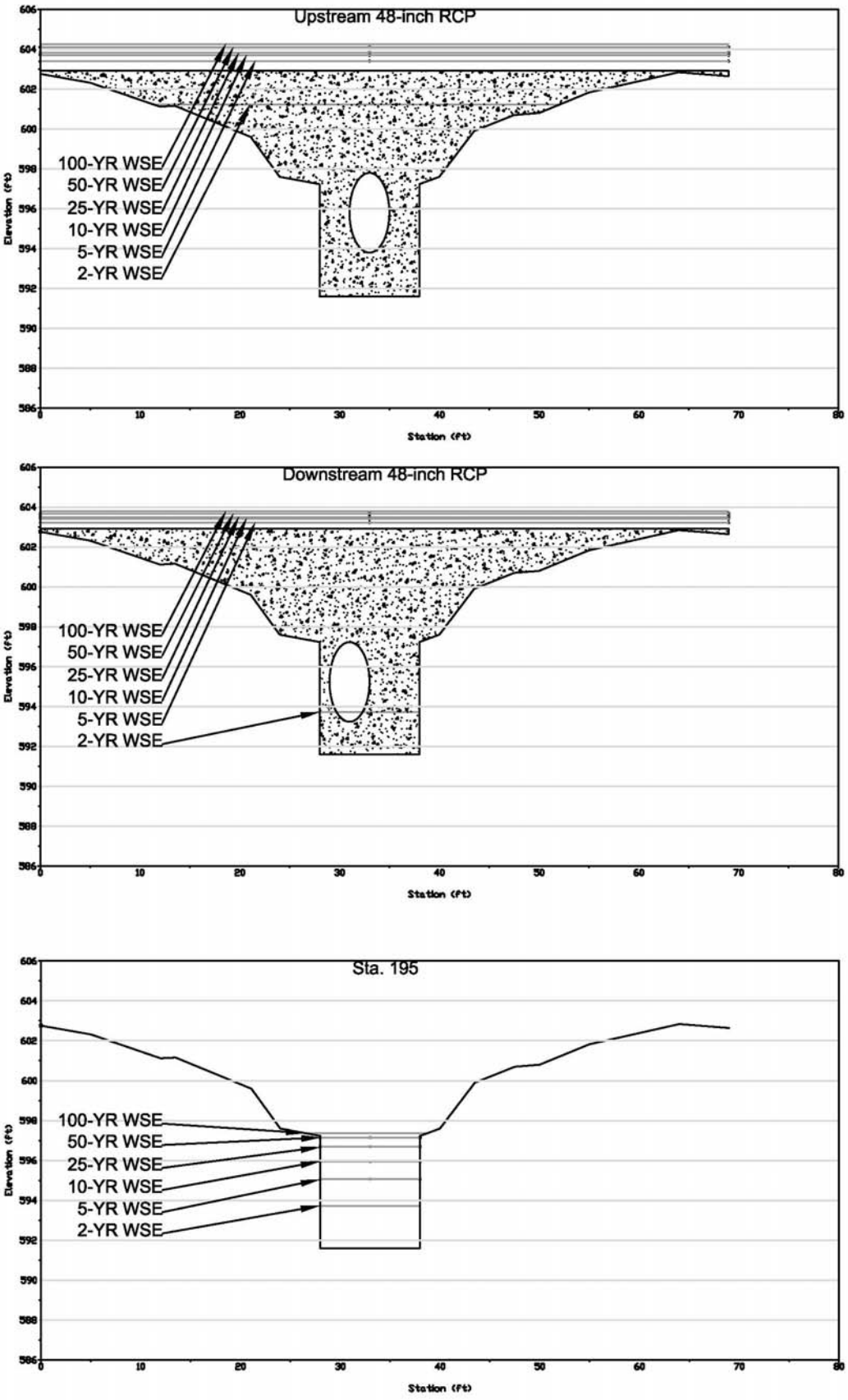



**Figure 6. Simulation A vs. B: Cross-sectional profiles of simulated 2- through 100-year flood water surfaces for existing conditions vs. proposed project conditions. See Figure 4 for cross-section locations.**

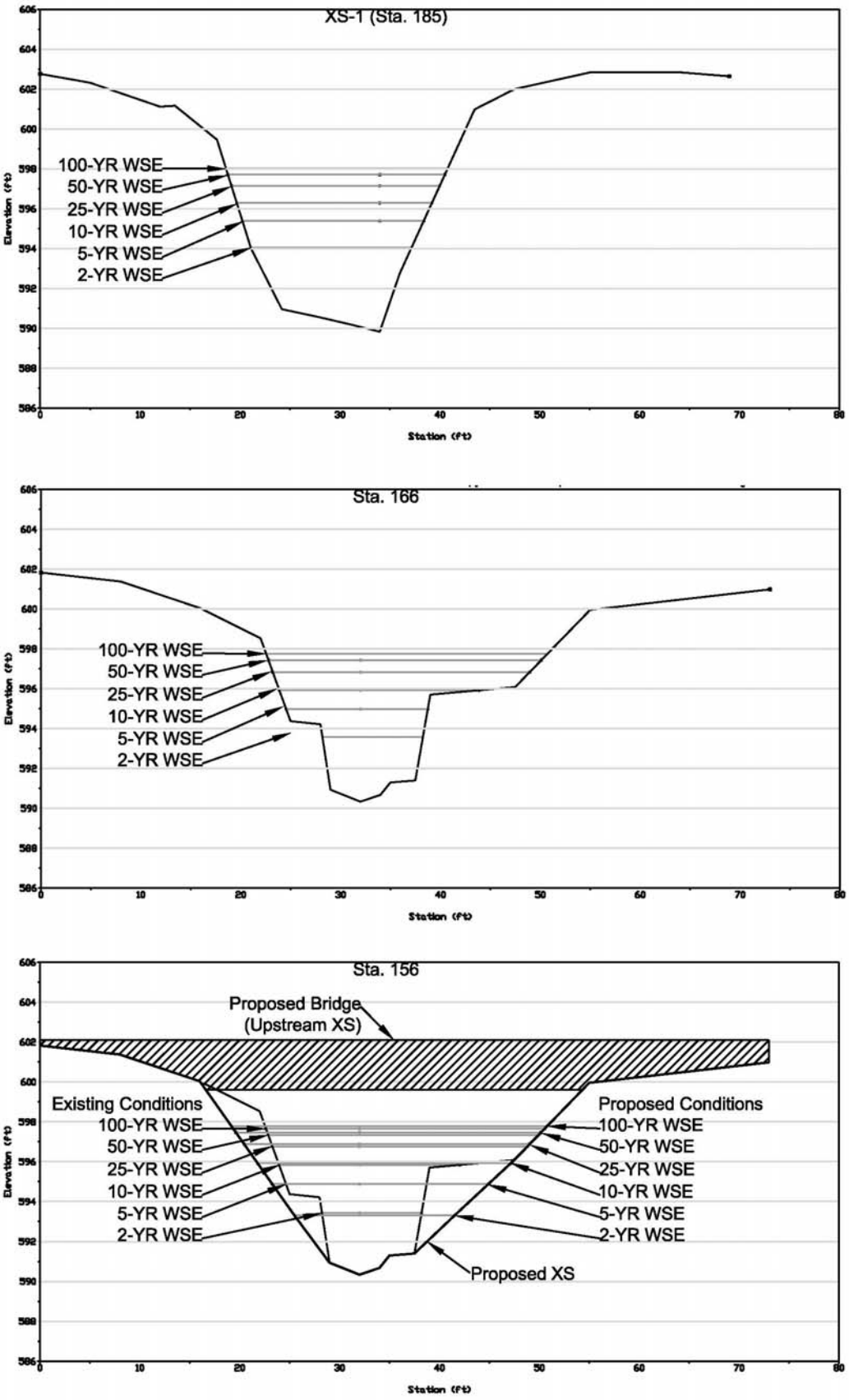



**Figure 6 (continued). Simulation A vs. B: Cross-sectional profiles of simulated 2- through 100-year flood water surfaces for existing conditions vs. proposed project conditions. See Figure 4 for cross-section locations.**

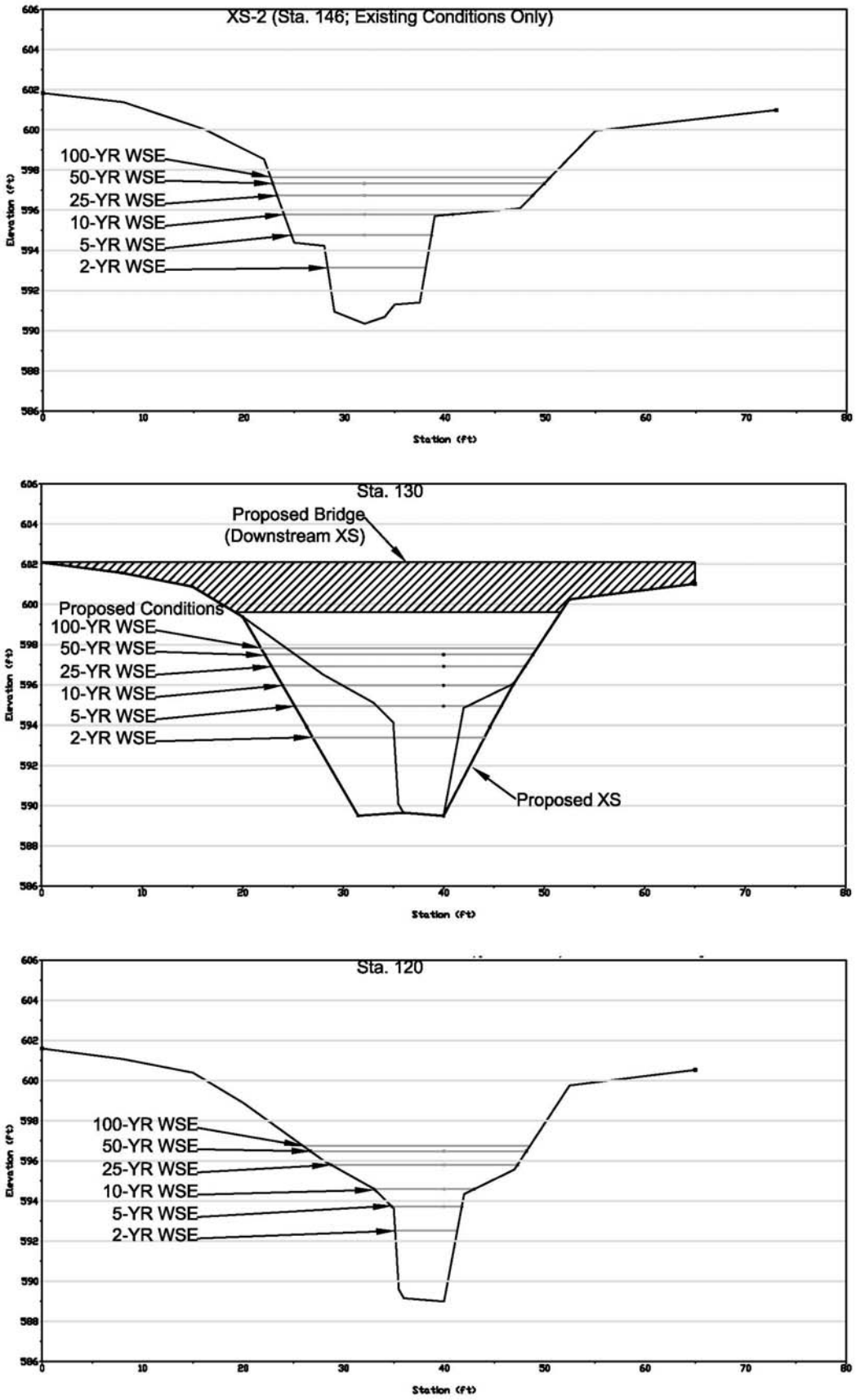



**Figure 6 (continued). Simulation A vs. B: Cross-sectional profiles of simulated 2- through 100-year flood water surfaces for existing conditions vs. proposed project conditions. See Figure 4 for cross-section locations.**

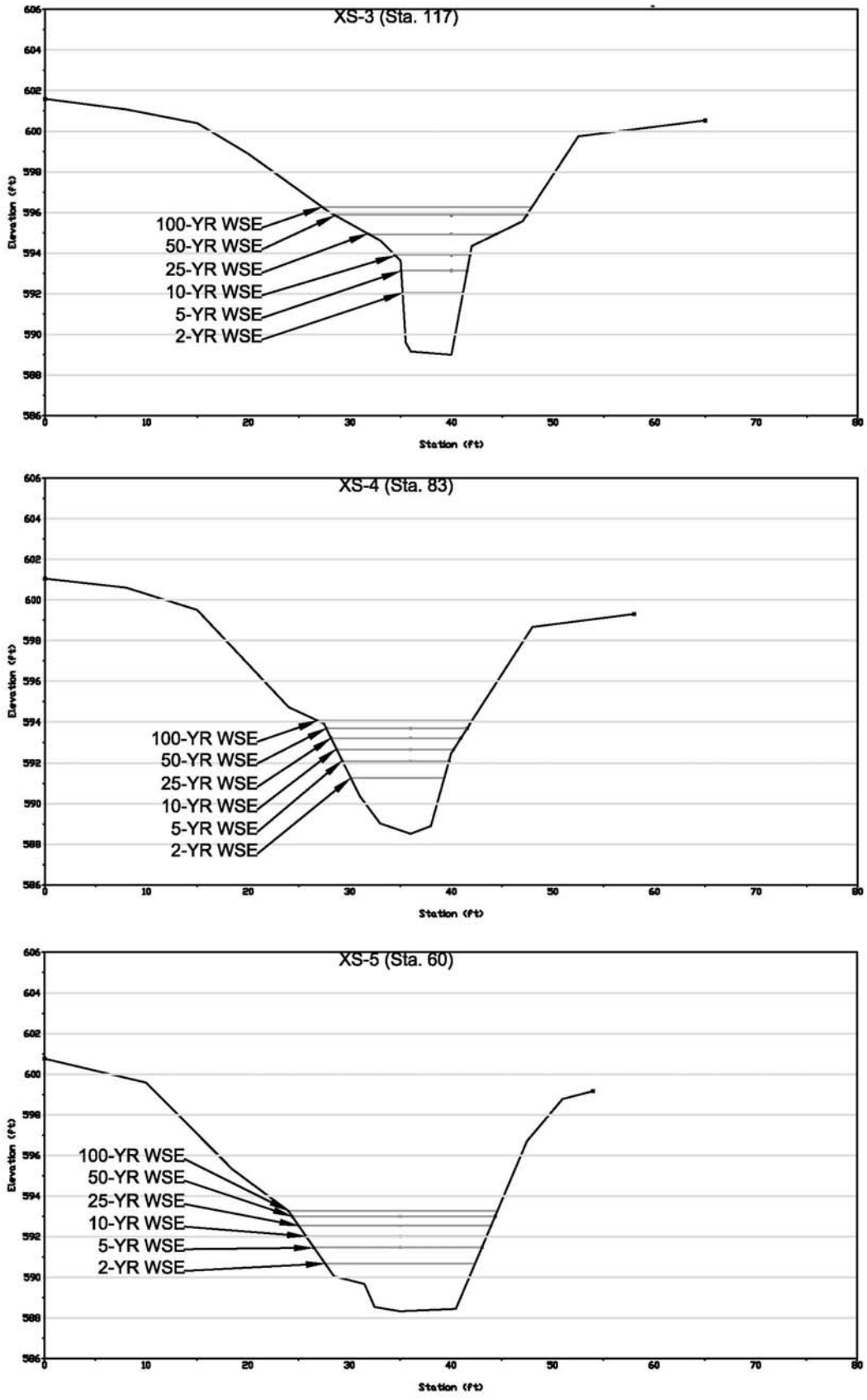



**Figure 6 (continued). Simulation A vs. B: Cross-sectional profiles of simulated 2- through 100-year flood water surfaces for existing conditions vs. proposed project conditions. See Figure 4 for cross-section locations.**

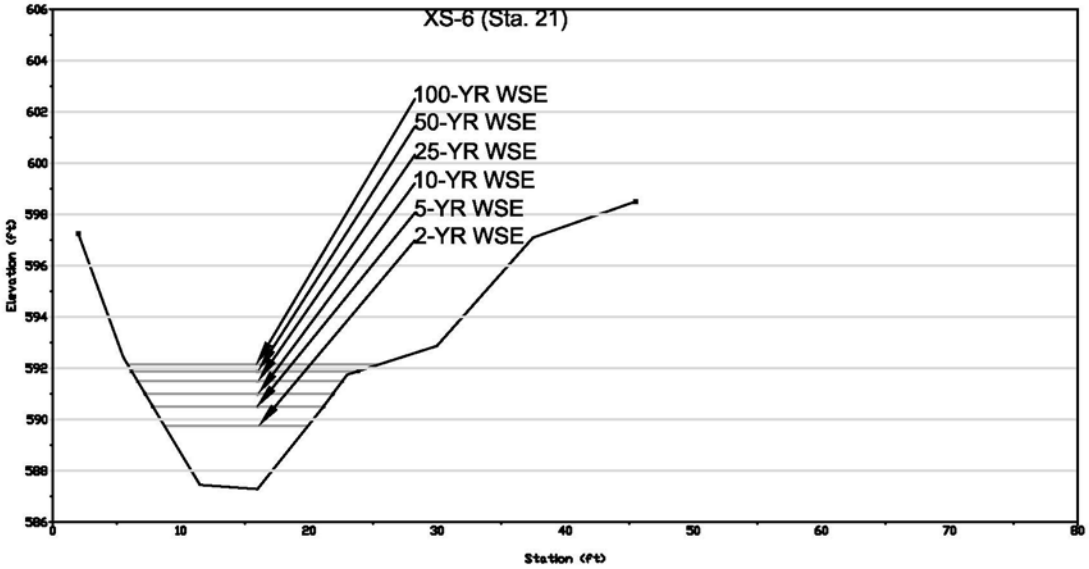



**Figure 6 (continued). Simulation A vs. B: Cross-sectional profiles of simulated 2- through 100-year flood water surfaces for existing conditions vs. proposed project conditions. See Figure 4 for cross-section locations.**

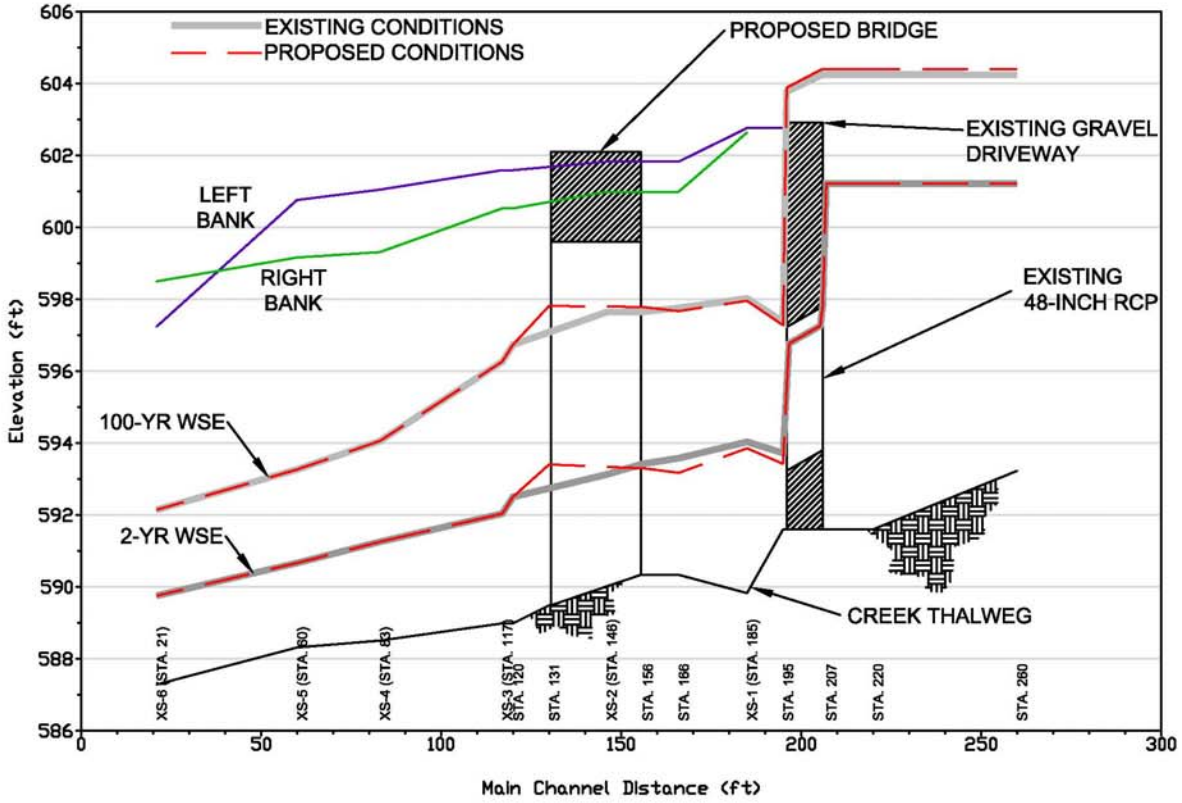
***Run B – Project Conditions:***

Only minor changes to water surface elevations were observed when comparing simulated existing and project conditions when using existing-conditions flow rates (see Figure 7). The minor differences, an approximately 1-foot rise in water level at the downstream end of the proposed bridge, are the result of manipulation of surveyed cross-sections within the model in order to accommodate the proposed bridge; construction of the project does not increase runoff to Temescal Creek and estimated creek flows do not change relative to existing conditions. As part of bridge installation, it is anticipated that the underlying channel banks will be widened in order to alleviate over-steepened and unstable conditions. Bioengineering techniques will be used to stabilize these altered banks as described in Section 3.2, below. The changes in channel cross-sections beneath the bridge are presented on Figure 6. A design condition of the proposed bridge is that it provides 2-feet of freeboard between 100-year flood level and bridge soffit (see Figures 6 and 7). Results also indicate that there will be no significant backwater effects or changes in water levels upstream of the project bridge that would adversely impact the upstream culvert and associated bank erosion.

Because of the increased channel width and conveyance capacity beneath the proposed bridge, there is a notable decrease in flow velocities when compared to existing conditions (see Figure 7). Beneath the bridge, velocities are reduced by 1- to 4-ft/s for both the 2- and 100-year floods. Project velocities are slightly elevated above existing conditions immediately upstream of the bridge. Simulated project velocities don't change relative to existing conditions at any other location along the project reach.

***Run C – Existing Conditions and Removal of RCP:***

Removal of the RCP essentially eliminates the backwater effect that elevates water levels upstream of the RCP under existing conditions (Figure 8). This also leads to increased flow velocities upstream of the culvert to within the range experienced downstream of the RCP; 2-year flood velocities increase to between approximately 6- and 8-cfs as opposed to 1-ft/s under existing conditions and 100-flood velocities increase to between 8- and 11-ft/s as opposed to 2-



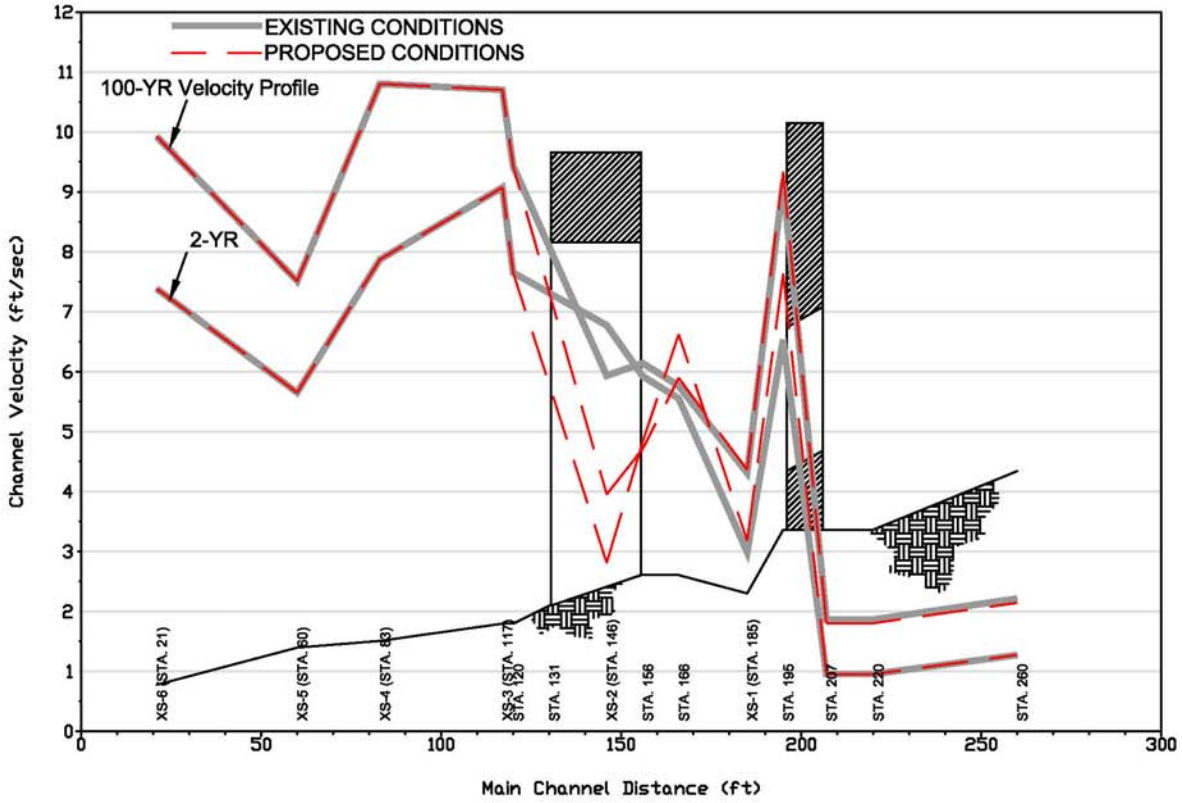
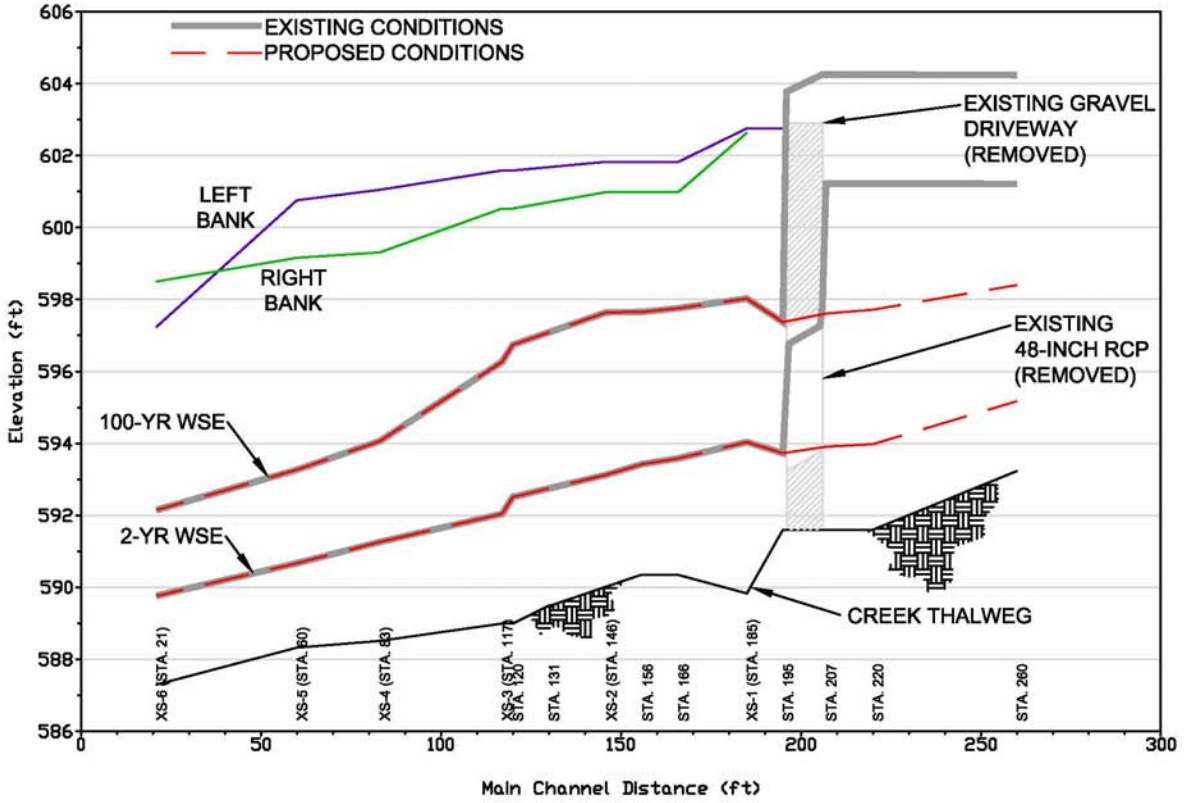




**Figure 7. Simulation B: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions vs. proposed project conditions.**



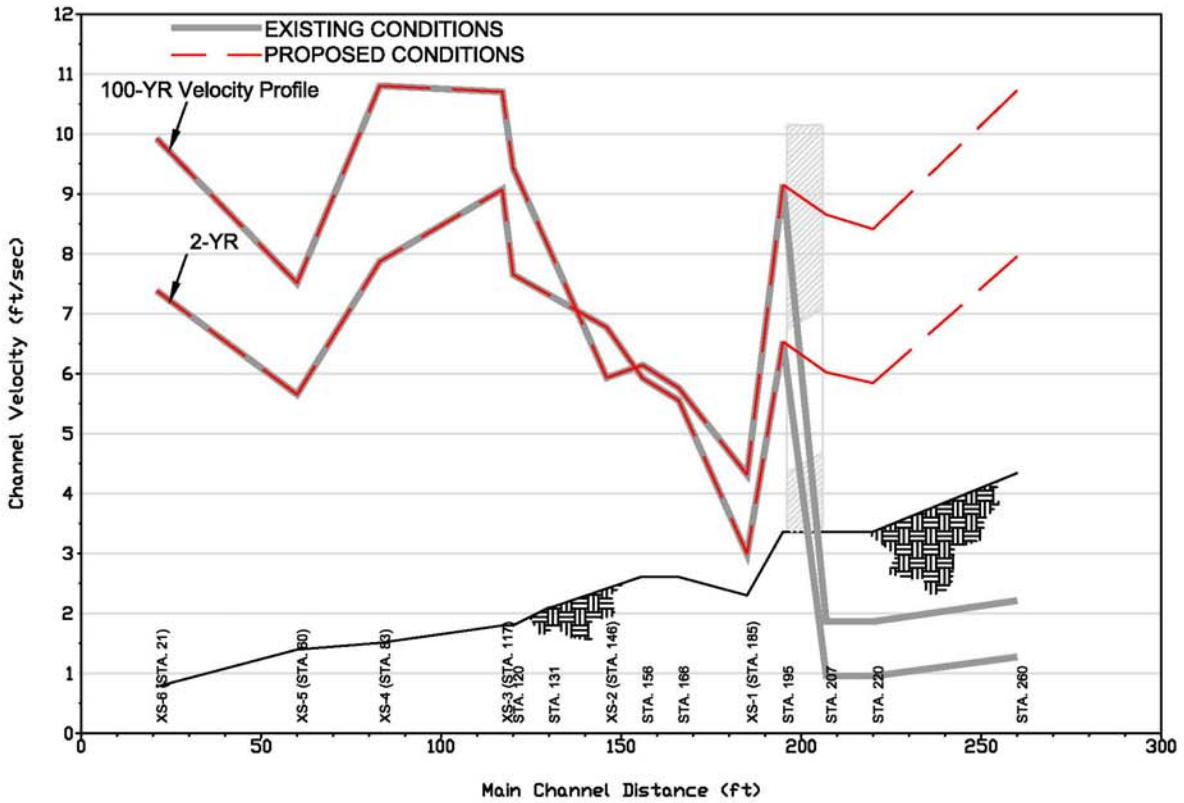




**Figure 8. Simulation C: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions vs. existing conditions with upstream 48-inch RCP removed.**

ft/s when the RCP is present. There is no predicted change in creek water levels and velocities downstream of RCP location (Figure 8).

***Run D – Project Conditions and Removal of RCP:*** Removal of the RCP under project conditions leads to the same changes in water level and flow velocity upstream of the RCP as simulated under existing conditions (Figure 9). Simulated water levels and velocities downstream of the RCP do not differ from those simulated under project conditions (RCP remaining; Run B, Figure 7).

***Run E – Full Build-out Flows under Existing Site Conditions:***
Simulating future full build-out flows under onsite existing conditions produces slightly greater water surface elevations, increasing from 0.2 to 0.3-feet under the 2-year flood and from 0.1- to 0.3-feet under the 100-year flood event through the project reach downstream of the RCP (Figure 10). With the exception of a 1.7-foot higher simulated water surface elevation for the 2-year flood, simulated increases in water levels for design floods upstream of the RCP are the same magnitude as those simulated downstream.

Slightly higher velocities for the 100-year flood were simulated, ranging from a decrease of 0.1-ft/s to an increase of 0.3-ft/s when compared to the existing conditions simulations (Run A) while velocities for the 2-year flood decreased by about 0.3-ft/s upstream of the RCP and increased slightly by 0- to 0.4-ft/s downstream of the RCP.

***Run F- Full Build-out Flows with Project Conditions:***
Similar to Run E, small increases in water surface elevation accompany the increase in flow rate, with the exception of the 2 year water surface elevation upstream of the 48-inch RCP, which increases by 1.7 feet (Figure 11). Water surface elevations downstream of the RCP increase between 0- and 0.3-feet under the 2-year flood and from 0.1- to 0.3-feet under the 100-year flood. These results indicate that there will be no significant backwater effects or changes in water levels upstream of the project bridge that would adversely impact the upstream culvert and associated bank erosion that wouldn't already occur under a No Project alternative.

Velocity fluctuates between a decrease of 0.6 feet/second and an increase of 0.4 feet per second. The proposed bridge remains 1.8 feet above the future build-out peak 100 year water surface elevation.

***Run G - Full Build-out Flows under Existing Conditions and Removal of 48" RCP:***
With the upstream culvert removed, upstream water surface elevations decrease and channel velocities increase, similar to Run C (Figure 12). Water surface elevations and velocities are slightly higher due to the larger volume of water expected under full build-out flows.

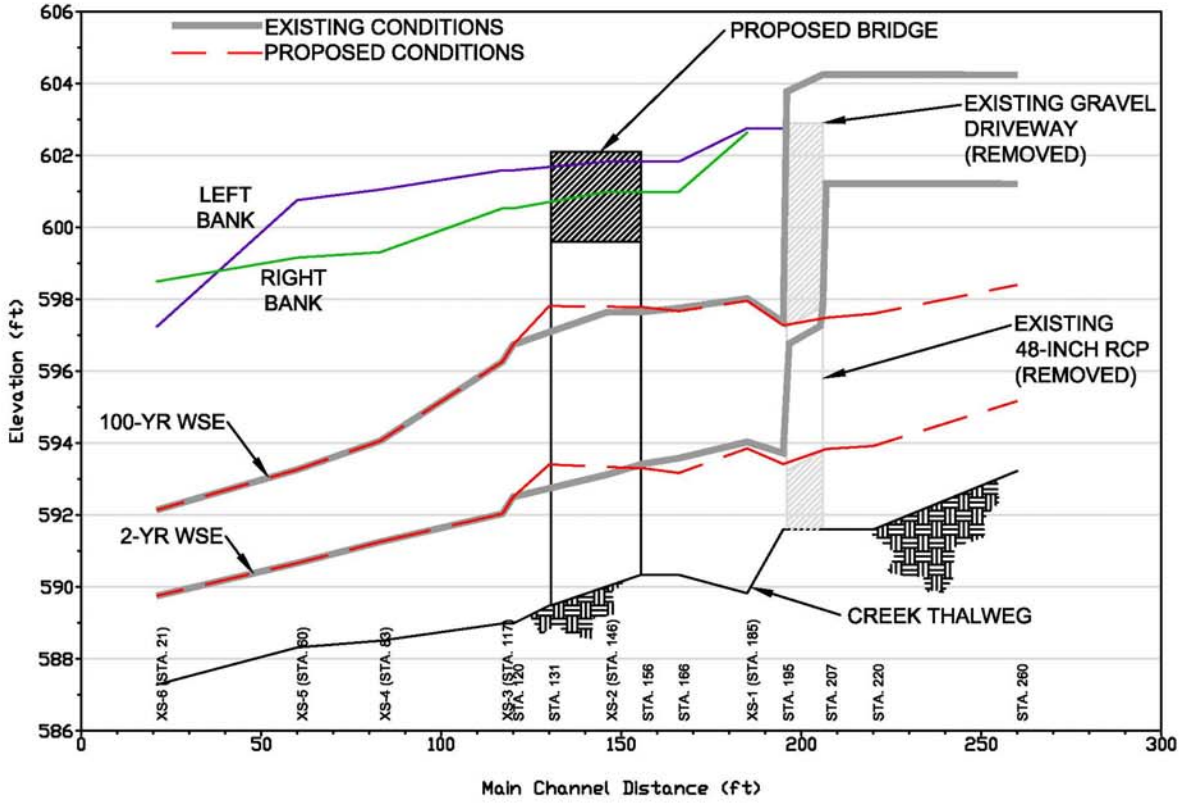
***Run H - Full Build-out Flows under Project Conditions and Removal of 48" RCP:***
Similar to Run D, future build-out flows in Temescal Creek with the upstream culvert removed results in an upstream drop in water levels and increase of velocities coupled with an overall increase of water surface elevations due to the higher future build-out flows (Figure 13).

## 2.3 Summary and Discussion of Results

The County alternative requirements for bridge freeboard are: a) the design (25-year) storm provides 2-feet of freeboard from bridge soffit (top of underside of bridge) or b) the bridge

provide 100-year storm capacity. As demonstrated in hydraulic model runs, the project reach and proposed bridge satisfy the County freeboard requirements.

Hydraulic model results indicate that construction of the proposed project would lead to minor fluctuation in water level and modest reductions in flow velocity restricted to the project bridge vicinity. None of these changes would lead to adverse channel instability or increased flood hazard either upstream or downstream of the project site. Work to lay-back the channel banks and complete bioengineering measures along the banks beneath the bridge (described in Section 3.2 below) would, in tandem with lower flow velocities, lead to improved channel stability. Future development within the watershed will lead to increases in flood flow magnitude between 7- and 16-percent. This will lead to minor (less than 0.25-feet) rise in the flood levels and flow velocities (the majority of channel will experience velocity increase of 0.1-ft/s and up to 0.5-ft/s around Station 120 during the 2-year flood. Construction of the project will not accentuate or exacerbate these changes beyond the magnitudes experienced under existing flow conditions, including at the upstream culvert and associated eroding bank. Removal of the RCP only affects water levels and velocities upstream of its position, eliminating the backwater flooding but increasing flow velocities to comparable speeds currently experienced downstream through the project reach. There were no simulated changes in water level or velocity through the project reach when removing the RCP. Increased velocities upstream of the RCP probably will not instigate channel instabilities off-site as the upstream reach is a concrete reinforced rectangular channel.



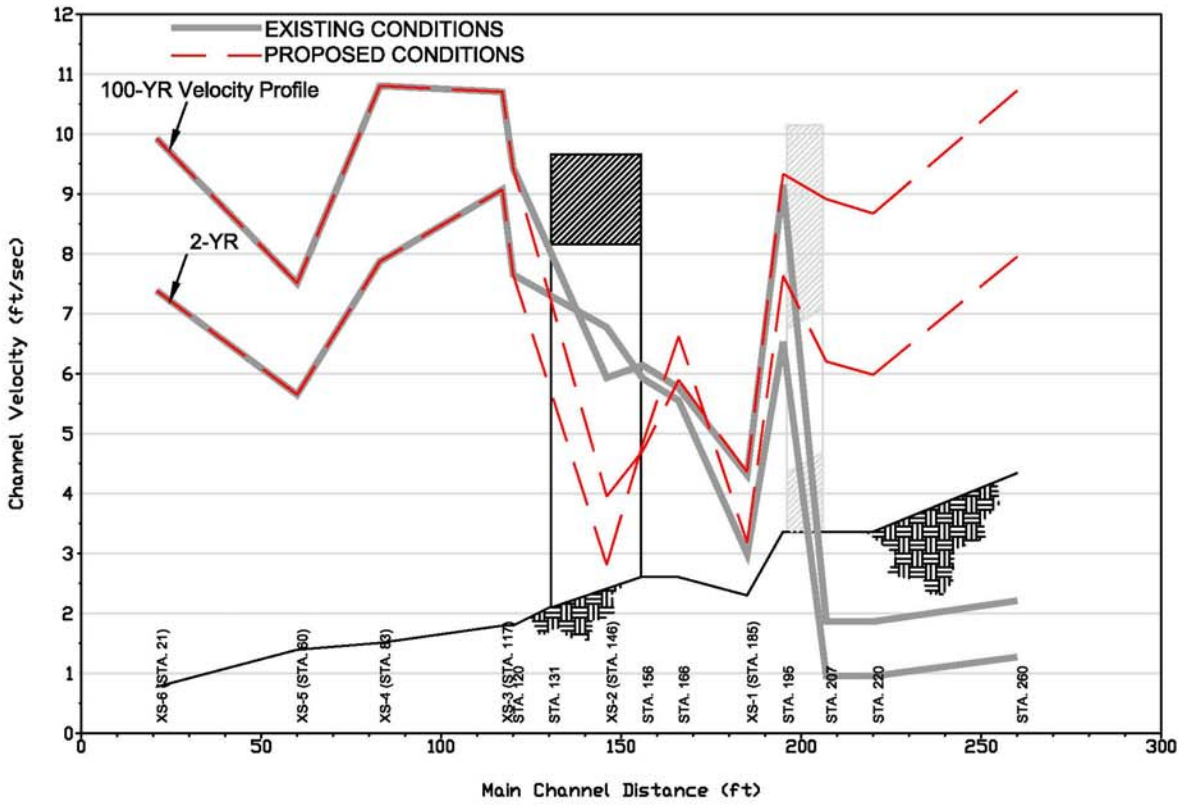
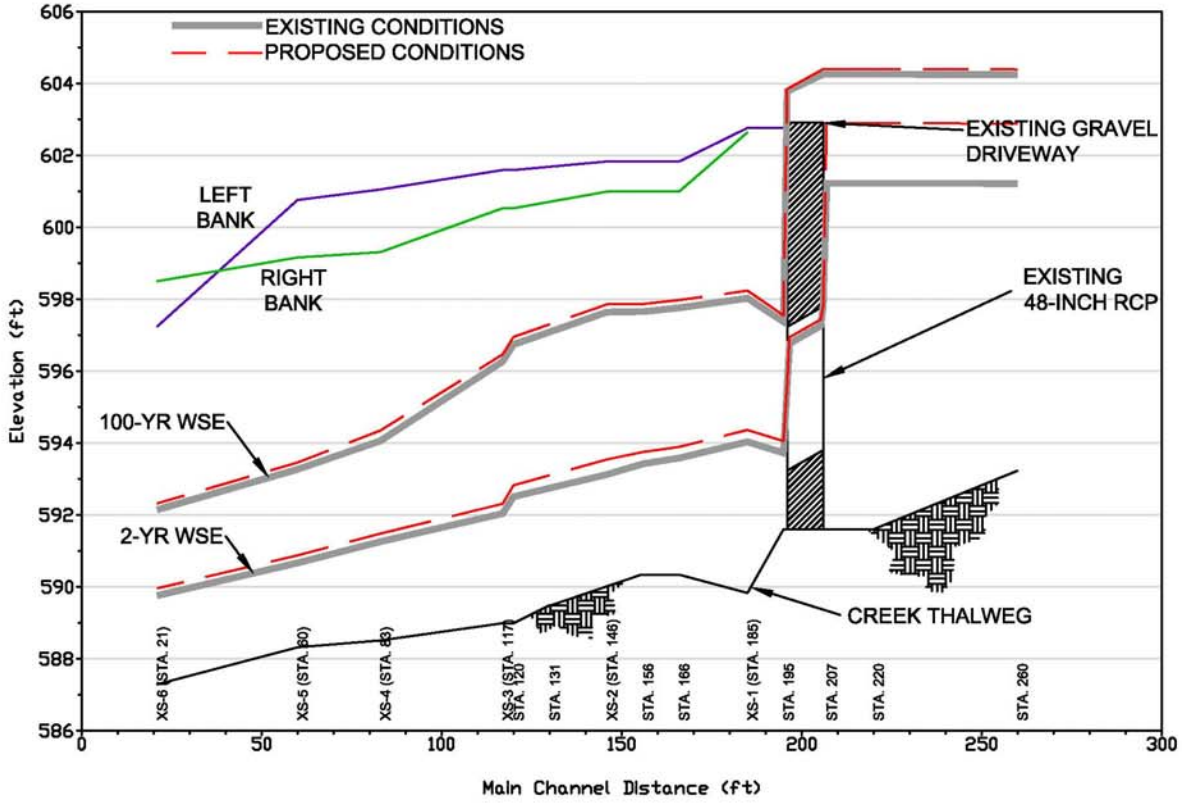




**Figure 9. Simulation D: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing vs. proposed project conditions with upstream 48-inch RCP removed.**



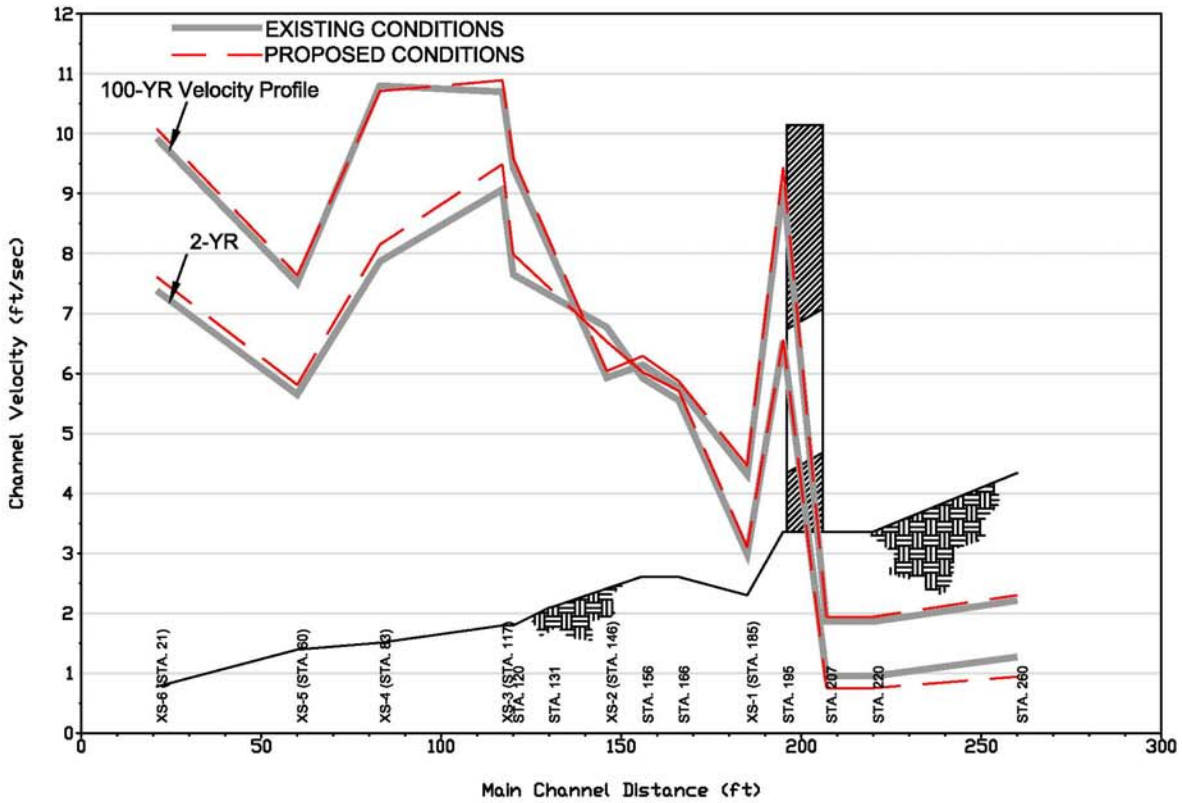
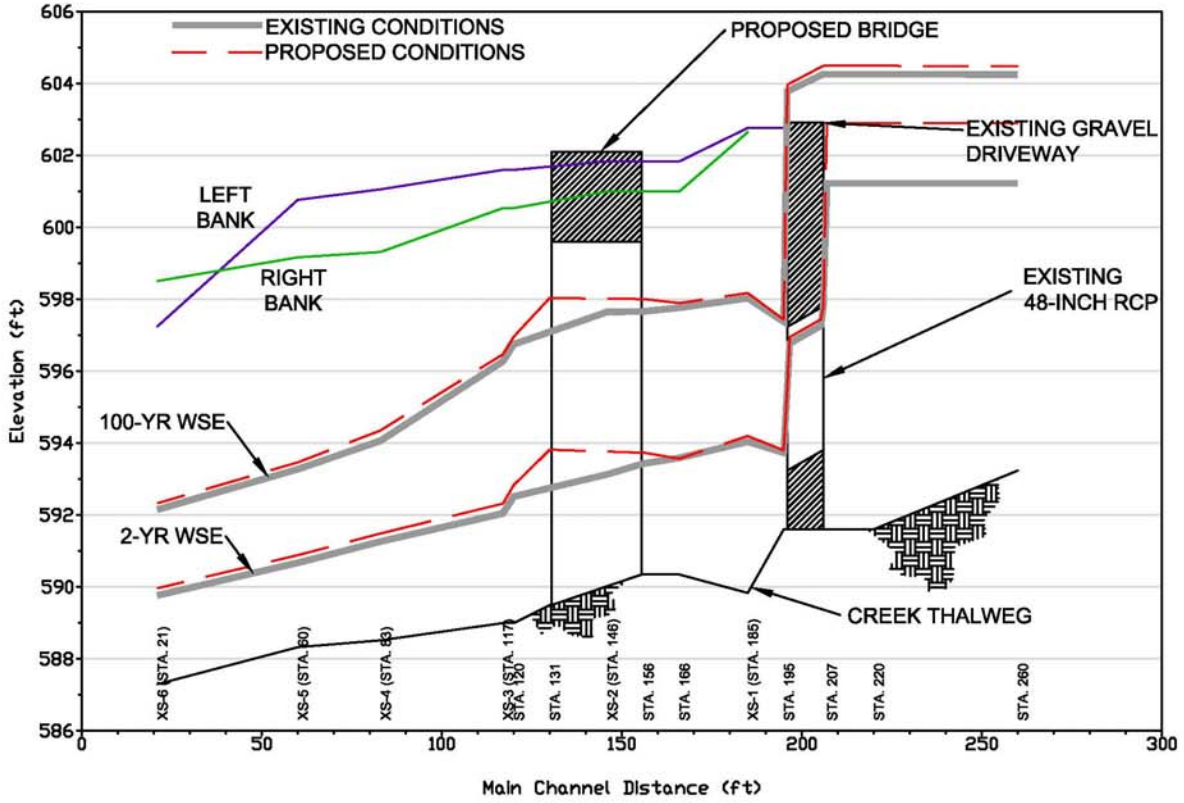




**Figure 10. Simulation E: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions vs. future (full build-out) conditions.**



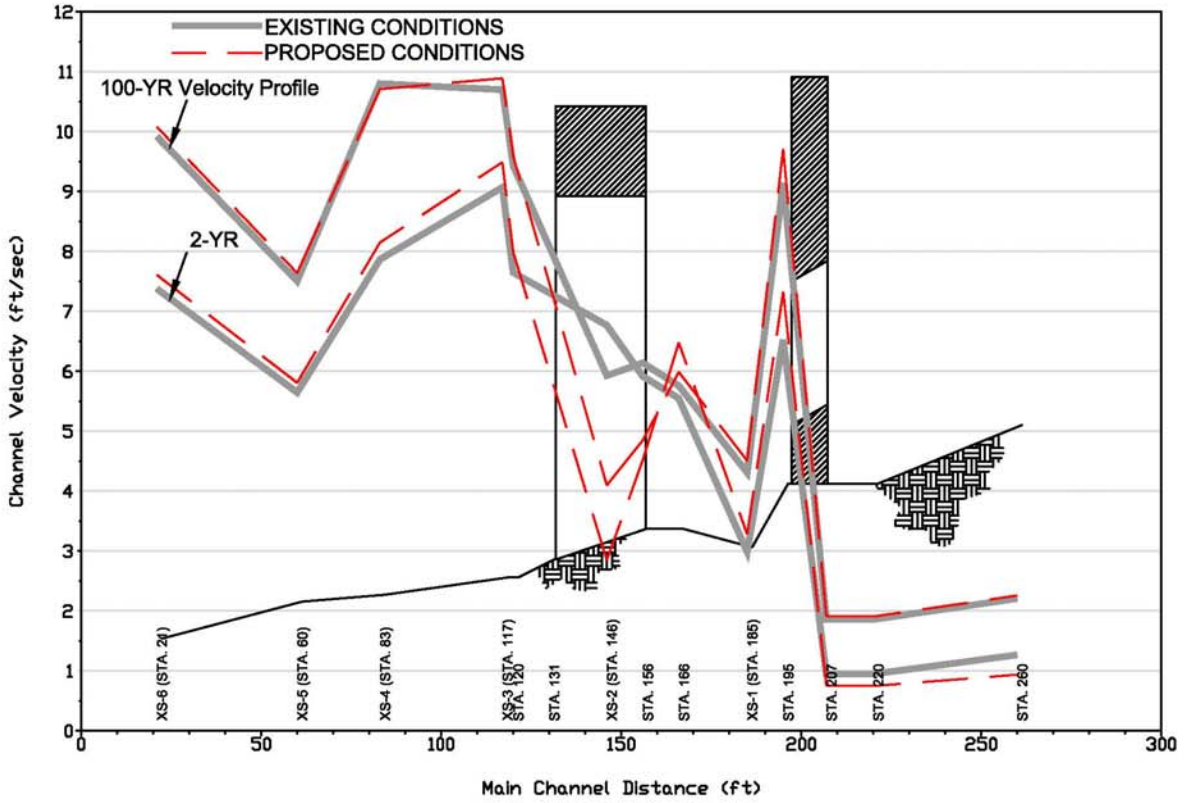
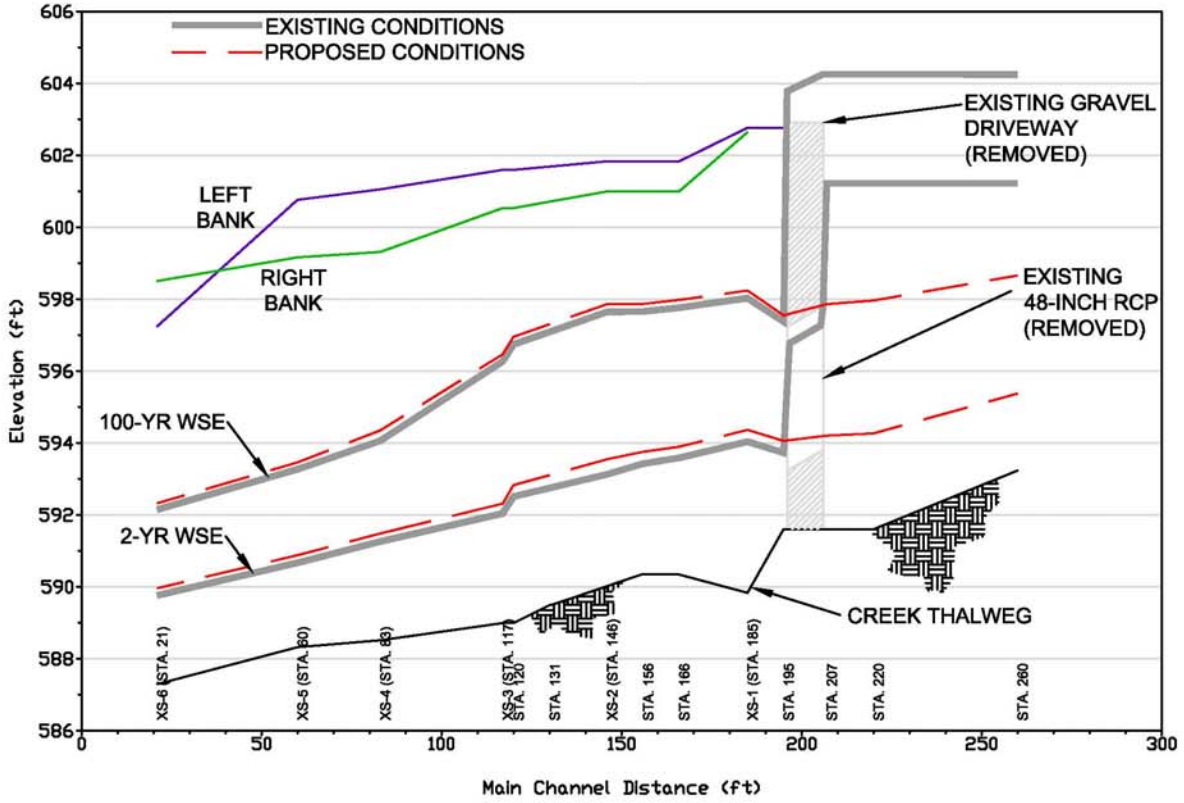




**Figure 11. Simulation F: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions vs. future (full build-out) project conditions.**



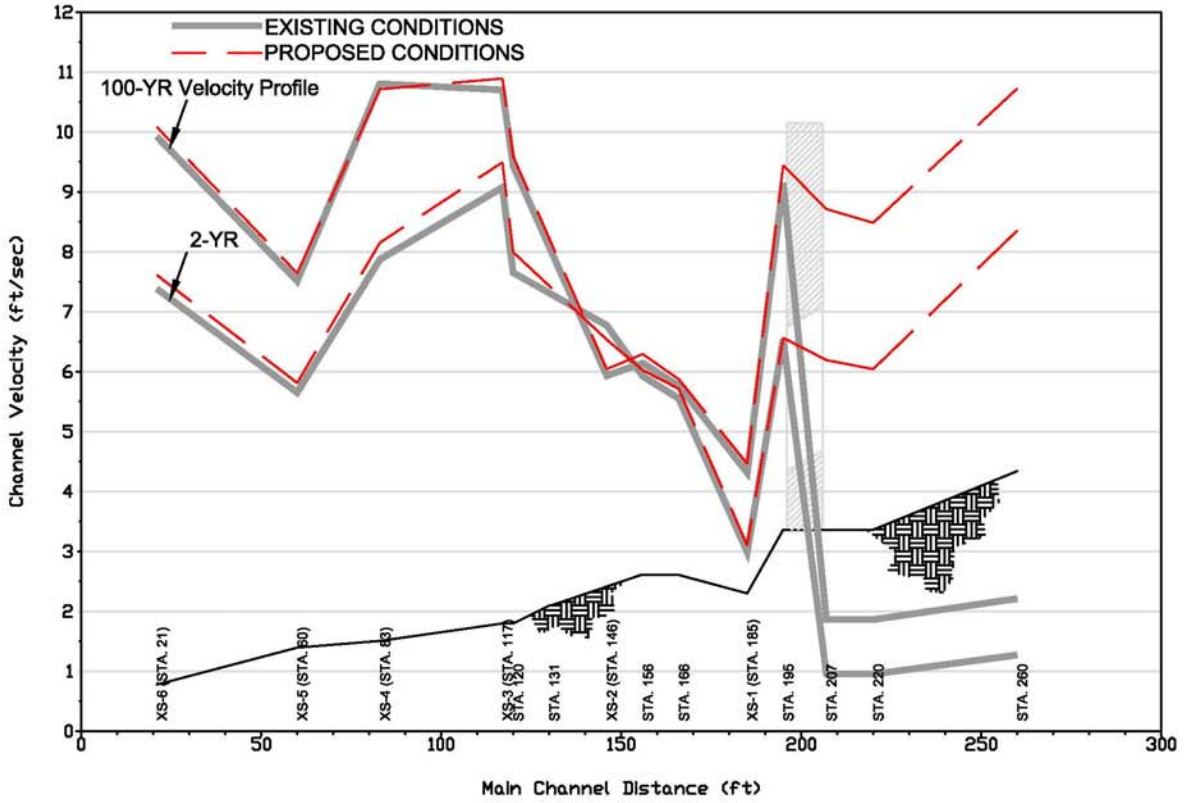




**Figure 12. Simulation G: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing vs. future (full build-out) conditions with 48-inch RCP removed.**

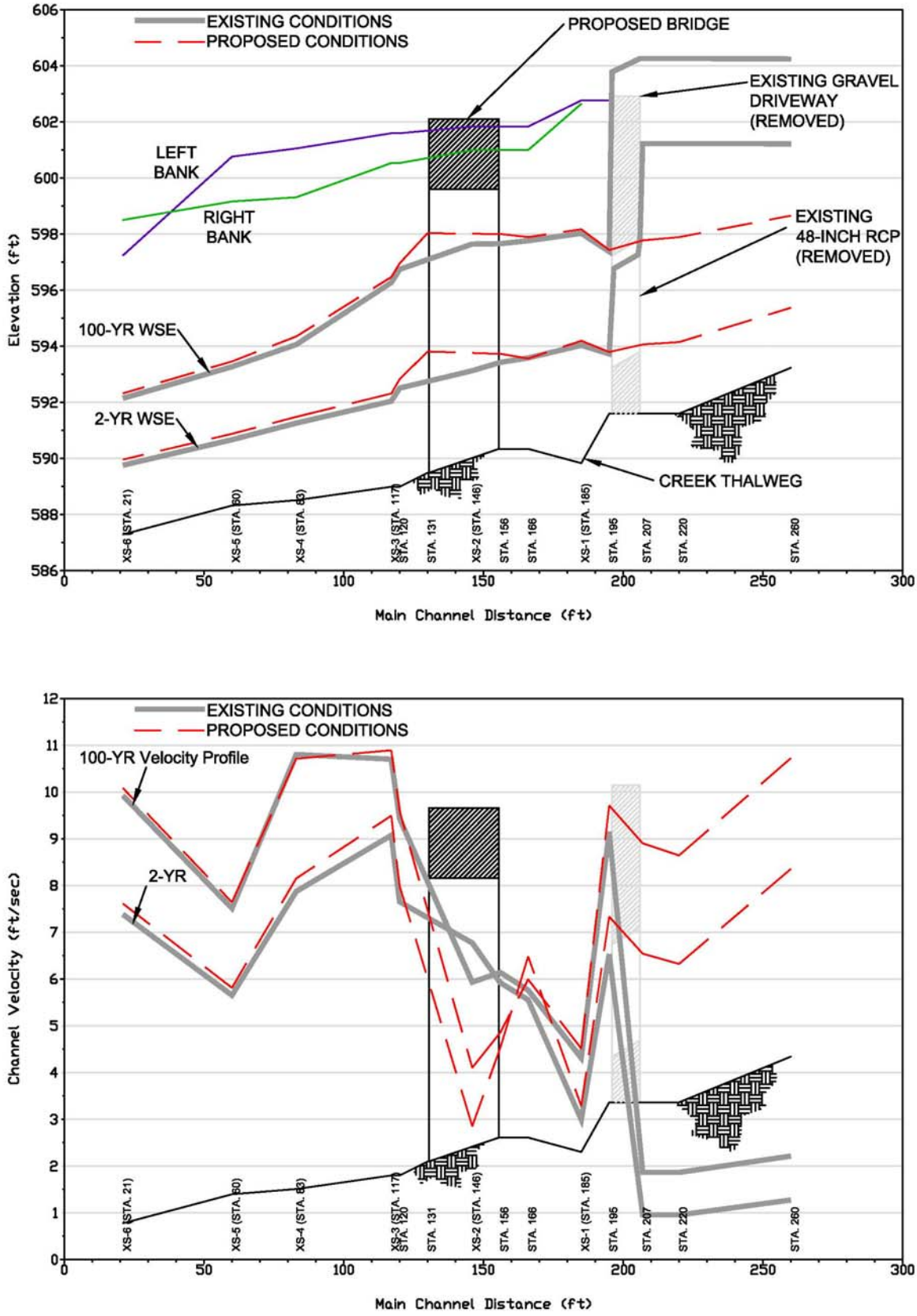



**Figure 13. Simulation H: Graphics comparing simulated 2- and 100-year flood water surface (upper) and velocity profiles (lower) for existing conditions vs. future (full build-out) project conditions with upstream 48-inch RCP removed.**

# 3.0 CREEK BANK STABILITY

## 3.1 Creek Bank Stability (Existing Conditions):

The east side of the creek is underlain by alluvial and colluvial soils which primarily consist of stiff silty to sandy clays; bedrock was encountered at a depth of about 17 feet (Land Marine, 2005). The colluvium/alluvium on the east side of the creek is relatively resistant to erosion and has moderate cohesive strength. Existing creek slopes on the east side are generally moderate, typically on the order of 2:1 (horizontal to vertical) and exhibit few signs of instability. The stream channel deposits along the west side of the creek contain layers of loose silty and clayey sand and gravels. These soils are susceptible to erosion and strength loss due to seepage during and following significant high flow events, as well as during strong seismic shaking.

The west side of the creek is underlain by a surficial layer of fat silty clay which extends to a depth about 3 feet. The surface clay is in turn underlain by loose silty and clayey sand and gravels which extend to bedrock at a depth of about 22 feet. The sandy soils on the west side of the creek are highly susceptible to erosion and to liquefaction during seismic shaking (Land Marine, 2005). There are numerous historic slope failures on the west side of the creek bank resulting in near vertical slopes in several areas [near vertical bank sections were observed in cross-sections 1 (Station 185), 4 (Station 83), and 5 (Station 60)]. Cross-sections 2 (Station 146), 3 (Station 117) and Station 156 exhibit a lower terrace on the right (west) bank, with elevations between three and six feet below the upper right bank (see Figure 6).

Due to the above-mentioned soil structure, the observed lower terraced bank between stations 117 and 156 may be the result of soil slump (Land Marine, 2005). Some of the bank failures on the west side of the creek are located in areas experiencing impinging flow associated with the local bends of the creek. Generally the creek bed is about 10 feet below the level of Thornhill Drive and setback 40 to 50 feet from the edge of roadway. However, between approximately station 63 and 83, the top of creek bank is as little as 5-feet from the edge of roadway. Future erosion and creek bank instability could potentially affect the roadway in this area, however this is a preexisting condition and the project is not anticipated to accelerate or alter this condition. As indicated above, an alternative to stabilize this bank as part of the project was proposed and evaluated, but the RWQCB and, in part, the City determined this action was undesirable. Neighbors were also concerned about additional tree loss that would accompany this alternative. Construction of the project will not interfere or limit any future repairs of this bank if such a repair is deemed necessary in the future.

There appears to be active erosion under and adjacent to the upstream (off-site) culvert. As of early May 2010, the slope to the east of the culvert and lying beneath the adjacent property driveway was covered in heavy plastic, an action typically implemented to protect actively eroding banks. This is a preexisting condition and the project is not anticipated to accelerate or alter this condition.

Existing-conditions creek velocities and shear stress throughout the reach for the range of storm recurrence intervals indicate the capability for coarse gravel and cobble mobilization within the creek bed. The upstream culvert currently reduces flow rates (and therefore velocities and shear stresses) upstream of the culvert; removal of this culvert will not alter the velocities occurring below the culvert location.

Placement of the proposed bridge footings would be outside the flow lines for all design flows. Project geotechnical engineers (Land/Marine, 2005) recommend that, at a minimum the effects of creek bank instability should be taken into account in the design of the bridge foundations and abutment walls. Specifically, the abutment walls should extend below an imaginary line projected upward from the creek bottom at an inclination of 2.5:1. In addition, the bridge should be supported on drilled pier foundations that derive their vertical and lateral support below the potentially unstable soils.

A tree fall below cross-section 3 (Station 117) was observed and acts as a flow control structure, likely increasing erosion potential during high flow events. This tree is decaying rapidly and will be removed during non-native vegetation removal efforts to alleviate the erosion potential.

The bed of the creek generally consists of alternating bars of coarse grained material, dominated by concrete and brick rubble, interspersed with gravel bars containing finer-grained sand and gravel and some small pools. The regular occurrence of dense accumulations of coarse-grained debris effectively acts as grade control structures. These structures in association with the fixed culvert inlet elevations both up- and downstream, act to prevent further channel incision.

### 3.2 Creek Bank Stability (Proposed Project Conditions):

During the preliminary project assessment and design phase, considerable channel bank stabilization measures were recommended to ameliorate the unstable conditions described above. In general, these measures consisted of considerable earthwork to realign the creek and create more stable channel bank slopes. However, based on conversations with PGA Design, the State Regional Water Quality Control Board (RWQCB) and City of Oakland staff, there was a stated desire that the project not significantly alter the morphology of the creek out of fear that such dramatic channel grading and realignment would lead to future chronic creek destabilization. Removal of concrete and brick rubble and debris may help to beautify the creek, but is not recommended as it may reactivate incision and destabilize existing creek banks. Therefore, the RWQCB requested that all construction activities in the creek channel be avoided where not absolutely necessary in order to minimize disturbance to the creek channel.

In compliance with RWQCB desires, the only significant modifications to the creek channel are proposed along the banks beneath and immediately upstream/downstream of the proposed bridge crossing (see Sheet CR-1 in Appendix C). As indicated above, this work includes laying back currently over-steepened banks and stabilizing the exposed slopes using bioengineering techniques. Bridge installation will not reduce the cross-sectional flow area of the creek. Instead, laying back the underlying banks and stabilization through bioengineering methods will lead to increased flow conveyance, lower velocities, and amelioration of the existing eroding slump block discussed above.

Beneath the proposed bridge, a combination of bioengineering techniques stabilize the creek banks, provide habitat and erosion protection, and prevent scour of the bridge support structure. Disturbance beneath the bridge footprint during construction provides a localized opportunity to widen the channel, producing an area of reduced flow velocity as discussed above.

The bioengineered slope to be reconstructed under the bridge will consist of a layered system. The lower portion of the creek banks will be stabilized using an elongated box-like interlocking log structure backfilled with rock and soil called a live crib wall (see Figure 14). The base of the live crib wall is keyed into the slopes and extends from 1- to 2-feet below the existing streambed

(or deeper pending design scour analysis). The top of the crib wall will be constructed to the elevation of the 2-year flood water level. The long sides of the log box run parallel to the channel centerline and shorter axis perpendicular to the creek centerline (see Sheet CR-1 in Appendix C). The crib wall and overlying treatment will extend approximately 10- to 20-feet both up- and down-stream of the bridge (or further if engineering design determines it necessary) to provide a smooth transition between modified bank (under bridge) and existing channel banks. Some minor adjustments to the structure and/or channel upstream of the bridge may be necessary. In order to accommodate the smooth transition upstream of the bridge, the bioengineered banks would transition into the rubble lined channel that lines the existing bank downstream of the 48-inch culvert.

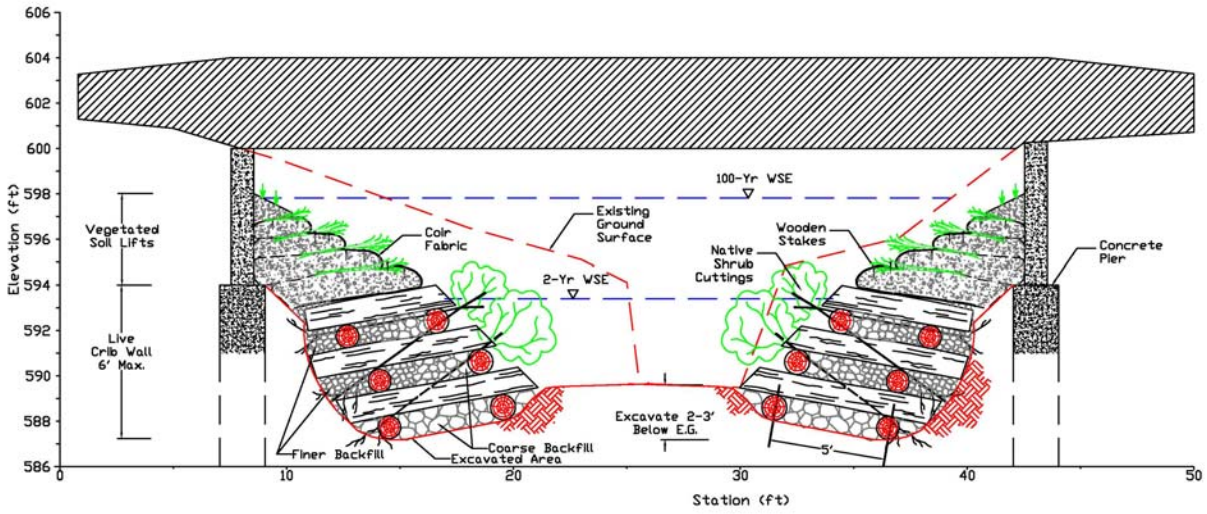



**Figure 14. Conceptual design of proposed bioengineering treatments (live crib wall and vegetated soil lifts) under proposed new bridge based on downstream bridge cross-section at Sta. 131.**

Courses of logs are placed at right angles on top of the previous course, overhanging by six inches, and secured to the preceding course with nails or rebar. Coarse rock fill lines the lowest course of the structure and is placed along the front of the structure in order to fill the gaps between logs along the structure's face and prevent loss of backfill though the log gaps. Finer granular rock and organic backfill is placed along the back of the structure to provide a suitable growing medium for the layers of live branch cuttings placed on each course perpendicular to the slope, creating a live crib wall. Additional log layers are added to a maximum structure height of approximately six feet, so the top face of the crib wall corresponds to the 2-year water surface elevation.

Above the live crib wall, vegetated soil lifts are constructed with erosion control fabric to provide erosion protection while installed vegetation is established. The fabric forms individual soil lifts, typically 1-foot tall, and filled with fine grained soils. Each lift is secured with wooden stakes and overlain with woody plant cuttings. The lifts are placed so as to create bank slopes no

steeper than 2-foot horizontal to 1-foot vertical (2H:1V) up to the height of the 100-year flood level.

Vegetation incorporated into the live crib wall and soil lifts under the bridge will consist of native, shade tolerant species (e.g., Snowberry, Creek dogwood, etc.) while willows will be used beyond the up- and down-stream limits of the bridge deck where there is more sunlight. There will likely be an area under the bridge that is shaded to a degree that little if any vegetation will grow. For this reason, the log crib wall structure was selected as it will provide sufficient erosion protection and bank stability without the need for vegetation. Similarly, the geotextile encapsulated soil lifts above the crib wall will provide sufficient bank stability in shaded areas devoid of vegetation. It is anticipated that vegetation will thrive along the deck margins under the bridge where it receives adequate sunlight. Based on post-project vegetation and geomorphic monitoring that will be conducted after project construction, adaptive management measures may be warranted to improve vegetation conditions (e.g., change is species) and/or bank instabilities within the project reach.

Additional information and photographs of live crib walls and vegetated soil lifts may be obtained in the following publications:

- Washington State Aquatic Habitat Guidelines Program, Integrated Streambank Protection Guidelines, 2003 (http://wdfw.wa.gov/hab/ahg/ispgdoc.htm); and

- U.S.D.A. Natural Resources Conservation Service, Streambank and Shoreline Protection, National Engineering Field Handbook, Part 650, Chapter 16, 1996.

Other recommendations to improve channel bank stability while minimizing disturbance includes repositioning existing large concrete debris within and around the large plunge pool to stabilize this feature below the existing 48-inch culvert. No additional material would be imported and added, this action would simply attempt to improve the stability of the existing materials. Material would be placed in an integrated fashion to create a smooth transition with the upstream end of the log crib wall.

## 4.0 ADDITIONAL HYDROLOGY REPORT INFORMATION

**Impact of Proposed Work to Direction of Flow:**
The only modification to the existing creek banks is beneath the proposed bridge. These banks will be reconstructed with equal or lesser exposure to creek flow. Where exposed to creek erosion, the restored bank is less susceptible to erosion than the existing earthen bank – especially along the softer and unstable west channel bank. The proposed bridge work will not adversely alter or redirect creek flow.

**Upstream and Downstream Conditions (Before and After Project Construction):**
Temescal Creek flows within culverts both upstream and downstream of the project area. The creek enters the project site at the outfall of an existing 48-inch culvert owned and maintained by a private residence. Upstream of this culvert, the creek flows in a concrete lined channel for at least a couple hundred feet. Downstream of the project reach, the creek flows along approximately 80-feet of rubble and vegetation armored channel before entering a buried storm drain.

The conditions upstream and downstream of the project area will not be affected in any way by the proposed project. The abutments to the proposed bridge shall be placed outside of the 100-year flood water surface elevation.

**Location of Major Drainage Facilities:**
A 48-inch diameter RCP culvert spans the driveway immediately upstream from the project. Upstream of the culvert, the creek flows within a rectangular concrete lined channel. Approximately 80-feet below the St. John's Church reach, the creek once again enters into a culvert beneath Alhambra Road.

**Cross Sections:**
Ground surface profiles and simulated flood levels at selected cross-sections are illustrated in Figures 5 through 13 (cross-section locations are indicted on Figure 4). Additional cross-sections not surveyed reflect the location of the proposed bridge.

**Proposed Improvements/Mitigation to the Creek:**
Removal of vegetation for the installation of the proposed bridge will be replaced with native vegetation in appropriate locations (i.e. riparian, upland). Restoration and revegetation will include planting of trees, understory vegetation, and shrubs to provide habitat, shade, creek bank stability and erosion control. PGA Design has developed extensive plans and lists indicating vegetation to be removed, vegetation suitable for preservation, and native vegetation to be planted. A total of seven (7) selected design sheets presenting the bridge bank treatment and tree preservation and replanting plans are included as Appendix C. In order to minimize soil disturbance, trees will be cut 6-inches above finished grade, retaining all root masses The revegetation plan will serve to increase the health of the landscape, including the natural stabilization of creek banks without the need for grading or channel disturbance.

**Vegetation Analysis**
Vegetation removal, including existing trees, shrubs and groundcovers will reduce the overall tree canopy in the vicinity of the proposed bridge, but will have minimal effect on the shading of the creek and adjacent banks. As shown on Figures CR-2 and CR-3 (Attachment C), the removal of 9 trees to construct the new bridge will reduce the existing tree canopy cover over the creek by

approximately one third. The remaining trees plus two additional trees, however, will continue to shade the creek and banks, allowing for some increase in filter light throughout the day. Most of the shading loss will occur from the removal of trees 9, 10, 11, and 12 on the west bank. On the east bank, the removal of trees 1, 2, 7, 24 and 55 will result in little net loss of shading due to remaining shade cover from the bridge and remaining trees along the bank. Two large canopied trees, as identified on the planting plan L2-1 (Appendix C), will ultimately grow to sufficient size to replace the canopy on the north side of the bridge. In addition, the initial increase in sunlight near the bridge will allow the newly planted native species to become established.

The entire creek corridor will be planted with native understory species, as shown on the planting plan sheets L2-1 and L2-2 (Appendix C). Given that most to the existing plants within the creek corridor are non-native, exotic species, the proposed plantings will greatly increase habitat value along the creek within the project area.

**Impact on Existing Vegetation or Wildlife within Affected Riparian Corridor:**
Despite its location in the upper watershed, Temescal Creek is an urban creek with several non-native riparian vegetation species. The project will help to remove some non-native species, reduce crowding and fire-prone materials, and plant native species where appropriate. Introduction of gravel and crushed granite into the parking area allows water to percolate into the ground while reducing dirt and chemical exposure to the creek. A temporary impact to urban wildlife in the area may be experienced during construction, but reintroduction of native plant species will increase the overall habitat value of the creek corridor, which is currently dominated by non-native species, providing higher-quality habitat post construction.

## 5.0 REFERENCES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# Appendix A
# Sandis Engineers On-Site Runoff Calculations

**St. Johns Episcopal Church**
**Stormwater Hydrology Calculations**
**By: AKF**
**Date: 9/4/2009**

**Q=CW*i*AT**

| Runoff Coefficients | C |
|---|---|
| Landscape | 0.30 |
| Hardscape | 0.90 |
| Gravel Parking | 0.45 |
| Decomposed Granite | 0.45 |

**2-Year / 10-Minute**

| i (in/hr) = | 1.2 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | AL (SF) | AH (SF) | AP (SF) | ADG (SF) | AT (SF)) | CW | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 1.843 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.109 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 1.838 | -0.005 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 1.814 | -0.029 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.117 | +0.008 |

| | CFS | GPM |
|---|---|---|
| QTotal (PRE-DEVL.) | 1.952 | 876.392 |
| QTotal (Phase 1 POST-DEVL.) | 1.954 | 877.424 |
| QTotal (Phase 2 POST-DEVL.) | 1.930 | 866.659 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

**5-Year / 10-Minute**

| i (in/hr) = | 1.5 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | $A_L$ (SF) | $A_H$ (SF) | $A_P$ (SF) | $A_{DG}$ (SF) | $A_T$ (SF)) | $C_W$ | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 2.304 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.136 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 2.297 | -0.007 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 2.267 | -0.037 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.146 | +0.010 |

| | CFS | GPM |
|---|---|---|
| $Q_{Total}$ (PRE-DEVL.) | 2.440 | 1095.490 |
| $Q_{Total}$ (Phase 1 POST-DEVL.) | 2.443 | 1096.780 |
| $Q_{Total}$ (Phase 2 POST-DEVL.) | 2.413 | 1083.324 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

**10-Year / 10-Minute**

| i (in/hr) = | 2 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | $A_L$ (SF) | $A_H$ (SF) | $A_P$ (SF) | $A_{DG}$ (SF) | $A_T$ (SF)) | $C_W$ | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 3.072 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.181 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 3.063 | -0.009 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 3.023 | -0.049 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.194 | +0.013 |

| | CFS | GPM |
|---|---|---|
| $Q_{Total}$ (PRE-DEVL.) | 3.253 | 1460.654 |
| $Q_{Total}$ (Phase 1 POST-DEVL.) | 3.257 | 1462.373 |
| $Q_{Total}$ (Phase 2 POST-DEVL.) | 3.217 | 1444.432 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

**25-Year / 10-Minute**

| i (in/hr) = | 2.5 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | $A_L$ (SF) | $A_H$ (SF) | $A_P$ (SF) | $A_{DG}$ (SF) | $A_T$ (SF)) | $C_W$ | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 3.840 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.227 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 3.828 | -0.011 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 3.778 | -0.061 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.243 | +0.016 |

| | CFS | GPM |
|---|---|---|
| $Q_{Total}$ (PRE-DEVL.) | 4.066 | 1825.817 |
| $Q_{Total}$ (Phase 1 POST-DEVL.) | 4.071 | 1827.967 |
| $Q_{Total}$ (Phase 2 POST-DEVL.) | 4.021 | 1805.540 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

**50-Year / 10-Minute**

| i (in/hr) = | 2.8 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | $A_L$ (SF) | $A_H$ (SF) | $A_P$ (SF) | $A_{DG}$ (SF) | $A_T$ (SF)) | $C_W$ | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 4.300 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.254 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 4.288 | -0.013 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 4.232 | -0.069 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.272 | +0.018 |

| | CFS | GPM |
|---|---|---|
| QTotal (PRE-DEVL.) | 4.554 | 2044.915 |
| QTotal (Phase 1 POST-DEVL.) | 4.560 | 2047.322 |
| QTotal (Phase 2 POST-DEVL.) | 4.504 | 2022.204 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

**100-Year / 10-Minute**

| i (in/hr) = | 3.2 |
|---|---|

from IDF curve 6856.70, page 28

| Runoff | $A_L$ (SF) | $A_H$ (SF) | $A_P$ (SF) | $A_{DG}$ (SF) | $A_T$ (SF)) | $C_W$ | Q (CFS) | Δ (CFS) |
|---|---|---|---|---|---|---|---|---|
| Pre-Development to Creek | 56702 | 55435 | - | - | 112137 | 0.597 | 4.915 | - |
| Pre-Development to Alhambra SD system | 3735 | 3145 | - | - | 6880 | 0.574 | 0.290 | - |
| Phase 1 Post-Development to Creek | 53013 | 53764 | 4496 | 864 | 112137 | 0.595 | 4.900 | -0.015 |
| Phase 2 Post-Development to Creek | 54462 | 52314 | 4496 | 864 | 112137 | 0.587 | 4.836 | -0.079 |
| Post-Development to Alhambra SD system | 3265 | 3615 | - | - | 6880 | 0.615 | 0.311 | +0.021 |

| | CFS | GPM |
|---|---|---|
| $Q_{Total}$ (PRE-DEVL.) | 5.205 | 2337.046 |
| $Q_{Total}$ (Phase 1 POST-DEVL.) | 5.211 | 2339.797 |
| $Q_{Total}$ (Phase 2 POST-DEVL.) | 5.147 | 2311.091 |

Note: (-)Δ means a decrease in runoff (+)Δ means increase in runoff

# Appendix B:
# HEC-RAS Modeling Results

**A**. Existing Conditions, existing flows

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 206 | Culvert | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| 146 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| | | | | |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**B**. Proposed Conditions existing flows

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 206 | Culvert | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| 131 | Bridge | | | |
| 130 | n | 0.05 | 0.035 | 0.05 |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**C**. Existing Conditions existing flows, no culvert

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| | | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| 146 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| | | | | |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**D**. Proposed Conditions, existing flows, no culvert

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| | | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| 131 | Bridge | | | |
| 130 | n | 0.05 | 0.035 | 0.05 |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**E**. Existing condtions, buildout flows

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 206 | Culvert | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| 146 | n | 0.05 | 0.035 | 0.05 |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**F**. Proposed Conditions, buildout flows

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 206 | Culvert | | | |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| 131 | Bridge | | | |
| 130 | n | 0.05 | 0.035 | 0.05 |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**G**. Existing Conditions, buildout flows, no culvert

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| 146 | n | 0.05 | 0.035 | 0.05 |
| | | | | |
| | | | | |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

**H**. Proposed Conditions, buildout flows, no culvert

| River Stati | Frctn (n/K) | LOB | Channel | ROB |
|---|---|---|---|---|
| 260 | n | 0.022 | 0.017 | 0.022 |
| 220 | n | 0.022 | 0.017 | 0.022 |
| 207 | n | 0.022 | 0.017 | 0.022 |
| 195 | n | 0.07 | 0.045 | 0.07 |
| 185 | n | 0.07 | 0.045 | 0.07 |
| 166 | n | 0.05 | 0.035 | 0.05 |
| 156 | n | 0.05 | 0.035 | 0.05 |
| 131 | Bridge | | | |
| 130 | n | 0.05 | 0.035 | 0.05 |
| 120 | n | 0.05 | 0.035 | 0.05 |
| 117 | n | 0.05 | 0.035 | 0.05 |
| 83 | n | 0.05 | 0.035 | 0.1 |
| 60 | n | 0.05 | 0.035 | 0.1 |
| 21 | n | 0.1 | 0.035 | 0.1 |

260, 220, 207: upstream concrete channel, Channel n=0.017, OB n=0.022
206 Upstream Culvert (not shown in table) n=0.011
195, 185: pool area upstream of proposed bridge, Channel n=0.045 (rubble), OB n=0.07 heavy vegetation
166, 156, 146, 130, 120, 117: Channel n=0.035 (natural bottom + rubble), OB n=0.05 (less dense vegetation, modified vegetation)
83, 60: Channel n=0.035 (natural bottom + rubble), LOB n=0.05 (less dense vegetation), ROB n=0.1 (soil slump adjacent to Thornhill Drive)
21: Channel n=0.035 (natural bottom + rubble), OB n=0.1 (soil slump)

**Simulation A: Existing Site and Flow Conditions**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.01 | 139 | 593.23 | 601.22 | | 601.24 | 0.000056 | 1.27 | 109.44 | 32.98 | 0.12 |
| St John's Church | 260 | 5 Yr | 0.01 | 231 | 593.23 | 603.4 | | 603.42 | 0.000029 | 1.18 | 217.51 | 69 | 0.09 |
| St John's Church | 260 | 10 Yr | 0.01 | 306 | 593.23 | 603.69 | | 603.72 | 0.00004 | 1.45 | 237.74 | 69 | 0.11 |
| St John's Church | 260 | 25 Yr | 0.02 | 392 | 593.23 | 603.81 | | 603.86 | 0.00006 | 1.81 | 245.76 | 69 | 0.14 |
| St John's Church | 260 | 50 Yr | 0.02 | 474 | 593.23 | 604.08 | | 604.14 | 0.000073 | 2.05 | 264.34 | 69 | 0.15 |
| St John's Church | 260 | 100 Yr | 0.02 | 530 | 593.23 | 604.24 | | 604.31 | 0.000082 | 2.21 | 275.62 | 69 | 0.16 |
| St John's Church | 220 | 2 Yr | 0.01 | 139 | 591.6 | 601.22 | | 601.24 | 0.000028 | 0.95 | 147.16 | 40.64 | 0.08 |
| St John's Church | 220 | 5 Yr | 0 | 231 | 591.6 | 603.4 | | 603.42 | 0.000016 | 0.96 | 269.06 | 69 | 0.07 |
| St John's Church | 220 | 10 Yr | 0.01 | 306 | 591.6 | 603.7 | | 603.72 | 0.000023 | 1.2 | 289.41 | 69 | 0.08 |
| St John's Church | 220 | 25 Yr | 0.01 | 392 | 591.6 | 603.82 | | 603.85 | 0.000035 | 1.5 | 297.63 | 69 | 0.1 |
| St John's Church | 220 | 50 Yr | 0.01 | 474 | 591.6 | 604.09 | | 604.13 | 0.000044 | 1.71 | 316.34 | 69 | 0.12 |
| St John's Church | 220 | 100 Yr | 0.02 | 530 | 591.6 | 604.25 | | 604.3 | 0.00005 | 1.86 | 327.71 | 69 | 0.12 |
| St John's Church | 207 | 2 Yr | 0.01 | 139 | 591.6 | 601.22 | 593.41 | 601.24 | 0.000028 | 0.95 | 147.15 | 40.64 | 0.08 |
| St John's Church | 207 | 5 Yr | 0 | 231 | 591.6 | 603.4 | 594.14 | 603.42 | 0.000016 | 0.96 | 269.05 | 69 | 0.07 |
| St John's Church | 207 | 10 Yr | 0.01 | 306 | 591.6 | 603.7 | 594.67 | 603.72 | 0.000023 | 1.2 | 289.39 | 69 | 0.08 |
| St John's Church | 207 | 25 Yr | 0.01 | 392 | 591.6 | 603.82 | 595.22 | 603.85 | 0.000035 | 1.5 | 297.6 | 69 | 0.1 |
| St John's Church | 207 | 50 Yr | 0.01 | 474 | 591.6 | 604.09 | 595.7 | 604.13 | 0.000044 | 1.71 | 316.3 | 69 | 0.12 |
| St John's Church | 207 | 100 Yr | 0.02 | 530 | 591.6 | 604.25 | 596.02 | 604.3 | 0.00005 | 1.86 | 327.66 | 69 | 0.12 |
| St John's Church | 206 | | Culvert | | | | | | | | | | |
| St John's Church | 195 | 2 Yr | 2.14 | 139 | 591.6 | 593.73 | 593.41 | 594.39 | 0.02296 | 6.53 | 21.27 | 10 | 0.79 |
| St John's Church | 195 | 5 Yr | 2 | 231 | 591.6 | 595.07 | 594.13 | 595.76 | 0.015682 | 6.67 | 34.65 | 10 | 0.63 |
| St John's Church | 195 | 10 Yr | 2.16 | 306 | 591.6 | 595.93 | 594.68 | 596.7 | 0.014933 | 7.07 | 43.27 | 10 | 0.6 |
| St John's Church | 195 | 25 Yr | 2.49 | 392 | 591.6 | 596.7 | 595.23 | 597.61 | 0.015792 | 7.69 | 50.96 | 10 | 0.6 |
| St John's Church | 195 | 50 Yr | 3.03 | 474 | 591.6 | 597.15 | 595.71 | 598.28 | 0.018446 | 8.54 | 55.48 | 10 | 0.64 |
| St John's Church | 195 | 100 Yr | 3.56 | 530 | 591.6 | 597.37 | 596.04 | 598.67 | 0.023233 | 9.15 | 57.91 | 12.34 | 0.74 |
| St John's Church | 185 | 2 Yr | 0.38 | 139 | 589.83 | 594.04 | 592.15 | 594.17 | 0.002567 | 2.99 | 46.55 | 16.08 | 0.31 |
| St John's Church | 185 | 5 Yr | 0.44 | 231 | 589.83 | 595.38 | 592.81 | 595.55 | 0.002302 | 3.32 | 69.56 | 18.15 | 0.3 |
| St John's Church | 185 | 10 Yr | 0.47 | 306 | 589.83 | 596.29 | 593.27 | 596.48 | 0.002205 | 3.53 | 86.67 | 19.54 | 0.3 |
| St John's Church | 185 | 25 Yr | 0.52 | 392 | 589.83 | 597.14 | 593.75 | 597.36 | 0.002211 | 3.78 | 103.8 | 20.85 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.6 | 474 | 589.83 | 597.71 | 594.15 | 597.97 | 0.002395 | 4.09 | 115.95 | 21.72 | 0.31 |
| St John's Church | 185 | 100 Yr | 0.66 | 530 | 589.83 | 598.03 | 594.38 | 598.31 | 0.002556 | 4.31 | 122.93 | 22.21 | 0.32 |
| St John's Church | 166 | 2 Yr | 0.88 | 139 | 590.34 | 593.58 | 592.87 | 594.06 | 0.007746 | 5.55 | 25.05 | 10.07 | 0.62 |
| St John's Church | 166 | 5 Yr | 0.82 | 231 | 590.34 | 594.98 | 593.63 | 595.45 | 0.006216 | 5.52 | 41.82 | 14.18 | 0.57 |
| St John's Church | 166 | 10 Yr | 0.76 | 306 | 590.34 | 595.93 | 594.19 | 596.4 | 0.004735 | 5.48 | 56.28 | 20.01 | 0.5 |
| St John's Church | 166 | 25 Yr | 0.7 | 392 | 590.34 | 596.84 | 594.9 | 597.28 | 0.003655 | 5.41 | 78.42 | 25.73 | 0.45 |
| St John's Church | 166 | 50 Yr | 0.72 | 474 | 590.34 | 597.44 | 595.32 | 597.89 | 0.003428 | 5.59 | 94.14 | 27.31 | 0.45 |
| St John's Church | 166 | 100 Yr | 0.75 | 530 | 590.34 | 597.76 | 595.59 | 598.24 | 0.003419 | 5.76 | 103.09 | 28.17 | 0.45 |
| St John's Church | 156 | 2 Yr | 1.01 | 139 | 590.34 | 593.43 | 592.86 | 593.97 | 0.009325 | 5.92 | 23.46 | 9.96 | 0.68 |
| St John's Church | 156 | 5 Yr | 0.89 | 231 | 590.34 | 594.87 | 593.62 | 595.39 | 0.00666 | 5.74 | 40.33 | 14.07 | 0.59 |
| St John's Church | 156 | 10 Yr | 0.8 | 306 | 590.34 | 595.85 | 594.42 | 596.34 | 0.004714 | 5.68 | 54.71 | 18.1 | 0.51 |
| St John's Church | 156 | 25 Yr | 0.74 | 392 | 590.34 | 596.76 | 594.89 | 597.24 | 0.003545 | 5.68 | 76.3 | 25.51 | 0.46 |
| St John's Church | 156 | 50 Yr | 0.78 | 474 | 590.34 | 597.34 | 595.3 | 597.85 | 0.003304 | 5.92 | 91.63 | 27.06 | 0.45 |
| St John's Church | 156 | 100 Yr | 0.82 | 530 | 590.34 | 597.66 | 595.56 | 598.2 | 0.003298 | 6.14 | 100.23 | 27.9 | 0.46 |
| St John's Church | 146 | 2 Yr | 1.36 | 139 | 590.34 | 593.13 | 592.87 | 593.84 | 0.01367 | 6.77 | 20.53 | 9.77 | 0.82 |
| St John's Church | 146 | 5 Yr | 0.98 | 231 | 590.34 | 594.76 | 593.63 | 595.31 | 0.007786 | 5.97 | 38.68 | 13.94 | 0.63 |
| St John's Church | 146 | 10 Yr | 0.83 | 306 | 590.34 | 595.79 | 594.19 | 596.29 | 0.005334 | 5.7 | 53.71 | 16.78 | 0.53 |
| St John's Church | 146 | 25 Yr | 0.75 | 392 | 590.34 | 596.73 | 594.9 | 597.2 | 0.003993 | 5.59 | 75.55 | 25.44 | 0.47 |
| St John's Church | 146 | 50 Yr | 0.77 | 474 | 590.34 | 597.32 | 595.32 | 597.81 | 0.003712 | 5.75 | 91.14 | 27.02 | 0.46 |
| St John's Church | 146 | 100 Yr | 0.8 | 530 | 590.34 | 597.64 | 595.59 | 598.15 | 0.0037 | 5.93 | 99.88 | 27.86 | 0.46 |
| St John's Church | 120 | 2 Yr | 1.73 | 139 | 588.99 | 592.51 | 592.04 | 593.42 | 0.017373 | 7.65 | 18.17 | 6.18 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.22 | 231 | 588.99 | 593.71 | 593.13 | 594.94 | 0.018871 | 8.9 | 25.97 | 6.95 | 0.8 |
| St John's Church | 120 | 10 Yr | 2.39 | 306 | 588.99 | 594.59 | 593.91 | 595.98 | 0.017222 | 9.48 | 33.13 | 10 | 0.78 |
| St John's Church | 120 | 25 Yr | 1.98 | 392 | 588.99 | 595.8 | 594.93 | 596.97 | 0.011308 | 8.98 | 50.65 | 18.56 | 0.66 |
| St John's Church | 120 | 50 Yr | 1.94 | 474 | 588.99 | 596.47 | 595.88 | 597.6 | 0.009927 | 9.05 | 64.23 | 21.49 | 0.63 |
| St John's Church | 120 | 100 Yr | 2.08 | 530 | 588.99 | 596.74 | 596.27 | 597.93 | 0.010213 | 9.43 | 70.12 | 22.58 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.5 | 139 | 588.99 | 592.04 | 592.04 | 593.32 | 0.027197 | 9.07 | 15.33 | 5.94 | 1 |
| St John's Church | 117 | 5 Yr | 3.13 | 231 | 588.99 | 593.13 | 593.13 | 594.83 | 0.028742 | 10.44 | 22.12 | 6.49 | 1 |
| St John's Church | 117 | 10 Yr | 3.48 | 306 | 588.99 | 593.91 | 593.91 | 595.86 | 0.028549 | 11.21 | 27.38 | 7.42 | 0.99 |
| St John's Church | 117 | 25 Yr | 3.26 | 392 | 588.99 | 594.93 | 594.93 | 596.85 | 0.021935 | 11.21 | 36.89 | 12.53 | 0.89 |
| St John's Church | 117 | 50 Yr | 2.76 | 474 | 588.99 | 595.88 | 595.88 | 597.51 | 0.015548 | 10.62 | 52.16 | 18.95 | 0.77 |
| St John's Church | 117 | 100 Yr | 2.74 | 530 | 588.99 | 596.27 | 596.27 | 597.86 | 0.014481 | 10.7 | 59.86 | 20.64 | 0.75 |
| St John's Church | 83 | 2 Yr | 1.86 | 139 | 588.51 | 591.26 | 591.26 | 592.22 | 0.019263 | 7.87 | 17.67 | 9.2 | 1 |
| St John's Church | 83 | 5 Yr | 2.22 | 231 | 588.51 | 592.09 | 592.09 | 593.33 | 0.018688 | 8.92 | 25.89 | 10.49 | 1 |
| St John's Church | 83 | 10 Yr | 2.44 | 306 | 588.51 | 592.66 | 592.66 | 594.07 | 0.018022 | 9.54 | 32.11 | 11.5 | 1 |
| St John's Church | 83 | 25 Yr | 2.64 | 392 | 588.51 | 593.22 | 593.22 | 594.82 | 0.017122 | 10.15 | 38.94 | 12.78 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.81 | 474 | 588.51 | 593.71 | 593.71 | 595.46 | 0.016525 | 10.65 | 45.38 | 13.88 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.86 | 530 | 588.51 | 594.06 | 594.06 | 595.86 | 0.016152 | 10.8 | 50.47 | 15.19 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.97 | 139 | 588.32 | 590.67 | 590.38 | 591.16 | 0.010436 | 5.65 | 24.6 | 14.76 | 0.77 |
| St John's Church | 60 | 5 Yr | 1.07 | 231 | 588.32 | 591.47 | 590.98 | 592.07 | 0.008772 | 6.22 | 37.12 | 16.56 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.15 | 306 | 588.32 | 592.01 | 591.42 | 592.68 | 0.00817 | 6.59 | 46.4 | 17.77 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.25 | 392 | 588.32 | 592.53 | 591.84 | 593.29 | 0.007915 | 7 | 55.98 | 18.94 | 0.72 |
| St John's Church | 60 | 50 Yr | 1.32 | 474 | 588.32 | 592.99 | 592.22 | 593.82 | 0.007682 | 7.31 | 64.85 | 19.96 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.37 | 530 | 588.32 | 593.27 | 592.47 | 594.14 | 0.007609 | 7.51 | 70.54 | 20.59 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.66 | 139 | 587.29 | 589.76 | 589.76 | 590.6 | 0.018011 | 7.38 | 18.83 | 11.23 | 1 |
| St John's Church | 21 | 5 Yr | 1.93 | 231 | 587.29 | 590.51 | 590.51 | 591.56 | 0.016892 | 8.24 | 28.03 | 13.32 | 1 |
| St John's Church | 21 | 10 Yr | 2.1 | 306 | 587.29 | 591 | 591 | 592.19 | 0.01639 | 8.78 | 34.87 | 14.64 | 1 |
| St John's Church | 21 | 25 Yr | 2.24 | 392 | 587.29 | 591.49 | 591.49 | 592.82 | 0.015796 | 9.23 | 42.47 | 15.98 | 1 |
| St John's Church | 21 | 50 Yr | 2.39 | 474 | 587.29 | 591.89 | 591.89 | 593.34 | 0.015454 | 9.67 | 49.06 | 17.71 | 1 |
| St John's Church | 21 | 100 Yr | 2.47 | 530 | 587.29 | 592.15 | 592.15 | 593.67 | 0.014906 | 9.92 | 53.87 | 19.63 | 0.99 |

**Simulation B: Project (developed) site conditions with existing flows (circa 2009)**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.01 | 139 | 593.23 | 601.22 | | 601.24 | 0.000056 | 1.27 | 109.44 | 32.98 | 0.12 |
| St John's Church | 260 | 5 Yr | 0.01 | 231 | 593.23 | 603.4 | | 603.42 | 0.000029 | 1.18 | 217.51 | 69 | 0.09 |
| St John's Church | 260 | 10 Yr | 0.01 | 306 | 593.23 | 603.69 | | 603.72 | 0.00004 | 1.45 | 237.74 | 69 | 0.11 |
| St John's Church | 260 | 25 Yr | 0.01 | 392 | 593.23 | 604.01 | | 604.05 | 0.000052 | 1.73 | 259.47 | 69 | 0.13 |
| St John's Church | 260 | 50 Yr | 0.02 | 474 | 593.23 | 604.27 | | 604.33 | 0.000064 | 1.96 | 277.77 | 69 | 0.14 |
| St John's Church | 260 | 100 Yr | 0.02 | 530 | 593.23 | 604.4 | | 604.46 | 0.000074 | 2.14 | 286.39 | 69 | 0.15 |
| St John's Church | 220 | 2 Yr | 0.01 | 139 | 591.6 | 601.22 | 593.42 | 601.24 | 0.000028 | 0.95 | 147.16 | 40.64 | 0.08 |
| St John's Church | 220 | 5 Yr | 0 | 231 | 591.6 | 603.4 | 594.14 | 603.42 | 0.000016 | 0.96 | 269.06 | 69 | 0.07 |
| St John's Church | 220 | 10 Yr | 0.01 | 306 | 591.6 | 603.7 | 594.67 | 603.72 | 0.000023 | 1.2 | 289.41 | 69 | 0.08 |
| St John's Church | 220 | 25 Yr | 0.01 | 392 | 591.6 | 604.01 | 595.22 | 604.04 | 0.000031 | 1.44 | 311.27 | 69 | 0.1 |
| St John's Church | 220 | 50 Yr | 0.01 | 474 | 591.6 | 604.28 | 595.72 | 604.32 | 0.000039 | 1.65 | 329.68 | 69 | 0.11 |
| St John's Church | 220 | 100 Yr | 0.02 | 530 | 591.6 | 604.41 | 596.04 | 604.45 | 0.000046 | 1.8 | 338.4 | 69 | 0.12 |
| St John's Church | 207 | 2 Yr | 0.01 | 139 | 591.6 | 601.22 | 593.41 | 601.24 | 0.000028 | 0.95 | 147.15 | 40.64 | 0.08 |
| St John's Church | 207 | 5 Yr | 0 | 231 | 591.6 | 603.4 | 594.14 | 603.42 | 0.000016 | 0.96 | 269.05 | 69 | 0.07 |
| St John's Church | 207 | 10 Yr | 0.01 | 306 | 591.6 | 603.7 | 594.67 | 603.72 | 0.000023 | 1.2 | 289.39 | 69 | 0.08 |
| St John's Church | 207 | 25 Yr | 0.01 | 392 | 591.6 | 604.01 | 595.22 | 604.04 | 0.000031 | 1.44 | 311.24 | 69 | 0.1 |
| St John's Church | 207 | 50 Yr | 0.01 | 474 | 591.6 | 604.28 | 595.7 | 604.32 | 0.000039 | 1.65 | 329.64 | 69 | 0.11 |
| St John's Church | 207 | 100 Yr | 0.02 | 530 | 591.6 | 604.41 | 596.02 | 604.45 | 0.000046 | 1.8 | 338.35 | 69 | 0.12 |
| St John's Church | 206 | | Culvert | | | | | | | | | | |
| St John's Church | 195 | 2 Yr | 3.02 | 139 | 591.6 | 593.42 | 593.42 | 594.33 | 0.036265 | 7.63 | 18.23 | 10 | 1 |
| St John's Church | 195 | 5 Yr | 2.31 | 231 | 591.6 | 594.85 | 594.14 | 595.63 | 0.018756 | 7.11 | 32.51 | 10 | 0.69 |
| St John's Church | 195 | 10 Yr | 2.32 | 306 | 591.6 | 595.79 | 594.67 | 596.62 | 0.01634 | 7.31 | 41.87 | 10 | 0.63 |
| St John's Church | 195 | 25 Yr | 2.58 | 392 | 591.6 | 596.61 | 595.22 | 597.56 | 0.016512 | 7.82 | 50.12 | 10 | 0.62 |
| St John's Church | 195 | 50 Yr | 3.13 | 474 | 591.6 | 597.07 | 595.72 | 598.23 | 0.019173 | 8.67 | 54.67 | 10 | 0.65 |
| St John's Church | 195 | 100 Yr | 3.64 | 530 | 591.6 | 597.28 | 596.04 | 598.63 | 0.022608 | 9.33 | 56.8 | 10.78 | 0.72 |
| St John's Church | 185 | 2 Yr | 0.44 | 139 | 589.83 | 593.86 | 592.15 | 594.01 | 0.003063 | 3.18 | 43.69 | 15.74 | 0.34 |
| St John's Church | 185 | 5 Yr | 0.48 | 231 | 589.83 | 595.21 | 592.81 | 595.4 | 0.002603 | 3.47 | 66.55 | 17.89 | 0.32 |
| St John's Church | 185 | 10 Yr | 0.5 | 306 | 589.83 | 596.17 | 593.27 | 596.38 | 0.002369 | 3.62 | 84.43 | 19.37 | 0.31 |
| St John's Church | 185 | 25 Yr | 0.54 | 392 | 589.83 | 597.07 | 593.75 | 597.3 | 0.002297 | 3.83 | 102.36 | 20.74 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.62 | 474 | 589.83 | 597.64 | 594.15 | 597.91 | 0.002473 | 4.14 | 114.59 | 21.63 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.68 | 530 | 589.83 | 597.96 | 594.38 | 598.25 | 0.00264 | 4.36 | 121.47 | 22.11 | 0.33 |
| St John's Church | 166 | 2 Yr | 1.29 | 139 | 590.34 | 593.17 | 592.87 | 593.86 | 0.01282 | 6.62 | 20.99 | 9.8 | 0.8 |
| St John's Church | 166 | 5 Yr | 1.02 | 231 | 590.34 | 594.71 | 593.63 | 595.28 | 0.008211 | 6.08 | 37.98 | 13.89 | 0.65 |
| St John's Church | 166 | 10 Yr | 0.84 | 306 | 590.34 | 595.77 | 594.19 | 596.28 | 0.005419 | 5.73 | 53.41 | 16.36 | 0.54 |
| St John's Church | 166 | 25 Yr | 0.74 | 392 | 590.34 | 596.75 | 594.9 | 597.22 | 0.003933 | 5.56 | 76.03 | 25.49 | 0.47 |
| St John's Church | 166 | 50 Yr | 0.76 | 474 | 590.34 | 597.35 | 595.32 | 597.83 | 0.003637 | 5.71 | 91.9 | 27.09 | 0.46 |
| St John's Church | 166 | 100 Yr | 0.79 | 530 | 590.34 | 597.67 | 595.59 | 598.18 | 0.003626 | 5.89 | 100.69 | 27.94 | 0.46 |
| St John's Church | 156 | 2 Yr | 0.68 | 139 | 590.34 | 593.31 | 592.74 | 593.67 | 0.006627 | 4.83 | 28.78 | 16.02 | 0.63 |
| St John's Church | 156 | 5 Yr | 0.42 | 231 | 590.34 | 594.88 | 593.38 | 595.15 | 0.002154 | 4.19 | 58.45 | 21.63 | 0.4 |
| St John's Church | 156 | 10 Yr | 0.37 | 306 | 590.34 | 595.93 | 593.78 | 596.18 | 0.001449 | 4.11 | 82.99 | 25.35 | 0.34 |
| St John's Church | 156 | 25 Yr | 0.36 | 392 | 590.34 | 596.88 | 594.2 | 597.13 | 0.001166 | 4.2 | 108.63 | 28.57 | 0.32 |
| St John's Church | 156 | 50 Yr | 0.39 | 474 | 590.34 | 597.47 | 594.56 | 597.76 | 0.001154 | 4.48 | 126.15 | 30.55 | 0.32 |
| St John's Church | 156 | 100 Yr | 0.43 | 530 | 590.34 | 597.79 | 594.82 | 598.1 | 0.001187 | 4.71 | 136.02 | 31.61 | 0.33 |
| St John's Church | 131 | | Bridge | | | | | | | | | | |
| St John's Church | 130 | 2 Yr | 0.2 | 139 | 589.49 | 593.41 | 591.42 | 593.53 | 0.001326 | 2.81 | 49.43 | 17.11 | 0.29 |
| St John's Church | 130 | 5 Yr | 0.2 | 231 | 589.49 | 594.94 | 592.08 | 595.08 | 0.000913 | 2.99 | 78.23 | 20.56 | 0.26 |
| St John's Church | 130 | 10 Yr | 0.21 | 306 | 589.49 | 595.97 | 592.54 | 596.12 | 0.000761 | 3.16 | 100.65 | 22.91 | 0.24 |
| St John's Church | 130 | 25 Yr | 0.23 | 392 | 589.49 | 596.91 | 592.99 | 597.08 | 0.000705 | 3.39 | 123.31 | 25.22 | 0.24 |
| St John's Church | 130 | 50 Yr | 0.27 | 474 | 589.49 | 597.5 | 593.39 | 597.71 | 0.000748 | 3.71 | 138.63 | 26.69 | 0.25 |
| St John's Church | 130 | 100 Yr | 0.3 | 530 | 589.49 | 597.82 | 593.63 | 598.05 | 0.000795 | 3.95 | 147.2 | 27.47 | 0.26 |
| St John's Church | 120 | 2 Yr | 1.73 | 139 | 588.99 | 592.51 | 592.04 | 593.42 | 0.017373 | 7.65 | 18.17 | 6.18 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.22 | 231 | 588.99 | 593.71 | 593.13 | 594.94 | 0.018871 | 8.9 | 25.97 | 6.95 | 0.8 |
| St John's Church | 120 | 10 Yr | 2.39 | 306 | 588.99 | 594.59 | 593.91 | 595.98 | 0.017222 | 9.48 | 33.13 | 10 | 0.78 |
| St John's Church | 120 | 25 Yr | 1.98 | 392 | 588.99 | 595.8 | 594.93 | 596.97 | 0.011308 | 8.98 | 50.65 | 18.56 | 0.66 |
| St John's Church | 120 | 50 Yr | 1.94 | 474 | 588.99 | 596.47 | 595.88 | 597.6 | 0.009927 | 9.05 | 64.23 | 21.49 | 0.63 |
| St John's Church | 120 | 100 Yr | 2.08 | 530 | 588.99 | 596.74 | 596.27 | 597.93 | 0.010213 | 9.43 | 70.12 | 22.58 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.5 | 139 | 588.99 | 592.04 | 592.04 | 593.32 | 0.027197 | 9.07 | 15.33 | 5.94 | 1 |
| St John's Church | 117 | 5 Yr | 3.13 | 231 | 588.99 | 593.13 | 593.13 | 594.83 | 0.028742 | 10.44 | 22.12 | 6.49 | 1 |
| St John's Church | 117 | 10 Yr | 3.48 | 306 | 588.99 | 593.91 | 593.91 | 595.86 | 0.028549 | 11.21 | 27.38 | 7.42 | 0.99 |
| St John's Church | 117 | 25 Yr | 3.26 | 392 | 588.99 | 594.93 | 594.93 | 596.85 | 0.021935 | 11.21 | 36.89 | 12.53 | 0.89 |
| St John's Church | 117 | 50 Yr | 2.76 | 474 | 588.99 | 595.88 | 595.88 | 597.51 | 0.015548 | 10.62 | 52.16 | 18.95 | 0.77 |
| St John's Church | 117 | 100 Yr | 2.74 | 530 | 588.99 | 596.27 | 596.27 | 597.86 | 0.014481 | 10.7 | 59.86 | 20.64 | 0.75 |
| St John's Church | 83 | 2 Yr | 1.86 | 139 | 588.51 | 591.26 | 591.26 | 592.22 | 0.019263 | 7.87 | 17.67 | 9.2 | 1 |
| St John's Church | 83 | 5 Yr | 2.22 | 231 | 588.51 | 592.09 | 592.09 | 593.33 | 0.018688 | 8.92 | 25.89 | 10.49 | 1 |
| St John's Church | 83 | 10 Yr | 2.44 | 306 | 588.51 | 592.66 | 592.66 | 594.07 | 0.018022 | 9.54 | 32.11 | 11.5 | 1 |
| St John's Church | 83 | 25 Yr | 2.64 | 392 | 588.51 | 593.22 | 593.22 | 594.82 | 0.017122 | 10.15 | 38.94 | 12.78 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.81 | 474 | 588.51 | 593.71 | 593.71 | 595.46 | 0.016525 | 10.65 | 45.38 | 13.88 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.86 | 530 | 588.51 | 594.06 | 594.06 | 595.86 | 0.016152 | 10.8 | 50.47 | 15.19 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.97 | 139 | 588.32 | 590.67 | 590.38 | 591.16 | 0.010436 | 5.65 | 24.6 | 14.76 | 0.77 |
| St John's Church | 60 | 5 Yr | 1.07 | 231 | 588.32 | 591.47 | 590.98 | 592.07 | 0.008772 | 6.22 | 37.12 | 16.56 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.15 | 306 | 588.32 | 592.01 | 591.42 | 592.68 | 0.00817 | 6.59 | 46.4 | 17.77 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.25 | 392 | 588.32 | 592.53 | 591.84 | 593.29 | 0.007915 | 7 | 55.98 | 18.94 | 0.72 |
| St John's Church | 60 | 50 Yr | 1.32 | 474 | 588.32 | 592.99 | 592.22 | 593.82 | 0.007682 | 7.31 | 64.85 | 19.96 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.37 | 530 | 588.32 | 593.27 | 592.47 | 594.14 | 0.007609 | 7.51 | 70.54 | 20.59 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.66 | 139 | 587.29 | 589.76 | 589.76 | 590.6 | 0.018011 | 7.38 | 18.83 | 11.23 | 1 |
| St John's Church | 21 | 5 Yr | 1.93 | 231 | 587.29 | 590.51 | 590.51 | 591.56 | 0.016892 | 8.24 | 28.03 | 13.32 | 1 |
| St John's Church | 21 | 10 Yr | 2.1 | 306 | 587.29 | 591 | 591 | 592.19 | 0.01639 | 8.78 | 34.87 | 14.64 | 1 |
| St John's Church | 21 | 25 Yr | 2.24 | 392 | 587.29 | 591.49 | 591.49 | 592.82 | 0.015796 | 9.23 | 42.47 | 15.98 | 1 |
| St John's Church | 21 | 50 Yr | 2.39 | 474 | 587.29 | 591.89 | 591.89 | 593.34 | 0.015454 | 9.67 | 49.06 | 17.71 | 1 |
| St John's Church | 21 | 100 Yr | 2.47 | 530 | 587.29 | 592.15 | 592.15 | 593.67 | 0.014906 | 9.92 | 53.87 | 19.63 | 0.99 |

**Simulation C: Existing site and flow conditions with upstream and off-site 48-inch reinforced concrete pipe (RCP) removed**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.47 | 139 | 593.23 | 595.17 | 595.17 | 596.15 | 0.005513 | 7.95 | 17.48 | 9 | 1.01 |
| St John's Church | 260 | 5 Yr | 0.61 | 231 | 593.23 | 595.96 | 595.96 | 597.33 | 0.005732 | 9.42 | 24.53 | 9 | 1.01 |
| St John's Church | 260 | 10 Yr | 0.7 | 306 | 593.23 | 596.52 | 596.52 | 598.18 | 0.00594 | 10.34 | 29.61 | 9 | 1 |
| St John's Church | 260 | 25 Yr | 0.81 | 392 | 593.23 | 597.09 | 597.09 | 599.07 | 0.006276 | 11.28 | 34.76 | 9 | 1.01 |
| St John's Church | 260 | 50 Yr | 0.74 | 474 | 593.23 | 597.97 | 597.97 | 599.79 | 0.005537 | 10.81 | 43.84 | 12.1 | 1 |
| St John's Church | 260 | 100 Yr | 0.72 | 530 | 593.23 | 598.4 | 598.4 | 600.19 | 0.005257 | 10.72 | 49.42 | 13.9 | 1 |
| St John's Church | 220 | 2 Yr | 0.24 | 139 | 591.6 | 593.98 | | 594.51 | 0.002366 | 5.84 | 23.78 | 10 | 0.67 |
| St John's Church | 220 | 5 Yr | 0.26 | 231 | 591.6 | 595.2 | | 595.84 | 0.002008 | 6.41 | 36.03 | 10 | 0.6 |
| St John's Church | 220 | 10 Yr | 0.29 | 306 | 591.6 | 596.06 | | 596.79 | 0.00197 | 6.87 | 44.55 | 10 | 0.57 |
| St John's Church | 220 | 25 Yr | 0.34 | 392 | 591.6 | 596.83 | | 597.7 | 0.002104 | 7.5 | 52.3 | 10 | 0.58 |
| St John's Church | 220 | 50 Yr | 0.41 | 474 | 591.6 | 597.33 | | 598.39 | 0.002623 | 8.26 | 57.37 | 11.61 | 0.65 |
| St John's Church | 220 | 100 Yr | 0.44 | 530 | 591.6 | 597.72 | | 598.82 | 0.003103 | 8.41 | 62.99 | 16.35 | 0.76 |
| St John's Church | 207 | 2 Yr | 0.25 | 139 | 591.6 | 593.91 | | 594.47 | 0.002582 | 6.02 | 23.08 | 10 | 0.7 |
| St John's Church | 207 | 5 Yr | 0.27 | 231 | 591.6 | 595.15 | | 595.81 | 0.002086 | 6.5 | 35.54 | 10 | 0.61 |
| St John's Church | 207 | 10 Yr | 0.3 | 306 | 591.6 | 596.01 | | 596.76 | 0.002027 | 6.94 | 44.09 | 10 | 0.58 |
| St John's Church | 207 | 25 Yr | 0.34 | 392 | 591.6 | 596.78 | | 597.67 | 0.002156 | 7.56 | 51.82 | 10 | 0.59 |
| St John's Church | 207 | 50 Yr | 0.42 | 474 | 591.6 | 597.26 | | 598.35 | 0.002566 | 8.37 | 56.64 | 10.53 | 0.64 |
| St John's Church | 207 | 100 Yr | 0.47 | 530 | 591.6 | 597.61 | | 598.77 | 0.00334 | 8.65 | 61.28 | 16.03 | 0.78 |
| St John's Church | 195 | 2 Yr | 2.14 | 139 | 591.6 | 593.73 | 593.41 | 594.39 | 0.02296 | 6.53 | 21.27 | 10 | 0.79 |
| St John's Church | 195 | 5 Yr | 2 | 231 | 591.6 | 595.07 | 594.13 | 595.76 | 0.015682 | 6.67 | 34.65 | 10 | 0.63 |
| St John's Church | 195 | 10 Yr | 2.16 | 306 | 591.6 | 595.93 | 594.68 | 596.7 | 0.014933 | 7.07 | 43.27 | 10 | 0.6 |
| St John's Church | 195 | 25 Yr | 2.49 | 392 | 591.6 | 596.7 | 595.23 | 597.61 | 0.015792 | 7.69 | 50.96 | 10 | 0.6 |
| St John's Church | 195 | 50 Yr | 3.03 | 474 | 591.6 | 597.15 | 595.71 | 598.28 | 0.018446 | 8.54 | 55.48 | 10 | 0.64 |
| St John's Church | 195 | 100 Yr | 3.56 | 530 | 591.6 | 597.37 | 596.04 | 598.67 | 0.023233 | 9.15 | 57.91 | 12.34 | 0.74 |
| St John's Church | 185 | 2 Yr | 0.38 | 139 | 589.83 | 594.04 | 592.15 | 594.17 | 0.002567 | 2.99 | 46.55 | 16.08 | 0.31 |
| St John's Church | 185 | 5 Yr | 0.44 | 231 | 589.83 | 595.38 | 592.81 | 595.55 | 0.002302 | 3.32 | 69.56 | 18.15 | 0.3 |
| St John's Church | 185 | 10 Yr | 0.47 | 306 | 589.83 | 596.29 | 593.27 | 596.48 | 0.002205 | 3.53 | 86.67 | 19.54 | 0.3 |
| St John's Church | 185 | 25 Yr | 0.52 | 392 | 589.83 | 597.14 | 593.75 | 597.36 | 0.002211 | 3.78 | 103.8 | 20.85 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.6 | 474 | 589.83 | 597.71 | 594.15 | 597.97 | 0.002395 | 4.09 | 115.95 | 21.72 | 0.31 |
| St John's Church | 185 | 100 Yr | 0.66 | 530 | 589.83 | 598.03 | 594.38 | 598.31 | 0.002556 | 4.31 | 122.93 | 22.21 | 0.32 |
| St John's Church | 166 | 2 Yr | 0.88 | 139 | 590.34 | 593.58 | 592.87 | 594.06 | 0.007746 | 5.55 | 25.05 | 10.07 | 0.62 |
| St John's Church | 166 | 5 Yr | 0.82 | 231 | 590.34 | 594.98 | 593.63 | 595.45 | 0.006216 | 5.52 | 41.82 | 14.18 | 0.57 |
| St John's Church | 166 | 10 Yr | 0.76 | 306 | 590.34 | 595.93 | 594.19 | 596.4 | 0.004735 | 5.48 | 56.28 | 20.01 | 0.5 |
| St John's Church | 166 | 25 Yr | 0.7 | 392 | 590.34 | 596.84 | 594.9 | 597.28 | 0.003655 | 5.41 | 78.42 | 25.73 | 0.45 |
| St John's Church | 166 | 50 Yr | 0.72 | 474 | 590.34 | 597.44 | 595.32 | 597.89 | 0.003428 | 5.59 | 94.14 | 27.31 | 0.45 |
| St John's Church | 166 | 100 Yr | 0.75 | 530 | 590.34 | 597.76 | 595.59 | 598.24 | 0.003419 | 5.76 | 103.09 | 28.17 | 0.45 |
| St John's Church | 156 | 2 Yr | 1.01 | 139 | 590.34 | 593.43 | 592.86 | 593.97 | 0.009325 | 5.92 | 23.46 | 9.96 | 0.68 |
| St John's Church | 156 | 5 Yr | 0.89 | 231 | 590.34 | 594.87 | 593.62 | 595.39 | 0.00666 | 5.74 | 40.33 | 14.07 | 0.59 |
| St John's Church | 156 | 10 Yr | 0.8 | 306 | 590.34 | 595.85 | 594.42 | 596.34 | 0.004714 | 5.68 | 54.71 | 18.1 | 0.51 |
| St John's Church | 156 | 25 Yr | 0.74 | 392 | 590.34 | 596.76 | 594.89 | 597.24 | 0.003545 | 5.68 | 76.3 | 25.51 | 0.46 |
| St John's Church | 156 | 50 Yr | 0.78 | 474 | 590.34 | 597.34 | 595.3 | 597.85 | 0.003304 | 5.92 | 91.63 | 27.06 | 0.45 |
| St John's Church | 156 | 100 Yr | 0.82 | 530 | 590.34 | 597.66 | 595.56 | 598.2 | 0.003298 | 6.14 | 100.23 | 27.9 | 0.46 |
| St John's Church | 146 | 2 Yr | 1.36 | 139 | 590.34 | 593.13 | 592.87 | 593.84 | 0.01367 | 6.77 | 20.53 | 9.77 | 0.82 |
| St John's Church | 146 | 5 Yr | 0.98 | 231 | 590.34 | 594.76 | 593.63 | 595.31 | 0.007786 | 5.97 | 38.68 | 13.94 | 0.63 |
| St John's Church | 146 | 10 Yr | 0.83 | 306 | 590.34 | 595.79 | 594.19 | 596.29 | 0.005334 | 5.7 | 53.71 | 16.78 | 0.53 |
| St John's Church | 146 | 25 Yr | 0.75 | 392 | 590.34 | 596.73 | 594.9 | 597.2 | 0.003993 | 5.59 | 75.55 | 25.44 | 0.47 |
| St John's Church | 146 | 50 Yr | 0.77 | 474 | 590.34 | 597.32 | 595.32 | 597.81 | 0.003712 | 5.75 | 91.14 | 27.02 | 0.46 |
| St John's Church | 146 | 100 Yr | 0.8 | 530 | 590.34 | 597.64 | 595.59 | 598.15 | 0.0037 | 5.93 | 99.88 | 27.86 | 0.46 |
| St John's Church | 120 | 2 Yr | 1.73 | 139 | 588.99 | 592.51 | 592.04 | 593.42 | 0.017373 | 7.65 | 18.17 | 6.18 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.22 | 231 | 588.99 | 593.71 | 593.13 | 594.94 | 0.018871 | 8.9 | 25.97 | 6.95 | 0.8 |
| St John's Church | 120 | 10 Yr | 2.39 | 306 | 588.99 | 594.59 | 593.91 | 595.98 | 0.017222 | 9.48 | 33.13 | 10 | 0.78 |
| St John's Church | 120 | 25 Yr | 1.98 | 392 | 588.99 | 595.8 | 594.93 | 596.97 | 0.011308 | 8.98 | 50.65 | 18.56 | 0.66 |
| St John's Church | 120 | 50 Yr | 1.94 | 474 | 588.99 | 596.47 | 595.88 | 597.6 | 0.009927 | 9.05 | 64.23 | 21.49 | 0.63 |
| St John's Church | 120 | 100 Yr | 2.08 | 530 | 588.99 | 596.74 | 596.27 | 597.93 | 0.010213 | 9.43 | 70.12 | 22.58 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.5 | 139 | 588.99 | 592.04 | 592.04 | 593.32 | 0.027197 | 9.07 | 15.33 | 5.94 | 1 |
| St John's Church | 117 | 5 Yr | 3.13 | 231 | 588.99 | 593.13 | 593.13 | 594.83 | 0.028742 | 10.44 | 22.12 | 6.49 | 1 |
| St John's Church | 117 | 10 Yr | 3.48 | 306 | 588.99 | 593.91 | 593.91 | 595.86 | 0.028549 | 11.21 | 27.38 | 7.42 | 0.99 |
| St John's Church | 117 | 25 Yr | 3.26 | 392 | 588.99 | 594.93 | 594.93 | 596.85 | 0.021935 | 11.21 | 36.89 | 12.53 | 0.89 |
| St John's Church | 117 | 50 Yr | 2.76 | 474 | 588.99 | 595.88 | 595.88 | 597.51 | 0.015548 | 10.62 | 52.16 | 18.95 | 0.77 |
| St John's Church | 117 | 100 Yr | 2.74 | 530 | 588.99 | 596.27 | 596.27 | 597.86 | 0.014481 | 10.7 | 59.86 | 20.64 | 0.75 |
| St John's Church | 83 | 2 Yr | 1.86 | 139 | 588.51 | 591.26 | 591.26 | 592.22 | 0.019263 | 7.87 | 17.67 | 9.2 | 1 |
| St John's Church | 83 | 5 Yr | 2.22 | 231 | 588.51 | 592.09 | 592.09 | 593.33 | 0.018688 | 8.92 | 25.89 | 10.49 | 1 |
| St John's Church | 83 | 10 Yr | 2.44 | 306 | 588.51 | 592.66 | 592.66 | 594.07 | 0.018022 | 9.54 | 32.11 | 11.5 | 1 |
| St John's Church | 83 | 25 Yr | 2.64 | 392 | 588.51 | 593.22 | 593.22 | 594.82 | 0.017122 | 10.15 | 38.94 | 12.78 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.81 | 474 | 588.51 | 593.71 | 593.71 | 595.46 | 0.016525 | 10.65 | 45.38 | 13.88 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.86 | 530 | 588.51 | 594.06 | 594.06 | 595.86 | 0.016152 | 10.8 | 50.47 | 15.19 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.97 | 139 | 588.32 | 590.67 | 590.38 | 591.16 | 0.010436 | 5.65 | 24.6 | 14.76 | 0.77 |
| St John's Church | 60 | 5 Yr | 1.07 | 231 | 588.32 | 591.47 | 590.98 | 592.07 | 0.008772 | 6.22 | 37.12 | 16.56 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.15 | 306 | 588.32 | 592.01 | 591.42 | 592.68 | 0.00817 | 6.59 | 46.4 | 17.77 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.25 | 392 | 588.32 | 592.53 | 591.84 | 593.29 | 0.007915 | 7 | 55.98 | 18.94 | 0.72 |
| St John's Church | 60 | 50 Yr | 1.32 | 474 | 588.32 | 592.99 | 592.22 | 593.82 | 0.007682 | 7.31 | 64.85 | 19.96 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.37 | 530 | 588.32 | 593.27 | 592.47 | 594.14 | 0.007609 | 7.51 | 70.54 | 20.59 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.66 | 139 | 587.29 | 589.76 | 589.76 | 590.6 | 0.018011 | 7.38 | 18.83 | 11.23 | 1 |
| St John's Church | 21 | 5 Yr | 1.93 | 231 | 587.29 | 590.51 | 590.51 | 591.56 | 0.016892 | 8.24 | 28.03 | 13.32 | 1 |
| St John's Church | 21 | 10 Yr | 2.1 | 306 | 587.29 | 591 | 591 | 592.19 | 0.01639 | 8.78 | 34.87 | 14.64 | 1 |
| St John's Church | 21 | 25 Yr | 2.24 | 392 | 587.29 | 591.49 | 591.49 | 592.82 | 0.015796 | 9.23 | 42.47 | 15.98 | 1 |
| St John's Church | 21 | 50 Yr | 2.39 | 474 | 587.29 | 591.89 | 591.89 | 593.34 | 0.015454 | 9.67 | 49.06 | 17.71 | 1 |
| St John's Church | 21 | 100 Yr | 2.47 | 530 | 587.29 | 592.15 | 592.15 | 593.67 | 0.014906 | 9.92 | 53.87 | 19.63 | 0.99 |

**Simulation D: Project site conditions under existing flows and 48-inch RCP removed**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.47 | 139 | 593.23 | 595.17 | 595.17 | 596.15 | 0.005511 | 7.95 | 17.48 | 9 | 1.01 |
| St John's Church | 260 | 5 Yr | 0.61 | 231 | 593.23 | 595.96 | 595.96 | 597.33 | 0.005732 | 9.42 | 24.53 | 9 | 1.01 |
| St John's Church | 260 | 10 Yr | 0.7 | 306 | 593.23 | 596.52 | 596.52 | 598.18 | 0.00594 | 10.34 | 29.61 | 9 | 1 |
| St John's Church | 260 | 25 Yr | 0.81 | 392 | 593.23 | 597.09 | 597.09 | 599.07 | 0.006276 | 11.28 | 34.76 | 9 | 1.01 |
| St John's Church | 260 | 50 Yr | 0.74 | 474 | 593.23 | 597.97 | 597.97 | 599.79 | 0.005537 | 10.81 | 43.84 | 12.1 | 1 |
| St John's Church | 260 | 100 Yr | 0.72 | 530 | 593.23 | 598.4 | 598.4 | 600.19 | 0.005257 | 10.72 | 49.42 | 13.9 | 1 |
| St John's Church | 220 | 2 Yr | 0.25 | 139 | 591.6 | 593.92 | 593.42 | 594.48 | 0.002528 | 5.98 | 23.25 | 10 | 0.69 |
| St John's Church | 220 | 5 Yr | 0.29 | 231 | 591.6 | 595.04 | 594.14 | 595.74 | 0.002288 | 6.72 | 34.38 | 10 | 0.64 |
| St John's Church | 220 | 10 Yr | 0.31 | 306 | 591.6 | 595.93 | 594.67 | 596.71 | 0.002126 | 7.06 | 43.32 | 10 | 0.6 |
| St John's Church | 220 | 25 Yr | 0.35 | 392 | 591.6 | 596.76 | 595.22 | 597.66 | 0.002179 | 7.6 | 51.61 | 10 | 0.59 |
| St John's Church | 220 | 50 Yr | 0.42 | 474 | 591.6 | 597.25 | 595.72 | 598.34 | 0.002557 | 8.38 | 56.54 | 10.38 | 0.63 |
| St John's Church | 220 | 100 Yr | 0.47 | 530 | 591.6 | 597.6 | 596.04 | 598.77 | 0.003362 | 8.67 | 61.13 | 16 | 0.78 |
| St John's Church | 207 | 2 Yr | 0.27 | 139 | 591.6 | 593.84 |  | 594.44 | 0.002815 | 6.2 | 22.41 | 10 | 0.73 |
| St John's Church | 207 | 5 Yr | 0.3 | 231 | 591.6 | 594.98 |  | 595.7 | 0.002406 | 6.84 | 33.77 | 10 | 0.66 |
| St John's Church | 207 | 10 Yr | 0.32 | 306 | 591.6 | 595.88 |  | 596.67 | 0.002197 | 7.15 | 42.79 | 10 | 0.61 |
| St John's Church | 207 | 25 Yr | 0.35 | 392 | 591.6 | 596.71 |  | 597.62 | 0.00224 | 7.67 | 51.08 | 10 | 0.6 |
| St John's Church | 207 | 50 Yr | 0.43 | 474 | 591.6 | 597.19 |  | 598.31 | 0.002582 | 8.48 | 55.89 | 10 | 0.63 |
| St John's Church | 207 | 100 Yr | 0.49 | 530 | 591.6 | 597.49 |  | 598.72 | 0.003368 | 8.91 | 59.46 | 14.23 | 0.77 |
| St John's Church | 195 | 2 Yr | 3.02 | 139 | 591.6 | 593.42 | 593.42 | 594.33 | 0.036265 | 7.63 | 18.23 | 10 | 1 |
| St John's Church | 195 | 5 Yr | 2.31 | 231 | 591.6 | 594.85 | 594.14 | 595.63 | 0.018756 | 7.11 | 32.51 | 10 | 0.69 |
| St John's Church | 195 | 10 Yr | 2.32 | 306 | 591.6 | 595.79 | 594.67 | 596.62 | 0.01634 | 7.31 | 41.87 | 10 | 0.63 |
| St John's Church | 195 | 25 Yr | 2.58 | 392 | 591.6 | 596.61 | 595.22 | 597.56 | 0.016512 | 7.82 | 50.12 | 10 | 0.62 |
| St John's Church | 195 | 50 Yr | 3.13 | 474 | 591.6 | 597.07 | 595.72 | 598.23 | 0.019173 | 8.67 | 54.67 | 10 | 0.65 |
| St John's Church | 195 | 100 Yr | 3.64 | 530 | 591.6 | 597.28 | 596.04 | 598.63 | 0.022608 | 9.33 | 56.8 | 10.78 | 0.72 |
| St John's Church | 185 | 2 Yr | 0.44 | 139 | 589.83 | 593.86 | 592.15 | 594.01 | 0.003063 | 3.18 | 43.69 | 15.74 | 0.34 |
| St John's Church | 185 | 5 Yr | 0.48 | 231 | 589.83 | 595.21 | 592.81 | 595.4 | 0.002603 | 3.47 | 66.55 | 17.89 | 0.32 |
| St John's Church | 185 | 10 Yr | 0.5 | 306 | 589.83 | 596.17 | 593.27 | 596.38 | 0.002369 | 3.62 | 84.43 | 19.37 | 0.31 |
| St John's Church | 185 | 25 Yr | 0.54 | 392 | 589.83 | 597.07 | 593.75 | 597.3 | 0.002297 | 3.83 | 102.36 | 20.74 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.62 | 474 | 589.83 | 597.64 | 594.15 | 597.91 | 0.002473 | 4.14 | 114.59 | 21.63 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.68 | 530 | 589.83 | 597.96 | 594.38 | 598.25 | 0.00264 | 4.36 | 121.47 | 22.11 | 0.33 |
| St John's Church | 166 | 2 Yr | 1.29 | 139 | 590.34 | 593.17 | 592.87 | 593.86 | 0.01282 | 6.62 | 20.99 | 9.8 | 0.8 |
| St John's Church | 166 | 5 Yr | 1.02 | 231 | 590.34 | 594.71 | 593.63 | 595.28 | 0.008211 | 6.08 | 37.98 | 13.89 | 0.65 |
| St John's Church | 166 | 10 Yr | 0.84 | 306 | 590.34 | 595.77 | 594.19 | 596.28 | 0.005419 | 5.73 | 53.41 | 16.36 | 0.54 |
| St John's Church | 166 | 25 Yr | 0.74 | 392 | 590.34 | 596.75 | 594.9 | 597.22 | 0.003933 | 5.56 | 76.03 | 25.49 | 0.47 |
| St John's Church | 166 | 50 Yr | 0.76 | 474 | 590.34 | 597.35 | 595.32 | 597.83 | 0.003637 | 5.71 | 91.9 | 27.09 | 0.46 |
| St John's Church | 166 | 100 Yr | 0.79 | 530 | 590.34 | 597.67 | 595.59 | 598.18 | 0.003626 | 5.89 | 100.69 | 27.94 | 0.46 |
| St John's Church | 156 | 2 Yr | 0.68 | 139 | 590.34 | 593.31 | 592.74 | 593.67 | 0.006627 | 4.83 | 28.78 | 16.02 | 0.63 |
| St John's Church | 156 | 5 Yr | 0.42 | 231 | 590.34 | 594.88 | 593.38 | 595.15 | 0.002154 | 4.19 | 58.45 | 21.63 | 0.4 |
| St John's Church | 156 | 10 Yr | 0.37 | 306 | 590.34 | 595.93 | 593.78 | 596.18 | 0.001449 | 4.11 | 82.99 | 25.35 | 0.34 |
| St John's Church | 156 | 25 Yr | 0.36 | 392 | 590.34 | 596.88 | 594.2 | 597.13 | 0.001166 | 4.2 | 108.63 | 28.57 | 0.32 |
| St John's Church | 156 | 50 Yr | 0.39 | 474 | 590.34 | 597.47 | 594.56 | 597.76 | 0.001154 | 4.48 | 126.15 | 30.55 | 0.32 |
| St John's Church | 156 | 100 Yr | 0.43 | 530 | 590.34 | 597.79 | 594.82 | 598.1 | 0.001187 | 4.71 | 136.02 | 31.61 | 0.33 |
| St John's Church | 131 |  | Bridge |  |  |  |  |  |  |  |  |  |  |
| St John's Church | 130 | 2 Yr | 0.2 | 139 | 589.49 | 593.41 | 591.42 | 593.53 | 0.001326 | 2.81 | 49.43 | 17.11 | 0.29 |
| St John's Church | 130 | 5 Yr | 0.2 | 231 | 589.49 | 594.94 | 592.08 | 595.08 | 0.000913 | 2.99 | 78.23 | 20.56 | 0.26 |
| St John's Church | 130 | 10 Yr | 0.21 | 306 | 589.49 | 595.97 | 592.54 | 596.12 | 0.000761 | 3.16 | 100.65 | 22.91 | 0.24 |
| St John's Church | 130 | 25 Yr | 0.23 | 392 | 589.49 | 596.91 | 592.99 | 597.08 | 0.000705 | 3.39 | 123.31 | 25.22 | 0.24 |
| St John's Church | 130 | 50 Yr | 0.27 | 474 | 589.49 | 597.5 | 593.39 | 597.71 | 0.000748 | 3.71 | 138.63 | 26.69 | 0.25 |
| St John's Church | 130 | 100 Yr | 0.3 | 530 | 589.49 | 597.82 | 593.63 | 598.05 | 0.000795 | 3.95 | 147.2 | 27.47 | 0.26 |
| St John's Church | 120 | 2 Yr | 1.73 | 139 | 588.99 | 592.51 | 592.04 | 593.42 | 0.017373 | 7.65 | 18.17 | 6.18 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.22 | 231 | 588.99 | 593.71 | 593.13 | 594.94 | 0.018871 | 8.9 | 25.97 | 6.95 | 0.8 |
| St John's Church | 120 | 10 Yr | 2.39 | 306 | 588.99 | 594.59 | 593.91 | 595.98 | 0.017222 | 9.48 | 33.13 | 10 | 0.78 |
| St John's Church | 120 | 25 Yr | 1.98 | 392 | 588.99 | 595.8 | 594.93 | 596.97 | 0.011308 | 8.98 | 50.65 | 18.56 | 0.66 |
| St John's Church | 120 | 50 Yr | 1.94 | 474 | 588.99 | 596.47 | 595.88 | 597.6 | 0.009927 | 9.05 | 64.23 | 21.49 | 0.63 |
| St John's Church | 120 | 100 Yr | 2.08 | 530 | 588.99 | 596.74 | 596.27 | 597.93 | 0.010213 | 9.43 | 70.12 | 22.58 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.5 | 139 | 588.99 | 592.04 | 592.04 | 593.32 | 0.027197 | 9.07 | 15.33 | 5.94 | 1 |
| St John's Church | 117 | 5 Yr | 3.13 | 231 | 588.99 | 593.13 | 593.13 | 594.83 | 0.028742 | 10.44 | 22.12 | 6.49 | 1 |
| St John's Church | 117 | 10 Yr | 3.48 | 306 | 588.99 | 593.91 | 593.91 | 595.86 | 0.028549 | 11.21 | 27.38 | 7.42 | 0.99 |
| St John's Church | 117 | 25 Yr | 3.26 | 392 | 588.99 | 594.93 | 594.93 | 596.85 | 0.021935 | 11.21 | 36.89 | 12.53 | 0.89 |
| St John's Church | 117 | 50 Yr | 2.76 | 474 | 588.99 | 595.88 | 595.88 | 597.51 | 0.015548 | 10.62 | 52.16 | 18.95 | 0.77 |
| St John's Church | 117 | 100 Yr | 2.74 | 530 | 588.99 | 596.27 | 596.27 | 597.86 | 0.014481 | 10.7 | 59.86 | 20.64 | 0.75 |
| St John's Church | 83 | 2 Yr | 1.86 | 139 | 588.51 | 591.26 | 591.26 | 592.22 | 0.019263 | 7.87 | 17.67 | 9.2 | 1 |
| St John's Church | 83 | 5 Yr | 2.22 | 231 | 588.51 | 592.09 | 592.09 | 593.33 | 0.018688 | 8.92 | 25.89 | 10.49 | 1 |
| St John's Church | 83 | 10 Yr | 2.44 | 306 | 588.51 | 592.66 | 592.66 | 594.07 | 0.018022 | 9.54 | 32.11 | 11.5 | 1 |
| St John's Church | 83 | 25 Yr | 2.64 | 392 | 588.51 | 593.22 | 593.22 | 594.82 | 0.017122 | 10.15 | 38.94 | 12.78 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.81 | 474 | 588.51 | 593.71 | 593.71 | 595.46 | 0.016525 | 10.65 | 45.38 | 13.88 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.86 | 530 | 588.51 | 594.06 | 594.06 | 595.86 | 0.016152 | 10.8 | 50.47 | 15.19 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.97 | 139 | 588.32 | 590.67 | 590.38 | 591.16 | 0.010436 | 5.65 | 24.6 | 14.76 | 0.77 |
| St John's Church | 60 | 5 Yr | 1.07 | 231 | 588.32 | 591.47 | 590.98 | 592.07 | 0.008772 | 6.22 | 37.12 | 16.56 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.15 | 306 | 588.32 | 592.01 | 591.42 | 592.68 | 0.00817 | 6.59 | 46.4 | 17.77 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.25 | 392 | 588.32 | 592.53 | 591.84 | 593.29 | 0.007915 | 7 | 55.98 | 18.94 | 0.72 |
| St John's Church | 60 | 50 Yr | 1.32 | 474 | 588.32 | 592.99 | 592.22 | 593.82 | 0.007682 | 7.31 | 64.85 | 19.96 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.37 | 530 | 588.32 | 593.27 | 592.47 | 594.14 | 0.007609 | 7.51 | 70.54 | 20.59 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.66 | 139 | 587.29 | 589.76 | 589.76 | 590.6 | 0.018011 | 7.38 | 18.83 | 11.23 | 1 |
| St John's Church | 21 | 5 Yr | 1.93 | 231 | 587.29 | 590.51 | 590.51 | 591.56 | 0.016892 | 8.24 | 28.03 | 13.32 | 1 |
| St John's Church | 21 | 10 Yr | 2.1 | 306 | 587.29 | 591 | 591 | 592.19 | 0.01639 | 8.78 | 34.87 | 14.64 | 1 |
| St John's Church | 21 | 25 Yr | 2.24 | 392 | 587.29 | 591.49 | 591.49 | 592.82 | 0.015796 | 9.23 | 42.47 | 15.98 | 1 |
| St John's Church | 21 | 50 Yr | 2.39 | 474 | 587.29 | 591.89 | 591.89 | 593.34 | 0.015454 | 9.67 | 49.06 | 17.71 | 1 |
| St John's Church | 21 | 100 Yr | 2.47 | 530 | 587.29 | 592.15 | 592.15 | 593.67 | 0.014906 | 9.92 | 53.87 | 19.63 | 0.99 |

**Simulation E: Future full watershed build-out flows under existing site conditions**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0 | 161 | 593.23 | 602.89 | | 602.9 | 0.000021 | 0.94 | 182.22 | 69 | 0.08 |
| St John's Church | 260 | 5 Yr | 0.01 | 264 | 593.23 | 603.52 | | 603.55 | 0.000034 | 1.31 | 226.09 | 69 | 0.1 |
| St John's Church | 260 | 10 Yr | 0.01 | 337 | 593.23 | 603.8 | | 603.83 | 0.000045 | 1.56 | 245 | 69 | 0.12 |
| St John's Church | 260 | 25 Yr | 0.02 | 431 | 593.23 | 603.93 | | 603.99 | 0.000067 | 1.93 | 254.35 | 69 | 0.14 |
| St John's Church | 260 | 50 Yr | 0.02 | 511 | 593.23 | 604.19 | | 604.26 | 0.000078 | 2.15 | 272.39 | 69 | 0.16 |
| St John's Church | 260 | 100 Yr | 0.03 | 569 | 593.23 | 604.39 | | 604.46 | 0.000085 | 2.3 | 285.64 | 69 | 0.16 |
| St John's Church | 220 | 2 Yr | 0 | 161 | 591.6 | 602.89 | | 602.9 | 0.000011 | 0.75 | 233.68 | 69 | 0.06 |
| St John's Church | 220 | 5 Yr | 0.01 | 264 | 591.6 | 603.53 | | 603.55 | 0.000019 | 1.07 | 277.7 | 69 | 0.07 |
| St John's Church | 220 | 10 Yr | 0.01 | 337 | 591.6 | 603.8 | | 603.83 | 0.000026 | 1.29 | 296.72 | 69 | 0.09 |
| St John's Church | 220 | 25 Yr | 0.01 | 431 | 591.6 | 603.94 | | 603.98 | 0.00004 | 1.6 | 306.28 | 69 | 0.11 |
| St John's Church | 220 | 50 Yr | 0.02 | 511 | 591.6 | 604.21 | | 604.25 | 0.000048 | 1.81 | 324.44 | 69 | 0.12 |
| St John's Church | 220 | 100 Yr | 0.02 | 569 | 591.6 | 604.4 | | 604.45 | 0.000053 | 1.94 | 337.77 | 69 | 0.13 |
| St John's Church | 207 | 2 Yr | 0 | 161 | 591.6 | 602.89 | 593.6 | 602.9 | 0.000011 | 0.75 | 233.67 | 69 | 0.06 |
| St John's Church | 207 | 5 Yr | 0.01 | 264 | 591.6 | 603.53 | 594.38 | 603.54 | 0.000019 | 1.07 | 277.68 | 69 | 0.07 |
| St John's Church | 207 | 10 Yr | 0.01 | 337 | 591.6 | 603.8 | 594.87 | 603.83 | 0.000026 | 1.29 | 296.69 | 69 | 0.09 |
| St John's Church | 207 | 25 Yr | 0.01 | 431 | 591.6 | 603.94 | 595.45 | 603.98 | 0.00004 | 1.6 | 306.25 | 69 | 0.11 |
| St John's Church | 207 | 50 Yr | 0.02 | 511 | 591.6 | 604.21 | 595.91 | 604.25 | 0.000048 | 1.81 | 324.4 | 69 | 0.12 |
| St John's Church | 207 | 100 Yr | 0.02 | 569 | 591.6 | 604.4 | 596.23 | 604.45 | 0.000053 | 1.94 | 337.72 | 69 | 0.13 |
| St John's Church | 206 | | Culvert | | | | | | | | | | |
| St John's Church | 195 | 2 Yr | 2.08 | 161 | 591.6 | 594.06 | 593.6 | 594.72 | 0.020268 | 6.56 | 24.56 | 10 | 0.74 |
| St John's Church | 195 | 5 Yr | 2.06 | 264 | 591.6 | 595.46 | 594.39 | 596.19 | 0.015163 | 6.83 | 38.63 | 10 | 0.61 |
| St John's Church | 195 | 10 Yr | 2.25 | 337 | 591.6 | 596.24 | 594.89 | 597.06 | 0.014989 | 7.26 | 46.41 | 10 | 0.59 |
| St John's Church | 195 | 25 Yr | 2.72 | 431 | 591.6 | 596.94 | 595.46 | 597.95 | 0.016906 | 8.08 | 53.35 | 10 | 0.62 |
| St John's Church | 195 | 50 Yr | 3.37 | 511 | 591.6 | 597.29 | 595.93 | 598.54 | 0.021129 | 8.97 | 56.97 | 11.03 | 0.7 |
| St John's Church | 195 | 100 Yr | 3.88 | 569 | 591.6 | 597.55 | 596.25 | 598.93 | 0.027232 | 9.44 | 60.28 | 15.13 | 0.83 |
| St John's Church | 185 | 2 Yr | 0.4 | 161 | 589.83 | 594.36 | 592.33 | 594.51 | 0.002535 | 3.1 | 51.89 | 16.58 | 0.31 |
| St John's Church | 185 | 5 Yr | 0.45 | 264 | 589.83 | 595.79 | 593.03 | 595.98 | 0.002255 | 3.42 | 77.21 | 18.78 | 0.3 |
| St John's Church | 185 | 10 Yr | 0.49 | 337 | 589.83 | 596.63 | 593.46 | 596.83 | 0.002182 | 3.61 | 93.36 | 20.06 | 0.29 |
| St John's Church | 185 | 25 Yr | 0.56 | 431 | 589.83 | 597.43 | 593.95 | 597.67 | 0.002287 | 3.92 | 109.95 | 21.29 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.64 | 511 | 589.83 | 597.92 | 594.31 | 598.2 | 0.002505 | 4.24 | 120.55 | 22.04 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.7 | 569 | 589.83 | 598.24 | 594.56 | 598.54 | 0.002661 | 4.46 | 127.65 | 22.53 | 0.33 |
| St John's Church | 166 | 2 Yr | 0.9 | 161 | 590.34 | 593.89 | 593.06 | 594.4 | 0.007446 | 5.71 | 28.2 | 10.27 | 0.61 |
| St John's Church | 166 | 5 Yr | 0.79 | 264 | 590.34 | 595.42 | 593.88 | 595.88 | 0.005435 | 5.49 | 48.12 | 14.65 | 0.53 |
| St John's Church | 166 | 10 Yr | 0.73 | 337 | 590.34 | 596.29 | 594.6 | 596.75 | 0.004227 | 5.44 | 64.64 | 24.27 | 0.48 |
| St John's Church | 166 | 25 Yr | 0.7 | 431 | 590.34 | 597.15 | 595.11 | 597.59 | 0.003498 | 5.48 | 86.4 | 26.55 | 0.45 |
| St John's Church | 166 | 50 Yr | 0.75 | 511 | 590.34 | 597.65 | 595.49 | 598.12 | 0.003429 | 5.71 | 100 | 27.87 | 0.45 |
| St John's Church | 166 | 100 Yr | 0.78 | 569 | 590.34 | 597.97 | 595.77 | 598.47 | 0.003408 | 5.87 | 109.25 | 28.74 | 0.45 |
| St John's Church | 156 | 2 Yr | 1.02 | 161 | 590.34 | 593.75 | 593.06 | 594.31 | 0.008641 | 6.02 | 26.74 | 10.18 | 0.65 |
| St John's Church | 156 | 5 Yr | 0.83 | 264 | 590.34 | 595.33 | 593.89 | 595.83 | 0.005553 | 5.67 | 46.8 | 14.55 | 0.55 |
| St John's Church | 156 | 10 Yr | 0.77 | 337 | 590.34 | 596.21 | 594.59 | 596.7 | 0.004165 | 5.67 | 62.63 | 24.05 | 0.49 |
| St John's Church | 156 | 25 Yr | 0.75 | 431 | 590.34 | 597.06 | 595.08 | 597.55 | 0.003377 | 5.77 | 84.12 | 26.32 | 0.45 |
| St John's Church | 156 | 50 Yr | 0.81 | 511 | 590.34 | 597.55 | 595.47 | 598.08 | 0.003307 | 6.07 | 97.26 | 27.61 | 0.45 |
| St John's Church | 156 | 100 Yr | 0.85 | 569 | 590.34 | 597.87 | 595.74 | 598.43 | 0.003288 | 6.29 | 106.14 | 28.45 | 0.46 |
| St John's Church | 146 | 2 Yr | 1.21 | 161 | 590.34 | 593.55 | 593.06 | 594.21 | 0.010858 | 6.53 | 24.66 | 10.04 | 0.73 |
| St John's Church | 146 | 5 Yr | 0.89 | 264 | 590.34 | 595.24 | 593.88 | 595.76 | 0.00635 | 5.79 | 45.56 | 14.46 | 0.58 |
| St John's Church | 146 | 10 Yr | 0.79 | 337 | 590.34 | 596.16 | 594.6 | 596.66 | 0.004706 | 5.65 | 61.58 | 23.93 | 0.51 |
| St John's Church | 146 | 25 Yr | 0.75 | 431 | 590.34 | 597.04 | 595.11 | 597.51 | 0.003799 | 5.64 | 83.51 | 26.25 | 0.46 |
| St John's Church | 146 | 50 Yr | 0.79 | 511 | 590.34 | 597.53 | 595.49 | 598.04 | 0.003713 | 5.87 | 96.86 | 27.57 | 0.46 |
| St John's Church | 146 | 100 Yr | 0.82 | 569 | 590.34 | 597.86 | 595.77 | 598.38 | 0.003685 | 6.04 | 105.89 | 28.43 | 0.47 |
| St John's Church | 120 | 2 Yr | 1.86 | 161 | 588.99 | 592.83 | 592.31 | 593.82 | 0.017784 | 7.99 | 20.16 | 6.34 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.31 | 264 | 588.99 | 594.12 | 593.48 | 595.42 | 0.018285 | 9.18 | 28.97 | 7.92 | 0.79 |
| St John's Church | 120 | 10 Yr | 2.3 | 337 | 588.99 | 595.01 | 594.25 | 596.37 | 0.015248 | 9.45 | 37.93 | 13.15 | 0.75 |
| St John's Church | 120 | 25 Yr | 1.91 | 431 | 588.99 | 596.18 | 595.48 | 597.29 | 0.010241 | 8.91 | 58.04 | 20.28 | 0.63 |
| St John's Church | 120 | 50 Yr | 2.05 | 511 | 588.99 | 596.64 | 596.15 | 597.82 | 0.010252 | 9.35 | 67.74 | 22.15 | 0.64 |
| St John's Church | 120 | 100 Yr | 2.13 | 569 | 588.99 | 596.95 | 596.47 | 598.16 | 0.01014 | 9.59 | 74.92 | 23.44 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.7 | 161 | 588.99 | 592.31 | 592.31 | 593.71 | 0.027913 | 9.49 | 16.96 | 6.08 | 1 |
| St John's Church | 117 | 5 Yr | 3.32 | 264 | 588.99 | 593.48 | 593.48 | 595.3 | 0.029212 | 10.83 | 24.38 | 6.66 | 1 |
| St John's Church | 117 | 10 Yr | 3.5 | 337 | 588.99 | 594.25 | 594.25 | 596.24 | 0.027162 | 11.35 | 30.02 | 8.23 | 0.97 |
| St John's Church | 117 | 25 Yr | 2.89 | 431 | 588.99 | 595.48 | 595.48 | 597.19 | 0.017496 | 10.75 | 44.94 | 16.75 | 0.81 |
| St John's Church | 117 | 50 Yr | 2.73 | 511 | 588.99 | 596.15 | 596.15 | 597.75 | 0.014714 | 10.65 | 57.45 | 20.16 | 0.76 |
| St John's Church | 117 | 100 Yr | 2.81 | 569 | 588.99 | 596.47 | 596.47 | 598.09 | 0.014397 | 10.89 | 64.04 | 21.45 | 0.76 |
| St John's Church | 83 | 2 Yr | 1.95 | 161 | 588.51 | 591.48 | 591.48 | 592.51 | 0.018975 | 8.15 | 19.76 | 9.54 | 1 |
| St John's Church | 83 | 5 Yr | 2.36 | 264 | 588.51 | 592.33 | 592.33 | 593.67 | 0.018892 | 9.28 | 28.46 | 10.86 | 1.01 |
| St John's Church | 83 | 10 Yr | 2.54 | 337 | 588.51 | 592.86 | 592.86 | 594.35 | 0.01788 | 9.82 | 34.42 | 11.95 | 1 |
| St John's Church | 83 | 25 Yr | 2.74 | 431 | 588.51 | 593.45 | 593.45 | 595.14 | 0.016903 | 10.42 | 41.93 | 13.3 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.88 | 511 | 588.51 | 593.91 | 593.91 | 595.73 | 0.016315 | 10.85 | 48.26 | 14.35 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.8 | 569 | 588.51 | 594.35 | 594.35 | 596.12 | 0.015738 | 10.71 | 55.06 | 16.8 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.99 | 161 | 588.32 | 590.88 | 590.54 | 591.4 | 0.009869 | 5.81 | 27.73 | 15.23 | 0.76 |
| St John's Church | 60 | 5 Yr | 1.11 | 264 | 588.32 | 591.71 | 591.19 | 592.35 | 0.008504 | 6.41 | 41.22 | 17.1 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.19 | 337 | 588.32 | 592.21 | 591.58 | 592.91 | 0.008058 | 6.75 | 49.94 | 18.21 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.28 | 431 | 588.32 | 592.76 | 592.03 | 593.55 | 0.007749 | 7.14 | 60.37 | 19.45 | 0.71 |
| St John's Church | 60 | 50 Yr | 1.35 | 511 | 588.32 | 593.18 | 592.39 | 594.04 | 0.007615 | 7.44 | 68.68 | 20.38 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.41 | 569 | 588.32 | 593.46 | 592.63 | 594.36 | 0.00762 | 7.64 | 74.52 | 21.26 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.73 | 161 | 587.29 | 589.96 | 589.96 | 590.86 | 0.017614 | 7.61 | 21.15 | 11.8 | 1 |
| St John's Church | 21 | 5 Yr | 1.99 | 264 | 587.29 | 590.74 | 590.74 | 591.85 | 0.016505 | 8.46 | 31.19 | 13.95 | 1 |
| St John's Church | 21 | 10 Yr | 2.14 | 337 | 587.29 | 591.19 | 591.19 | 592.43 | 0.016055 | 8.93 | 37.74 | 15.16 | 1 |
| St John's Church | 21 | 25 Yr | 2.33 | 431 | 587.29 | 591.68 | 591.68 | 593.07 | 0.015828 | 9.47 | 45.53 | 16.49 | 1 |
| St John's Church | 21 | 50 Yr | 2.45 | 511 | 587.29 | 592.05 | 592.05 | 593.56 | 0.015175 | 9.86 | 52.09 | 18.94 | 1 |
| St John's Church | 21 | 100 Yr | 2.51 | 569 | 587.29 | 592.32 | 592.32 | 593.9 | 0.014552 | 10.08 | 57.39 | 20.92 | 0.99 |

**Simulation F: Full build-out flows with project conditions**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0 | 161 | 593.23 | 602.89 | | 602.9 | 0.000021 | 0.94 | 182.22 | 69 | 0.08 |
| St John's Church | 260 | 5 Yr | 0.01 | 264 | 593.23 | 603.52 | | 603.55 | 0.000034 | 1.31 | 225.94 | 69 | 0.1 |
| St John's Church | 260 | 10 Yr | 0.01 | 337 | 593.23 | 603.84 | | 603.88 | 0.000044 | 1.54 | 248.11 | 69 | 0.12 |
| St John's Church | 260 | 25 Yr | 0.02 | 431 | 593.23 | 604.13 | | 604.18 | 0.000058 | 1.84 | 268.05 | 69 | 0.13 |
| St John's Church | 260 | 50 Yr | 0.02 | 511 | 593.23 | 604.4 | | 604.46 | 0.000068 | 2.06 | 286.59 | 69 | 0.15 |
| St John's Church | 260 | 100 Yr | 0.02 | 569 | 593.23 | 604.47 | | 604.55 | 0.000081 | 2.26 | 291.69 | 69 | 0.16 |
| St John's Church | 220 | 2 Yr | 0 | 161 | 591.6 | 602.89 | 593.61 | 602.9 | 0.000011 | 0.75 | 233.68 | 69 | 0.06 |
| St John's Church | 220 | 5 Yr | 0.01 | 264 | 591.6 | 603.53 | 594.38 | 603.54 | 0.000019 | 1.07 | 277.54 | 69 | 0.08 |
| St John's Church | 220 | 10 Yr | 0.01 | 337 | 591.6 | 603.85 | 594.88 | 603.87 | 0.000026 | 1.28 | 299.81 | 69 | 0.09 |
| St John's Church | 220 | 25 Yr | 0.01 | 431 | 591.6 | 604.14 | 595.47 | 604.17 | 0.000035 | 1.54 | 319.9 | 69 | 0.1 |
| St John's Church | 220 | 50 Yr | 0.01 | 511 | 591.6 | 604.41 | 595.93 | 604.45 | 0.000042 | 1.74 | 338.55 | 69 | 0.11 |
| St John's Church | 220 | 100 Yr | 0.02 | 569 | 591.6 | 604.49 | 596.23 | 604.54 | 0.00005 | 1.91 | 343.77 | 69 | 0.12 |
| St John's Church | 207 | 2 Yr | 0 | 161 | 591.6 | 602.89 | 593.6 | 602.9 | 0.000011 | 0.75 | 233.67 | 69 | 0.06 |
| St John's Church | 207 | 5 Yr | 0.01 | 264 | 591.6 | 603.53 | 594.38 | 603.54 | 0.000019 | 1.07 | 277.53 | 69 | 0.08 |
| St John's Church | 207 | 10 Yr | 0.01 | 337 | 591.6 | 603.85 | 594.87 | 603.87 | 0.000026 | 1.28 | 299.79 | 69 | 0.09 |
| St John's Church | 207 | 25 Yr | 0.01 | 431 | 591.6 | 604.14 | 595.45 | 604.17 | 0.000035 | 1.54 | 319.87 | 69 | 0.1 |
| St John's Church | 207 | 50 Yr | 0.01 | 511 | 591.6 | 604.41 | 595.91 | 604.45 | 0.000042 | 1.74 | 338.51 | 69 | 0.11 |
| St John's Church | 207 | 100 Yr | 0.02 | 569 | 591.6 | 604.49 | 596.23 | 604.54 | 0.00005 | 1.91 | 343.72 | 69 | 0.12 |
| St John's Church | 206 | | Culvert | | | | | | | | | | |
| St John's Church | 195 | 2 Yr | 2.67 | 161 | 591.6 | 593.8 | 593.61 | 594.63 | 0.028085 | 7.33 | 21.95 | 10 | 0.87 |
| St John's Church | 195 | 5 Yr | 2.29 | 264 | 591.6 | 595.28 | 594.38 | 596.08 | 0.017329 | 7.17 | 36.8 | 10 | 0.66 |
| St John's Church | 195 | 10 Yr | 2.38 | 337 | 591.6 | 596.13 | 594.88 | 596.99 | 0.016012 | 7.44 | 45.29 | 10 | 0.62 |
| St John's Church | 195 | 25 Yr | 2.81 | 431 | 591.6 | 596.86 | 595.47 | 597.9 | 0.017587 | 8.2 | 52.56 | 10 | 0.63 |
| St John's Church | 195 | 50 Yr | 3.44 | 511 | 591.6 | 597.21 | 595.93 | 598.5 | 0.020819 | 9.11 | 56.1 | 10 | 0.68 |
| St John's Church | 195 | 100 Yr | 4.04 | 569 | 591.6 | 597.43 | 596.23 | 598.89 | 0.027035 | 9.71 | 58.61 | 13.22 | 0.81 |
| St John's Church | 185 | 2 Yr | 0.46 | 161 | 589.83 | 594.19 | 592.33 | 594.36 | 0.002962 | 3.28 | 49.09 | 16.32 | 0.33 |
| St John's Church | 185 | 5 Yr | 0.49 | 264 | 589.83 | 595.65 | 593.03 | 595.85 | 0.002485 | 3.54 | 74.52 | 18.56 | 0.31 |
| St John's Church | 185 | 10 Yr | 0.51 | 337 | 589.83 | 596.53 | 593.46 | 596.74 | 0.002304 | 3.68 | 91.52 | 19.92 | 0.3 |
| St John's Church | 185 | 25 Yr | 0.57 | 431 | 589.83 | 597.36 | 593.95 | 597.61 | 0.002365 | 3.97 | 108.59 | 21.2 | 0.31 |
| St John's Church | 185 | 50 Yr | 0.66 | 511 | 589.83 | 597.85 | 594.31 | 598.14 | 0.002588 | 4.29 | 119.11 | 21.94 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.72 | 569 | 589.83 | 598.17 | 594.56 | 598.48 | 0.002748 | 4.51 | 126.14 | 22.43 | 0.34 |
| St John's Church | 166 | 2 Yr | 1.2 | 161 | 590.34 | 593.56 | 593.06 | 594.21 | 0.010655 | 6.48 | 24.83 | 10.05 | 0.73 |
| St John's Church | 166 | 5 Yr | 0.91 | 264 | 590.34 | 595.21 | 593.88 | 595.74 | 0.006554 | 5.86 | 45.06 | 14.42 | 0.58 |
| St John's Church | 166 | 10 Yr | 0.79 | 337 | 590.34 | 596.16 | 594.6 | 596.66 | 0.004714 | 5.65 | 61.53 | 23.92 | 0.51 |
| St John's Church | 166 | 25 Yr | 0.74 | 431 | 590.34 | 597.06 | 595.11 | 597.53 | 0.003727 | 5.6 | 84.17 | 26.32 | 0.46 |
| St John's Church | 166 | 50 Yr | 0.78 | 511 | 590.34 | 597.56 | 595.49 | 598.06 | 0.003639 | 5.83 | 97.64 | 27.65 | 0.46 |
| St John's Church | 166 | 100 Yr | 0.81 | 569 | 590.34 | 597.89 | 595.77 | 598.41 | 0.00361 | 5.99 | 106.76 | 28.51 | 0.46 |
| St John's Church | 156 | 2 Yr | 0.56 | 161 | 590.34 | 593.73 | 592.92 | 594.05 | 0.004378 | 4.52 | 35.89 | 17.53 | 0.53 |
| St John's Church | 156 | 5 Yr | 0.39 | 264 | 590.34 | 595.37 | 593.55 | 595.63 | 0.001749 | 4.13 | 69.4 | 23.37 | 0.37 |
| St John's Church | 156 | 10 Yr | 0.36 | 337 | 590.34 | 596.31 | 593.94 | 596.56 | 0.001298 | 4.12 | 92.99 | 26.67 | 0.33 |
| St John's Church | 156 | 25 Yr | 0.37 | 431 | 590.34 | 597.18 | 594.39 | 597.45 | 0.001146 | 4.32 | 117.57 | 29.6 | 0.32 |
| St John's Church | 156 | 50 Yr | 0.42 | 511 | 590.34 | 597.68 | 594.73 | 597.98 | 0.001179 | 4.63 | 132.6 | 31.25 | 0.33 |
| St John's Church | 156 | 100 Yr | 0.45 | 569 | 590.34 | 598 | 594.96 | 598.33 | 0.001206 | 4.85 | 142.82 | 32.33 | 0.34 |
| St John's Church | 131 | | Bridge | | | | | | | | | | |
| St John's Church | 130 | 2 Yr | 0.2 | 161 | 589.49 | 593.81 | 591.59 | 593.93 | 0.001231 | 2.85 | 56.49 | 18 | 0.28 |
| St John's Church | 130 | 5 Yr | 0.21 | 264 | 589.49 | 595.42 | 592.29 | 595.56 | 0.000828 | 3.06 | 88.36 | 21.65 | 0.25 |
| St John's Church | 130 | 10 Yr | 0.22 | 337 | 589.49 | 596.35 | 592.72 | 596.51 | 0.000725 | 3.23 | 109.53 | 23.83 | 0.24 |
| St John's Church | 130 | 25 Yr | 0.25 | 431 | 589.49 | 597.22 | 593.19 | 597.41 | 0.000719 | 3.54 | 131.13 | 25.98 | 0.24 |
| St John's Church | 130 | 50 Yr | 0.29 | 511 | 589.49 | 597.71 | 593.57 | 597.93 | 0.00078 | 3.87 | 144.24 | 27.2 | 0.26 |
| St John's Church | 130 | 100 Yr | 0.32 | 569 | 589.49 | 598.03 | 593.82 | 598.28 | 0.000825 | 4.1 | 153.08 | 28 | 0.27 |
| St John's Church | 120 | 2 Yr | 1.86 | 161 | 588.99 | 592.83 | 592.31 | 593.82 | 0.017784 | 7.99 | 20.16 | 6.34 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.31 | 264 | 588.99 | 594.12 | 593.48 | 595.42 | 0.018285 | 9.18 | 28.97 | 7.92 | 0.79 |
| St John's Church | 120 | 10 Yr | 2.3 | 337 | 588.99 | 595.01 | 594.25 | 596.37 | 0.015248 | 9.45 | 37.93 | 13.15 | 0.75 |
| St John's Church | 120 | 25 Yr | 1.91 | 431 | 588.99 | 596.18 | 595.48 | 597.29 | 0.010241 | 8.91 | 58.04 | 20.28 | 0.63 |
| St John's Church | 120 | 50 Yr | 2.05 | 511 | 588.99 | 596.64 | 596.15 | 597.82 | 0.010252 | 9.35 | 67.74 | 22.15 | 0.64 |
| St John's Church | 120 | 100 Yr | 2.13 | 569 | 588.99 | 596.95 | 596.47 | 598.16 | 0.01014 | 9.59 | 74.92 | 23.44 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.7 | 161 | 588.99 | 592.31 | 592.31 | 593.71 | 0.027913 | 9.49 | 16.96 | 6.08 | 1 |
| St John's Church | 117 | 5 Yr | 3.32 | 264 | 588.99 | 593.48 | 593.48 | 595.3 | 0.029212 | 10.83 | 24.38 | 6.66 | 1 |
| St John's Church | 117 | 10 Yr | 3.5 | 337 | 588.99 | 594.25 | 594.25 | 596.24 | 0.027162 | 11.35 | 30.02 | 8.23 | 0.97 |
| St John's Church | 117 | 25 Yr | 2.89 | 431 | 588.99 | 595.48 | 595.48 | 597.19 | 0.017496 | 10.75 | 44.94 | 16.75 | 0.81 |
| St John's Church | 117 | 50 Yr | 2.73 | 511 | 588.99 | 596.15 | 596.15 | 597.75 | 0.014714 | 10.65 | 57.45 | 20.16 | 0.76 |
| St John's Church | 117 | 100 Yr | 2.81 | 569 | 588.99 | 596.47 | 596.47 | 598.09 | 0.014397 | 10.89 | 64.04 | 21.45 | 0.76 |
| St John's Church | 83 | 2 Yr | 1.95 | 161 | 588.51 | 591.48 | 591.48 | 592.51 | 0.018975 | 8.15 | 19.76 | 9.54 | 1 |
| St John's Church | 83 | 5 Yr | 2.36 | 264 | 588.51 | 592.33 | 592.33 | 593.67 | 0.018892 | 9.28 | 28.46 | 10.86 | 1.01 |
| St John's Church | 83 | 10 Yr | 2.54 | 337 | 588.51 | 592.86 | 592.86 | 594.35 | 0.01788 | 9.82 | 34.42 | 11.95 | 1 |
| St John's Church | 83 | 25 Yr | 2.74 | 431 | 588.51 | 593.45 | 593.45 | 595.14 | 0.016903 | 10.42 | 41.93 | 13.3 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.88 | 511 | 588.51 | 593.91 | 593.91 | 595.73 | 0.016315 | 10.85 | 48.26 | 14.35 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.8 | 569 | 588.51 | 594.35 | 594.35 | 596.12 | 0.015738 | 10.71 | 55.06 | 16.8 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.99 | 161 | 588.32 | 590.88 | 590.54 | 591.4 | 0.009869 | 5.81 | 27.73 | 15.23 | 0.76 |
| St John's Church | 60 | 5 Yr | 1.11 | 264 | 588.32 | 591.71 | 591.19 | 592.35 | 0.008504 | 6.41 | 41.22 | 17.1 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.19 | 337 | 588.32 | 592.21 | 591.58 | 592.91 | 0.008058 | 6.75 | 49.94 | 18.21 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.28 | 431 | 588.32 | 592.76 | 592.03 | 593.55 | 0.007749 | 7.14 | 60.37 | 19.45 | 0.71 |
| St John's Church | 60 | 50 Yr | 1.35 | 511 | 588.32 | 593.18 | 592.39 | 594.04 | 0.007615 | 7.44 | 68.68 | 20.38 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.41 | 569 | 588.32 | 593.46 | 592.63 | 594.36 | 0.00762 | 7.64 | 74.52 | 21.26 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.73 | 161 | 587.29 | 589.96 | 589.96 | 590.86 | 0.017614 | 7.61 | 21.15 | 11.8 | 1 |
| St John's Church | 21 | 5 Yr | 1.99 | 264 | 587.29 | 590.74 | 590.74 | 591.85 | 0.016505 | 8.46 | 31.19 | 13.95 | 1 |
| St John's Church | 21 | 10 Yr | 2.14 | 337 | 587.29 | 591.19 | 591.19 | 592.43 | 0.016055 | 8.93 | 37.74 | 15.16 | 1 |
| St John's Church | 21 | 25 Yr | 2.33 | 431 | 587.29 | 591.68 | 591.68 | 593.07 | 0.015828 | 9.47 | 45.53 | 16.49 | 1 |
| St John's Church | 21 | 50 Yr | 2.45 | 511 | 587.29 | 592.05 | 592.05 | 593.56 | 0.015175 | 9.86 | 52.09 | 18.94 | 1 |
| St John's Church | 21 | 100 Yr | 2.51 | 569 | 587.29 | 592.32 | 592.32 | 593.9 | 0.014552 | 10.08 | 57.39 | 20.92 | 0.99 |

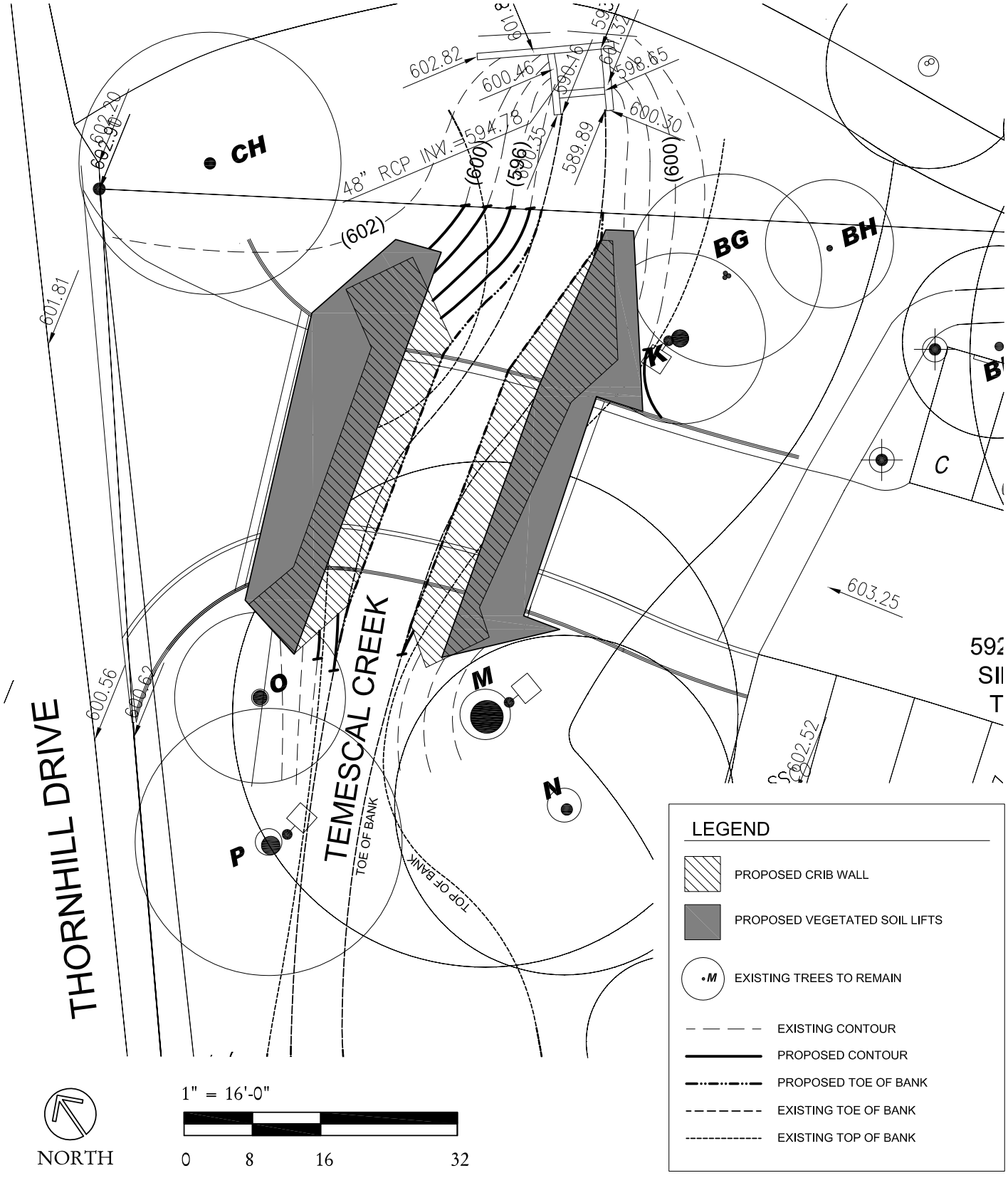
**Simulation G: Full build-out flows under existing site conditions and removal of 48-inch RCP**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.5 | 161 | 593.23 | 595.37 | 595.37 | 596.46 | 0.00555 | 8.35 | 19.29 | 9 | 1 |
| St John's Church | 260 | 5 Yr | 0.65 | 264 | 593.23 | 596.21 | 596.21 | 597.71 | 0.00583 | 9.85 | 26.81 | 9 | 1.01 |
| St John's Church | 260 | 10 Yr | 0.74 | 337 | 593.23 | 596.74 | 596.74 | 598.51 | 0.006041 | 10.68 | 31.56 | 9 | 1.01 |
| St John's Church | 260 | 25 Yr | 0.78 | 431 | 593.23 | 597.55 | 597.55 | 599.44 | 0.005871 | 11.03 | 39.06 | 10.32 | 1 |
| St John's Church | 260 | 50 Yr | 0.73 | 511 | 593.23 | 598.27 | 598.27 | 600.06 | 0.005338 | 10.74 | 47.59 | 13.34 | 1 |
| St John's Church | 260 | 100 Yr | 0.72 | 569 | 593.23 | 598.66 | 598.66 | 600.44 | 0.005115 | 10.72 | 53.07 | 14.96 | 1 |
| St John's Church | 220 | 2 Yr | 0.25 | 161 | 591.6 | 594.27 | | 594.83 | 0.002285 | 6.04 | 26.65 | 10 | 0.65 |
| St John's Church | 220 | 5 Yr | 0.27 | 264 | 591.6 | 595.59 | | 596.27 | 0.001974 | 6.61 | 39.94 | 10 | 0.58 |
| St John's Church | 220 | 10 Yr | 0.3 | 337 | 591.6 | 596.37 | | 597.14 | 0.001992 | 7.07 | 47.66 | 10 | 0.57 |
| St John's Church | 220 | 25 Yr | 0.37 | 431 | 591.6 | 597.09 | | 598.05 | 0.002239 | 7.85 | 54.89 | 10 | 0.59 |
| St John's Church | 220 | 50 Yr | 0.44 | 511 | 591.6 | 597.57 | | 598.67 | 0.003133 | 8.44 | 60.57 | 15.44 | 0.75 |
| St John's Church | 220 | 100 Yr | 0.44 | 569 | 591.6 | 597.96 | | 599.08 | 0.003025 | 8.48 | 67.06 | 17.07 | 0.75 |
| St John's Church | 207 | 2 Yr | 0.26 | 161 | 591.6 | 594.2 | | 594.8 | 0.002452 | 6.19 | 26 | 10 | 0.68 |
| St John's Church | 207 | 5 Yr | 0.28 | 264 | 591.6 | 595.55 | | 596.24 | 0.00204 | 6.69 | 39.47 | 10 | 0.59 |
| St John's Church | 207 | 10 Yr | 0.31 | 337 | 591.6 | 596.32 | | 597.11 | 0.002042 | 7.14 | 47.22 | 10 | 0.58 |
| St John's Church | 207 | 25 Yr | 0.37 | 431 | 591.6 | 597.03 | | 598.01 | 0.002298 | 7.93 | 54.34 | 10 | 0.6 |
| St John's Church | 207 | 50 Yr | 0.46 | 511 | 591.6 | 597.47 | | 598.63 | 0.003127 | 8.63 | 59.21 | 13.94 | 0.74 |
| St John's Church | 207 | 100 Yr | 0.47 | 569 | 591.6 | 597.86 | | 599.04 | 0.003241 | 8.71 | 65.35 | 16.77 | 0.78 |
| St John's Church | 195 | 2 Yr | 2.08 | 161 | 591.6 | 594.06 | 593.6 | 594.72 | 0.020268 | 6.56 | 24.56 | 10 | 0.74 |
| St John's Church | 195 | 5 Yr | 2.06 | 264 | 591.6 | 595.46 | 594.39 | 596.19 | 0.015163 | 6.83 | 38.63 | 10 | 0.61 |
| St John's Church | 195 | 10 Yr | 2.25 | 337 | 591.6 | 596.24 | 594.89 | 597.06 | 0.014989 | 7.26 | 46.41 | 10 | 0.59 |
| St John's Church | 195 | 25 Yr | 2.72 | 431 | 591.6 | 596.94 | 595.46 | 597.95 | 0.016906 | 8.08 | 53.35 | 10 | 0.62 |
| St John's Church | 195 | 50 Yr | 3.37 | 511 | 591.6 | 597.29 | 595.93 | 598.54 | 0.021129 | 8.97 | 56.97 | 11.03 | 0.7 |
| St John's Church | 195 | 100 Yr | 3.88 | 569 | 591.6 | 597.55 | 596.25 | 598.93 | 0.027232 | 9.44 | 60.28 | 15.13 | 0.83 |
| St John's Church | 185 | 2 Yr | 0.4 | 161 | 589.83 | 594.36 | 592.33 | 594.51 | 0.002535 | 3.1 | 51.89 | 16.58 | 0.31 |
| St John's Church | 185 | 5 Yr | 0.45 | 264 | 589.83 | 595.79 | 593.03 | 595.98 | 0.002255 | 3.42 | 77.21 | 18.78 | 0.3 |
| St John's Church | 185 | 10 Yr | 0.49 | 337 | 589.83 | 596.63 | 593.46 | 596.83 | 0.002182 | 3.61 | 93.36 | 20.06 | 0.29 |
| St John's Church | 185 | 25 Yr | 0.56 | 431 | 589.83 | 597.43 | 593.95 | 597.67 | 0.002287 | 3.92 | 109.95 | 21.29 | 0.3 |
| St John's Church | 185 | 50 Yr | 0.64 | 511 | 589.83 | 597.92 | 594.31 | 598.2 | 0.002505 | 4.24 | 120.55 | 22.04 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.7 | 569 | 589.83 | 598.24 | 594.56 | 598.54 | 0.002661 | 4.46 | 127.65 | 22.53 | 0.33 |
| St John's Church | 166 | 2 Yr | 0.9 | 161 | 590.34 | 593.89 | 593.06 | 594.4 | 0.007446 | 5.71 | 28.2 | 10.27 | 0.61 |
| St John's Church | 166 | 5 Yr | 0.79 | 264 | 590.34 | 595.42 | 593.88 | 595.88 | 0.005435 | 5.49 | 48.12 | 14.65 | 0.53 |
| St John's Church | 166 | 10 Yr | 0.73 | 337 | 590.34 | 596.29 | 594.6 | 596.75 | 0.004227 | 5.44 | 64.64 | 24.27 | 0.48 |
| St John's Church | 166 | 25 Yr | 0.7 | 431 | 590.34 | 597.15 | 595.11 | 597.59 | 0.003498 | 5.48 | 86.4 | 26.55 | 0.45 |
| St John's Church | 166 | 50 Yr | 0.75 | 511 | 590.34 | 597.65 | 595.49 | 598.12 | 0.003429 | 5.71 | 100 | 27.87 | 0.45 |
| St John's Church | 166 | 100 Yr | 0.78 | 569 | 590.34 | 597.97 | 595.77 | 598.47 | 0.003408 | 5.87 | 109.25 | 28.74 | 0.45 |
| St John's Church | 156 | 2 Yr | 1.02 | 161 | 590.34 | 593.75 | 593.06 | 594.31 | 0.008641 | 6.02 | 26.74 | 10.18 | 0.65 |
| St John's Church | 156 | 5 Yr | 0.83 | 264 | 590.34 | 595.33 | 593.89 | 595.83 | 0.005553 | 5.67 | 46.8 | 14.55 | 0.55 |
| St John's Church | 156 | 10 Yr | 0.77 | 337 | 590.34 | 596.21 | 594.59 | 596.7 | 0.004165 | 5.67 | 62.63 | 24.05 | 0.49 |
| St John's Church | 156 | 25 Yr | 0.75 | 431 | 590.34 | 597.06 | 595.08 | 597.55 | 0.003377 | 5.77 | 84.12 | 26.32 | 0.45 |
| St John's Church | 156 | 50 Yr | 0.81 | 511 | 590.34 | 597.55 | 595.47 | 598.08 | 0.003307 | 6.07 | 97.26 | 27.61 | 0.45 |
| St John's Church | 156 | 100 Yr | 0.85 | 569 | 590.34 | 597.87 | 595.74 | 598.43 | 0.003288 | 6.29 | 106.14 | 28.45 | 0.46 |
| St John's Church | 146 | 2 Yr | 1.21 | 161 | 590.34 | 593.55 | 593.06 | 594.21 | 0.010858 | 6.53 | 24.66 | 10.04 | 0.73 |
| St John's Church | 146 | 5 Yr | 0.89 | 264 | 590.34 | 595.24 | 593.88 | 595.76 | 0.00635 | 5.79 | 45.56 | 14.46 | 0.58 |
| St John's Church | 146 | 10 Yr | 0.79 | 337 | 590.34 | 596.16 | 594.6 | 596.66 | 0.004706 | 5.65 | 61.58 | 23.93 | 0.51 |
| St John's Church | 146 | 25 Yr | 0.75 | 431 | 590.34 | 597.04 | 595.11 | 597.51 | 0.003799 | 5.64 | 83.51 | 26.25 | 0.46 |
| St John's Church | 146 | 50 Yr | 0.79 | 511 | 590.34 | 597.53 | 595.49 | 598.04 | 0.003713 | 5.87 | 96.86 | 27.57 | 0.46 |
| St John's Church | 146 | 100 Yr | 0.82 | 569 | 590.34 | 597.86 | 595.77 | 598.38 | 0.003685 | 6.04 | 105.89 | 28.43 | 0.47 |
| St John's Church | 120 | 2 Yr | 1.86 | 161 | 588.99 | 592.83 | 592.31 | 593.82 | 0.017784 | 7.99 | 20.16 | 6.34 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.31 | 264 | 588.99 | 594.12 | 593.48 | 595.42 | 0.018285 | 9.18 | 28.97 | 7.92 | 0.79 |
| St John's Church | 120 | 10 Yr | 2.3 | 337 | 588.99 | 595.01 | 594.25 | 596.37 | 0.015248 | 9.45 | 37.93 | 13.15 | 0.75 |
| St John's Church | 120 | 25 Yr | 1.91 | 431 | 588.99 | 596.18 | 595.48 | 597.29 | 0.010241 | 8.91 | 58.04 | 20.28 | 0.63 |
| St John's Church | 120 | 50 Yr | 2.05 | 511 | 588.99 | 596.64 | 596.15 | 597.82 | 0.010252 | 9.35 | 67.74 | 22.15 | 0.64 |
| St John's Church | 120 | 100 Yr | 2.13 | 569 | 588.99 | 596.95 | 596.47 | 598.16 | 0.01014 | 9.59 | 74.92 | 23.44 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.7 | 161 | 588.99 | 592.31 | 592.31 | 593.71 | 0.027913 | 9.49 | 16.96 | 6.08 | 1 |
| St John's Church | 117 | 5 Yr | 3.32 | 264 | 588.99 | 593.48 | 593.48 | 595.3 | 0.029212 | 10.83 | 24.38 | 6.66 | 1 |
| St John's Church | 117 | 10 Yr | 3.5 | 337 | 588.99 | 594.25 | 594.25 | 596.24 | 0.027162 | 11.35 | 30.02 | 8.23 | 0.97 |
| St John's Church | 117 | 25 Yr | 2.89 | 431 | 588.99 | 595.48 | 595.48 | 597.19 | 0.017496 | 10.75 | 44.94 | 16.75 | 0.81 |
| St John's Church | 117 | 50 Yr | 2.73 | 511 | 588.99 | 596.15 | 596.15 | 597.75 | 0.014714 | 10.65 | 57.45 | 20.16 | 0.76 |
| St John's Church | 117 | 100 Yr | 2.81 | 569 | 588.99 | 596.47 | 596.47 | 598.09 | 0.014397 | 10.89 | 64.04 | 21.45 | 0.76 |
| St John's Church | 83 | 2 Yr | 1.95 | 161 | 588.51 | 591.48 | 591.48 | 592.51 | 0.018975 | 8.15 | 19.76 | 9.54 | 1 |
| St John's Church | 83 | 5 Yr | 2.36 | 264 | 588.51 | 592.33 | 592.33 | 593.67 | 0.018892 | 9.28 | 28.46 | 10.86 | 1.01 |
| St John's Church | 83 | 10 Yr | 2.54 | 337 | 588.51 | 592.86 | 592.86 | 594.35 | 0.01788 | 9.82 | 34.42 | 11.95 | 1 |
| St John's Church | 83 | 25 Yr | 2.74 | 431 | 588.51 | 593.45 | 593.45 | 595.14 | 0.016903 | 10.42 | 41.93 | 13.3 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.88 | 511 | 588.51 | 593.91 | 593.91 | 595.73 | 0.016315 | 10.85 | 48.26 | 14.35 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.8 | 569 | 588.51 | 594.35 | 594.35 | 596.12 | 0.015738 | 10.71 | 55.06 | 16.8 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.99 | 161 | 588.32 | 590.88 | 590.54 | 591.4 | 0.009869 | 5.81 | 27.73 | 15.23 | 0.76 |
| St John's Church | 60 | 5 Yr | 1.11 | 264 | 588.32 | 591.71 | 591.19 | 592.35 | 0.008504 | 6.41 | 41.22 | 17.1 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.19 | 337 | 588.32 | 592.21 | 591.58 | 592.91 | 0.008058 | 6.75 | 49.94 | 18.21 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.28 | 431 | 588.32 | 592.76 | 592.03 | 593.55 | 0.007749 | 7.14 | 60.37 | 19.45 | 0.71 |
| St John's Church | 60 | 50 Yr | 1.35 | 511 | 588.32 | 593.18 | 592.39 | 594.04 | 0.007615 | 7.44 | 68.68 | 20.38 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.41 | 569 | 588.32 | 593.46 | 592.63 | 594.36 | 0.00762 | 7.64 | 74.52 | 21.26 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.73 | 161 | 587.29 | 589.96 | 589.96 | 590.86 | 0.017614 | 7.61 | 21.15 | 11.8 | 1 |
| St John's Church | 21 | 5 Yr | 1.99 | 264 | 587.29 | 590.74 | 590.74 | 591.85 | 0.016505 | 8.46 | 31.19 | 13.95 | 1 |
| St John's Church | 21 | 10 Yr | 2.14 | 337 | 587.29 | 591.19 | 591.19 | 592.43 | 0.016055 | 8.93 | 37.74 | 15.16 | 1 |
| St John's Church | 21 | 25 Yr | 2.33 | 431 | 587.29 | 591.68 | 591.68 | 593.07 | 0.015828 | 9.47 | 45.53 | 16.49 | 1 |
| St John's Church | 21 | 50 Yr | 2.45 | 511 | 587.29 | 592.05 | 592.05 | 593.56 | 0.015175 | 9.86 | 52.09 | 18.94 | 1 |
| St John's Church | 21 | 100 Yr | 2.51 | 569 | 587.29 | 592.32 | 592.32 | 593.9 | 0.014552 | 10.08 | 57.39 | 20.92 | 0.99 |

**Simulation H: Full build-out flows under project site conditions and removal of 48-inch RCP**

| Reach | River Sta | Profile | Shear Chan (lb/sq ft) | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St John's Church | 260 | 2 Yr | 0.5 | 161 | 593.23 | 595.37 | 595.37 | 596.46 | 0.005558 | 8.35 | 19.28 | 9 | 1.01 |
| St John's Church | 260 | 5 Yr | 0.65 | 264 | 593.23 | 596.21 | 596.21 | 597.71 | 0.00583 | 9.85 | 26.81 | 9 | 1.01 |
| St John's Church | 260 | 10 Yr | 0.74 | 337 | 593.23 | 596.74 | 596.74 | 598.51 | 0.006041 | 10.68 | 31.56 | 9 | 1.01 |
| St John's Church | 260 | 25 Yr | 0.78 | 431 | 593.23 | 597.55 | 597.55 | 599.44 | 0.005871 | 11.03 | 39.06 | 10.32 | 1 |
| St John's Church | 260 | 50 Yr | 0.73 | 511 | 593.23 | 598.27 | 598.27 | 600.06 | 0.005338 | 10.74 | 47.59 | 13.34 | 1 |
| St John's Church | 260 | 100 Yr | 0.72 | 569 | 593.23 | 598.66 | 598.66 | 600.44 | 0.005115 | 10.72 | 53.07 | 14.96 | 1 |
| St John's Church | 220 | 2 Yr | 0.27 | 161 | 591.6 | 594.15 | 593.61 | 594.77 | 0.002607 | 6.32 | 25.46 | 10 | 0.7 |
| St John's Church | 220 | 5 Yr | 0.3 | 264 | 591.6 | 595.45 | 594.38 | 596.18 | 0.002191 | 6.87 | 38.45 | 10 | 0.62 |
| St John's Church | 220 | 10 Yr | 0.32 | 337 | 591.6 | 596.27 | 594.88 | 597.08 | 0.002105 | 7.22 | 46.69 | 10 | 0.59 |
| St John's Church | 220 | 25 Yr | 0.38 | 431 | 591.6 | 597.02 | 595.47 | 598 | 0.002315 | 7.95 | 54.19 | 10 | 0.6 |
| St John's Church | 220 | 50 Yr | 0.46 | 511 | 591.6 | 597.46 | 595.93 | 598.62 | 0.003124 | 8.65 | 59.05 | 13.76 | 0.74 |
| St John's Church | 220 | 100 Yr | 0.46 | 569 | 591.6 | 597.89 | 596.23 | 599.05 | 0.003178 | 8.64 | 65.84 | 16.86 | 0.77 |
| St John's Church | 207 | 2 Yr | 0.3 | 161 | 591.6 | 594.06 |  | 594.73 | 0.002871 | 6.54 | 24.62 | 10 | 0.73 |
| St John's Church | 207 | 5 Yr | 0.31 | 264 | 591.6 | 595.39 |  | 596.14 | 0.002282 | 6.97 | 37.89 | 10 | 0.63 |
| St John's Church | 207 | 10 Yr | 0.32 | 337 | 591.6 | 596.22 |  | 597.05 | 0.002168 | 7.3 | 46.18 | 10 | 0.6 |
| St John's Church | 207 | 25 Yr | 0.38 | 431 | 591.6 | 596.96 |  | 597.97 | 0.002381 | 8.04 | 53.62 | 10 | 0.61 |
| St John's Church | 207 | 50 Yr | 0.47 | 511 | 591.6 | 597.37 |  | 598.58 | 0.003081 | 8.83 | 57.89 | 12.31 | 0.72 |
| St John's Church | 207 | 100 Yr | 0.49 | 569 | 591.6 | 597.77 |  | 599 | 0.003439 | 8.9 | 63.92 | 16.51 | 0.8 |
| St John's Church | 195 | 2 Yr | 2.67 | 161 | 591.6 | 593.8 | 593.61 | 594.63 | 0.028085 | 7.33 | 21.95 | 10 | 0.87 |
| St John's Church | 195 | 5 Yr | 2.29 | 264 | 591.6 | 595.28 | 594.38 | 596.08 | 0.017329 | 7.17 | 36.8 | 10 | 0.66 |
| St John's Church | 195 | 10 Yr | 2.38 | 337 | 591.6 | 596.13 | 594.88 | 596.99 | 0.016012 | 7.44 | 45.29 | 10 | 0.62 |
| St John's Church | 195 | 25 Yr | 2.81 | 431 | 591.6 | 596.86 | 595.47 | 597.9 | 0.017587 | 8.2 | 52.56 | 10 | 0.63 |
| St John's Church | 195 | 50 Yr | 3.44 | 511 | 591.6 | 597.21 | 595.93 | 598.5 | 0.020819 | 9.11 | 56.1 | 10 | 0.68 |
| St John's Church | 195 | 100 Yr | 4.04 | 569 | 591.6 | 597.43 | 596.23 | 598.89 | 0.027035 | 9.71 | 58.61 | 13.22 | 0.81 |
| St John's Church | 185 | 2 Yr | 0.46 | 161 | 589.83 | 594.19 | 592.33 | 594.36 | 0.002962 | 3.28 | 49.09 | 16.32 | 0.33 |
| St John's Church | 185 | 5 Yr | 0.49 | 264 | 589.83 | 595.65 | 593.03 | 595.85 | 0.002485 | 3.54 | 74.52 | 18.56 | 0.31 |
| St John's Church | 185 | 10 Yr | 0.51 | 337 | 589.83 | 596.53 | 593.46 | 596.74 | 0.002304 | 3.68 | 91.52 | 19.92 | 0.3 |
| St John's Church | 185 | 25 Yr | 0.57 | 431 | 589.83 | 597.36 | 593.95 | 597.61 | 0.002365 | 3.97 | 108.59 | 21.2 | 0.31 |
| St John's Church | 185 | 50 Yr | 0.66 | 511 | 589.83 | 597.85 | 594.31 | 598.14 | 0.002588 | 4.29 | 119.11 | 21.94 | 0.32 |
| St John's Church | 185 | 100 Yr | 0.72 | 569 | 589.83 | 598.17 | 594.56 | 598.48 | 0.002748 | 4.51 | 126.14 | 22.43 | 0.34 |
| St John's Church | 166 | 2 Yr | 1.2 | 161 | 590.34 | 593.56 | 593.06 | 594.21 | 0.010655 | 6.48 | 24.83 | 10.05 | 0.73 |
| St John's Church | 166 | 5 Yr | 0.91 | 264 | 590.34 | 595.21 | 593.88 | 595.74 | 0.006554 | 5.86 | 45.06 | 14.42 | 0.58 |
| St John's Church | 166 | 10 Yr | 0.79 | 337 | 590.34 | 596.16 | 594.6 | 596.66 | 0.004714 | 5.65 | 61.53 | 23.92 | 0.51 |
| St John's Church | 166 | 25 Yr | 0.74 | 431 | 590.34 | 597.06 | 595.11 | 597.53 | 0.003727 | 5.6 | 84.17 | 26.32 | 0.46 |
| St John's Church | 166 | 50 Yr | 0.78 | 511 | 590.34 | 597.56 | 595.49 | 598.06 | 0.003639 | 5.83 | 97.64 | 27.65 | 0.46 |
| St John's Church | 166 | 100 Yr | 0.81 | 569 | 590.34 | 597.89 | 595.77 | 598.41 | 0.00361 | 5.99 | 106.76 | 28.51 | 0.46 |
| St John's Church | 156 | 2 Yr | 0.56 | 161 | 590.34 | 593.73 | 592.92 | 594.05 | 0.004378 | 4.52 | 35.89 | 17.53 | 0.53 |
| St John's Church | 156 | 5 Yr | 0.39 | 264 | 590.34 | 595.37 | 593.55 | 595.63 | 0.001749 | 4.13 | 69.4 | 23.37 | 0.37 |
| St John's Church | 156 | 10 Yr | 0.36 | 337 | 590.34 | 596.31 | 593.94 | 596.56 | 0.001298 | 4.12 | 92.99 | 26.67 | 0.33 |
| St John's Church | 156 | 25 Yr | 0.37 | 431 | 590.34 | 597.18 | 594.39 | 597.45 | 0.001146 | 4.32 | 117.57 | 29.6 | 0.32 |
| St John's Church | 156 | 50 Yr | 0.42 | 511 | 590.34 | 597.68 | 594.73 | 597.98 | 0.001179 | 4.63 | 132.6 | 31.25 | 0.33 |
| St John's Church | 156 | 100 Yr | 0.45 | 569 | 590.34 | 598 | 594.96 | 598.33 | 0.001206 | 4.85 | 142.82 | 32.33 | 0.34 |
| St John's Church | 131 |  | Bridge |  |  |  |  |  |  |  |  |  |  |
| St John's Church | 130 | 2 Yr | 0.2 | 161 | 589.49 | 593.81 | 591.59 | 593.93 | 0.001231 | 2.85 | 56.49 | 18 | 0.28 |
| St John's Church | 130 | 5 Yr | 0.21 | 264 | 589.49 | 595.42 | 592.29 | 595.56 | 0.000828 | 3.06 | 88.36 | 21.65 | 0.25 |
| St John's Church | 130 | 10 Yr | 0.22 | 337 | 589.49 | 596.35 | 592.72 | 596.51 | 0.000725 | 3.23 | 109.53 | 23.83 | 0.24 |
| St John's Church | 130 | 25 Yr | 0.25 | 431 | 589.49 | 597.22 | 593.19 | 597.41 | 0.000719 | 3.54 | 131.13 | 25.98 | 0.24 |
| St John's Church | 130 | 50 Yr | 0.29 | 511 | 589.49 | 597.71 | 593.57 | 597.93 | 0.00078 | 3.87 | 144.24 | 27.2 | 0.26 |
| St John's Church | 130 | 100 Yr | 0.32 | 569 | 589.49 | 598.03 | 593.82 | 598.28 | 0.000825 | 4.1 | 153.08 | 28 | 0.27 |
| St John's Church | 120 | 2 Yr | 1.86 | 161 | 588.99 | 592.83 | 592.31 | 593.82 | 0.017784 | 7.99 | 20.16 | 6.34 | 0.79 |
| St John's Church | 120 | 5 Yr | 2.31 | 264 | 588.99 | 594.12 | 593.48 | 595.42 | 0.018285 | 9.18 | 28.97 | 7.92 | 0.79 |
| St John's Church | 120 | 10 Yr | 2.3 | 337 | 588.99 | 595.01 | 594.25 | 596.37 | 0.015248 | 9.45 | 37.93 | 13.15 | 0.75 |
| St John's Church | 120 | 25 Yr | 1.91 | 431 | 588.99 | 596.18 | 595.48 | 597.29 | 0.010241 | 8.91 | 58.04 | 20.28 | 0.63 |
| St John's Church | 120 | 50 Yr | 2.05 | 511 | 588.99 | 596.64 | 596.15 | 597.82 | 0.010252 | 9.35 | 67.74 | 22.15 | 0.64 |
| St John's Church | 120 | 100 Yr | 2.13 | 569 | 588.99 | 596.95 | 596.47 | 598.16 | 0.01014 | 9.59 | 74.92 | 23.44 | 0.64 |
| St John's Church | 117 | 2 Yr | 2.7 | 161 | 588.99 | 592.31 | 592.31 | 593.71 | 0.027913 | 9.49 | 16.96 | 6.08 | 1 |
| St John's Church | 117 | 5 Yr | 3.32 | 264 | 588.99 | 593.48 | 593.48 | 595.3 | 0.029212 | 10.83 | 24.38 | 6.66 | 1 |
| St John's Church | 117 | 10 Yr | 3.5 | 337 | 588.99 | 594.25 | 594.25 | 596.24 | 0.027162 | 11.35 | 30.02 | 8.23 | 0.97 |
| St John's Church | 117 | 25 Yr | 2.89 | 431 | 588.99 | 595.48 | 595.48 | 597.19 | 0.017496 | 10.75 | 44.94 | 16.75 | 0.81 |
| St John's Church | 117 | 50 Yr | 2.73 | 511 | 588.99 | 596.15 | 596.15 | 597.75 | 0.014714 | 10.65 | 57.45 | 20.16 | 0.76 |
| St John's Church | 117 | 100 Yr | 2.81 | 569 | 588.99 | 596.47 | 596.47 | 598.09 | 0.014397 | 10.89 | 64.04 | 21.45 | 0.76 |
| St John's Church | 83 | 2 Yr | 1.95 | 161 | 588.51 | 591.48 | 591.48 | 592.51 | 0.018975 | 8.15 | 19.76 | 9.54 | 1 |
| St John's Church | 83 | 5 Yr | 2.36 | 264 | 588.51 | 592.33 | 592.33 | 593.67 | 0.018892 | 9.28 | 28.46 | 10.86 | 1.01 |
| St John's Church | 83 | 10 Yr | 2.54 | 337 | 588.51 | 592.86 | 592.86 | 594.35 | 0.01788 | 9.82 | 34.42 | 11.95 | 1 |
| St John's Church | 83 | 25 Yr | 2.74 | 431 | 588.51 | 593.45 | 593.45 | 595.14 | 0.016903 | 10.42 | 41.93 | 13.3 | 0.99 |
| St John's Church | 83 | 50 Yr | 2.88 | 511 | 588.51 | 593.91 | 593.91 | 595.73 | 0.016315 | 10.85 | 48.26 | 14.35 | 0.99 |
| St John's Church | 83 | 100 Yr | 2.8 | 569 | 588.51 | 594.35 | 594.35 | 596.12 | 0.015738 | 10.71 | 55.06 | 16.8 | 0.99 |
| St John's Church | 60 | 2 Yr | 0.99 | 161 | 588.32 | 590.88 | 590.54 | 591.4 | 0.009869 | 5.81 | 27.73 | 15.23 | 0.76 |
| St John's Church | 60 | 5 Yr | 1.11 | 264 | 588.32 | 591.71 | 591.19 | 592.35 | 0.008504 | 6.41 | 41.22 | 17.1 | 0.73 |
| St John's Church | 60 | 10 Yr | 1.19 | 337 | 588.32 | 592.21 | 591.58 | 592.91 | 0.008058 | 6.75 | 49.94 | 18.21 | 0.72 |
| St John's Church | 60 | 25 Yr | 1.28 | 431 | 588.32 | 592.76 | 592.03 | 593.55 | 0.007749 | 7.14 | 60.37 | 19.45 | 0.71 |
| St John's Church | 60 | 50 Yr | 1.35 | 511 | 588.32 | 593.18 | 592.39 | 594.04 | 0.007615 | 7.44 | 68.68 | 20.38 | 0.71 |
| St John's Church | 60 | 100 Yr | 1.41 | 569 | 588.32 | 593.46 | 592.63 | 594.36 | 0.00762 | 7.64 | 74.52 | 21.26 | 0.72 |
| St John's Church | 21 | 2 Yr | 1.73 | 161 | 587.29 | 589.96 | 589.96 | 590.86 | 0.017614 | 7.61 | 21.15 | 11.8 | 1 |
| St John's Church | 21 | 5 Yr | 1.99 | 264 | 587.29 | 590.74 | 590.74 | 591.85 | 0.016505 | 8.46 | 31.19 | 13.95 | 1 |
| St John's Church | 21 | 10 Yr | 2.14 | 337 | 587.29 | 591.19 | 591.19 | 592.43 | 0.016055 | 8.93 | 37.74 | 15.16 | 1 |
| St John's Church | 21 | 25 Yr | 2.33 | 431 | 587.29 | 591.68 | 591.68 | 593.07 | 0.015828 | 9.47 | 45.53 | 16.49 | 1 |
| St John's Church | 21 | 50 Yr | 2.45 | 511 | 587.29 | 592.05 | 592.05 | 593.56 | 0.015175 | 9.86 | 52.09 | 18.94 | 1 |
| St John's Church | 21 | 100 Yr | 2.51 | 569 | 587.29 | 592.32 | 592.32 | 593.9 | 0.014552 | 10.08 | 57.39 | 20.92 | 0.99 |

# Appendix C:
# Proposed Bridge Bank Treatments and Project Tree Preservation and Planting Plans




DESIGN, COMMUNITY & ENVIRONMENT
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BERKELEY, CA 94709
TEL: 510 848 3815
FAX: 510 848 4315

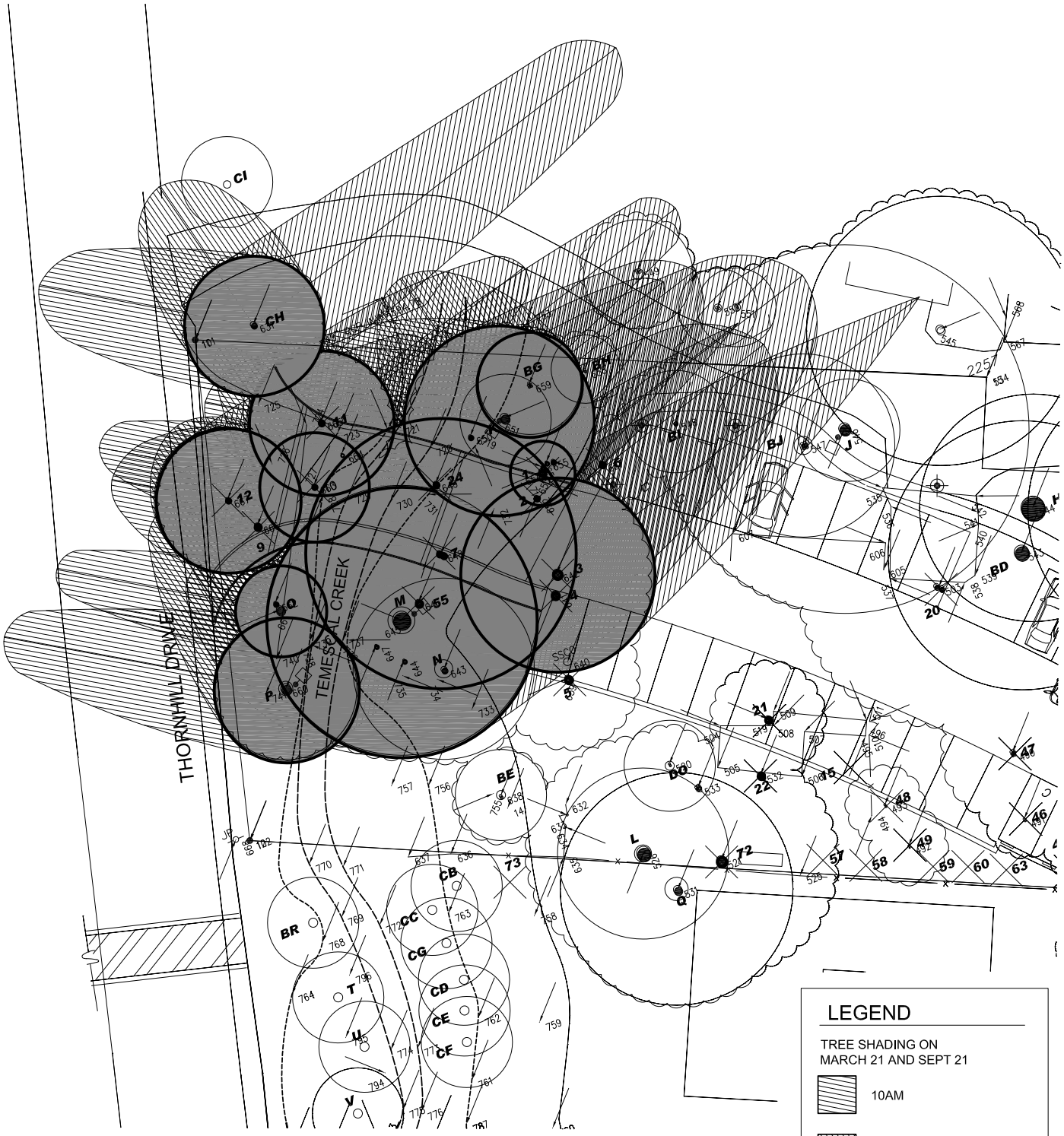
DRAWING TITLE:
PROPOSED BANK TREATMENT AT CREEK/BRIDGE

PROJECT TITLE:
CREEK PROTECTION PERMIT
ST. JOHN'S EPISCOPAL CHURCH

SHEET REFERENCE: CR-1

PROJECT NUMBER: 703.W

DATE: 04/27/10

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COMMUNITY
&
ENVIRONMENT

1625 SHATTUCK AVENUE
SUITE 300
BERKELEY, CA 94709
TEL: 510 848 3815
FAX: 510 848 4315

DRAWING TITLE:

# EXISTING SHADING AT CREEK/BRIDGE

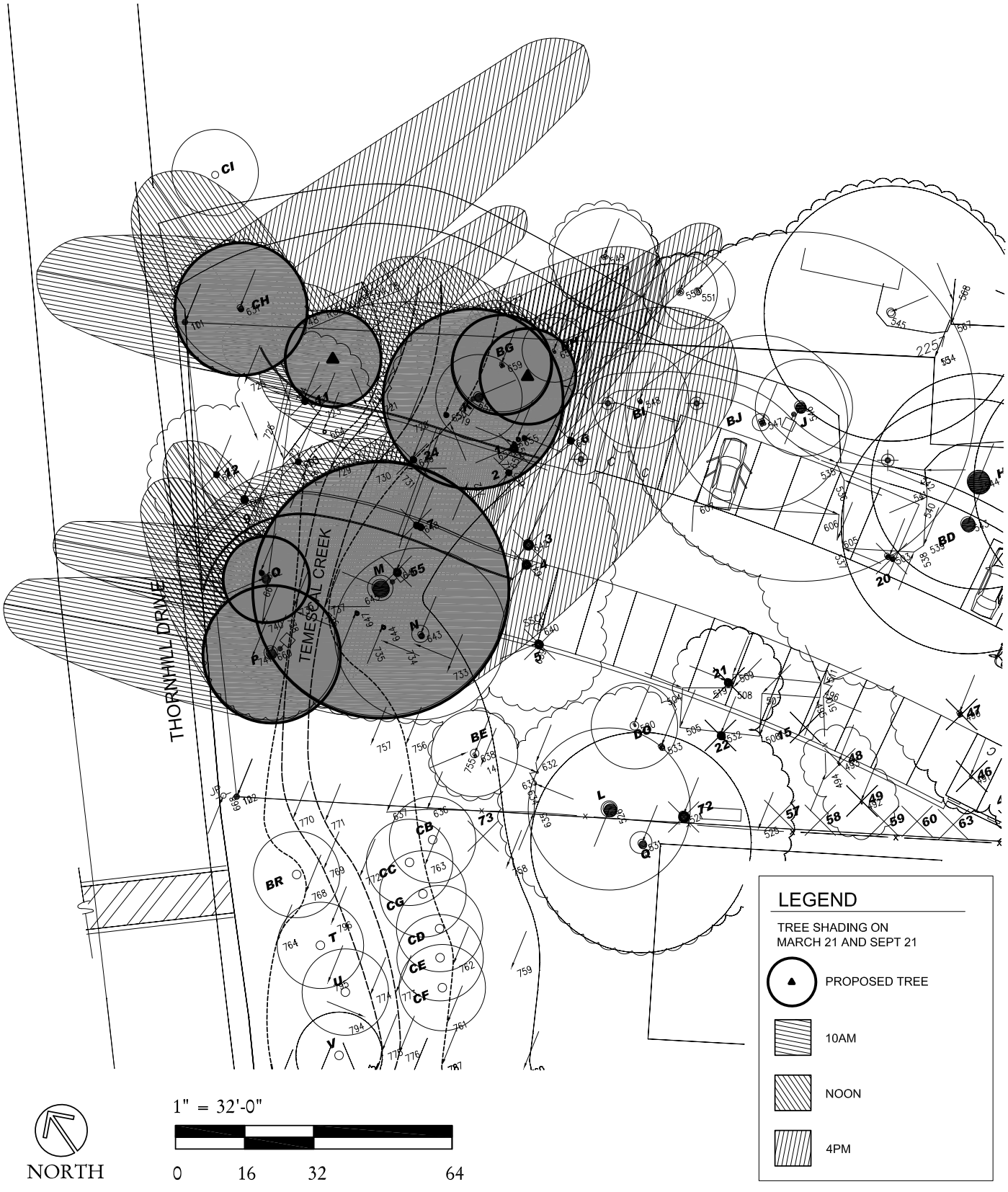
PROJECT TITLE:

CREEK PROTECTION PERMIT
ST. JOHN'S EPISCOPAL CHURCH

SHEET REFERENCE:
CR-2

PROJECT NUMBER:
703.W

DATE:
04/27/10

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COMMUNITY
&
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DRAWING TITLE:

PROPOSED SHADING AT CREEK/BRIDGE

PROJECT TITLE:

CREEK PROTECTION PERMIT
ST. JOHN'S EPISCOPAL CHURCH

SHEET REFERENCE:
CR-3

PROJECT NUMBER:
703.W

DATE:
04/27/10

## PLANTING NOTES

1. VERIFY LOCATION OF SUBSURFACE UTILITIES, PIPES AND STRUCTURES. SHOULD UTILITIES OR OTHER WORK NOT SHOWN ON THE PLANS BE FOUND DURING EXCAVATIONS, PROMPTLY NOTIFY OWNER'S REPRESENTATIVE, FAILURE TO DO SO WILL MAKE CONTRACTOR LIABLE FOR DAMAGE ARISING FROM HIS OPERATIONS SUBSEQUENT TO DISCOVERY OF UTILITIES NOT SHOWN ON PLANS.
2. LANDSCAPE CONTRACTOR TO RECEIVE SITE GRADED TO PLUS OR MINUS 0.10 FT PRIOR TO PROJECT EXECUTION.
3. NO PLANT SPECIES SUBSTITUTIONS WILL BE ACCEPTED. CONTRACT GROW PLANTS AS REQUIRED. CONTRACT GROWN PLANTS MUST MEET INDUSTRY STANDARDS FOR SIZE IN ORDER TO BE ACCEPTED.
4. ALL PLANTS AND LAYOUT TO BE APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO EXCAVATION OF PLANTING HOLES.
5. NOTIFY OWNER'S REPRESENTATIVE 36 HOURS PRIOR TO COMMENCEMENT OF WORK TO COORDINATE PROJECT OBSERVATION MEETINGS.
6. CLEAR AND GRUB ALL AREAS TO RECEIVE NEW PLANTING AND PREPARE SOIL PER SPECIFICATION. SLOPE SOIL AWAY FROM BUILDING AT 2% MINIMUM.
7. SPACE GROUND COVERS TRIANGULARLY IN PLANTING AREAS. GROUND COVER KEY INDICATIONS ARE SHOWN IN LEGEND. HOLD GROUND COVER BACK 18 IN. FROM THE EDGE OF NEW SHRUB PLANTS UNLESS NOTED OTHERWISE. PLANT GROUND COVER WHERE SHRUBS ARE PLANTED 2 1/2 FT. APART OR MORE.
8. PROTECT EXISTING TREES TO REMAIN PER PRESERVATION AND REMOVAL PLAN.

## IRRIGATION STATEMENT

AUTOMATIC IRRIGATION WILL BE PROVIDED TO ALL NEW PLANTS. CREEK RESTORATION IRRIGATION WILL BE TEMPORARY FOR PLANT ESTABLISHMENT PERIOD. APPROPRIATE WATER CONSERVING EQUIPMENT AND DETAILS WILL BE INCORPORATED INTO THE DESIGN SUCH AS PRESSURE COMPENSATING HEADS AND VALVES, USE OF CHECK VALVES, LOW-FLOW BUBBLERS AND CIRCUITING THAT CONSIDERS PLANT TYPES AND EXPOSURES. BACKFLOW PROTECTION WILL BE PROVIDED AT THE POINT OF CONNECTION. STREET TREES WILL BE IRRIGATED SEPARATELY AND CAPABLE OF DEEP, INFREQUENT WATER APPLICATIONS. THE SYSTEM WILL BE HIGH-QUALITY, HEAVY DUTY AND WHERE NEEDED WILL INCORPORATE VANDAL RESISTANT MECHANISMS. THE SYSTEM WILL BE CONTROLLED BY A MULTIPLE PROGRAM CONTROLLER. THE CONTROLLER WILL ALSO MONITOR SYSTEM FLOWS, AND INCLUDE CAPABILITY FOR AUTOMATIC SHUTDOWN OF SYSTEM IN THE EVENT OF PIPING BREAKS.

## PLANT LIST

FOR CREEK AND SHRUB PLANT LIST SEE SHEET L2-2.

- EXISTING TREE
- EXISTING SHRUB MASS TO BE RETAINED
- NEW TALL SHRUB MASS, SEE PLANT LIST FOR SPECIES
- SHRUB AND GROUNDCOVER PLANTING, TYP. SEE PLANT LIST FOR SPECIES

## TREE LIST

| SYMBOL | BOTANICAL NAME (COMMON NAME) | CONTAINER SIZE | COMMENTS |
|---|---|---|---|
| | LARGE CANOPIED TREE:<br>AESCULUS CALIFORNICA (CALIFORNIA BUCKEYE)<br>NYSSA SYLVATICA (TUPLEO)<br>PLATANUS RACEMOSA (WESTERN SYCAMORE)<br>QUERCUS AGRIFOLIA (COAST LIVE OAK)<br>QUERCUS LOBATA (VALLEY OAK)<br>UMBELLARIA CALIFORNICA (CALIFORNIA BAY) | 24" BOX | STANDARD |
| | CONIFEROUS EVERGREEN TREE:<br>SEQUOIA SEMPERVIRENS (COAST REDOWOOD) | 24" BOX | STANDARD |
| | PARKING ORCHARD TREE:<br>GINGKO BILOBA (GINKGO)<br>PYRUS CALLERYANA 'ARISTOCRAT' (FLOWERING PEAR) | 24" BOX | STANDARD |
| | ACCENT TREE:<br>ARBUTS MENZIESII (MADRONE)<br>CERCIS OCCIDENTALIS (WESTERN REDBUD)<br>PRUNUS ILICIFOLIA (HOLLYLEAF CHERRY) | 15 GAL | MULTI STEM |

NORTH

0' 15' 30' 60'
FEET

NOT FOR CONSTRUCTION

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Oakland CA 94612
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Client

**St John's Episcopal Church**
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Project Partners

Stamp

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# St John's Episcopal Church
5928 Thornhill Drive
Oakland, CA

| No. | Date | Description |
|---|---|---|
| 1 | 11/1/06 | CUP SUBMITAL |
| 2 | 7/2/07 | CUP SUBMITAL-NO.2 |
| 3 | 8/8/08 | REPRINT |
| 4 | 4/14/09 | CUP SUBMITAL-NO.3 |
| | | |
| | | |

## PLANTING PLAN

| | |
|---|---|
| Date | NOVEMBER 1, 2006 |
| Scale | 1" = 30' 0" |
| Drawn | KK |
| Check | CG |
| Sheet | L2-1 |

F:\St. Johns.SUC\CAD-StJohn\Current set-St John\ Lp-L2-1-planting plan.dwg krolewski Thu May 21,2009 - 9:47 am

## CREEK RESTORATION PLANT LIST

| BOTANICAL NAME | COMMON NAME | WATER'S EDGE | MIDDLE SLOPE | UPPER | FULL SUN TOLERANT | SHADE TOLERANT |
|---|---|---|---|---|---|---|
| TREES (ALL TREES 24"' BOX, ALL WILLOWS PLANTED VIA WATTLE BUNDLES) | | | | | | |
| AESCULUS CALIFORNICA | CALIFORNIA BUCKEYE | | X | X | | X |
| ACER MACROPHYLLUM | BIG-LEAF MAPLE | | X | X | X | X |
| ALUNUS RUBRA | RED ALDER | X | X | | X | X |
| CERCIS OCCIDENTALIS | WESTERN REDBUD | | | X | X | |
| QUERCUS AGRIFOLIA | COAST LIVE OAK | | | X | X | |
| SALIX LASIANDRA | YELLOW WILLOW | X | | | X | |
| SALIX LASIOLEPIS | ARROYO WILLOW | X | | | X | |
| SHRUBS, WOODY GROUNDCOVERS | | | | | | |
| ARTEMESIA DOUGLASIANA | MUGWORT | X | X | | X | X |
| CEANOTHUS SPP. | CEANOTHUS | | | X | X | |
| CORNUS STOLONIFERA, SERICEA | DOGWOOD | X | | | X | X |
| DIPLACUS AURANTIACUS | STICKEY MONKEYFLOWER | | | X | X | |
| HOLODISCUS DISCOLOR | CREAM BUSH | | X | X | X | X |
| MIMULUS CARDINALIS | SCARLET MONKEYFLOWER | X | X | | | |
| PHYSOCARPUS CAPITATUS | NINEBARK | | X | | | X |
| POLYSTICHUM MUNITUM | SWORD FERN | | X | X | X | |
| RHAMNUS CALIFORNICA | CALIFORNIA COFFEEBERRY | | | X | X | X |
| RIBES MENZIESII | GOOSEBERRY | | | X | | X |
| RIBES SANGUINEUM | FLOWERING CURRENT | | | X | X | X |
| ROSA CALIFORNICA | CALIFORNIA WILD ROSE | | | X | X | X |
| RUBUS URSINUS | CALIFORNIA BLACKBERRY | X | X | X | X | X |
| RUBUS PARVIFLORUS | THIMBLEBERRY | | | X | | X |
| SAMBUCUS MEXICANA | BLUE ELDERBERRY | | X | X | X | X |
| SYMPHORICARPOS MOLLIS | CREEPING HONEYSUCKLE | | X | X | X | X |
| VINES | | | | | | |
| ARISTOLOCHIA CALIFORNICA | PIPEVINE | X | X | X | | X |
| LONICERA HISPUDULA | WILD HONEYSUCKLE | | X | X | X | X |
| VITIS CALIFORNICA | WILD GRAPE | | | X | X | |
| HERBACEOUS GROUNDCOVERS AND WILDFLOWERS | | | | | | |
| ACHILLEA MILLEFOLIUM | YARROW | | X | X | X | |
| ASARUM CAUDATUM | WILD GINGER | X | X | | | x |
| ASTER CHILENSIS, RADULINIS, SUBULATUS | WESTERN ASTER | | X | X | X | |
| HEUCHERA MICRANTHA | ALUMROOT | | X | X | | X |
| GRASSES/ SEDGES/ RUSHES | | | | | | |
| BROMUS CARINATUS | CALIFORNIA BROOM | X | X | X | X | |
| CALAMAGROSTIS NUTKAENSIS | REED GRASS | X | | | X | |
| FESTUCA RUBRA | CREEPING RED FESCUE | | X | X | X | |
| JUNCUS EFFUSUS | BLUE RUSH | X | X | | | X |
| JUNCUS PATENS | PACIFIC RUSH | X | X | X | X | X |
| LEYMUS TRITICOIDES | CREEPING WILD RYE | X | X | X | X | |

## SHRUB LIST

| BOTANIC NAME | COMMON NAME | CONTAINER | SPACING | COMMENTS |
|---|---|---|---|---|
| ABELIA X GRANDIFLORA 'CONFETTI' | GLOSSY ABELIA | 5 GAL. | 5' O.C. | |
| ARCTOSTAPHYLOS HOOKERI 'WAYSIDE' | MONTERREY MANZENITTA | 5 GAL. OR TREEPOT | 4' O.C. | |
| ARCTOSTAPHYLOS UVA-URSI 'RADIANT' | ARCTOSTAPHYLOS | 5 GAL. OR TREEPOT | 4' O.C. | |
| BACCHARIS PILULARIUS 'PIGEON POINT' | COYOTE BRUSH | 5 GAL.5 GAL. OR TREEPOT | 4' O.C. | |
| BUDDLEJA DAVIDII 'PINK CHARMING' | BUTTERFLY BUSH | 5 GAL. OR TREEPOT | 4' O.C. | PINK CHARMING |
| CORNUS STOLONIFERA | RED TWIG DOGWOOD | 5 GAL. OR TREEPOT | 4' O.C. | |
| CARPENTERIA CALIFORNICA 'ELIZABETH' | BUSH ANEMONE | 5 GAL. OR TREEPOT | 4' O.C. | |
| COLEONMA PULCHRUM 'SUNSET GOLD' | COLEONMA | 5 GAL. | 3' O.C. | |
| GARRYA ELLIPTICA | SILKTASSEL | 5 GAL. OR TREEPOT | 6' O.C. | |
| HETEROMELES ARBUTIFOLIA | TOYON | 5 GAL. OR TREEPOT | 6' O.C. | |
| LOROPETALUM CHINENSIS | LOROPETALUM CHINENSIS | 5 GAL. | 4' O.C. | GREEN LEAF, WHITE FLOWER |
| RHAMUS CALIFORNICA 'EVE CASE' | CALIFORNIA COFFEE BERRY | 5 GAL. OR TREEPOT | 6' O.C. | |
| RHAMUS CALIFORNICA 'MOUND SAN BRUNO' | CALIFORNIA COFFEE BERRY | 5 GAL. OR TREEPOT | 6' O.C. | |
| RIBES SANGUINEUM | RED FLOWERING CURRENT | 5 GAL. OR TREEPOT | 4' O.C. | |

## HERBACEOUS GROUNDCOVERS AND WILDFLOWERS

| BOTANICAL NAME | COMMON NAME | CONTAINER SIZE | SPACING | REMARKS |
|---|---|---|---|---|
| ACHILLEA TERRA COTTA | YARROW | 1 GAL. OR DEEPOT | 2' O.C. | |
| ANEMONE X HONORINE JOBERT | JAPANESE ANEMONE | 1 GAL. OR DEEPOT | 3' O.C. | |
| ARTEMESIA CALIFORNICA | CALIFORNIA SAGEBRUSH | 1 GAL. OR DEEPOT | 2' O.C. | |
| CALAMAGROSTIS OVERDAM | CALAMAGROSTIS | 1 GAL. OR DEEPOT | 2' O.C. | |
| ERIGERON GLAUCUS | SEASIDE DAISY | 1 GAL. OR DEEPOT | 2' O.C. | |
| PHORMIUM COOKANIUM 'APRICOT QUEEN' | PHORMIUM | 1 GAL. OR DEEPOT | 3' O.C. | 3' HT, APRICOT GREEN FOLIAGE, |
| PHORMIUM COOKANIUM 'JACK SRAT' | PHORMIUM | 1 GAL. OR DEEPOT | 2' O.C. | 18" HT, BRONZE FOLIAGE |
| SALVIA CLEVELANDII | CLEVLAND SAGE | 1 GAL. OR DEEPOT | 2' O.C. | |
| SALVIA MICROPHYLLA GRAHAMII 'BEZERKELEY' | SALVIA | 1 GAL. OR DEEPOT | 2' O.C. | |

NOT FOR CONSTRUCTION

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Client

**St John's Episcopal Church**
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Project Partners

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| 4 | 4/14/09 | CUP SUBMITAL-NO.3 |
| | | |
| | | |

PLANTING LISTS

| | |
|---|---|
| Date | NOVEMBER 1, 2006 |
| Scale | 1" = 20' 0" |
| Drawn | KK |
| Check | CG |
| Sheet | L2-2 |

F:\St. Johns.SLO\CAD-St.John\Current set-St. John\ Lp-L2-1-planting plan.dwg chen Wed May 20,2009 - 3:51 pm

## LEGEND

- EXISTING TREE SHOWN WITH APPROXIMATE CANOPY; TO REMAIN AND BE PROTECTED DURING CONSTRUCTION
- TREE TO BE REMOVED, REMOVE TRUNK TO 2' BELOW FINISH GRADE
- LIMIT OF WORK/PHASE 1
- 10' OR 30' OFF-SET FROM LIMIT OF WORK

## NOTES

1. TAKE EXTREME CARE TO PROTECT EXISTING TREES MARKED TO BE RETAINED.
2. BEFORE CLEARING, GRADING, SOIL PREPARATION, CONSTRUCTION OR OTHER WORK, CONSTRUCT FENCES AROUND ALL PLANTS MARKED TO BE SAVED. FENCE TO BE TO BE 6' HIGH MINIMUM, OF CHAINLINK FENCE. DISTANCE FROM THE BASE OF THE TREE TO FENCE TO BE FOUR FEET BEYOND THE DRIPLINE UNLESS DETERMINED OTHERWISE BY THE ARBORIST REPORT. LEAVE FENCES IN PLACE FOR THE DURATION OF THE WORK. REMOVE AND REPLACE ONE BY ONE TO PERMIT CONSTRUCTION WORK OR INSTALLATION OF IRRIGATION SYSTEM, AT APPROVAL OF OWNER'S REPRESENTATIVE AND BY REVIEW OF ARBORIST WHEN NECESSARY AS DESCRIBED IN ARBORIST REPORT.
3. WARNING SIGN AT TREE PROTECTION FENCING: A WARNING SIGN TO BE PROMINENTLY DISPLAYED AT TREE PROTECTION FENCING, SEE ARBORIST REPORT FOR SPECIFIC LOCATIONS.
4. DBH MEANS DIAMETER AT BREAST HEIGHT MEASURED IN INCHES.

SEE SHEET 00–3B FOR TREE LISTS.

DASHED RED LINES SHOW PROPOSED PLAN LAYOUT

CONTOURS ARE DIAGRAMATIC, REFER TO SPOT GRADES FOR EXACT SURVEYED ELEVATIONS.

## TREE PRESERVATION ZONES

TREE PROTECTION ZONE SHALL BE ESTABLISHED AROUND EACH TREE. NO GRADING, EXCAVATION, CONSTRUCTION, OR STORAGE OF MATERIALS SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, EXCEPT AS NOTED ABOVE FOR CERTAIN IMPROVEMENTS (EG. WALKWAYS, FINE HAND GRADING, LANDSCAPING, AND IRRIGATION). NO UNDERGROUND SERVICES INCLUDING UTILITIES, SUB-DRAINS, WATER OR SEWER SHALL BE PLACED IN THE TREE PROTECTION ZONE, EXCEPT AS APPROVED FOR SELECTED UTILITIES. SPOIL FROM TRENCH, FOOTING, UTILITY OR OTHER EXCAVATION SHALL NOT BE PLACED WITHIN THE TREE PROTECTION ZONE, EITHER TEMPORARILY OR PERMANENTLY.
THE LIMITS OF THE TREE PROTECTION ZONE WILL BE ADJUSTED FOLLOWING DESIGN CHANGES. THE TREE PROTECTION ZONES SHALL BE DEFINED AS FOLLOWS.

a. #M, N, P, BE, BG, BH, BL, DB, DC, DF, DG, DH, DO– DRIPLINE ON ALL SIDES.
b. #A, B, C–EDGE OF EXISTING PLANTER. AFTER DEMOLITION EXPAND FENCE TO EDGE OF NEW PLANTER.
c. #D–10' EAST, 20' NORTH AND SOUTH.
d. #E–20' WEST, 17' EAST, 10' SOUTH, 13' NORTH TO FENCE.
e. #F–20' WEST AND EAST, 15' SOUTH, FENCE ON NORTH.
f. #H–20' WEST, EAST AND SOUTH, 8' NORTH TO FENCE.
g. #I, BW, BX–EDGE OF EXISTING PAVING ON EAST.
h. #J–30' WEST AND EAST, 9' SOUTH, FENCE ON NORTH.
i. #K–20' WEST AND EAST, 10' SOUTH, 13' TO PROPERTY LINE ON NORTH.
j. #L–20' ON WEST, EAST AND NORTH; FENCE ON SOUTH.
k. #O–10' NORTH AND DRIPLINE ON ALL OTHER SIDES.
l. #Q–15' NORTH OF EXISTING FENCE.
m. #T, U, V, BR, CD, CE, CF,CG–PROPERTY LINE ON NORTH.
n. #X, BD–20' ON ALL SIDES.
o. #AA, AC, AF, AG, AI, AJ, AK, AN, AR, CA, CL, CM, CN, CP, CQ, CT, CU, CV, CW, CZ–EDGE OF EXISTING PAVING ON WEST AND NORTH.
p. #AL– EXISTING FENCE ON SOUTH.
q. #AO, AP, AT, BK–EDGE OF EXISTING PAVING ON EAST, SOUTH AND NORTH.
r. #AU, AV, AW, DA– NO TREE PROTECTION REQUIRED.
s. #AY, AZ, BB, DD, DE, DI– DRIPLINE OR EDGE OF PROPOSED PAVING.
t. #AX–DRIPLINE ON SOUTH.
u. #BI, BJ–NEW PATHWAY ON SOUTH, DRIPLINE ON ALL OTHER SIDES.
v. #BV–10' SOUTH AND EDGE OF NEW WALKWAY ON WEST.
w. #BY–3' SOUTH, DRIPLINE ON ALL OTHER SIDES.
x. #CH–15' WEST AND EAST, 10' NORTH AND SOUTH.
y. #CI–NORTH EDGE OF THE EXISTING GRAVEL DRIVEWAY.
z. #DJ, DK, DL, DM, DN–EXISTING RETAINING WALL ON WEST.
aa. #DP–23' WEST, 8' EAST, 20' NORTH AND 10' SOUTH.

NOTE: DURING DEMOLITION AND CONSTRUCTION TREE PROTECTION ZONES MAY NEED TO BE TEMPORARILY MODIFIED TO ACCOMMODATE CONSTRUCTION ACTIVITIES. WHERE TREES ARE CLUSTERED TOGETHER CREATE ONE CONTINUOUS TREE PROTECTION ZONE. THIS WILL IMPROVE TREE PROTECTION BY ELIMINATING CUT THROUGH TRAFFIC BETWEEN TREES, AND WILL BE LESS EXPENSIVE THEN INDIVIDUALLY FENCING EACH TREE.

## TREECOMMON NAME - BOTANIC KEY

| COMMON NAME | BOTANIC NAME |
|---|---|
| Ovens wattle | Acacia pravissma |
| Bigleaf maple | Acer macrophyllum |
| Japanese maple | Acer palmatum |
| Red horse chestnut | Aesculus x carnea |
| Incense cedar | Calocedrus decurrens |
| Deodar cedar | Cedrus deodara |
| English hawthorn | Crataegus laevigata |
| Japanese cryptomeria | Cryptomeria japonica |
| Smooth cypress | Cupressus glabra |
| Monterey cypress | Cupressus macrocarpa |
| Loquat | Eriobotrya japonica |
| Hollywood juniper | Juniperus chinensis 'Torulosa' |
| Glossy privet | Ligustrum lucidum |
| Saucer magnolia | Magnolia soulangeana |
| Apple | Malus domestica |
| Canary Island pine | Pinus canariensis |
| Monterey pine | Pinus radiata |
| London plane | Platanus x acerifolia |
| Fremont cottonwood | Populus fremontii |
| Cherry | Prunus avium |
| Purple-leaf plum | Prunus x blireiana |
| Plum | Prunus domestica |
| English laurel | Prunus laurocerasus |
| Douglas-fir | Pseudotsuga menziesii |
| Pyracantha | Pyracantha coccinea |
| Coast live oak | Quercus agrifolia |
| Coast redwood | Sequoia sempervirens |
| Giant sequoia | Sequoiadendron giganteum |
| Irish yew | Taxus baccata 'Stricta' |
| American elm | Ulmus americana |
| Chinese elm | Ulmus parvifolia |
| Unknown | |

## THE FOLLOWING ARE PROTECTED TREES ACCORDING TO TREE PRESERVATION ORDINANCE (12.36 O.M.C.)

A. ANY COAST LIVE OAK THAT IS LARGER THAN 4 INCHES DBH.
B. ANY TREE (EXCEPT EUCALYPTUS) THAT IS LARGER THAN 9 INCHES DBH (EUCALYPTUS TREE AND UP TO 5 MONTERREY PINES PER ACRE ARE NOT CONSIDERED PROTECTED TREES UNDER THIS SECTION.
C. ANY TREE OF ANY SIZE LOCATED IN THE PUBLIC RIGHT-OF-WAY (INCLUDING STREET TREES).

NOT FOR CONSTRUCTION

PGA design INC
LANDSCAPE ARCHITECTS
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Oakland CA 94612
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Client

**St John's Episcopal Church**
1707 Gouldin Road
Oakland, CA

Project Partners

Stamp

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St John's Episcopal Church
5928 Thornhill Drive
Oakland, CA

| No. | Date | Description |
|---|---|---|
| 1 | 11/1/06 | CUP SUBMITAL |
| 2 | 7/2/07 | CUP SUBMITAL–NO.2 |
| 3 | 8/8/08 | REPRINT |
| 4 | 4/14/09 | CUP SUBMITAL–NO.3 |
| | | |
| | | |

# TREE PRESERVATION PLAN

| | |
|---|---|
| Date | NOVEMBER 1, 2006 |
| Scale | 1" = 30' 0" |
| Drawn | KK |
| Check | CG |
| Sheet | |

# 00-3

F:\St Johns.SJC\CAD-StJohn\Current set-St John\ Lp-00-3-tree pres plan.dwg krolewski Thu May 21,2009 - 9:38 am

## TREE REMOVAL INVENTORY

| TREE NO. | SPECIES | SIZE (DIAMETER IN INCHES) | PROTECTED TREE | CONDITION 1 = POOR 5 = EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 1 | Incense cedar | 18,9,7,6 | Yes | 3 | Moderate | Codominant at base with included bark between trunks; thin crown; small trunks with suppressed crowns. |
| 2 | Coast live oak | 11 | Yes | 2 | Poor | Tree in decline; thin crown; trunk leans south; branch dieback. |
| 3 | Incense cedar | 21 | Yes | 3 | Moderate | Narrow upright form; thin high crown. |
| 4 | Incense cedar | 18 | Yes | 2 | Poor | High crown bows over house; high potential to fail; remove tree. |
| 5 | Douglas-fir | 20 | Yes | 4 | Good | Good form and structure; full high crown. |
| 6 | Pyracantha | 7,2,2 | Yes | 2 | Poor | Suppressed crown; branch dieback; large shrub form. |
| 7 | Bigleaf maple | 14,13 | Yes | 3 | Moderate | Codominant at 2'; 14" stem bows west; twig dieback. |
| 9 | Unknown | | No | 0 | Poor | High stump with ivy. |
| 10 | Coast redwood | 12 | Yes | 3 | Moderate | High thin crown; top of creek. |
| 11 | Plum | 10 | Yes | 3 | Poor | "Branch dieback; branch failures; epicormic sprouts; top of creek. |
| 12 | Plum | 10 | Yes | 2 | Poor | "Trunk engulfed in ivy; epicormic sprouts. |
| 15 | Cherry | 9 | Yes | 0 | Poor | Dead. |
| 20 | Incense cedar | 21,21 | Yes | 3 | Moderate | Codominant at base with included bark between trunks; full crown; stems maybe separating. |
| 21 | Hollywood juniper | 14 | Yes | 4 | Moderate | Crown flat on north; trunk growing into porch. |
| 24 | Deodar cedar | 13 | Yes | 1 | Poor | Trunk and crown engulfed in ivy; small crown; top of creek. |
| 25 | Plum | 10,6 | Yes | 2 | Poor | Codominant at 6' with included bark between attachments. |
| 26 | English laurel | 8,6,5 | Yes | 3 | Poor | Partial root failure; trunk leans north; low crown. |
| 27 | American elm | 16 | Yes | 3 | Moderate | "High crown; branch failures; trunks engulfed in ivy. " |
| 28 | American elm | 15 | Yes | 3 | Moderate | "High crown; branch failures; trunks engulfed in ivy. |
| 29 | American elm | 14 | Yes | 3 | Moderate | "High crown; branch failures; trunks engulfed in ivy. |
| 30 | Plum | 6,5 | Yes | 1 | Poor | Poor form and structure; suppressed crown. |
| 31 | Plum | 8,4,4 | Yes | 2 | Poor | Extensive sprouting; included bark between attachments. |
| 32 | Apple | 5,4 | Yes | 3 | Moderate | Trunks divide at 3' with included bark; upright form; low crown; fireblight. |
| 33 | Apple | 4,4,4 | Yes | 3 | Poor | Trunks divide at 1' with included bark; upright form; low crown; fireblight. |
| 34 | Apple | 6,3,3 | Yes | 3 | Poor | Partial root failure; trunk leans west low crown; fireblight. |
| 35 | Apple | 3,3,3 | Yes | 3 | Poor | Trunks divide at ground with included bark; upright form; fireblight. |
| 36 | Apple | 6,3 | Yes | 3 | Poor | Suppressed crown; crown bows southwest; fireblight. |
| 37 | Cherry | 4,4,4 | Yes | 3 | Moderate | Trunks divide at 1' with included bark; upright narrow form; twig dieback. |
| 38 | Plum | 4,2 | No | 2 | Poor | Trunks stem from base with included bark between attachments; twig dieback. |
| 39 | Loquat | 5,3 | No | 3 | Moderate | Previously topped; full crown; trunks stem from base within included bark. |
| 40 | Plum | 4,3,2,2,2 | Yes | 1 | Poor | Thin crown; extensive branch dieback. |
| 41 | Plum | 7,4 | Yes | 3 | Moderate | Good form and structure; crown somewhat thin; branch dieback. |
| 42 | Apple | 5,4,3 | Yes | 3 | Moderate | Trunks divide at 2'; upright form; low crown; fireblight. |
| 43 | Plum | 4,4,3,3 | Yes | 2 | Poor | Trunks stem from base with included bark between attachments; twig dieback. |
| 44 | Plum | 6,3 | Yes | 2 | Poor | Crown leans west; trunks stem from base with included bark between attachments; twig dieback. |
| 45 | Apple | 5,4,3 | Yes | 2 | Poor | Partial root failure; trunk leans west; suppressed crown. |
| 46 | Apple | 6,5 | Yes | 3 | Moderate | Upright form; twig dieback; fireblight. |
| 47 | Apple | 8,8,6,6 | Yes | 2 | Poor | Tree in decline; extensive branch dieback. |
| 48 | Apple | 10,7,6,4 | Yes | 3 | Moderate | Trunks divide at 2'; good form; low crown; 4" west facing stem was dead; fireblight. |
| 49 | Apple | 5,3,2 | Yes | 2 | Poor | Tree in decline; extensive branch dieback. |
| 50 | Monterey pine | 20 | No | 3 | Poor | Codominant at 18' with included bark; high potential to fail; crown somewhat thin; chlorotic needles. |
| 51 | Coast live oak | 8 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 52 | Coast live oak | 7 | Yes | 2 | Poor | Suppressed crown in grove; crook in trunk at 4'. |
| 53 | Hawthorne | 4,4 | No | 3 | Poor | Poor form and structure; tree leans west. |
| 54 | Plum | 9 | Yes | 2 | Poor | Topped at 7'; extensive sprouting; included bark between attachments. |
| 55 | Monterey pine | 15 | No | 2 | Poor | Poor narrow form; crook in trunk; ivy on trunk. |

## TREE REMOVAL INVENTORY

| TREE NO. | SPECIES | SIZE (DIAMETER IN INCHES) | PROTECTED TREE | CONDITION 1 = POOR 5 = EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| 56 | Plum | 9,8 | Yes | 2 | Poor | Extensive branch dieback; included bark between attachments. |
| 57 | Glossy privet | 3,3,2,2,2 | Yes | 2 | Poor | Trunks stem from base; shrub form. |
| 58 | Glossy privet | 3,3,3,2,2,2,2 | Yes | 2 | Poor | Trunks stem from base; shrub form. |
| 59 | Glossy privet | 3,3,2,2 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 60 | Glossy privet | 7,6 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 61 | Chinese elm | 7 | No | 2 | Poor | Poor form and structure; large trunk wound. |
| 62 | Hawthorne | 6 | No | 3 | Poor | Narrow upright form; branch failure; trunk wound on east. |
| 63 | Glossy privet | 4,3,2,2 | Yes | 1 | Poor | Suppressed crown; declining health; shrub form. |
| 64 | Coast live oak | 4 | Yes | 1 | Poor | Suppressed crown in grove. |
| 65 | Coast live oak | 6 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 66 | Coast live oak | 10,6 | Yes | 2 | Poor | Trunk divides at 2' with included bark; decay in 6" trunk; trunk and crown leans north; suppressed form. |
| 67 | Coast live oak | 5,5 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 68 | Coast live oak | 8 | Yes | 2 | Poor | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| 69 | Coast live oak | 5 | Yes | 2 | Poor | Suppressed crown in grove; trunk leans north; branch dieback. |
| 70 | Coast live oak | 7 | Yes | 2 | Poor | Suppressed crown in grove; upright form; branch dieback. |
| 71 | Crytomeria | 13 | Yes | 2 | Poor | Tree in decline; narrow form. |
| 72 | Monterey pine | 28 | No | 3 | Poor | Poor form; one–sided crown; branch dieback. |
| 73 | Douglas-fir | 20 | Yes | 3 | Poor | Poor form; crook in trunk at 40'; one sided crown. |
| 74 | Coast live oak | 10 | Yes | 3 | Poor | Suppressed crown to west; tree bows over parking lot . |
| 75 | Coast live oak | 14 | Yes | 3 | Moderate | Trunk and crown leans west over parking lot. |
| TOTAL TREES FOR REMOVAL | | | | | | 66 |

## TREE PRESERVATION INVENTORY

| TREE NO. | SPECIES | SIZE (DIAMETER IN INCHES) | PROTECTED TREE | CONDITION 1 = POOR 5 = EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| A | Coast redwood | 42 | Yes | 4 | Good | Good form and structure; full crown. |
| AA | Coast live oak | 14 | Yes | 3 | Moderate | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| AC | Coast live oak | 15 | Yes | 4 | Good | Good form and structure; crown somewhat thin. |
| AF | Coast live oak | 15 | Yes | 3 | Moderate | Tree leans west towards parking lot; good form and structure; crown somewhat thin. |
| AG | Coast live oak | 11 | Yes | 3 | Moderate | Good form; branch dieback; suppressed crown in grove. |
| AI | Coast live oak | 10,6 | Yes | 3 | Moderate | Trunk and crown leans north; suppressed crown in grove; branch dieback. |
| AJ | Coast live oak | 8 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| AK | Coast live oak | 7 | Yes | 3 | Moderate | Suppressed crown in grove; trunk leans north; branch dieback. |
| AL | Coast live oak | 20 | Yes | 4 | Good | Untagged and offsite; good form and structure; crown extended 24' south from edge of property into project site. |
| AN | Coast live oak | 10 | Yes | 3 | Moderate | Trunk and crown leans north; branch dieback. |
| AO | Coast live oak | 24,20,20 | Yes | 3 | Moderate | Trunks divide at 1.5'; cavity in trunk at attachments; decay in pruning wound; two stems over house and rear yard with heavy weight; epicormic sprouts. |
| AP | Coast live oak | 10,9 | Yes | 3 | Moderate | Trunk divides at 1'; crook in–trunk. |
| AR | Coast live oak | 9 | Yes | 3 | Moderate | Suppressed crown; thin crown. |
| AS | NOT USED | | | | | |
| AT | Coast live oak | 19 | Yes | 4 | Moderate | Good form; trunk divides at 15'; decay in pruning wounds. |
| AU | Coast live oak | 28 | Yes | 3 | Moderate | Trunk divides at 15' into two stems; decay in pruning wound; crown somewhat thin; branch on east propped with steel post. |
| AV | Red horse chestnut | 17 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well; raised concrete. |
| AW | Red horse chestnut | 20 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well; raised concrete. |
| AX | Red horse chestnut | 9 | Yes | 4 | Good | Good form and structure; crown somewhat thin; in 4' tree well. |
| AY | Coast live oak | 15 | Yes | 4 | Good | Good young tree; remove 5"–stem with included bark. |
| AZ | Cherry | 7,4 | Yes | 3 | Moderate | Overtopped by BB; thin crown; branch dieback. |
| B | Coast redwood | 67 | Yes | 4 | Good | Good form; full crown; trunk divides into multiple stems at 5' with included bark; trunks fused together. |
| BB | Saucer magnolia | 6,6,6,4,3 | Yes | 4 | Good | Trunks stem from base; good form; full crown. |
| BD | Coast redwood | 36 | Yes | 4 | Good | Good form; full crown; codominant at 6' with trunks fused together. |
| BE | Cherry | 9 | Yes | 3 | Moderate | Trunks divide at 4'; twig dieback; crown somewhat thin. |
| BG | English laurel | 8,6,6 | Yes | 4 | Good | Trunks stem from base; upright form; full crown. |
| BH | English laurel | 6 | No | 2 | Poor | Partial root failure; suppressed crown. |
| BI | English laurel | 8,8 | Yes | 3 | Moderate | Trunk divides at 3' with wide attachment; low crown. |
| BJ | English laurel | 9,7,7,6,5,5,4,4,4,3 | Yes | 3 | Moderate | Partial root failure; trunks stem from base; some trunks on ground. |
| BK | Coast live oak | 19 | Yes | 4 | Good | "Offsite; codominant at 5'; good form; crown somewhat thin; canopy extends east over parking lot 23'. |
| BL | Purple leaf plum | 16 | Yes | 3 | Moderate | "Offsite; branch dieback; epicormic sprouts; canopy extends to edge of parking lot. |
| BR | Coast redwood | 32 | Yes | 4 | Moderate | Narrow crown; side pruned for utility line; top of creek. |
| BV | Douglas-fir | 14 | Yes | 3 | Moderate | High crown, first branch at 20'; 3' from church building. |
| BW | Plum | 9,5 | Yes | 3 | Moderate | Extensive sprouting; included bark between attachments. |

## TREE PRESERVATION INVENTORY

| TREE NO. | SPECIES | SIZE (DIAMETER IN INCHES) | PROTECTED TREE | CONDITION 1 = POOR 5 = EXCELLENT | SUITABILITY FOR PRESERVATION | COMMENTS |
|---|---|---|---|---|---|---|
| BX | Plum | 10,8,8 | Yes | 3 | Moderate | Trunks stem from base; extensive sprouting; included bark between attachments. |
| BY | Japanese maple | 10,9 | Yes | 4 | Good | Trunks stem from base; full crown; branches touch at 4'. |
| C | Coast redwood | 26 | Yes | 3 | Moderate | Narrow upright form; suppressed crown on east from A. |
| CA | Plum | 6,5 | Yes | 3 | Moderate | Good upright form; twig dieback. |
| CB | Monterey pine | 24 | No | 3 | Moderate | Thin crown; branch dieback. |
| CC | Monterey pine | 27 | No | 3 | Moderate | Thin crown; branch dieback; ivy on trunk; top of creek. |
| CD | Giant sequoia | 19 | Yes | 3 | Moderate | Good form and structure; crown somewhat thin; browning needles; ivy on trunk. |
| CE | Giant sequoia | 30 | Yes | 3 | Moderate | Suppressed crown on creek side; crown somewhat thin; browning needles; ivy on trunk. |
| CF | Giant sequoia | 7 | No | 3 | Moderate | One sided form; browning needles; top of creek. |
| CG | Fremont cottonwood | 15 | Yes | 3 | Moderate | Codominant at 35' with wide attachment; branch dieback; ivy on trunk. |
| CH | Monterey cypress | 18 | Yes | 5 | Good | Excellent form and structure; full low crown. |
| CI | Incense cedar | 18 | Yes | 4 | Good | Untagged and offsite; full crown; codominant at 10' with included bark between attachment. |
| CL | Coast live oak | 5 | Yes | 3 | Moderate | Good form; suppressed crown in grove; branch dieback. |
| CM | Ovens wattle | 10 | Yes | 3 | Moderate | Good form; thin crown; branch dieback; suppressed crown in grove. |
| CN | Coast live oak | 20,18 | Yes | 3 | Moderate | Trunk divides at 2' with included bark; trunk and crown leans north; suppressed form. |
| CP | Coast live oak | 14,14,12 | Yes | 4 | Moderate | Trunks divides at 2'; good form; tree under utility lines. |
| CQ | Coast live oak | 10 | Yes | 3 | Moderate | Trunk and crown leans east; suppressed form. |
| CT | Coast live oak | 13 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| CU | Coast live oak | 8 | Yes | 3 | Moderate | Suppressed crown in grove; trunk leans north; branch dieback. |
| CV | Coast live oak | 10 | Yes | 3 | Moderate | Suppressed crown in grove; branch dieback. |
| CW | Coast live oak | 6 | Yes | 3 | Moderate | Suppressed crown in grove; upright form; branch dieback. |
| CZ | Coast live oak | 10 | Yes | 3 | Moderate | Upright form; high crown; in grove; branch dieback. |
| D | Deodar cedar | 36 | Yes | 4 | Moderate | Offsite; narrow form; codominant at 30'; two stems touch at 33'; branch failure. |
| DA | Coast redwood | 40,18,14,13,11,10,7 | Yes | 3 | Poor | Topped; wide crown; under utility lines. |
| DB | Coast live oak | 8 | Yes | 4 | Moderate | Good young tree; codominant at 18'; under utility lines. |
| DC | Coast live oak | 12,6 | Yes | 4 | Moderate | Good young tree; trunks stem from base; under utility lines. |
| DD | Coast live oak | 9 | Yes | 4 | Good | Good young tree; codominant at 15'. |
| DE | Coast live oak | 22 | Yes | 4 | Moderate | Good form; trunk divides at 5'; corner of Goulidn Rd. and driveway; under utility lines. |
| DF | Coast live oak | 8 | Yes | 4 | Good | Good young tree; codominant at 6'; remove small stem. |
| DG | Coast live oak | 8,3 | Yes | 4 | Good | Good young tree; full crown; codominant at 6' with included bark. |
| DH | Plum | 5,5,5 | Yes | 3 | Moderate | Multiple attachments at 2'; branch dieback. |
| DI | Coast live oak | 9 | Yes | 5 | Good | Good young tree; excellent form and structure. |
| DJ | Coast live oak | 16,13 | Yes | 4 | Moderate | Good form; full crown; trunk divides at 1' with included bark; seam below attachment. |
| DK | Coast live oak | 6 | Yes | 2 | Poor | Poor form; lost central leader; suppressed crown. |
| DL | Monterey pine | 27 | No | 3 | Moderate | High crown; trunk leans north; weight heavier on north. |
| DM | Monterey pine | 27 | No | 3 | Moderate | High crown; crown bows southeast; weight heavier on southeast; ivy on trunk. |
| DN | Monterey pine | 11 | No | 3 | Moderate | Young tree; crook in trunk at 30'. |
| DO | Irish yew | 9 | Yes | 4 | Moderate | Oval form; full crown. |
| DP | Coast live oak | 21 | Yes | 4 | Good | Good form; codominant at 6' with included bark; ivy on trunk. |
| E | Coast redwood | 32 | Yes | 5 | Good | Excellent form and structure; full low crown. |
| F | Coast live oak | 25 | Yes | 4 | Good | Good form; decay in pruning wound on south; cable north facing stem towards carport. |
| H | Coast redwood | 61 | Yes | 4 | Good | Good form; codominant at 6–10' with several stems fused together; full crown. |
| I | Irish yew | multi | Yes | 4 | Good | Offsite; eight stems 7" and under; trunks divide at 2'; full crown. |
| J | Coast live oak | 35 | Yes | 4 | Good | Good form and structure; northwest facing scaffold horizontal and heavy; large pruning wound on south was closed. |
| K | London plane | 27 | Yes | 4 | Good | Open spreading form; high crown; top of creek. |
| L | Canary Island pine | 32 | Yes | 4 | Good | Good form and structure; full crown; ivy on trunk. |
| M | Fremont cottonwood | 36 | Yes | 4 | Moderate | High crown; branch failures; ivy on trunk. |
| N | Deodar cedar | 16 | Yes | 3 | Moderate | Thin crown; branch dieback; at top of creek. |
| O | Coast redwood | 22,7 | Yes | 4 | Moderate | Narrow crown; side pruned for utility line. |
| P | Coast redwood | 27 | Yes | 3 | Moderate | Narrow small crown; side pruned for utility line. |
| Q | Coast live oak | 23 | Yes | 3 | Moderate | Topped; trunk leans northwest touching wood shed; cavity in pruning wound on west; trunk maybe in fill soil. |
| T | Coast redwood | 28 | Yes | 4 | Good | Narrow crown; side of creek. |
| U | Coast redwood | 15 | Yes | 3 | Moderate | Narrow suppressed crown; side of creek. |
| V | Coast redwood | 30 | Yes | 4 | Good | Good form; full crown; side of creek. |
| X | Coast redwood | 56 | Yes | 4 | Good | Good young tree. |
| Y | Smooth cypress | 7 | No | 4 | Good | Good young tree. |
| TOTAL TREES FOR PRESERVATION | | | | | | 89 |

### TREE NUMBERS NOT USED

THE FOLLOWING TREE NUMBERS WERE OMITTED FROM THE TREE INVENTORY:
8, 13, 14, 16-19, 22, 23, G, R, S, W, Z, AB, AD, AE,AH, AM, AQ, AS, BC, BF, BM-BQ, BS-BU, BZ, CJ, CK, CO, CR, CS, CX, CY

NOT FOR CONSTRUCTION


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Client

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1707 Gouldin Road
Oakland, CA

Project Partners

Stamp


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St John's Episcopal Church
5928 Thornhill Drive
Oakland, CA

| No. | Date | Description |
|---|---|---|
| 1 | 11/1/06 | CUP SUBMITAL |
| 2 | 7/2/07 | CUP SUBMITAL–NO.2 |
| 3 | 8/8/08 | REPRINT |
| 4 | 4/14/09 | CUP SUBMITAL–NO.3 |
| | | |

# TREE PRESERVATION LIST

| | |
|---|---|
| Date | NOVEMBER 1, 2006 |
| Scale | 1" = 20' 0" |
| Drawn | KK |
| Check | CG |
| Sheet | |

# 00-3B


F:\St Johns.S.C\CAD-StJohn\Current set-St John\ Lp-00-3-tree pres plan.dwg chen Wed May 20,2009 - 2:56 pm

FarWest
RESTORATION
ENGINEERING

May 18, 2010

Mr. Kyle Simpson
Design, Community & Environment
1625 Shattuck Avenue, Suite 300
Berkeley, CA 94709

Subject: Peer Review Comments for Kamman Hydrology Report Revised May 3, 2010 and received May 14, 2010, St. Johns Church, Oakland, Ca

Dear Kyle:

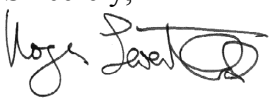
As requested, I have reviewed the subject report (latest revision dated May 3, 2010) and in general I agree with the conclusions of the report that that the proposed clear span bridge project should pose no significant adverse impacts to Temescal Creek if the work is conducted as proposed. As part of this work I reviewed both the current and previous versions of Hydrology Report and provided comments that were subsequently addressed in revised versions of the report. In addition, I conducted a site visit on April 22, 2010 to visually inspect site conditions. I did no independent review or calculation of quantity and flow estimates (i.e. drainage, land use area and usage estimates). Nor did I conduct any independent surveying and have relied on the information provided within the report as accurate.

Although there are always different approaches to generating and analyzing flood flows in an ungauged creek, I concur with the approach taken within the KHE report to assess the hydraulic impacts of the proposed project. I believe that the range of project alternatives analyzed to assess hydraulic impacts to the creek was very thorough and covered the range of conditions that could reasonably be expected to occur through the project site.

During my site visit, I noticed that the existing upstream bank conditions were in somewhat worse condition then identified in the previous version of the report. The upstream bank next to the outlet culvert was covered in heavy plastic and sandbagged – typically evidence of bank erosion and stability issues. An existing log that crosses the creek (station 117) and could potentially create backwater erosion issues, is proposed to be removed and KHE has modified the report to clearly state that the proposed project will create no backwater conditions that would exacerbate the existing upstream bank erosion.

During my previous reviews, I did have a number of comments and questions which were all satisfactorily addressed by KHE in the revised submittal. Please do not hesitate to contact me at 510-644-2798 ext 2 with any questions or comments.

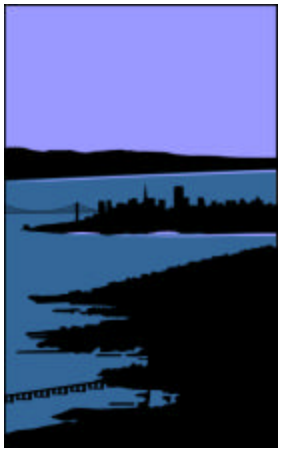
Sincerely,



Roger Leventhal, P.E.
Principal Engineer

APPENDIX H

# GEOTECHNICAL INVESTIGATION



Land/Marine
***Geotechnics***
Geotechnical Consultants

# GEOTECHNICAL INVESTIGATION
## St. John's Episcopal Church
## Entry Road, Bridge Parking and New Sanctuary
## Oakland, California

Prepared for:
St John's Episcopal Church
Oakland, California

May 2005
Project No. 110.001

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**GEOTECHNICAL INVESTIGATION**
**ST. JOHN'S EPISCOPAL CHURCH**
**ENTRY ROAD, BRIDGE, PARKING AND NEW SANCTUARY**
**Oakland, California**

## 1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Land Marine Geotechnics for the proposed improvements to St. John's Episcopal Church in Oakland, California. Our services were provided in accordance with our proposal dated August 27, 2004.

The site is located at 1707 Gouldin Road as shown on the Site Location Map and Site Plan, Figures 1 and 2, respectively.

## 2.0 PROJECT DESCRIPTION

The project will involve the construction of a new entry road and bridge across Temescal Creek, to provide access to the Church property from Thornhill Boulevard. Additional parking will be provided along the entry road. The entry road and additional parking will be located on property that was recently acquired by the church. The existing house on the property will be demolished and moderated cuts and fill are anticipated to grade the new entry road and parking area. The project will incorporate permeable pavements and onsite infiltration of storm water to the extent practical.

The new vehicular bridge will be about 22 feet wide with a 5 foot pedestrian walkway and will clear span about 60 feet across the creek. We anticipate that deep foundations will be needed for the bridge abutments. As part of the project, portions of Temescal Creek may be improved to reduce future erosion and slope instability.

As a future phase of construction, a new Sanctuary building will be constructed southeast of the existing Parish Hall. The Sanctuary will likely be a tall single story structure. The south wall of the Sanctuary will be cut into the hillside. As a result, a site retaining wall may be needed along the south

side of the new building. The hillside shows indications of historic instability that will need to be mitigated during site development.

## 3.0 SCOPE OF SERVICES

Our scope of services, as outlined in our proposal, consisted of exploring the subsurface conditions at the site and performing laboratory tests and engineering analyses to develop conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- site geology and seismicity
- the most appropriate foundation type(s) for the proposed bridges, sanctuary and site retaining walls
- design criteria for the recommended foundation type(s), including vertical, lateral, and uplift capacities
- estimated foundation settlement
- site seismicity and seismic hazards, including the potential for liquefaction, lateral spreading, cyclic densification, and estimated seismically-induced settlement, if any
- landslide hazards both on the creek banks and on the slope along the south-east side of the property
- measures to mitigate seismic and landslide hazards, if appropriate
- site grading and subgrade preparation, including fill quality and compaction requirements
- retaining wall design parameters, as required
- 2001 California Building Code soil profile type and near-source factors
- geotechnical input to permeable pavement alternatives
- construction considerations

## 4.0 FIELD INVESTIGATION

### 4.1 Test Borings

Subsurface conditions at the site were explored by drilling eight test borings, designated as B-1 through B-8. The approximate locations of the borings are shown on Figure 2. The borings were drilled on March 23 and 24, 2005 using a truck-mounted drill, a track-mounted rig and a portable Minute Man drill rig equipped with solid flight augers. The boring depths ranged from 10 feet (B- 2) to 30.5 feet (B- 8) below ground surface (bgs). During drilling, our field geologist logged the soil encountered and obtained samples for visual classification and laboratory testing. Logs of the borings are presented in Appendix A on Figures A-1 through A-8. The materials encountered are classified according to the soil classification system described on Figure A-9. Rock is described in accordance with the criteria presented on Figure A-10.

Soil samples were obtained using the following samplers:

- Standard Penetration Test (SPT) sampler with a 2.0-inch-outside diameter and a 1.5-inch-inside diameter, without liners
- Modified California (Mod Cal) split-barrel sampler with a 3.0-inch-outside diameter, 2.5-inch-inside diameter, lined with brass tubes with an inside diameter of 2.43 inches.

For Borings B-1 through B-5 and B-7 the SPT and Mod Cal samplers were driven with a 140-pound, hammer falling approximately 30 inches. For Borings B-6 and B-8 the samplers were driven with a hand-held 70-pound hammer falling approximately 30 inches. The blow counts required to drive the samplers the final 12-inches of an 18-inch drive are shown on the boring logs. Where the SPT sampler and the 140-pound hammer falling 30-inches was used the blow counts represent SPT N-values. Blow count using other samplers or the hand operated hammer should be converted to obtain approximate SPT N-values. After completion, the borings were backfilled with soil cuttings.

### 4.2 Review of Previous Investigation Data

We reviewed available published and unpublished geologic map and other information regarding the geology and soil conditions in the vicinity. This included visiting the City of Oakland Building Department and checking for records of historic landslides or foundation distress on or near the property. In addition, we reviewed stereo pairs of historical air photographs of the area to evaluate what past grading has occurred and areas of past slope instability.

## 5.0 LABORATORY TESTING

We re-examined soil samples from the borings in our office to confirm field classifications and selected representative soil samples for testing. Selected samples were tested to measure moisture content, dry density, plasticity index, sieve analysis, strength, and permeability. The laboratory test results are presented on the boring logs and in Appendix B on Figures B-1 through B-4.

## 6,0 REGIONAL GEOLOGY AND SEISMISITY

### 6.1 Regional Geology

The site is located in the Northern California Coast Ranges geomorphic province, which is dominated by northwest-trending faults and folds. Published geologic maps[1] indicate that the site is underlain at depth and near the ground surface on the east side of the site by claystone and sandstone bedrock of the Cretaceous age Redwood Canyon formation (Kr) and by unnamed Tertiary age mudstone (Tes). As shown on Figure 2, the mudstone underlies the northern portion of the site and the Redwood Canyon Formation underlies the southern portion. The contact between the Kr and Tes is by an inactive thrust fault.

The bedrock is covered by surficial Quaternary age deposits, there is a large regional landslide (mapped Qls) along the east side of the site. The extent of the landslide deposit, as shown by the USGS is presented on Figure 3. The majority of the site is underlain at shallow depth by alluvial

[1] Radbruch, D. H. 1969 *Areal and Engineering Geology of the Oakland East Quadrangle, California* USGS Quad Map GQ67

and colluvial soils (Qal/Qc. Alluvium and Colluvium consists of soils that have been deposited on the valley floor by the action of water and downslope movement of soils on the adjacent hillsides. The stream channel of Temescal Creek has meandered within the valley floor over time. Recent Holocene age stream channel deposits are present along the west bank of the creek. These deposits appear to have been deposited against an eroded surface within the Qal/Qc.

## 6.2 Seismicity

The major active faults in the area are the Hayward, Calaveras, and San Andreas, Faults. For each of the active faults within 50 kilometers (km) of the site, the distance from the site and estimated maximum Moment magnitude[2,3] events are summarized in Table 1.

**TABLE 1**

**Regional Faults and Seismicity**

| Fault Segment | Approximate Distance from Site (km) | Direction from Site | Maximum Magnitude |
|---|---|---|---|
| Northern Hayward | 0.7 | Southwest | 6.6 |
| Hayward - Total | 0.7 | Southwest | 7.1 |
| Southern Hayward | 6 | Southeast | 6.9 |
| Mount Diablo Thrust | 15 | East | 6.7 |
| Northern Calaveras | 16 | East | 7.0 |
| Concord | 21 | Northeast | 6.5 |
| Southern Green Valley | 27 | North | 6.5 |
| Northern Greenville | 28 | Northeast | 6.6 |
| Rodgers Creek | 30 | North | 7.1 |
| San Andreas - 1906 Rupture | 31 | Southwest | 7.9 |
| San Andreas - Peninsula | 31 | Southwest | 7.2 |
| San Andreas - North Coast South | 34 | West | 7.5 |

[2] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

[3] California Division of Mines and Geology, 1996, *Probabilistic Seismic Hazard Assessment for the State of California*, CDMG Open-File Report 96-08.

| | | | |
|---|---|---|---|
| Great Valley - 6 | 34 | Northeast | 6.7 |
| Central Greenville | 36 | East | 6.7 |
| San Gregorio North | 36 | West | 7.3 |
| West Napa | 36 | North | 6.5 |
| Great Valley - 5 | 39 | Northeast | 6.5 |
| Point Reyes | 49 | West | 6.8 |

In 2002, the Working Group on California Earthquake Probabilities at the U.S. Geologic Survey (USGS) predicted a 62 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2030[4]. Smaller earthquakes (between magnitudes 6.0 and 6.7), capable of considerable damage if they occur in proximity to urban areas, have about an 80 percent chance of occurring in the Bay Area by 2032.

## 7.0 SUBSURFACE CONDITIONS

Our interpretation of subsurface conditions at the site is presented on Figure 3 - Subsurface Profiles. For purposed of discussion we have divided the site in to the three areas of importance to the proposed improvements including; bridge and creek banks, parking grove and fire truck turnaround, new sanctuary area including existing hillside to the east.

### 7.1 Creek and Bridge Area

As shown on the subsurface profile, the south side of the creek is underlain by alluvial and colluvial soils which primarily consist of stiff silty to sandy clays. A 2-foot-thick clayey gravel layer was encountered within the predominately clayey soils at a depth of about 4 feet in Boring B-8; bedrock was encountered at a depth of about 17 feet. The west side of the creek is underlain by a surficial layer of fat silty clay which extends to a depth about 3 feet. The surface clay is in turn underlain by loose silty and clayey sand and gravels which extend to bedrock at a depth of about 22 feet. The sandy soils are susceptible highly susceptible to erosion and to liquefaction

[4] Working Group on California Earthquake Probabilities (WGCEP), 2002, *Earthquake Probabilities in the San Francisco Bay region; 2000 to 2032 – A Summary of Findings*, Open File Report 99-517.

during a seismic shaking. Slope failure and erosion have resulted in a steep creek bank slope near the proposed west bridge abutment.

Bedrock underlying the north side of the creek consist of claystone and sandstone which varies greatly from being hard and moderately strong to low hardness and weak. On the south side of the creek the bedrock encountered in Boring 8 was completely weathered to residual soil.

### 7.2 Parking Grove and Fire Truck Turnaround

The parking grove and fire truck turnaround are underlain by alluvial and colluvial soils primarily consisting of medium stiff to stiff silty clays, with occasional layers of medium dense clayey gravel. The surface soils have a moderate to high plasticity and expansion potential. Boring B-3 located at the top of a slope along the north side of the parking lot encountered about 5 feet of fill apparently placed during the original grading of the parking lot. The fill consists of medium stiff clay and contains abundant rock fragments. The fill appears to have been moderately compacted but likely does not meet current day compaction standards for engineered fill.

Permeability tests were conducted to evaluate the feasibility of permeable pavements with exfiltration into the subgrade soils. The test results indicated permeability varying from 1.4 E-08 to 5.0 E-07 centimeters per second. These are relatively low values indicating a very slow infiltration rate from the pavement components into the subgrade soils.

In the area of Boring 3 claystone bedrock was encountered at a depth of 7 feet. Boring B-7 extended to a depth of 15.5 feet and did not encounter bedrock. The rock is moderately hard and varies from weak to moderately strong.

Groundwater was encountered at depth of about 9 and 6 feet in borings B-3 and B-7, respectively. Groundwater levels will likely vary seasonally.

### 7.3 New Sanctuary Area

Subsurface conditions in the proposed new sanctuary area vary across the proposed building site. Weathered claystone bedrock of the Redwood Canyon formation exists at shallow depth below the pavement along the base of the hillside to the southwest. Near the center of the building area and along the north side we interpret that there may be up to 4 feet of medium dense clayey sand and medium stiff to silty clay fill. Similar to the parking grove area, the fill appears to have been moderately compacted but likely does not meet current day compaction standards for engineered fill. The fill is underlain alluvial and colluvial soils. These soils consist of stiff to medium stiff clay and medium dense clayey sand that extend to depths of about 20 feet. The alluvial soils are in turn underlain by claystone bedrock. Within the depths explored the bedrock materials are closely fractured of low hardness, weak to moderately strong, and exhibit varying degrees of weathering.

Groundwater was encountered in boring B-1 at a depth about 7 feet just following drilling. Extensive seepage was observed along the base of the retaining wall to the southwest indicating that groundwater levels adjacent to the base of the hill are elevated during and following rainfall. Water in fractures within the rock may be under excess hydrostatic pressure during the wet winter months resulting in springs at the toe of the slope adjacent to the building area following particularly wet periods.

The hillside on the southwest side of the site is the lower portion of a mapped regional landslide deposit within the Redwood Canyon formation. The ground surface in the areas is irregular and has numerous surface features indicative of historic shallow landsliding and soil creep. Boring B-6 that was drilled on the hillside encountered about 5 feet of medium stiff clay colluvial soils overlying fractured bedrock. During drilling a soft zone of wet, completely sheared rock was encountered at depth of 9.5 feet. This zone was interpreted as a slide plane along which down slope movement is occurring. Groundwater under excess pressure was encountered below the slide plane and rose to about 5 feet once the slide plane was penetrated. Siltstone bedrock that becomes harder and stronger with depth was encountered below the slide plane.

## 8.0 DISCUSSION AND CONCLUSIONS

We conclude that from a geotechnical engineering standpoint, the site can be developed as proposed, provided the recommendations presented in this report are incorporated into the project plans and specifications, and are implemented during construction. Potential seismic hazards and the primary geotechnical concern for each of the project elements are discussed below.

### 8.1 Seismic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the site. The seismic risk at the site is dominated by the Hayward fault, located 0.7 km to the southwest. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction[5], lateral spreading[6], and cyclic densification[7]. We used data from the test borings to evaluate the potential for these phenomena to occur at the site. The results of our evaluation are presented below.

#### 8.1.1 Soil Liquefaction and Associated Hazards

We evaluated the liquefaction potential of soil layers encountered in our borings and concluded that with the exception of the stream channel deposits north of the creek, the soils are either sufficiently dense or contain fines content such that they are not susceptible to liquefaction. As a result, we conclude the potential for lateral spreading and for sand boils and lurch cracking at the ground surface is nil. Liquefaction and lateral spreading within the creek channel deposits is discussed in Section 8.2.

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5 Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, and low-plasticity silt deposits.

6 Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported down slope or in the direction of a free face by earthquake and gravitational forces.

7 Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing differential settlement.

### 8.1.2 Cyclic Densification

Seismically induced compaction or cyclic densification of non-saturated sand (sand above the groundwater table) due to earthquake vibrations can result in settlement of the ground surface. Our field investigation indicates that the soil above groundwater is predominately medium stiff to very stiff clay. Therefore, we estimate the potential for ground surface settlement due to cyclic densification is nil.

### 8.1.3 Fault Rupture

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act and no known active or potentially active faults exist on the site. As previously discussed the Oakland East Geologic Quadrangle map show a thrust fault crossing the site. This fault has not been designated by the USGS as an active or potentially active fault. In a seismically active area, the remote possibility exists for future faulting in areas where inactive faults exist; however on a preliminary basis the scope of our services did not include a detailed assessment of the faulting at the site. We conclude the risk of surface faulting and consequent secondary ground failure is low.

## 8.2 Creek and Bridge Area

As discussed in section 7.1 the creek is the boundary between stiff colluvial/ alluvial soils to the south and recent stream channel deposits to the north. The colluvium/alluvium consists primarily of stiff clays which are relatively resistant to erosion and have moderate cohesive strength. Existing creek slopes on the south side are generally moderate, typically on the order of 2:1 (horizontal to vertical) and exhibit few signs of instability. In addition, the soils are generally susceptible to strength loss during seismic shaking. The stream channel deposits along the south side of the creek contain layers of loose silty and clayey sand and gravels. These soils are susceptible to erosion and strength loss due to seepage during and following significant rainfall events, as well as during strong seismic shaking. There are numerous historic slope failures on the north side of the creek bank resulting in near vertical slopes in several areas. These failures are located in areas of impinging flow associated with the local meandering of the creek.

If unmitigated the creek banks, particularly the north bank, will continue to erode and experience localized slope failures. Generally the creek bed is about 10 feet below the level of Thornhill Drive and setback 40 to 50 feet from the edge of roadway. However, in the area located about 100 feet downstream of the proposed new bridge and extending about 100 feet downstream, the creek bed is as close as 25 feet from the roadway. Future erosion and creek bank instability could eventually potentially affect the roadway in this area. In addition, there are underground utilities between the road edge and the creek bank that could be affected by future instability. There are other localized areas of very steep creek banks including the area below the new bridge. While slope failures in these areas are unlikely to affect the roadway or utilities, creek bank regression may deposit sediment into the creek and undermine bridge foundations and abutment walls if they are not properly designed.

At a minimum the effects of creek bank instability should be taken into account in the design of the bridge foundations and abutment walls. Specifically the abutment walls should extend below an imaginary line projected upward from the creek bottom at an inclination of 2.5:1. In addition the bridge should be supported on drilled pier foundations that derive their vertical and lateral support below the potentially unstable soils.

Two alternative approaches could be adopted with regard to the areas of potential creek bank instability. A proactive approach would be to realign the creek in the area where it could impinge on the roadway in the future. This could be accomplished in an environmentally sensitive manor using bioengineering approaches currently being considered by Wolfe Mason Associates. LMG should continue to work with Wolfe Mason Associates to provide specific geotechnical analyses and recommendations for the selected creek stabilization scheme.

Another approach would involve adaptive management of localized problem areas as they occur. While this approach may have the lowest initial cost it may lead to expensive emergency repairs of greater cost than proactive measures that could be implemented as part of the project improvements.

The stream channel deposits contain layers of loose silty sands that are potentially susceptible to liquefaction during a significant earthquake. Creek bank slope failures during a major earthquake are likely particularly, particularly if an earthquake occurs during the wet winter months.

## 8.3 Sanctuary Building

### 8.3.1 Foundations

The sanctuary building is located in an area of varying soil conditions. Bedrock will be exposed along the base of the hillside to the southwest. Fill underlain by relatively thick deposits of alluvial/colluvial soils likely exist beneath other portions of the proposed building pad. The structure could experience unacceptable foundation settlement if it is supported on these dissimilar soils conditions. In addition, the clayey soils and claystone bedrock are moderately expansive and will required mitigation to isolate the building and slabs-on-grade from the detrimental effects of soils shrinkage and swelling.

There are at least two acceptable foundation alternatives for the structure. The structure could be supported on conventional spread footing foundations that are underlain by at least 2 feet of properly compacted select fill. In this case extensive earthwork would be required to excavate the existing fill and the native soil and rock extending to a depth of at least 2 feet below the proposed footings and replacing it with properly compacted select fill.

Alternatively the building could be supported on drilled pier foundations with only minor grading to prepare the surface soils and placement of at least 12-inches of select fill beneath slabs-on-grade. In this case site grading would be limited to excavating the pad to grade, scarifying, and compacting the upper 12 inches of below the select fill subgrade level and placing the select fill.

### 8.3.2 Hillside Stability and Site Retaining Wall

The hillside southwest of the proposed sanctuary building is located to the toe of a large regional landslide deposit. The hillside has experienced localized slope failures in the past and there are indications of ongoing downslope creep, as evidenced by the leaning trees and hummocky

ground surface in the area. In addition there are numerous springs and seeps that exist near the toe of the slope during the wet winter months.

While our investigation did not include a comprehensive evaluation of slope stability and potential mitigation measures for the entire hillside, we did drill one test boring (Boring 7) on the hillside to evaluate subsurface conditions above the proposed sanctuary. Based on the results of the test boring and review of historical information and aerial photographs, we have developed the following preliminary consultations regarding hillside stability. In addition, we have developed recommendation to minimize the effects of hillside instability on the proposed sanctuary by the construction of a site retaining wall along the base of the hillside. However, additional investigation and detailed geotechnical engineering would be required to conduct a comprehensive evaluation of hillside stability and potential mitigation measures, if desired.

Test boring 7 encountered about 5 feet of colluvial soil overlying weak bedrock. At a depth of about 9.5 feet a well defined landslide plane was encountered. Groundwater was present under excess hydrostatic pressure along the side plane. Relatively intact and moderately strong bedrock was encountered below the slide plane. In addition there are several overgrown and subdued landslide scarps on the hillside where previous landslides have occurred. Based on these conditions, it appears that the landsliding may be limited to the upper 10 feet or so of soil/rock on this portion of the hillside. The historic landslides appear to be related to previous site grading associated with cutting at the toe of the slopes to install the parking lots and roadway at the site.

Installation of a site retaining wall along the base of the hillside will mitigate the risk of shallow landslide movements affecting the proposed sanctuary. In addition the added subsurface drainage and support at the toe of the slope will have a beneficial effect on slope stability. However, a landslide risk will remain above the proposed improvements. In particular there is a risk of future shallow slope movement that could destabilize the existing trees on the slope causing them to topple. In addition, surficial mudflow could occur during period of significant rainfall. As a result, a qualified arborist should evaluate the health of the trees and potential risks they pose. It may be necessary to remove the hazardous trees and re-landscape the hillside with appropriate plant materials to reduce erosion potential. In addition the retaining wall behind the new

sanctuary should be constructed with freeboard to provide an area to catch mud and debris in the event of an upslope mudflow.

### 8.4 Parking Grove and Fire Truck Turnaround

The proposed parking grove and fire truck turnaround area is underlain by clayey native soils and fill which have a low permeability and are judged to have a low resistance, "R" value for pavement design. As a result, the pavement subgrade soils are not suitable for the infiltration of surface storm water. In addition, the soils will not support heavy wheel loads from fire trucks without properly engineered pavement sections. From a practical standpoint we recommend that conventional asphalt concrete pavement sections be used in areas of fire truck access or heavy vehicle use.

Permeable pavements may have a hydrologic benefit by acting to detain peak runoff from the pavements during significant rainfall events and in promoting the growth of trees in the parking areas. Permeable pavements may be appropriate in areas designated for passenger vehicle parking. There are a number of alternative designs and produces available for this purpose. LMG should review paving plans and provide additional recommendations.

## 9.0 RECOMMENDATIONS

Our recommendations regarding site preparation fill placement, foundation and seismic design, and other geotechnical aspects of this project are presented in this section.

### 9.1 Site Grading

#### 9.1.1 Site Preparation and Fill Placement

In areas to receive improvements (including buildings, pavements and exterior concrete slabs), site preparation should include removal of all existing pavements, and underground utilities. Underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean

concrete or cement grout to the property line. Voids resulting from demolition activities should be properly backfilled with engineered fill as described later in this section.

Where fill is to be placed or where new pavements or exterior slabs will be constructed, the existing fill exposed at the subgrade level, should be scarified to a depth of at least 12-inches, moisture-conditioned to about optimum moisture content, and compacted to at least 90 percent relative compaction. [8] The soil subgrade should be kept moist until it is covered by fill. Onsite or import fill, to be used as general site fill, should be moisture-conditioned to about optimum moisture content, placed in lifts not exceeding eight inches in loose thickness, and compacted to at least 90 percent relative compaction. Select fill should consist of soil that is free of organic matter, contains no rocks or lumps larger than three inches in greatest dimension, have a liquid limit less than 40 and plasticity index less than 12, and be approved by the geotechnical engineer. All fill placed at the site should be free of organic matter and contain no rocks or lumps larger than three inches in greatest dimension.

### 9.1.2 Placement of Select Fill

If the spread footing foundation alternative is used for the new sanctuary, we recommend the proposed building area be excavated to allow placement of at least 24-inches of select fill beneath the building foundations or to remove the existing fill to its full depth, whichever is deeper. The over-excavation and select fill should extend at least three feet horizontally beyond the building perimeter. If drilled pier foundations are used, the building pad should be excavated to accommodate at layer of select fill at least 12-inches thick below slabs-on-grade. The soil subgrade at the base of the excavation should be scarified to a depth of at least eight inches, moisture-conditioned to at least three percent above optimum moisture content, and compacted to between 90 and 93 percent relative compaction.

[8] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-91 laboratory compaction procedure.

### 9.1.3 Utility Trench Backfill

Excavations for utility trenches can be readily made with a backhoe. All trenches should conform to the current CAL-OSHA requirements.

Backfill for utility trenches and other excavations is also considered fill, and should be placed and compacted according to the recommendations previously presented. If imported clean sand or gravel (defined as soil with less than 10 percent fines) is used as backfill, it should be compacted to at least 95 percent relative compaction. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in pavement areas. Poor compaction may cause excessive settlements, resulting in damage to the pavement section.

Where utility trenches enter the building pads and pavement areas, an impermeable plug consisting of lean concrete, at least five feet in length, should be installed where the trenches enter the building footprints. Furthermore, where sand- or gravel-backfilled trenches cross planter areas and pass below asphalt or concrete pavements, a similar plug should be placed at the edge of the pavement. The purpose of these recommendations is to reduce the potential for water to become trapped in trenches beneath the buildings or pavements. This trapped water can cause heaving of soils beneath slabs and softening of subgrade soil beneath pavements.

## 9.2 New Sanctuary Foundation Support

### 9.2.1 Spread Footings

The proposed sanctuary buildings may be supported on isolated interior spread footings and continuous perimeter footings bearing at least 24-inches of properly compacted select fill. Continuous footings should be at least 18-inches wide and isolated spread footings should be at least 24-inches wide. Footings should extend at least 18-inches below the lowest adjacent soil subgrade (defined as the bottom of the gravel layer beneath the slabs-on-grade). The footings may be designed using allowable bearing pressures of 3,500 pounds per square foot (psf) for dead plus live loads and 4,500 psf for total loads, including wind or seismic forces. These values include factors of safety of at least 2.0 and 1.5 for dead plus live loads and total loads, respectively.

Lateral loads can be resisted by a combination of passive pressure acting on the vertical faces of the footings and friction along the bases of the footings. Passive resistance may be calculated using an equivalent fluid weight (triangular distribution) of 350 pounds per cubic foot (pcf). The upper one-foot of soil should be ignored unless it is confined by slabs or pavement. Frictional resistance should be computed using a base friction coefficient of 0.40. These values include a factor of safety of about 1.5. Footings located adjacent to utility trenches should bear below an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the bottom edge of the adjacent trench.

The footing excavations should be free of standing water, debris, and disturbed materials prior to placing concrete. We should check foundation excavations prior to placement of reinforcing steel to confirm suitable bearing material is present. We should recheck the condition of the excavations just prior to concrete placement to confirm the excavations are sufficiently moist.

### 9.2.2 Drilled Piers

Alternatively the building can be supported on drilled piers. The advantage of using drilled piers is that only minimal site grading will be required. Drilled piers should be designed to derive their axial capacity from the skin friction in the soil and bedrock below a depth of 4-feet. The piers should have a minimum diameter of 14-inches and extend at least 15-feet deep regardless of load.

Piers installed in a group should be spaced at least three diameters on center. To compute the axial capacity of drilled piers, we recommend using an allowable skin friction of 600 pounds per square foot (psf) for dead and live loads. For temporary, compressive, total loads, including wind and/or seismic load, the skin friction value can be increased by one third. For temporary uplift loads, we recommend an allowable skin friction of 500 psf.

Drilled piers should be installed by a qualified contractor with demonstrated experience in this type of foundation. While not encountered in the test borings potentially caving soils may encountered during drilling and the pier holes will extend below groundwater. Therefore, the drilling contractor would be prepared to use casing if caving soils are encountered. Concrete

placement should start upon completion of the drilling and clean out. Concrete should be placed from the bottom up in a single operation using a tremie and/or a pumper pipe. The tremie pipe should be maintained at least 5-feet below the upper surface of the concrete during casting of the piers.

If drilled piers are used we have assumed that resistance to lateral loads will be developed by passive earth pressures acting on the sides of grade beams. Additional lateral resistance will be available from the piers. If necessary we can provide additional lateral load analyses for the piers.

### 9.3 Site Retaining Wall along Base of Hillside

We anticipate a cantilevered soldier pile and lagging wall may be used along the base of the hillside southwest of the new sanctuary. The cantilevered soldier pile and lagging system should be designed using active equivalent fluid weights acting behind the wall of 85 pcf to account for the sloping backfill condition and potentially weak, unstable soils behind the wall. These pressures should be assumed to act over the entire width of the lagging installed above the base of the excavation; the pressures need only be assumed to act over one pier width below the bottom of the excavation. Passive resistance in rock at the toe should be computed using an equivalent fluid weight of 350 pcf. For soldier piles spaced greater than three times the soldier pile diameter, the passive pressure should be assumed to act over three pile diameters.

The calculated embedment depth for the soldier piles should be increased by at least 20 percent to obtain the design embedment depth. The lateral earth pressures for both cases were developed assuming the groundwater level will be lowered to the bottom of the wall by permanent back drainage measures. The lateral pressure to be resisted by the lagging will depend on the size of the soldier piles and the spacing between them.

Site retaining walls should be provided with backdrains. Drains should consist of a drainrock layer at least 1-foot thick that extends to within 1 foot of the top of the backfill. Four-inch-diameter, perforated, smooth-wall plastic pipe should be installed (with perforations down) along the base of the on a 2-inch-thick layer of drainrock. The pipe should be sloped to drain by gravity

to a suitable discharge facility. Alternatively, one-half inch wide spaces can be provided between the lagging boards to provide discharge points for the drainrock layer.

Drainrock should conform to current Caltrans specifications for Class 2 permeable material. A more open-graded material, such as ¾-inch-crushed rock, could be used provided the rock is surrounded by a geotextile filter fabric (Mirafi 140N or equivalent) to limit the migration of fine-grained soils into the drainrock.

Backfill behind retaining walls and other fills should be compacted to at least 90 percent relative compaction. Fill material should be placed in layers no thicker than 8 inches, and should be free of organic debris and/or rocks greater than 6-inches in largest dimension.

Since the area above the site retaining walls may be subject to earth flows, at least two feet of freeboard should be provided where the wall are adjacent to the new structure. A concrete lined "V" Ditch should be provided above the wall. Access should be provided to allow for the removal of accumulated mud and debris following rainfall or earth flow events.

### 9.4 Drainage

Positive surface drainage should be provided around the buildings to direct surface water away from the foundations. To reduce the potential for water ponding adjacent to the buildings, we recommend the ground surface within a horizontal distance of five feet from the buildings slope down away from the buildings with a surface gradient of at least two percent in unpaved areas and one percent in paved areas. In addition, roof downspouts should be discharged into controlled drainage facilities to keep the water away from the foundations.

### 9.5 Slab-on-Grade Floors

The building slab-on-grade floors should be underlain by at least 12-inches of properly compacted select fill as described in Section 9.1 If the previously compacted soil subgrade is disturbed during foundation and utility excavation, the subgrade should be scarified, moisture-conditioned, and re-rolled to provide a firm, unyielding surface prior to placement of the

capillary break material. To further reduce the potential for cracking of slab-on-grade floors, we recommend the slab be reinforced with at least No. 4 bars spaced at 18-inches, each way.

To reduce water vapor transmission through the floor slab, we recommend installing a capillary moisture break and a water vapor barrier beneath the floor. A capillary moisture break consists of at least four inches of clean, free-draining gravel or crushed rock. The vapor barrier should meet current industry standards. The vapor barrier should be covered with two inches of sand to aid in curing the concrete and to protect the vapor barrier during slab construction. The particle size of the gravel/crushed rock and sand should meet the gradation requirements presented in Table 2.

**TABLE 2**
**Gradation Requirements for Capillary Moisture Break**

| Sieve Size | Percentage Passing Sieve |
|---|---|
| *Gravel or Crushed Rock* | |
| 1 inch | 90 – 100 |
| ¾ inch | 30 – 100 |
| ½ inch | 5 – 25 |
| 3/8 inch | 0 – 6 |
| *Sand* | |
| No. 4 | 100 |
| No. 200 | 0 – 5 |

The sand overlying the barrier should be dry at the time concrete is placed. Excess water trapped in the sand could eventually be transmitted as vapor through the slab. If rain is forecast prior to pouring the slab, the sand should be covered with plastic sheeting to avoid wetting. If the sand becomes wet, concrete should not be placed until the sand has been dried or replaced.

## 9.6 Exterior Concrete Flatwork

Exterior concrete flatwork should be underlain by at least 12-inches of properly compacted select fill or Class 2 aggregate base. The soil or aggregate base should extend at least six inches beyond the slab edges, and should be moisture-conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction.

## 9.7 Bridge Foundations

### 9.7.1 Drilled Piers

The new bridge should be supported on drilled pier foundations that derive their support from skin friction in the bedrock that exists at an elevation of about 575 feet. End bearing should be ignored since it will be difficult to properly clean out the pier bottoms to the extent that they can rely on end bearing.

Piers installed in a group should be spaced at least three diameters on center. To compute the axial capacity of drilled piers, we recommend using an allowable skin friction of 1,000 pounds per square foot (psf) for dead and live loads. For temporary, compressive, total loads, including wind and/or seismic load, the skin friction value can be increased by one third. The piers should extend at least 10-feet in to rock regardless of load.

Longitudinal seismic loads will be resisted by passive pressures acting on the abutment walls. Since seismic forces are short term transient loads a uniform ultimate passive resistance of 2500 pounds per square foot can be used to evaluate the available resistance provide by the abutments. When considering allowable seismic loads a safety factor of at least 1.5 should be applied.

Transverse seismic forces will be resisted by the drilled piers supporting the abutment walls. Piers will provide lateral resistance from passive pressure acting on the upper portion of the piers and from their structural rigidity. Lateral resistance of piers will depend on the pier diameter, pier head condition (restrained or unrestrained), allowable deflection of the pier top, and the bending moment resistance of the piers. We have performed lateral load analyses for isolated, 2-foot-diameter piers extending 10-feet into rock and for a deflection of 0.5-inch at the pier head.

The results of our analyses are presented in Table 3 Plots of deflection, shear and bending moment versus depth are presented on Figures 4 and 5.

**TABLE 3**
**Results of Lateral Load Analyses**
**for 0.5-inch deflection at pier top**

| Pier Diameter (feet) | Pier Top Condition | Computed Lateral Load at 0.5-inch Deflection (kips) | Computed Maximum Bending Moment (kip-feet) | Depth to Maximum Bending Moment (feet) |
|---|---|---|---|---|
| 2 | Restrained | 55 | - 324 | 0 |
| 2 | Unrestrained | 25 | 111 | 7 |

The lateral resistances tabulated in Table 3 are for isolated piers and piers in a group with a pier spacing of at least six pier diameters. If piers are installed in a group of two with a spacing of three pier diameters, we recommend reducing the lateral capacities by 15 percent. However, the design bending moments should not be reduced; they should be the same as those for single piers. If larger pier groups are needed to support the building, we should provide the reduction factors for these groups.

The lateral resistances tabulated in Table 3 are based on a deflection of 0.5 inch at the top of the pier. If required, we can evaluate the lateral resistance of piers for other conditions, such as, a different deflection criterion, a predetermined moment resistance, and partial restrained condition at the pier top.

Drilled piers should be installed by a qualified contractor with demonstrated experience in this type of foundation. Potentially caving sand will be encountered during drilling. Therefore, casing and/or drilling fluid will be required. Casing should be able to extend to at least elevation 575-feet (bottom of loose sand). If casing is not extended to this elevation, water or drilling slurry should be used, to stabilize holes. Concrete placement should start upon completion of the drilling and clean out. Concrete should be placed from the bottom up in a single operation

using a tremie and/or a pumper pipe. The tremie pipe should be maintained at least 5-feet below the upper surface of the concrete during casting of the piers. As the concrete is placed, casing used to stabilize the hole can be withdrawn. The bottom of the casing should be maintained at least 3-feet below the surface of the concrete.

### 9.7.2 Bridge Abutment Retaining Walls

Abutment retaining walls should be designed to resist both lateral loads imposed by earth pressures and any additional lateral loads caused by surcharging from construction equipment and vehicles operating above the walls.

We recommend that the walls new abutment walls be designed to resist an equivalent fluid weight of 55 pounds per cubic foot, assuming that they are relatively rigid. The equivalent fluid pressure given above assumes fully drained conditions and level backfill. To account for traffic loads, the walls should be designed for an additional uniform lateral pressure of 150 psf to be applied over the entire height of the wall.

Abutment retaining walls should be supported on drilled pier foundations as described above.

Retaining walls should be provided with backdrains. Drains should consist of a drainrock layer at least 1-foot thick that extends to within 1-foot of the top of the backfill. Four-inch-diameter, perforated, smooth-wall plastic pipe should be installed (with perforations down) along the base of the on a 2-inch-thick layer of drainrock. The pipe should be sloped to drain by gravity to a suitable discharge facility. Alternatively, weep holes could be installed along the bottom of the abutment wall to provide discharge points for the drainrock layer

Drainrock should conform to current Caltrans specifications for Class 2 permeable material. A more open-graded material, such as ¾-inch-crushed rock, could be used provided the rock is surrounded by a geotextile filter fabric (Mirafi 140N or equivalent) to limit the migration of fine-grained soils into the drainrock.

Backfill behind retaining walls and other fills should be compacted to at least 90 percent relative compaction. Fill material should be placed in layers no thicker than 8-inches, and should be free of organic debris and/or rocks greater than 6-inches in largest dimension.

## 9.8 Pavements

### 9.8.1 Asphalt Pavements

The State of California flexible pavement design method was used to develop the recommended asphalt concrete pavement sections. We expect the final soil subgrade in asphalt-paved areas will generally consist of silty clay. R-value tests were not performed for the site. On the basis of our experience with this soil type, we selected an R-value of 5 for design. Traffic data are not available for the proposed parking lots and driveways.

Therefore, we have assumed traffic indices (TIs) of 4.0 for parking lots and 5.0 for access lanes and the fire truck turnaround. Recommended pavement sections for these traffic indices are presented in Table 4.

**TABLE 4**
**Pavement Section Design**

| TI | Asphaltic Concrete (inches) | Class 2 Aggregate Base R = 78 (inches) |
|---|---|---|
| 4.0 | 2.5 | 6 |
| 5.0 | 4.0 | 9 |

(Note: The minimum thickness of asphalt concrete and aggregate base is 2.5 and 6 inches, respectively.)

Pavement components should conform to the current Caltrans Standard Specifications. The upper six inches of the soil subgrade in pavement areas should be moisture-conditioned to about optimum and compacted to at least 95 percent relative compaction and rolled to provide a smooth non-yielding surface. Aggregate base should be compacted to at least 95 percent relative compaction.

### 9.8.2 Concrete Pavements

Concrete pavement design is based on a maximum single-axle load of 20,000 pounds and a maximum tandem axle of 32,000 pounds. The recommended rigid pavement section for these axle loads is six inches of Portland cement concrete over six inches of Class 2 aggregate base. The modulus of rupture of the concrete should be at least 500 psi at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. Recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those we have described for asphalt pavement.

### 9.8.3 Interlocking Concrete Pavers

We anticipate decorative precast concrete pavers may be used for this project in the entry and parking areas. Where pavers will receive vehicular traffic, we recommend they consist of fully dentated interlocking shapes and be at least 3.15-inches (80 millimeters) thick. Non-interlocking shapes can be used in non-vehicle areas such as pedestrian paths. The pavers should be placed on a 1- to 2-inch-thick sand-leveling course. The appropriate aggregate base thickness given above in Table 4 for asphalt concrete pavements can also be used beneath the pavers and sand-leveling course. The subgrade and aggregate base beneath the pavers should be compacted in accordance with the recommendations previously provided for asphalt concrete pavements. The unit pavers should be installed in accordance with the manufacturer's recommendations. LMG should be consulted the recommendations presented above conflict with the manufacturer's recommendations.

### 9.8.4 Permeable Pavers

The design of permeable pavers is significantly different from standard interlocking pavers. A permeable pavement system is intended to direct surface water through the paver system and into an underlying permeable water storage and retention system. The storage and retention layer generally consists of open-graded, free draining, angular crushed rock or stone. The permeability and storage capacity of the soil subgrade determines how much water can infiltrate from the storage layer in to the underlying subgrade.

For a TI of 4.0, we recommend the permeable pavers be underlain by at least 8-inches of crushed rock or stone. The crushed rock or stone should meet the gradation requirements for ASTM Standard C33 No. 57 crushed stone. The crushed stone should be placed in loose lifts not exceeding 8-inches thick and mechanically compacted with a minimum 10-ton static roller. A 2- to 3-inch thick leveling ("choker") courses should be placed over the crushed stone to provide uniform support for the unit pavers. The choker course should consist of ASTM C33 No. 8 stone and should also be mechanically compacted. Prior to the placement of the unit pavers, the upper 1-inch of the choker course should be raked to create a smooth, loose surface, to facilitate seating of the unit pavers. As described above in Section 9.5.3, the pavers should be at least 3.15- inches (80 millimeters) thick and be installed in accordance with the manufacturer's recommendations.

After the pavers have been set, the No. 8 stone can be used to fill the gaps between the pavers. If the No. 8 stone is too coarse to fill the gaps, ASTM C33 No. 89 sand can be used. Gradation requirements for the No. 57 and No. 8 stone and sand are presented in Table 5.

**TABLE 5**

**Gradation for Permeable Paver Gravel Layer**

| Sieve Size | Percentage Passing Sieve | Sieve Size | Percentage Passing Sieve |
|---|---|---|---|
| **ASTM C33 No. 57** | | **ASTM C33 No. 8** | |
| 1-1/2 inch | 100 | ½ inch | 100 |
| 1 inch | 95 to 100 | 3/8 inch | 85 to 100 |
| ½ inch | 25 to 60 | No. 4 | 10 to 30 |
| No. 4 | 0 to 10 | No. 8 | 0 to 10 |
| No. 8 | 0 to 5 | No. 16 | 0 to 5 |

Prior to the placement of the crushed rock, the subgrade should be moisture conditioned to about optimum moisture contend and compacted to at least 95 percent relative compaction. The subgrade should be smooth and non-yielding prior to the placement of crushed rock.

The thickness of the permeable gravel base is presented above is based on the structural design of the pavement section. The civil engineer or landscape architect should determine if this thickness is adequate to meet the hydrologic requirements of the project.

Because the soil at the subgrade will consist of silty clay that has a low permeability, water stored in the crushed rock will not infiltrate significantly into the subgrade following the design

storm. As a result, a subdrain system will be required within the permeable storage layer. The subdrain should consist of at least 4-inch-diameter, Schedule 40 PVC perforated pipes spaced at least 25-feet center to center. The perforations should be placed facing downward. The subdrain pipes should be underlain by at least 2-inches of No. 57 stone, have a minimum slope of 0.5 percent and be covered with a prefabricated filter fabric sock to prevent fines from infiltration into the perforated pipes. The subdrains should drain to the storm drain system through a series of solid collection pipes.

Provisions should be made to capture or redirect excess water from storm larges than the design event. This may include curb pass-throughs to facilitate surface drainage to swales, catch basins or drop inlets.

### 9.8.5 Pavement Edge Treatment

To prevent irrigation water from entering the pavement section, vertical curbs adjacent to landscaped areas should extend at least four inches into the underlying clay. Subdrains may be required behind curbs downslope of heavily watered landscaped areas. We should review the final plans to determine whether subdrains should be used to reduce the potential for irrigation water to enter the pavement section.

## 9.9 Seismic Design

The nearest fault to the site is the Hayward Fault, approximately .07 km southwest of the site. For seismic design in accordance with the 2001 California Building Code we recommend using the following parameters:

Seismic Zone Factor 4

Soil Profile Type $S_D$

Near Source Factors $N_a$ and $N_v$ of 1.5 and 2.0, respectively.

## 10.0 ADDITIONAL GEOTECHNICAL SERVICES

Land Marine Geotechnics should consult with the design team during final design. Prior to construction, we should review the project plans and specifications to check their conformance with the intent of our recommendations. During construction, our field engineer should provide on-site observation during site preparation; fill placement, and installation of building and bridge foundations. These observations will allow us to compare the actual with the anticipated soil conditions and to check that the contractor's work conforms with the geotechnical aspects of the plans and specifications.

## 11.0 LIMITATIONS

The conclusions and recommendations presented in this report result from limited engineering studies based on our interpretation of the geotechnical conditions existing at the time of the investigation. Actual subsurface conditions may vary. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that described in this report, Land Marine Geotechnics should be notified to make supplemental recommendations, if necessary.

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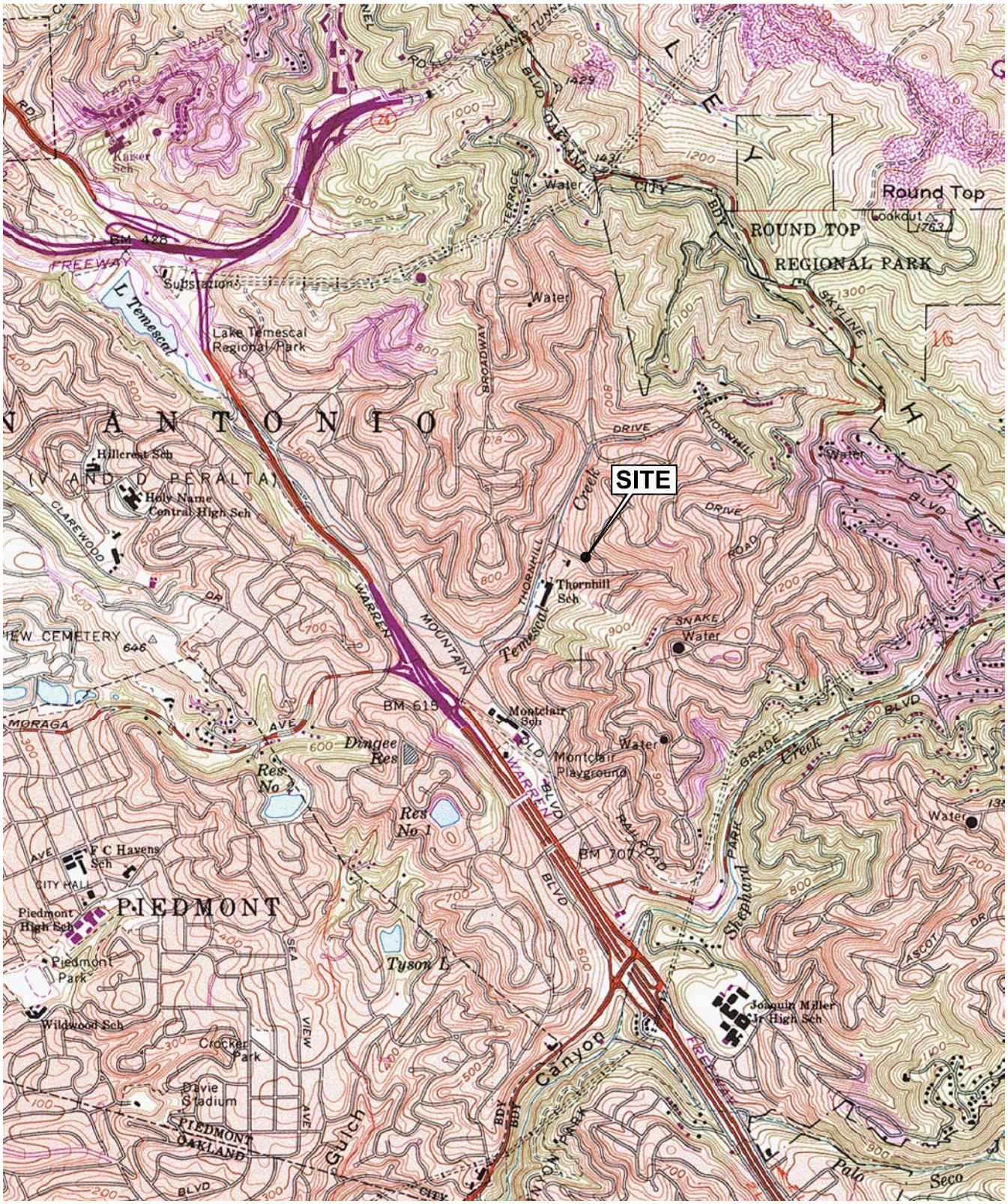
# FIGURES




Source:
USGS Topographic Map, 1978

0 1000' 2000'

SCALE: 1" = 2,000'

N

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# SITE LOCATION MAP

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Figure: 1

Date: May 2005

Job Number: 110.001

KEY:

- Existing Structures
- Proposed Improvements
- Subsurface Profile
- 7 Test Boring
- Hillside Creep
- Spring or Seepage
- Landslide Scarp
- Fault Contact (per USGS Oakland East geologic quadrangle)
- Approximate Geologic Contact
- Qls Landslide Deposit
- Qal/Qc Alluvium and/or Colluvium
- Qhsc Stream Channel Deposits
- Tes Unnamed Mudstone
- Kr Redwood Canyon Formation

Qal/Qc

Parish Hall

Tes

B

1

New Sanctuary

2

A

4

8

Vehicular Bridge

5

Bridge

Parking Grove

7

Qal/Qc

Fire Truck Turnaround

3

6

B'

A'

Qls (Kr)

Qhsc

Creek

St. John's House

Upper Parking

0 25' 50'

SCALE: 1" = 50'

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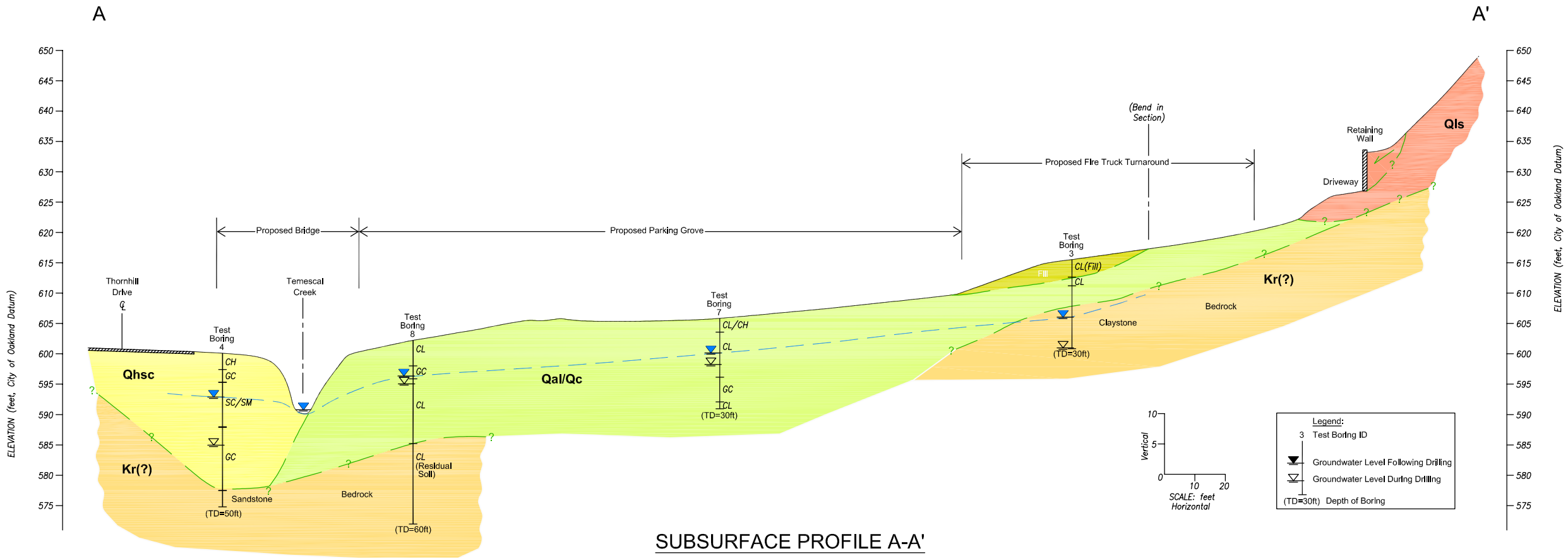
**SITE PLAN**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

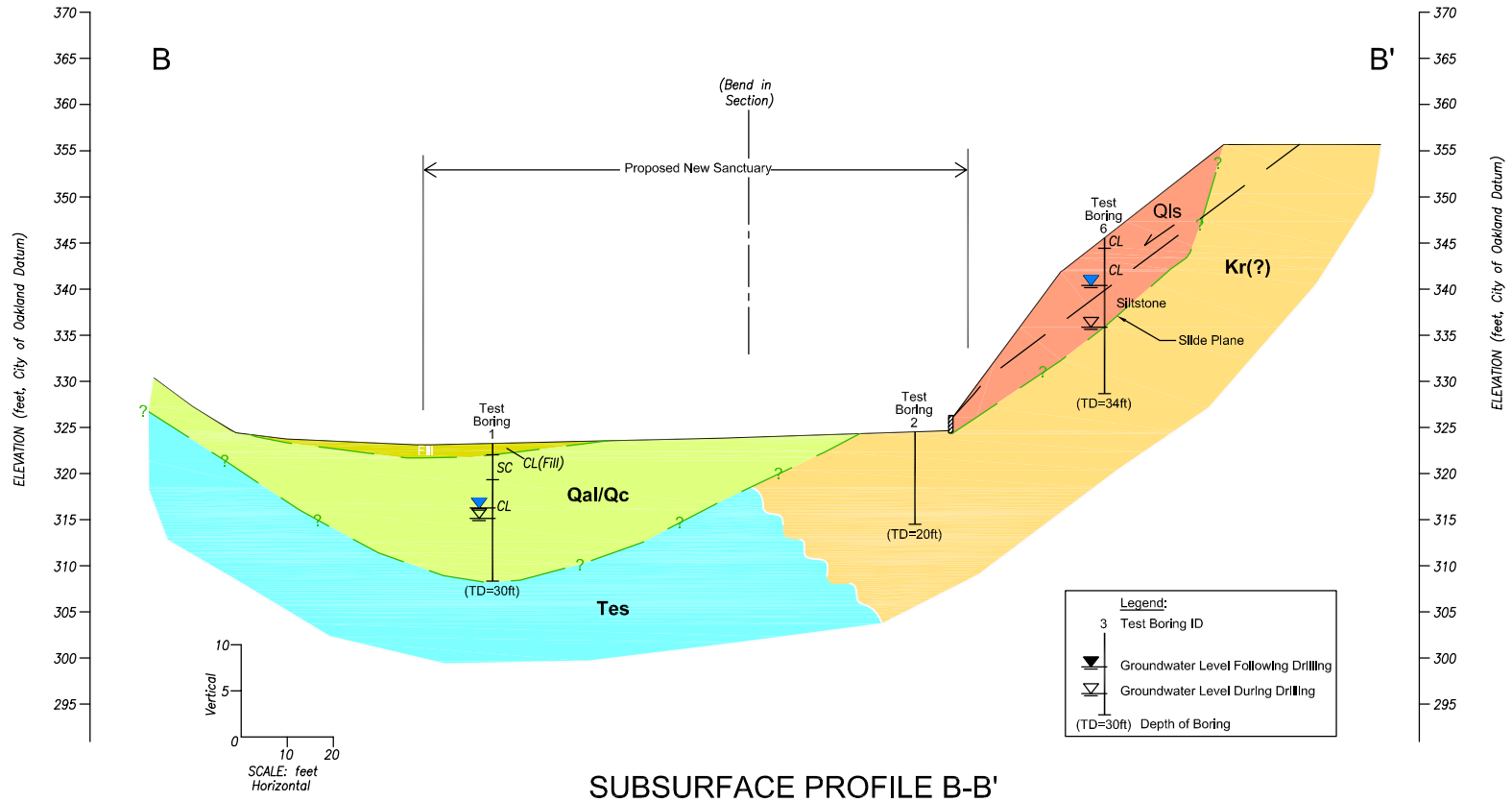
Figure: 2

Date: May 2005

Job Number: 110.001




SUBSURFACE PROFILE A-A'




SUBSURFACE PROFILE B-B'

0 20' 40'

HORIZ. SCALE: 1" = 40'

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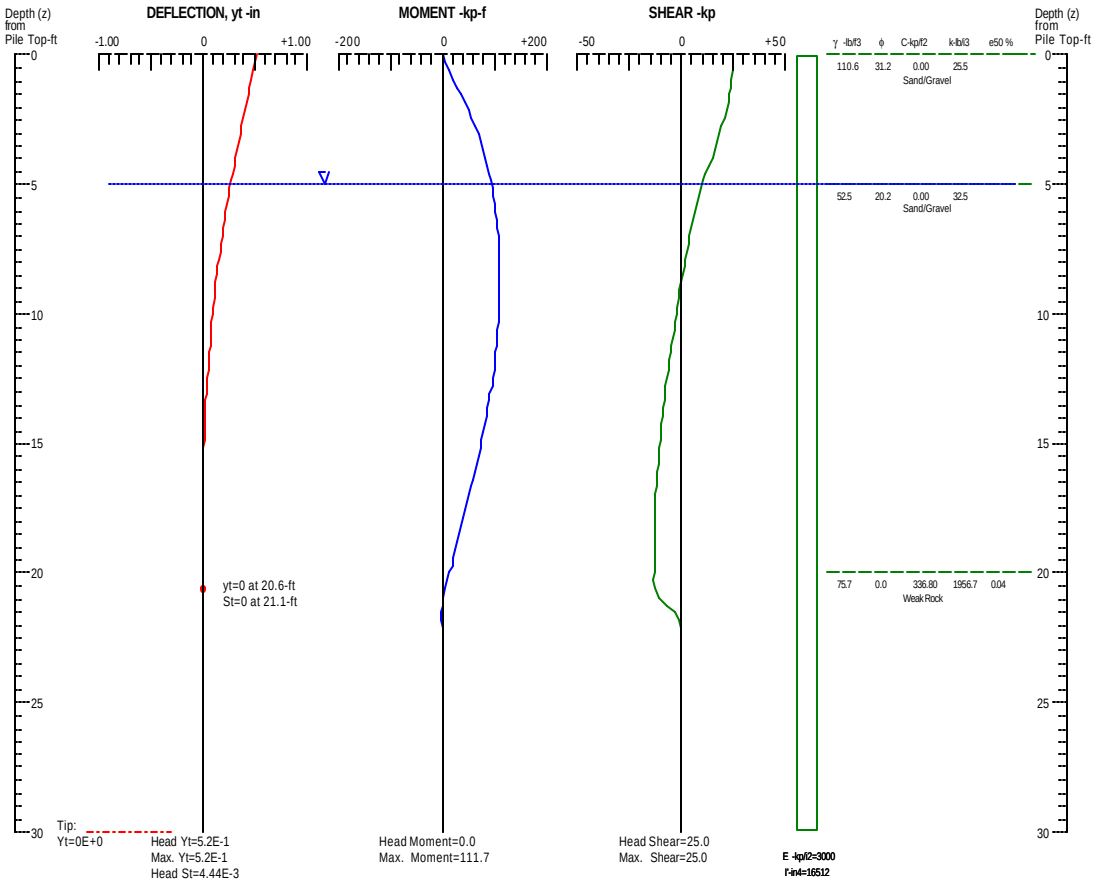
**SUBSURFACE PROFILES**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Figure: **3**

Date: May 2005

Job Number: 110.001

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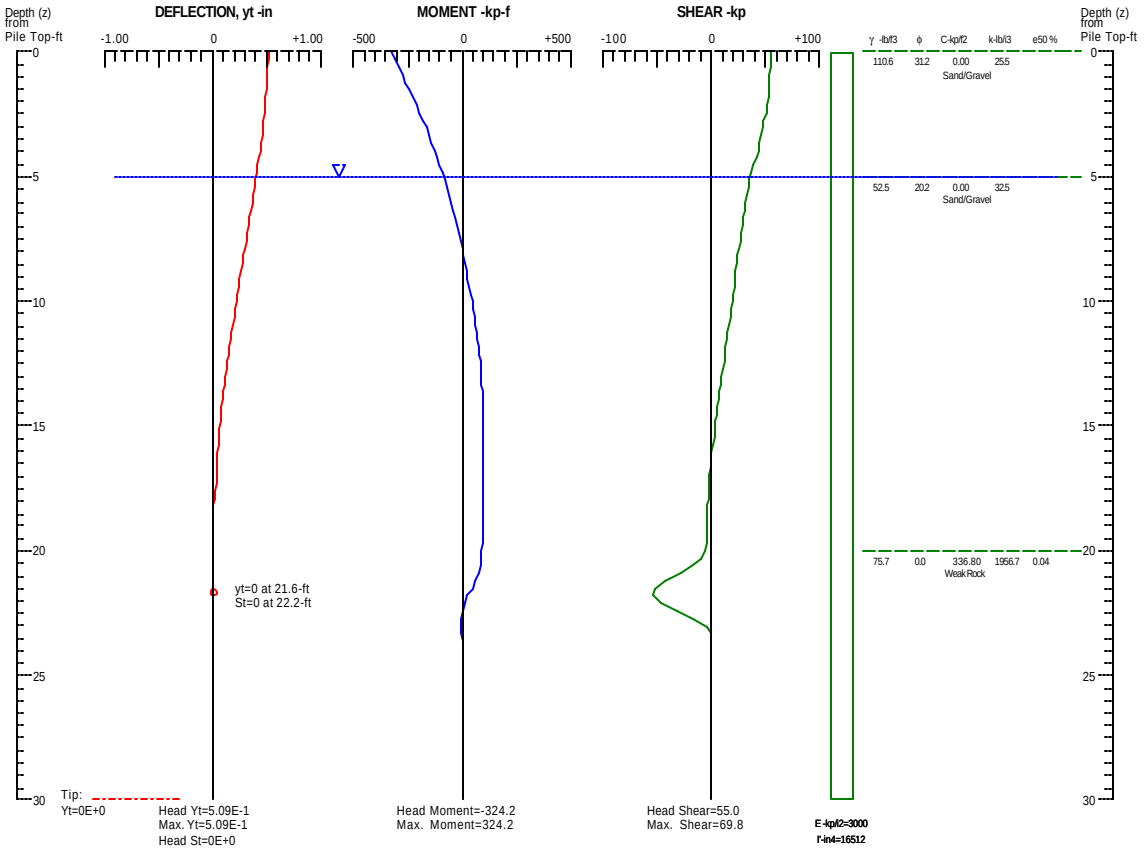
## Unrestrained Case

**Bridge Drilled Pier - Lateral Load Capacity**

**St. John's Episcopal Church**
**1701 Gouldin Road, Oakland, California**

| | |
|---|---|
| Figure: | 4 |
| Date: | May 2005 |
| Job Number: | 110.001 |

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**Restrained Case**

**Bridge Drilled Pier - Lateral Load Capacity**

**St. John's Episcopal Church**
**1701 Gouldin Road, Oakland, California**

**Figure:** 5

**Date:** May 2005

**Job Number:** 110.001

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# APPENDIX A
# FIELD INVESTIGATION

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 1



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 625 feet ± | | | | | | |
| | | | | | 3-inch thick concrete<br>9-inch thick base rock | | | | | | |
| 1–2 | MC | | 20 | SC | CLAYEY SAND WITH SANDSTONE ROCK FRAGMENTS (SC)<br>brown, medium dense, moist, angular sandstone to 3" dia. (fill) | | | | | | |
| 3–4 | MC | | 26 | CL | LEAN CLAY WITH SAND AND GRAVEL (CL)<br>dark brown, medium stiff to stiff, moist | PP | | 2,150 | | 19.1 | 99 |
| 5–6 | MC | | 55 | | | PP | | 2,250 | | | |
| 7 | | | | | ▼ Groundwater level following drilling | | | | | | |
| 8 | | | | | ▽ Groundwater level during drilling | | | | | | |
| 9–10 | MC | | 25 | | | PP | | 900 | | | |
| | | | | | | UC | | 767 | | 22.1 | 105 |
| 11–14 | | | | | | | | | | | |
| 14–15 | MC | | 12 | SC | CLAYEY SAND (SC)<br>dark yellowish brown, medium dense, wet, with gravel subrounded to subangular | | | | | | |
| 16–18 | | | | | | | | | | | |
| 19 | MC | | 12 | | Sieve Analysis, See Figure B-3 | | | | 50% | 80.9 | 108 |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 26 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-1a

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 1



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MC | | 12 | SC | | | | | | | |
| 21 | | | | | SILTY CLAYSTONE<br>bluish gray, thin bedded, fractured, low hardness, friable, deep weathering | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | MC | | 55 | | | | | | | | |
| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
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| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

Boring terminated at a depth of 26 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-1b

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 2



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 624 feet ± | | | | | | |
| | | | | | 2-inches concrete | | | | | | |
| | | | | | 6-inches asphalt base rock | | | | | | |
| 1 | MC | | 27 | | SILTY CLAYSTONE<br>olive brown, thin bedded, closely fractured, low to moderate hardness, weak to moderately strong, little weathering | PP | | >2250 | | | |
| 2 | | | | | | | | | | | |
| 3 | MC | | 74 | | Liquid Limit = 36%<br>Plasticity Index = 19%<br>See Figure B-1 | PP | | >2250 | | | |
| 4 | | | | | | | | | | | |
| 5 | MC | | 80/9" | | | PP | | >2250 | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | color changes to dark olive gray | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | SPT | | 83/ 10" | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 10 feet.
Boring backfilled with soil cuttings.
No groundwater encountered during drilling
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-2

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 3



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 617 feet ± | | | | | | |
| | | | | | 6-inches asphalt concrete | | | | | | |
| 1 | MC | ■ | 19 | CL/GC | LEAN CLAY WITH SAND AND RICK FRAGMENTS (CL/GC)<br>dark yellowish brown, medium stiff, moist (fill) | PP | | 2,000 | | 20.3 | 104 |
| 2 | | | | | Permeability Test, See Figure B-2 | | | | | | |
| 3 | MC | ■ | 16 | | | PP | | 1,825 | | | |
| 3 | | | | CL | LEAN CLAY WITH SAND AND GRAVEL (CL)<br>brown and very dark gray, medium stiff, moist (fill) | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | MC | ■ | 21 | | | | | >2250 | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | SILTY CLAYSTONE WITH INTERBEDDED FINE GRAINED SANDSTONE<br>olive brown, thin bedded, closely fractured, moderately hard, weak to moderately strong, moderately weathered, some alteration to clay along fractures | | | | | | |
| 9 | | | | | ▼ Groundwater level following drilling | | | | | | |
| 10 | MC | ■ | 79 | | | PP | | >2250 | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | MC | ■ | 63 | | ▽ Groundwater level during drilling | PP | | >2250 | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 15.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-3

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 4



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 599 feet ± | | | | | | |
| 1 | MC | | 4 | CH | SANDY FAT CLAY (CH)<br>very dark grayish brown, soft to medium stiff, moist | PP | | 600 | | | |
| 3 | MC | | 14 | GC | CLAYEY GRAVEL (GC)<br>very dark grayish brown. medium dense, moist, gravel subrounded to subangular | | | | | 19.1 | 106 |
| 5 | MC | | 11 | SC/SM | CLAYEY SAND (SC/SM) with some gravel<br>brown, loose, moist | | | | | | |
| 7 | | | | | ▼ Groundwater level following drilling | | | | | | |
| 9 | | | | | ▽ Groundwater level during drilling | | | | | | |
| 10 | MC | | 15 | | Sieve Analysis, See Figure B-3 | | | | 49% | | |
| 12 | | | | SC | CLAYEY SAND (SC) with gravel<br>brown, medium dense, wet | | | | | | |
| 15 | MC | | 20 | | | | | | | | |
| 17 | | | | | becomes loose | | | | | | |
| 19 | MC | | 6 | | Sieve Analysis, See Figure B-4 | | | | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 25 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-4a

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 4



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | MC | | 6 | SC | CLAYEY SAND (SC) with gravel<br>brown, medium dense, wet | | | | | | |
| 22 | SPT | | 4 | | | | | | 35% | | |
| 23 | | | | | SILTY SANDSTONE<br>yellowish brown, thin bedded, closely fractured, hard, moderately strong, little weathering | | | | | | |
| 24 | SPT | | 50/2" | | | | | | | | |
| 25 | | | | | Auger Refusal at 25 feet | | | | | | |
| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

Boring terminated at a depth of 25 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-4b

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 5



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 601 feet ± | | | | | | |
| 1 | MC | | 7 | CL | SANDY LEAN CLAY WITH GRAVEL (CL)<br>yellowish brown, soft to medium stiff, moist,<br>sandstone rock fragments to 3-inch dia. | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | MC | | 15 | | | PP | | 375 | | | |
| 4 | | | | | | | | | | | |
| 5 | MC | | 16 | | | PP | | 650 | | | |
| 6 | | | | CL | SANDY LEAN CLAY (CL)<br>dark yellowish brown, medium stiff, moist | | | | | | |
| 7 | | | | SC | CLAYEY SAND (SC) with gravel<br>yellowish brown, medium dense to dense, wet<br>Groundwater level following drilling<br>Groundwater level during drilling | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | MC | | 22 | | Sieve Analysis, See Figure B-4 | | | | 42% | 25.4 | 93 |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | CL/ ML | CLAYEY SILT WITH SAND<br>bluish gray, soft, wet, sand very fine grained | | | | | | |
| 15 | SPT | | 5 | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | CL | SANDY LEAN CLAY WITH ROCK FRAGMENTS (CL)<br>dark bluish gray, medium stiff, wet | | | | | | |
| 19 | MC | | 9 | | | PP | | 500 | | 27.4 | 98 |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 24.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-5a

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 5



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MC | | 9 | CL | SANDY LEAN CLAY WITH ROCK FRAGMENTS (CL)<br>dark bluish gray, medium stiff, wet | PP | | 500 | | 27.4 | 98 |
| 21 | | | | | SILTY CLAYSTONE<br>bluish gray and light yellowish brown, thin bedded, closely fractured, low hardness, weak, moderately weathered | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | SPT | | 52/6" | | | | | | | | |
| 25 | | | | | | | | | | | |
| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

Boring terminated at a depth of 24.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-5b

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 6



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Minute Man
Hammer weight/drop: 70lbs./30-inches Hammer type: Hand Held

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 647 feet ± | | | | | | |
| 1 | MC | | 21 | CL | LEAN CLAY (CL)<br>very dark grayish brown, medium stiff, moist, with angular sandstone rock fragments to 4-inch dia. and roots | PP | | 1,750 | | | |
| | | | | CL | LEAN CLAY (CL)<br>mottled brownish yellow and light gray, medium stiff, moist | | | | | | |
| 2 | SPT | | 19 | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | MC | | 60 | | | PP | | 2,200 | | | |
| 5 | SPT | | | | CLAYEY SILTSTONE<br>olive, thin bedded, closely fractured, low hardness, moderately strong, little weathering<br>Groundwater level following drilling | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | Groundwater level during drilling<br><br>sheared wet rock, possible slide plane at 9.5 feet | | | | | | |
| 10 | SPT | | 55/6" | | | | | | | | |
| 11 | | | | | Clayey siltstone continued | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | MC | | 90/8" | | | | | | | | |
| 16 | | | | | | | | | | | |
| | | | | | Auger Refusal at 17 feet | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 17 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-6

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 7



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Truck Mounted Mobile B-24
Hammer weight/drop: 140lbs./30-inches Hammer type: Cathead and Rope

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 605.5 feet ± | | | | | | |
| 1 | MC | | 18 | CL/CH | LEAN TO FAT CLAY (CL/CH)<br>dark grayish brown, medium stiff, moist, with sand and rock fragments | PP | | 800 | | | |
| 2 | | | | | | | | | | | |
| 3 | MC | | 30 | CL | LEAN CLAY (CL)<br>dark yellowish brown, medium stiff to stiff, moist<br><br>Liquid Limit = 43%<br>Plasticity Index = 22%<br>See Figure B-1 | PP | | 1,350 | | | |
| 4 | | | | | | | | | | | |
| 5 | MC | | 30 | | | PP | | 1,375 | | | |
| 6 | | | | | ▼ Groundwater level following drilling | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | ▽ Groundwater level during drilling | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | MC | | 23 | SC | CLAYEY SAND (SC) with gravel<br>dark yellowish brown, medium dense to dense, wet, gravel subangular to subrounded to 1-inch dia. | PP | | 875 | | 22.4 | 104 |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | CL | LEAN CLAY WITH GRAVEL (CL)<br>mottled yellowish brown, medium stiff, wet | | | | | | |
| 15 | SPT | | 51 | | | PP | | 1,250 | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 15.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-7

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 8



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Minute Man
Hammer weight/drop: 70lbs./30-inches Hammer type: Hand Held

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Elevation: 602.5 feet ± | | | | | | |
| 1 | MC | | 32 | CL | LEAN CLAY (CL)<br>dark grayish brown, medium stiff, moist, high silt and organic content | PP | | 1,350 | | | |
| | | | | CL | LEAN CLAY (CL)<br>very dark grayish brown, stiff, moist | | | | | | |
| 2 | MC | | 42 | | | PP | | 1,125 | | 21.5 | 103 |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | MC | | 44 | | | | | 2,250 | | | |
| 6 | | | | SC | CLAYEY SAND (SC) with gravel<br>yellowish brown, medium dense, moist<br>Groundwater level following drilling | | | | | | |
| 7 | | | | CL | LEAN CLAY (CL)<br>dark yellowish brown, medium stiff to stiff | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | MC | | 26 | | | PP | | 750 | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | MC | | 32 | | | PP | | 1,150 | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | CL | LEAN CLAY (CL)<br>mottled bluish gray and olive, medium stiff, moist<br>(residual soil?) | | | | | | |
| 19 | SPT | | 29 | | | PP | | 1,125 | | | |
| 20 | | | | | | | | | | | |

Boring terminated at a depth of 30.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-8a

Land/ Marine Geotechnics

PROJECT: **ST. JOHNS EPISCOPAL CHURCH**
Oakland, California

# Log of Boring 8



Boring location: See Site Plan, Figure 2
Logged by: John Wolfe
Date started: 3/23/05 Date finished: 3/23/05
Drilled By: RAM (B. Miles)
Drilling method: Minute Man
Hammer weight/drop: 70lbs./30-inches Hammer type: Hand Held

| DEPTH (feet) | INFORMATION: SAMPLE TYPE | Sample | Blows/Foot | LITHOLOGY | MATERIAL DESCRIPTION | LABORATORY TEST DATA: Type of Strength Test | Confining Pressure Lbs/Sq Ft | Shear Strength Lbs/Sq Ft | Fines % | Natural Moisture Content, % | Dry Density Lbs/Cu Ft |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | SPT | | 29 | | LEAN CLAY (CL)<br>mottled bluish gray and olive, medium stiff, moist<br>(residual soil?) | PP | | 1,125 | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | color changes to dark greenish gray | | | | | | |
| 25 | SPT | | 23 | | | PP | | 1,250 | | | |
| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| 30 | SPT | | 22 | | | PP | | 1,450 | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |

Boring terminated at a depth of 30.5 feet.
Boring backfilled with soil cuttings.
Groundwater level as shown.
Field blow counts are shown, no conversion factor used.

Project No.: 110.001
Figure: A-8b

Land/ Marine Geotechnics

| UNIFIED SOIL CLASSIFICATION SYSTEM | | | |
|---|---|---|---|
| **Major Divisions** | | **Symbols** | **Typical Names** |
| **Coarse-Grained Soils (more than half of soil > no.200 sieve)** | **Gravels** (More than half of coarse fraction > no. 4 sieve size) | **GW** | Well-graded gravels or gravel-sand mixtures, little or no fines |
| | | **GP** | Poorly-graded gravels or gravel-sand mixtures, little or no fines |
| | | **GM** | Silty gravels, gravel-sand-silt mixtures |
| | | **GC** | Clayey gravels, gravel-sand-clay mixtures |
| | **Sands** (More than half of coarse fraction < no. 4 sieve size) | **SW** | Well-graded sands or gravelly sands, little or no fines |
| | | **SP** | Poorly-graded sands or gravelly sands, little or no fines |
| | | **SM** | Silty sands, sand-silt mixtures |
| | | **SC** | Clayey sands, sand-clay mixtures |
| **Fine-Grained Soils (more than half of soil < no.200 sieve size)** | **Silts and Clays** LL = <50 | **ML** | Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts |
| | | **CL** | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays |
| | | **OL** | Organic silts and organic silt-clays of low plasticity |
| | **Silts and Clays** LL = >50 | **MH** | Inorganic silts of high plasticity |
| | | **CH** | Inorganic clays of high plasticity, fat clays |
| | | **OH** | Organic silts and clays of high plasticity |
| **Highly Organic Soils** | | **PT** | Peat and other highly organic soils |

| GRAIN SIZE CHART | | |
|---|---|---|
| **Classification** | **Range of Grain Sizes** | |
| | **U.S. Standard Sieve Size** | **Grain Size in Millimeters** |
| Boulders | Above 12" | Above 305 |
| Cobbles | 12 to 3" | 305 to 76.2 |
| Gravel | 3" to No.4 | 76.2 to 4.76 |
| coarse | 3" to 3/4" | 76.2 to 19.1 |
| fine | 3/4" to No.4" | 19.1 to 4.76" |
| Sand | No.4 to No.200 | 4.76 to 0.074 |
| coarse | No.4 to No.10 | 4.76 to 2.00 |
| medium | No.10 to No.40 | 2.00 to 0.420 |
| fine | No.40 to No.200 | 0.420 to 0.074 |
| Silt and Clay | Below No.200 | Below 0.074 |

## SAMPLE DESIGNATIONS/SYMBOLS

- Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered.
- Classification sample taken with Standard Penetration Test sampler
- Undisturbed sample taken with thin-walled tube
- Disturbed sample
- Sampling attempted with no recovery
- Core sample
- Analytical laboratory sample
- Sample taken with Direct Push sampler

| SAMPLER TYPE | | | |
|---|---|---|---|
| C | Core Barrel | PT | Pitcher Tube sampler using 3.0-inch outside diameter, thin-walled Shelby Tube |
| CA | California split-barrel sampler using 2.5-inch outside diamter and a 1.93-inch inside diameter | MC | Modified California split-barrel sampler with 3.0-inch outside diameter and a 2.43-inch inside diameter |
| D&M | Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube | SPT | Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter |
| O | Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby Tube | ST | Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure |

Land/ Marine Geotechnics

# SOIL CLASSIFICATION CHART

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Figure: **A-9**

Date: May 2005

Job Number: 110.001

## BEDDING OF SEDIMENTARY ROCKS

| | | |
|---|---|---|
| Very thick-bedded | Greater than 4.0 | Bed thickness in feet |
| Thick-bedded | 2.0 to 4.0 | |
| Thin-bedded | 0.2 to 2.0 | |
| Very thin-bedded | 0.05 to 0.2 | |
| Laminated | 0.01 to 0.05 | |
| Thinly laminated | less than 0.01 | |

## FRACTURING

| | | |
|---|---|---|
| Very little fractured | Greater than 4.0 | Size of pieces in feet |
| Occasionally fractured | 1.0 to 4.0 | |
| Moderately fractured | 0.5 to 1.0 | |
| Closely fractured | 0.1 to 0.5 | |
| Intensely fractured | 0.05 to 0.1 | |
| Crushed | less than 0.05 | |

## HARDNESS

| | |
|---|---|
| Soft | reserved for plastic material alone. |
| Low hardness | can be gouged deeply or carved easily with a knife blade. |
| Moderately hard | can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away. |
| Hard | can be scratched with difficulty; scratch produces little powder and is often faintly visible. |
| Very hard | cannot be scratched with knife blade; leaves a metallic streak. |

## STRENGTH

| | |
|---|---|
| Plastic | very low strength. |
| Friable | crumbles easily by rubbing with fingers. |
| Weak | an unfractured specimen of such material will crumble under light hammer blows. |
| Moderately strong | specimen will withstand a few heavy hammer blows before breaking. |
| Strong | specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments. |
| Very strong | specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments. |

## WEATHERING

| | |
|---|---|
| Deep | moderate to complete mineral decomposition, extensive disintegration, deep and thorough discoloration, many fractures, all extensively coated or filled with oxides. carbonates and/or clay or silt. |
| Moderate | slight change or partial decomposition of minerals, little disintegration; cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures. |
| Little | no megascopic decomposition of minerals; little or no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surfaces. |
| Fresh | unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints. |

Land/ Marine Geotechnics

**ROCK CLASSIFICATION CRITERIA**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

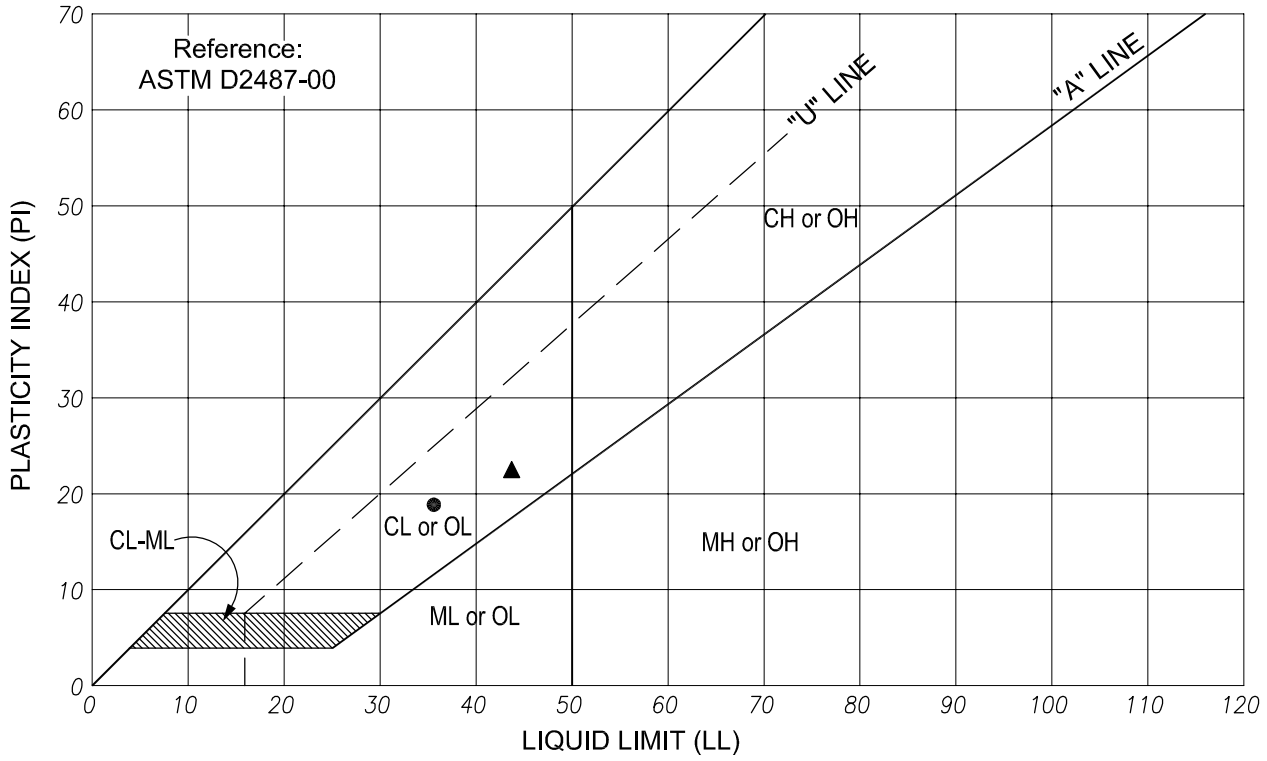
Figure: **A-10**

Date: May 2005

Job Number: 110.001

Land/
Marine
*Geotechnics*

# APPENDIX B
# LABORATORY TEST RESULTS




| Symbol | Source | Description & Classification | Natural M.C. (%) | Liquid Limit (%) | Plasticity Index (%) | % Passing #200 Sieve |
|---|---|---|---|---|---|---|
| ● | B-2 @ 1.0ft | Gray-brown CLAY (CL) | 13.2 | 36 | 19 | |
| ▲ | B-7 @ 2.5ft | LEAN CLAY (CL) | | 43 | 22 | |

Land/ Marine Geotechnics

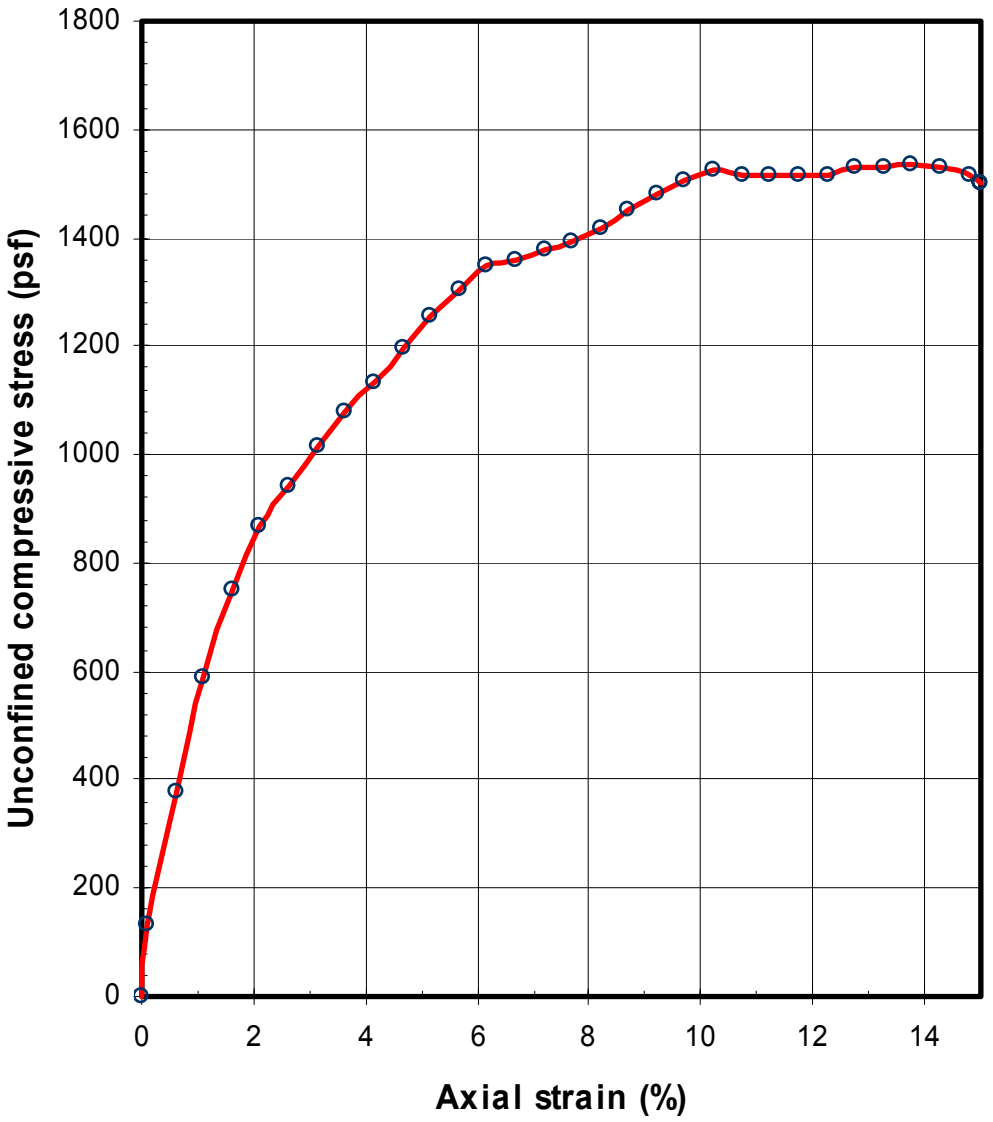
**PLASTICITY CHART**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Figure: **B-1**

Date: May 2005

Job Number: 110.001




(see worksheet for sketch of failure)

| | | | | | |
|---|---|---|---|---|---|
| Specimen Type | | | Undisturbed | Shear Strength (psf) | 2262 |
| Diameter (in.) | 2.42 | Height (in.) | 6.0 | Strain at Failure (%) | 8.2 |
| Moisture Content (%) | | | 18.5 | Strain Rate (in./min.) | 0.05 |
| Dry Density (pcf) | | | 109 | Confining Pressure (psf) | n/a |
| Source | | | B-1 at 14.5-ft. | Description | Red-brown CLAY (CL) |

Land/ Marine Geotechnics

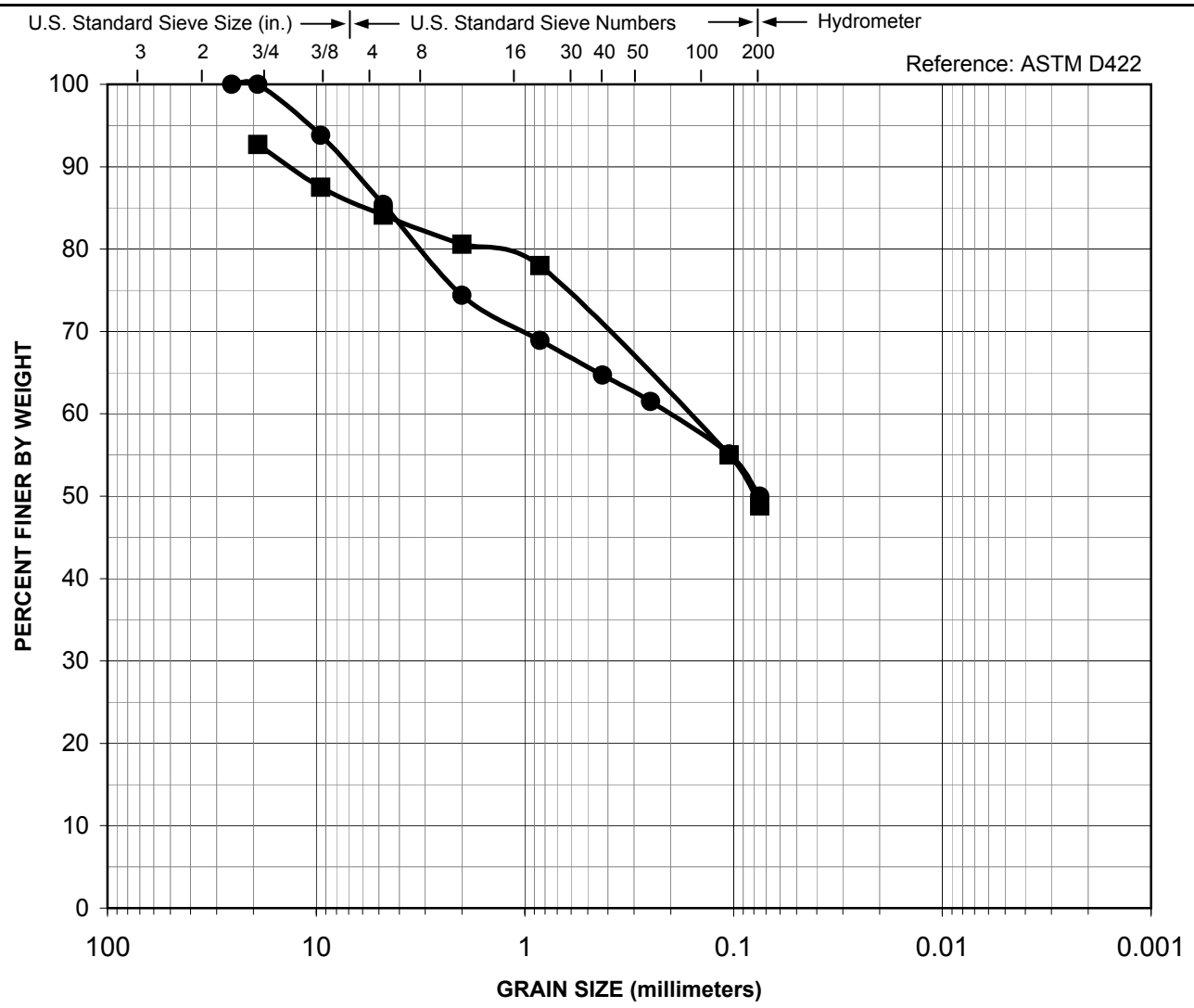
**UNCONFINED COMPRESSION TEST**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Figure: **B-2**

Date: May 2005

Job Number: 110.001




| Cobble | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

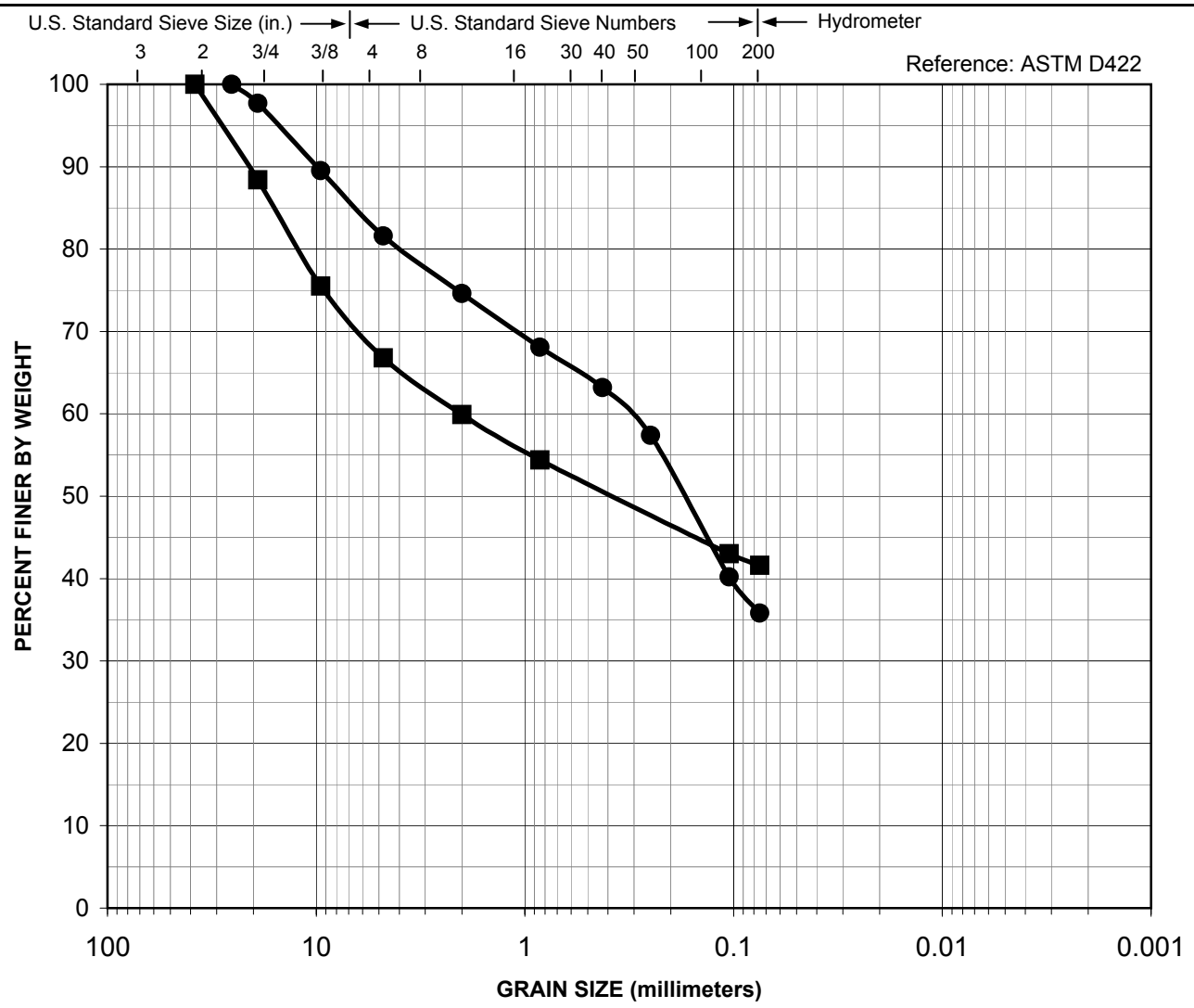
| Symbol | Sample Source | Classification |
|---|---|---|
| ● | B-1 at 19.5 feet | CLAYEY SAND (SC), light yellowish brown |
| ■ | B-4 at 9.5 feet | CLAYEY SAND (SC), brown |

Land/ Marine Geotechnics

**PARTICLE SIZE ANALYSIS**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Date: May 2005 | Project No.: 110.001 | Figure: **B-3**




| Cobble | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |

| Symbol | Sample Source | Classification |
|---|---|---|
| ● | B-4 at 20.5 feet | CLAYEY SAND (SC), brown |
| ■ | B-5 at 9.5 feet | CLAYEY SAND (SC), yellowish brown |

Land/ Marine Geotechnics

**PARTICLE SIZE ANALYSIS**

St. John's Episcopal Church
1701 Gouldin Road, Oakland, California

Date: May 2005 | Project No.: 110.001 | Figure: **B-4**

**DISTRIBUTION**

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Oakland, California 94607

1 copy: Mr. Eric Haesloop
Turnbull, Griffin & Haesloop Architects
817 Bancroft Way
Berkeley, California 94710

**APPENDIX I**

# TRAFFIC AND CIRCULATION

- Traffic Study – April 9, 2007
- Supplemental Transportation and Parking Study – July 15, 2008
- Addendum to the Supplemental Transportation and Parking Study – September 23, 2008
- St. John's Episcopal Church Calendar
- Intersection Level of Service and Peak-Hour Warrants Calculation Sheets

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*traffic@dowlinginc.com*

Dowling Associates, Inc.

**Date:** April 9th, 2007

# Memorandum

| | |
|---|---|
| **To:** | Ed Manasi, City of Oakland |
| | Ceasar Quitivis, City of Oakland |
| **cc:** | Jerry Moran, St Johns Episcopal Church, Oakland |
| **From:** | Madhav Pai, Dowling Associates, Inc. |
| | Alice Chen, Dowling Associates, Inc. |
| **Reference #:** | P07-022 |
| **Subject:** | Traffic Study – Renovation at St Johns Episcopal Church, Oakland |

## Introduction

Dowling Associates has completed analysis of traffic impacts for the proposed renovation work at the St Johns Episcopal Church in the City of Oakland located at 1707 Gouldin Road. An operations analysis was done to determine if the renovation work impacted traffic along Thornhill Drive. We also studied the existing site circulation and parking and recommended changes to the proposed site circulation and parking after the renovation work is completed. This memo summarizes the project description, study methodology and the findings of the study.

## Summary of Findings and Recommendations

- During the Sunday peak hour Level of Service (LOS) B was observed on Thornhill Drive at Gouldin Road and Thornhill Drive at Alhambra Lane. The proposed renovation work would generate 2 additional weekday and 25 additional Sunday peak hour trips. Since the additional trips generated are very small, the project will not have any significant impacts to existing traffic operations that would require any mitigation.
- Relocating the Church entrance to Thornhill Drive will not have any significant impacts to existing traffic operations that would require any mitigation.
- The parking spaces eliminated by the construction of the new sanctuary on the south side of the property will be replaced by the parking along the driveway from the new entrance.

## Existing Condition

The project site is located along Thornhill Drive between Gouldin Road and Alhambra Lane. Thornhill Elementary School is south of the site on the other side of Alhambra Lane.

Based on information provided by the Church the current activities at the Church site are listed below.

- Church staff: The Church employs one full time staff person and eight part-time staff persons that enter and leave at different times.
- Weekly Church services: The Church has three services on a typical Sunday morning. Tandem parking is a problem on normal Sundays especially for the last service. Some members regularly use the Thornhill Elementary School playground for parking. The Church services and their approximate attendances are as follows
    1. 7:45 AM – 30 persons
    2. 9:00 AM – 75 persons
    3. 10:45 AM – 100 persons
- Special Church services: There are four special services a year including Christmas and Easter. The attendance numbers are approximately doubled for these events. The parking lot is full, with most cars parked in non-designated parking spaces. There is also an increased use of parking in the playground at the elementary school. For funerals the average attendance is approximately 150 persons.
- Church Meetings: Fifteen regularly scheduled meetings occur at the Church in addition to the services. The majority of these occur in the evenings. Non-Church or community meetings average about twenty per week or 3 to 4 meetings per day.
- Thornhill Elementary School: The Church site is used by the Thornhill Elementary School. Parents use the Gouldin Road ingress to drop-off or pick-up students. The faculty and staff use the site on school days for parking.

**Traffic Operations:** Two intersections likely to be affected by the project are Thornhill Drive at Gouldin Road and Thornhill Drive at Alhambra Lane. Sunday is the peak activity period at the Church. An intersection traffic count was conducted on Thornhill Drive at Gouldin Road and Alhambra Lane on Sunday March 18th between 9:30 AM and 12:30 PM. A total of 69 vehicles were observed exiting the site at Alhambra Lane during the 3 hour period. At the peak one hour, 35 cars exited the site between 10:15 and 11:15 AM. The cars enter and exit the site at a steady rate with no unusual spike. Both intersections operate at Level of Service (LOS) B during the Sunday peak hour. The detailed three hour traffic counts are in Appendix I.

**Site Circulation**: The entrance to the project site is at 1707 Gouldin Road. The entrance is one-way. The vehicles exit the site on to Thornhill Drive from Alhambra Lane. The current circulation patterns at the site are shown in Figure 1. Vehicles enter the site on Gouldin Road. There is a steep downgrade at the entrance and the entering vehicles have limited sight distance. Vehicles exit the site on Alhambra Lane. Vehicles turning left onto Thornhill Drive, due to limited sight distance, need to pull out into the crosswalk.

**Parking:** The four parking areas on the site are marked in Figure 1. Area 1 has five spaces, Area 2 has eleven spaces and Area 3 has fifteen spaces. Area 4 has parking along the sanctuary structure and an open space extending all the way to the edge of the property. Tandem parking occurs in the open space. Twelve to eighteen vehicles can fit in

this space depending upon how they are parked. There are a total of 56 designated spaces on the site.

Some cars were observed to be parked in non-designated areas. At one point in time, 62 cars were observed on the Church site on Sunday March 18th by Dowling Associates staff.

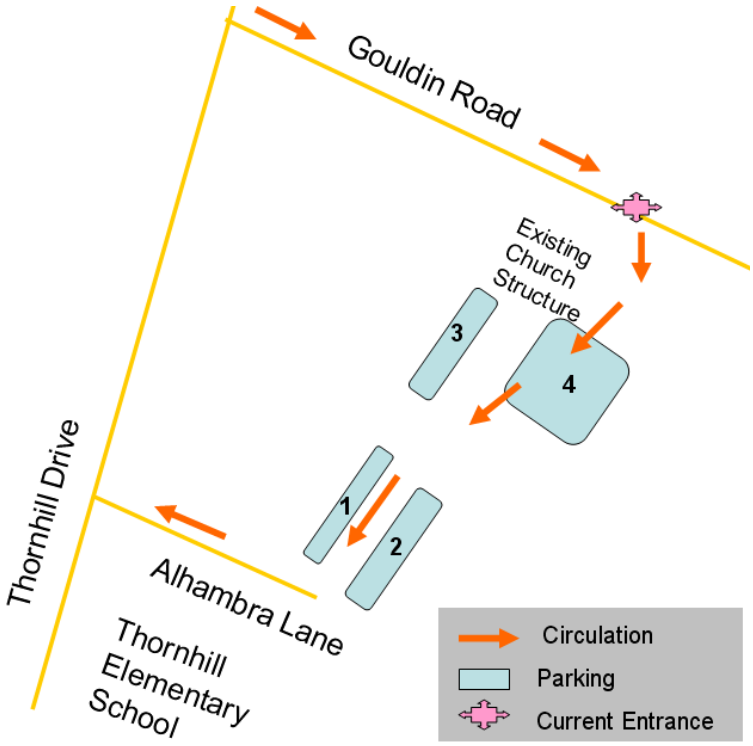



**Figure 1 – Existing site circulation and parking situation**

## Project Description

The proposed renovation work includes construction of a new 5,500 square foot sanctuary structure. The new structure will be able to accommodate 15% more seats at the place of worship. The current sanctuary structure doubles up as a place of worship and a Parish Hall. With the new sanctuary in place, the old structure will serve as a social hall. As per the Church officials there will be no simultaneous use of the social hall and the proposed new sanctuary.

The project also involves

- Relocating the entrance to the Church from Gouldin Road to Thornhill Drive
- Changes to the existing parking situation. The new sanctuary will be built on the parking at the south end of the site.

## Impact Analysis

**Trip Generation:** The existing maximum capacity of the Church is 230 seats (201-Seats, 24-Choir and 5 Clergy). After the renovation work is completed the seats will increase by a maximum of 15%. The increased trip generation is estimated to be less than 25 trips. The project trip generation calculations are based on equations published in the standard reference *Trip Generation* (Institute of Transportation Engineers (ITE), 7th Edition, 2003). ITE trip generation manual provides rates by seat for the Sunday peak hour only. For the weekday AM and PM peak hours, trip generation rates provided are per 1000 square feet. Tables 1 & 2 summarizes the estimated project trip generation.

**Table 1 – Sunday Peak Hour Trip Generation**

| | | Sunday Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|
| | | Rates | | | Trips | | |
| | Size | Total | % In | % Out | Total | In | Out |
| Existing | 225 (Seats) | 1 | 50 | 50 | 142 | 71 | 71 |
| 15% Increase | 259 (Seats) | 1 | 50 | 50 | 164 | 82 | 82 |
| Project Trips | | | | | 22 | 11 | 11 |

**Table 2 – Weekday AM & PM Peak Hour Trip Generation**

| Land Use | | AM Peak Hour | | | | | | PM Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rates | | | Trips | | | Rates | | | Trips | | |
| | Size | Total | % In | % Out | Total | In | Out | Total | % In | % Out | Total | In | Out |
| Existing | 7700 (Sq.ft) | (a) | 50% | 50% | 11 | 6 | 5 | (b) | 59% | 41% | 11 | 7 | 4 |
| 15% Increase | 8855 (Sq.ft) | (a) | 50% | 50% | 13 | 7 | 6 | (b) | 59% | 41% | 13 | 8 | 5 |
| Project Trips | | | | | 2 | 1 | 1 | | | | 2 | 1 | 1 |

Source: Dowling Associates, based on Institute of Transportation Engineers, *Trip Generation*, 7th Edition, 2003.

**Traffic Operations:** Since the proposed project would generate less than 2 weekday and 25 Sunday peak hour trips, it is not expected to affect the existing LOS at the intersections along Thornhill Drive. City of Oakland threshold to require an intersection LOS impact analysis is 25 trips peak hours trips. As per City of Oakland's Table 1: Level of Analysis - "Oakland TSD SOP Transportation Study Guidelines - Working Draft - March16-2006".

**Proposed Site Circulation and Parking:** The project involves relocating the entrance to the Church from Gouldin Road to Thornhill Drive. Figure 2 shows the proposed change in

circulation patterns. A two-way driveway is proposed at the new entrance with 90 degree parking spaces provided along the driveway. The new driveway will remove 5 spaces in Area 3 on Figure 2. The new sanctuary will be built on the parking at the south end of the site. The renovation work will remove 28 to 30 parking spaces which will be replaced by 30 new 90 degree parking spaces along the new driveway.

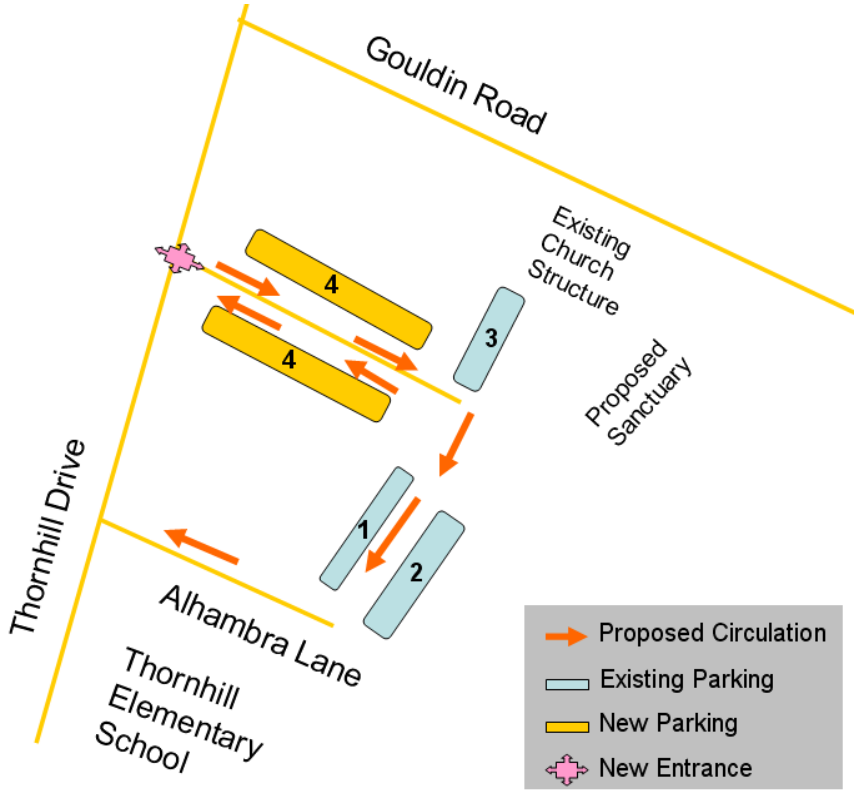



**Figure 2 – Proposed site circulation and parking situation**

## Recommendations

Suggestions to improve existing site circulation

- Vehicles turning left onto Thornhill Drive while exiting from Alhambra Lane need to pull out into the crosswalk due to limited sight distance. There is a slight downgrade right at the exit. Repaving and raising the pavement to be at the same level as Thornhill Drive will improve sight distance.

- An advisory sign can be put up to prevent vehicles associated with a school pick-up or drop off to enter on Alhambra Lane. The sign could either say "School Trips – Next Right Turn" or a no U-Turn sign during school hours on Alhambra Lane. A note along the same lines can be posted on the Thornhill Elementary School website or distributed to parents. U-turns on Alhambra Lane affect the one way circulation pattern on the site.

**Appendix I** – Traffic Counts on Thornhill Drive at Gouldin Road and Thornhill Drive at Alhambra Lane , 9:30 AM to 12:30 AM Sunday March 18th, 2007**.**

# WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

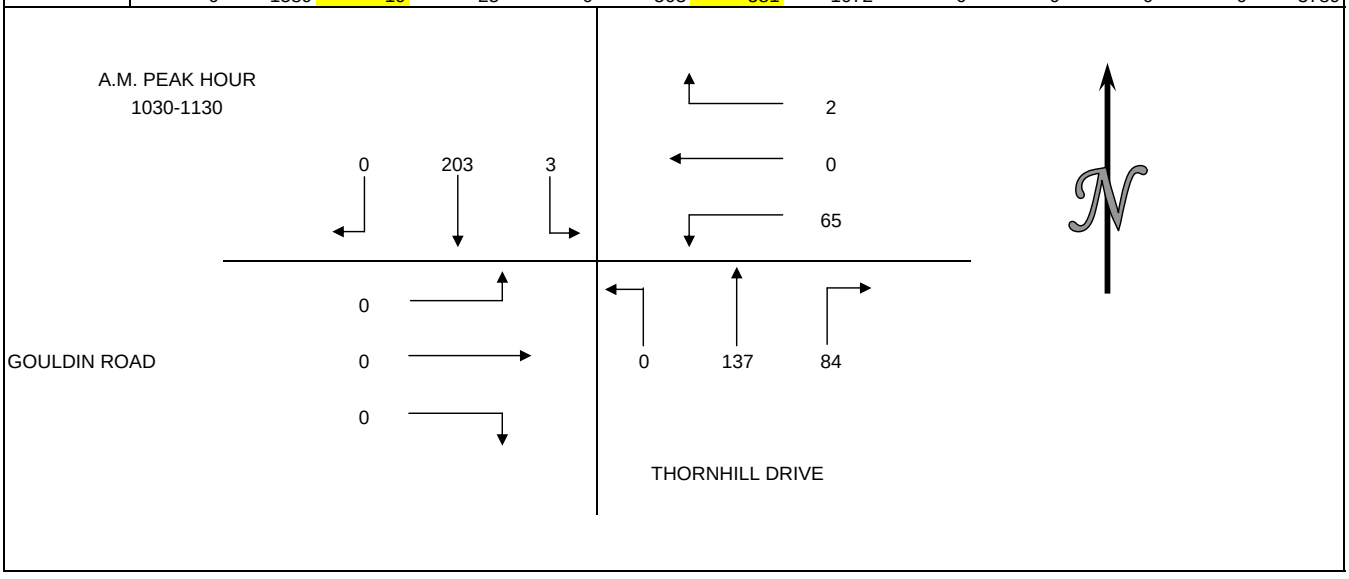
CLIENT: DOWLING ASSOCIATES
PROJECT: OAKLAND TRAFFIC COUNTS
DATE: SUNDAY, MARCH 18, 2007
PERIOD: 9:30 AM TO 12:30 AM
INTERSECTION: N/S THORNHILL DRIVE
E/W GOULDIN ROAD

15 MIN COUNTS

| PERIOD | 1 SBRT | 2 SBTH | 3 SBLT | 4 WBRT | 5 WBTH | 6 WBLT | 7 NBRT | 8 NBTH | 9 NBLT | 10 EBRT | 11 EBTH | 12 EBLT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930-945 | 0 | 32 | 0 | 0 | 0 | 10 | 8 | 18 | 0 | 0 | 0 | 0 | 68 |
| 945-1000 | 0 | 32 | 0 | 1 | 0 | 10 | 18 | 24 | 0 | 0 | 0 | 0 | 85 |
| 1000-1015 | 0 | 38 | 0 | 3 | 0 | 16 | 15 | 22 | 0 | 0 | 0 | 0 | 94 |
| 1015-1030 | 0 | 38 | 1 | 1 | 0 | 12 | 13 | 18 | 0 | 0 | 0 | 0 | 83 |
| 1030-1045 | 0 | 52 | 0 | 0 | 0 | 16 | 28 | 31 | 0 | 0 | 0 | 0 | 127 |
| 1045-1100 | 0 | 53 | 0 | 0 | 0 | 22 | 33 | 31 | 0 | 0 | 0 | 0 | 139 |
| 1100-1115 | 0 | 46 | 2 | 1 | 0 | 15 | 12 | 36 | 0 | 0 | 0 | 0 | 112 |
| 1115-1130 | 0 | 52 | 1 | 1 | 0 | 12 | 11 | 39 | 0 | 0 | 0 | 0 | 116 |
| 1130-1145 | 0 | 43 | 0 | 0 | 0 | 10 | 9 | 29 | 0 | 0 | 0 | 0 | 91 |
| 1145-1200 | 0 | 38 | 1 | 0 | 0 | 12 | 13 | 33 | 0 | 0 | 0 | 0 | 97 |
| 1200-1215 | 0 | 40 | 0 | 1 | 0 | 14 | 10 | 36 | 0 | 0 | 0 | 0 | 101 |
| 1215-1230 | 0 | 49 | 0 | 0 | 0 | 13 | 9 | 33 | 0 | 0 | 0 | 0 | 104 |

HOUR TOTALS

| TIME | 1 SBRT | 2 SBTH | 3 SBLT | 4 WBRT | 5 WBTH | 6 WBLT | 7 NBRT | 8 NBTH | 9 NBLT | 10 EBRT | 11 EBTH | 12 EBLT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930-1030 | 0 | 140 | 1 | 5 | 0 | 48 | 54 | 82 | 0 | 0 | 0 | 0 | 330 |
| 945-1045 | 0 | 160 | 1 | 5 | 0 | 54 | 74 | 95 | 0 | 0 | 0 | 0 | 389 |
| 1000-1100 | 0 | 181 | 1 | 4 | 0 | 66 | 89 | 102 | 0 | 0 | 0 | 0 | 443 |
| 1015-1115 | 0 | 189 | 3 | 2 | 0 | 65 | 86 | 116 | 0 | 0 | 0 | 0 | 461 |
| 1030-1130 | 0 | 203 | 3 | 2 | 0 | 65 | 84 | 137 | 0 | 0 | 0 | 0 | 494 |
| 1045-1145 | 0 | 194 | 3 | 2 | 0 | 59 | 65 | 135 | 0 | 0 | 0 | 0 | 458 |
| 1100-1200 | 0 | 179 | 4 | 2 | 0 | 49 | 45 | 137 | 0 | 0 | 0 | 0 | 416 |
| 1115-1215 | 0 | 173 | 2 | 2 | 0 | 48 | 43 | 137 | 0 | 0 | 0 | 0 | 405 |
| 1130-1230 | 0 | 170 | 1 | 1 | 0 | 49 | 41 | 131 | 0 | 0 | 0 | 0 | 393 |
| | 0 | 1589 | 19 | 25 | 0 | 503 | 581 | 1072 | 0 | 0 | 0 | 0 | 3789 |



# WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

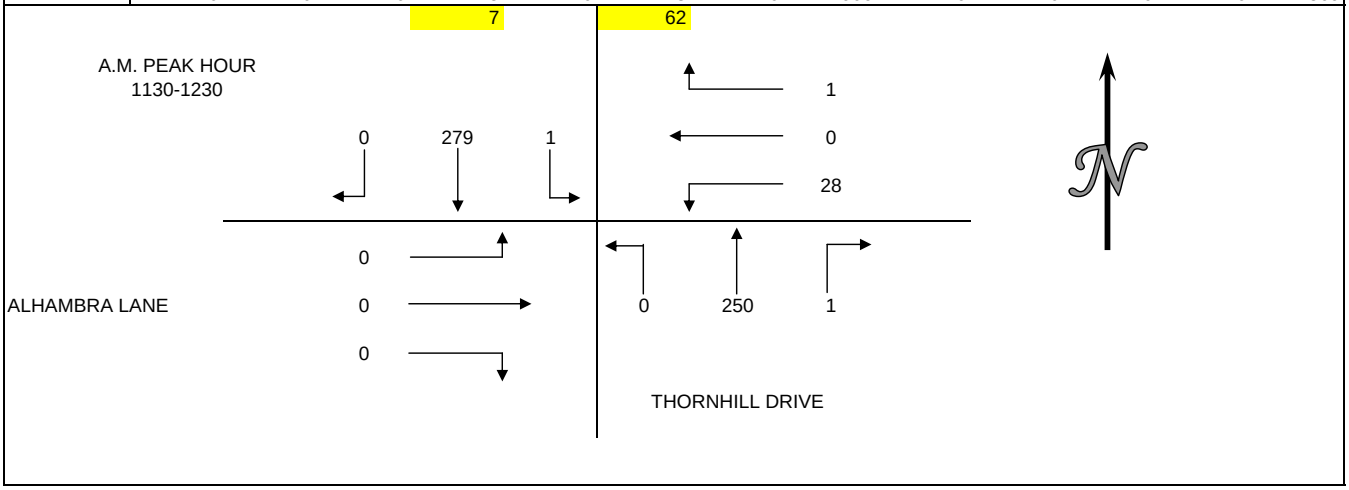
CLIENT: DOWLING ASSOCIATES
PROJECT: OAKLAND TRAFFIC COUNTS
DATE: SUNDAY, MARCH 18, 2007
PERIOD: 9:30 AM TO 12:30 AM
INTERSECTION: N/S THORNHILL DRIVE
E/W ALHAMBRA LANE

15 MIN COUNTS

| PERIOD | 1 SBRT | 2 SBTH | 3 SBLT | 4 WBRT | 5 WBTH | 6 WBLT | 7 NBRT | 8 NBTH | 9 NBLT | 10 EBRT | 11 EBTH | 12 EBLT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930-945 | 0 | 58 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 100 |
| 945-1000 | 0 | 58 | 0 | 0 | 0 | 3 | 1 | 47 | 0 | 0 | 0 | 0 | 109 |
| 1000-1015 | 0 | 65 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 98 |
| 1015-1030 | 0 | 73 | 0 | 0 | 0 | 5 | 0 | 49 | 0 | 0 | 0 | 0 | 127 |
| 1030-1045 | 0 | 63 | 1 | 1 | 0 | 7 | 1 | 44 | 0 | 0 | 0 | 0 | 117 |
| 1045-1100 | 0 | 72 | 0 | 5 | 0 | 13 | 0 | 60 | 0 | 0 | 0 | 0 | 150 |
| 1100-1115 | 0 | 64 | 0 | 0 | 0 | 4 | 0 | 50 | 0 | 0 | 0 | 0 | 118 |
| 1115-1130 | 0 | 67 | 1 | 0 | 0 | 2 | 0 | 60 | 0 | 0 | 0 | 0 | 130 |
| 1130-1145 | 0 | 79 | 0 | 0 | 0 | 3 | 1 | 58 | 0 | 0 | 0 | 0 | 141 |
| 1145-1200 | 0 | 65 | 0 | 0 | 0 | 3 | 0 | 63 | 0 | 0 | 0 | 0 | 131 |
| 1200-1215 | 0 | 69 | 1 | 0 | 0 | 5 | 0 | 69 | 0 | 0 | 0 | 0 | 144 |
| 1215-1230 | 0 | 66 | 0 | 1 | 0 | 17 | 0 | 60 | 0 | 0 | 0 | 0 | 144 |

HOUR TOTALS

| TIME | 1 SBRT | 2 SBTH | 3 SBLT | 4 WBRT | 5 WBTH | 6 WBLT | 7 NBRT | 8 NBTH | 9 NBLT | 10 EBRT | 11 EBTH | 12 EBLT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930-1030 | 0 | 254 | 0 | 0 | 0 | 8 | 1 | 171 | 0 | 0 | 0 | 0 | 434 |
| 945-1045 | 0 | 259 | 1 | 1 | 0 | 15 | 2 | 173 | 0 | 0 | 0 | 0 | 451 |
| 1000-1100 | 0 | 273 | 1 | 6 | 0 | 25 | 1 | 186 | 0 | 0 | 0 | 0 | 492 |
| 1015-1115 | 0 | 272 | 1 | 6 | 0 | 29 | 1 | 203 | 0 | 0 | 0 | 0 | 512 |
| 1030-1130 | 0 | 266 | 2 | 6 | 0 | 26 | 1 | 214 | 0 | 0 | 0 | 0 | 515 |
| 1045-1145 | 0 | 282 | 1 | 5 | 0 | 22 | 1 | 228 | 0 | 0 | 0 | 0 | 539 |
| 1100-1200 | 0 | 275 | 1 | 0 | 0 | 12 | 1 | 231 | 0 | 0 | 0 | 0 | 520 |
| 1115-1215 | 0 | 280 | 2 | 0 | 0 | 13 | 1 | 250 | 0 | 0 | 0 | 0 | 546 |
| 1130-1230 | 0 | 279 | 1 | 1 | 0 | 28 | 1 | 250 | 0 | 0 | 0 | 0 | 560 |
| | 0 | 2440 | 10 | 25 | 0 | 178 | 10 | 1906 | 0 | 0 | 0 | 0 | 4569 |
| | | | | 7 | | 62 | | | | | | | |



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Dowling Associates, Inc.

**Date:** July 15, 2008

# Memorandum

**To:** Steve Noack, Design, Community, & Environment (DC&E)

**From:** Alice Chen and Kamala Parks, Dowling Associates, Inc.

**Reference #:** P08054

**Subject:** Supplemental Transportation and Parking Study for the Renovation at St John's Episcopal Church, Oakland

Dowling Associates has prepared a focused transportation and parking study for the Renovation at St. John's Episcopal Church. The analysis focuses on weekday traffic conditions during morning drop-off and afternoon pick-up at Thornhill Elementary School. This study supplements previous analysis of weekend traffic operations, site circulation, and parking supply.

## Existing Weekday Conditions

Under existing weekday conditions, the church facilities are used by the Thornhill Elementary School for student drop-off and pick-up as well as for staff parking. Dowling Associates conducted counts at the peak-hours of trip generation for Thornhill Elementary School. The school has different drop-off and pick-up times for Kindergarten students as compared to Grades 1 through 5 students. Kindergarten students arrive for an 8:20 AM start, but the rest of the students arrive in time for the 8:40 AM class time. On regular (non-minimum) school days, Kindergarten students are dismissed at 2:15 PM and Grades 1 through 5 students are dismissed at 3:00 PM. Timing of the traffic counts was determined by the Grades 1 through 5 students' class schedules. The vehicle intersection turning movement counts were done on Tuesday, May 13, 2008 from 8:15 to 8:45 AM and 2:45 to 3:15 PM at the following study intersections:

1. Thornhill Drive & Gouldin Road
2. Thornhill Drive & Alhambra Lane

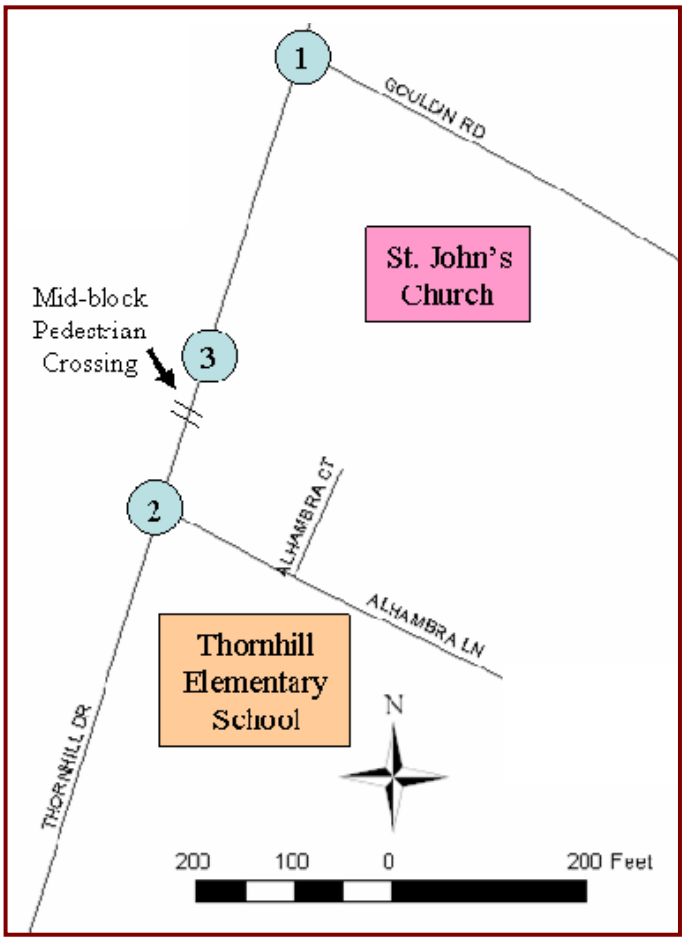
Following the City of Oakland's orientation standards, roadways that run parallel to the Oakland hills are considered east-west, while those that run perpendicular are north-south. Thus, orientations of all roadways in or near the study area are as follows:

| North-South | East-West |
|---|---|
| Thornhill Drive | Gouldin Road |
| Alhambra Court | Alhambra Lane |

Figure 1 shows these study locations. A summary of the counts is provided as an attachment.

At these same times and locations, bicyclists passing through the study intersections were counted. Pedestrian crossings were also counted at the two intersections, as well as at the mid-block pedestrian crossing on Thornhill Drive between Gouldin Road and Alhambra Lane.

**Figure 1: Study Locations**




Weekday Traffic Operations

Vehicle levels of service (LOS) were calculated at the two existing study intersections using the Traffix software, employing the *2000 Highway Capacity Manual* methodology for unsignalized intersections. LOS is a qualitative measure that calculates weighted average delay and assigns a grade from LOS "A" to "F", with LOS "A" representing little or no delay and LOS "F" representing excessive delay and congestion. At side-street stop-controlled intersections, the LOS grade is assigned based on the intersection leg experiencing the worst delay.

Typically, LOS is calculated using the volumes for the highest hour (sixty minutes). Since counts were conducted for the 30 minutes to capture the school's peak activity periods, the intersection turning movement volumes were doubled to create a full hour of vehicle volumes for analysis. Pedestrian volumes were increased by 50% to create a full hour for analysis. These estimations most likely provide higher volumes than would have been counted in a full-hour, as the counts were conducted at the peak trip generation times for the school.

The results of the LOS analysis are contained in Table 1, which display LOS and delay for both the worst leg and overall intersection.

**Table 1: Vehicle Intersection Levels of Service**

| | | | AM | | PM | |
|---|---|---|---|---|---|---|
| **Intersection** | | | **LOS** | **Delay** | **LOS** | **Delay** |
| 1 | Thornhill Drive & Gouldin Road | Worst Leg | D | 32.5 | B | 14.3 |
| | | Overall Intersection | A | 4.0 | A | 1.4 |
| 2 | Thornhill Drive & Alhambra Lane | Worst Leg | C | 17.0 | B | 12.2 |
| | | Overall Intersection | A | 1.5 | A | 1.2 |
| 3 | Thornhill Drive & New St. John's driveway | Worst Leg | C | 17.1 | B | 12.4 |
| | | Overall Intersection | A | 1.7 | A | 1.3 |

LOS at one- or two-way stop-controlled intersections is based on the leg with the worst weighted average delay, which is measured as seconds per vehicle. The LOS and delay for both the overall intersection and the intersection leg with the worst LOS are reported here.

AM counts were done from 8:15 to 8:45 AM and PM counts were done from 2:45 to 3:15 PM on Tuesday, May 13, 2008. Vehicle volumes were doubled and pedestrian volumes were increased by 50% to conduct the analysis for the peak-hour.

Calculated by Dowling Associates, Inc in June 2008 using TRAFFIX © version 7.9 Build R4

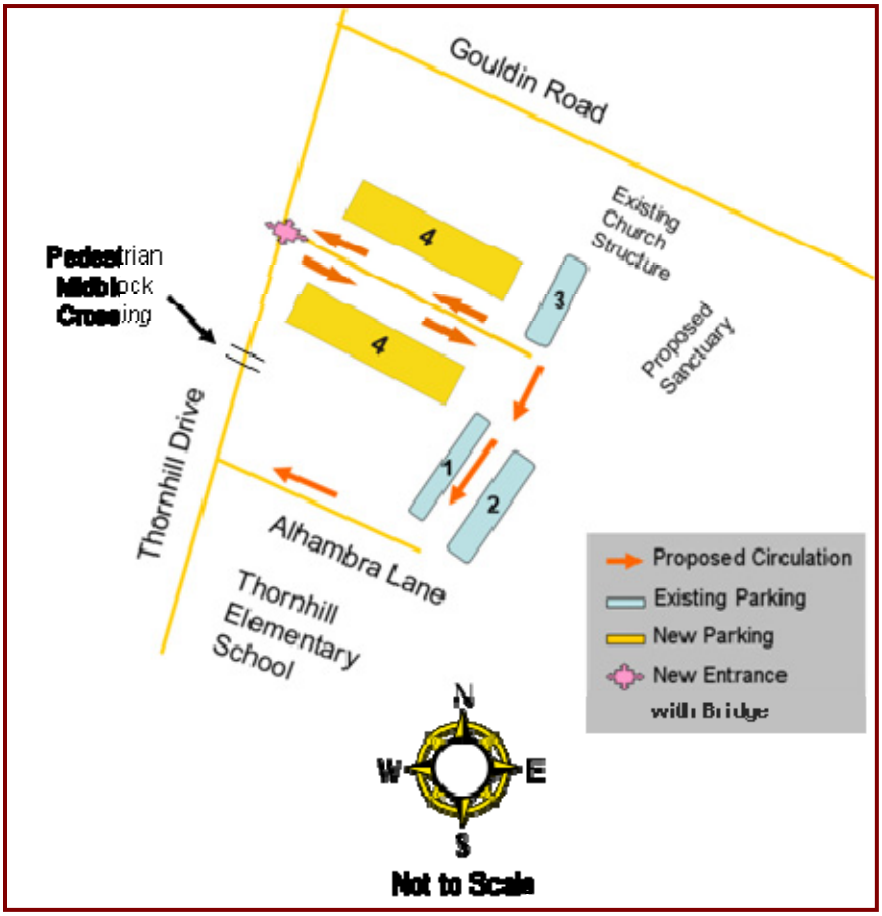
Results from the analysis found both existing intersections operated at LOS D or better, which is within Oakland's LOS standard for intersections located outside of the downtown area.

School Circulation and Access

Thornhill Elementary School uses about ten (10) on-street parking spaces in front of the school on Thornhill Drive south of Alhambra Lane for drop-off and pick-up operations. A few drivers were observed performing U-turns on Thornhill Drive at the intersections of Gouldin Road and Alhambra Lane after dropping off or picking up students. Several drivers parked their vehicles on the west side of Thornhill Drive between Alhambra Lane

and the mid-block pedestrian crossing to park all day or to escort students to and from school. The majority of these drivers performed a 3-point turn in order to park on the opposite side of the roadway. It should be noted that parking in this location is illegal. Additionally, St. John's Episcopal Church allows the use its parking lot to the school for pick-up and drop-off circulation, as well as overflow parking for faculty, staff, and volunteers. Vehicles associated with the school enter the parking lot at Gouldin Road, which is a one-way entrance. There is a steep downgrade at the entrance and the entering vehicles have limited sight distance. They either park in the lot or enter Alhambra Lane for drop-offs or pick-ups. The vehicles exit the site from Alhambra Lane, which is one-way westbound from Alhambra Court to Thornhill Drive. Vehicles turning left onto Thornhill Drive from Alhambra Lane need to pull out into the crosswalk due to limited sight distance. The current circulation patterns at the site are shown in Figure 2.

**Figure 2: Existing Site Circulation and Parking Areas**




During the AM and PM 30-minute counts, no bicyclists were observed at the study intersections. There were, however, sizeable pedestrian volumes observed, especially during the morning. These 30-minute pedestrian volumes are summarized in Table 2.

**Table 2: AM and PM Pedestrian Volumes (30-minute)**

| Intersection | Time | Intersection Leg North | East | South | Total |
|---|---|---|---|---|---|
| 1 Thornhill Drive & Gouldin Road | AM | 0 | 17 | 0 | **17** |
| | PM | 0 | 11 | 0 | **11** |
| 2 Thornhill Drive & Alhambra Lane | AM | 6 | 50 | 0 | **56** |
| | PM | 4 | 20 | 2 | **26** |

| Location | Time | Crosswalk In * | Out * | Total |
|---|---|---|---|---|
| Mid-block crosswalk on Thornhill Dr between Gouldin Rd and Alhambra Ln | AM | 19 | 10 | **29** |
| | PM | 7 | 2 | **9** |

AM counts were done from 8:15 to 8:45 AM and PM counts were done from 2:45 to 3:15 PM on Tuesday, May 13, 2008.

***In** means that pedestrians crossed within the marked crosswalk; **Out** means that pedestrians crossed outside of the marked crosswalk.

Pedestrians use the mid-block crossing (located in Figure 1) because there is a public staircase on the west side of Thornhill Drive, shown in Photo 2 below, which provides access to homes in the hilly areas. Drivers who park on the west side of Thornhill Drive between Alhambra Lane and the mid-block pedestrian crosswalk tend to cross where their cars are parked. This is because accessing the mid-block crosswalk would require walking in the travel lane, as there is no room on the shoulder for both parked vehicles and pedestrians, shown in Photo 1 below. Additionally, most drivers who park here are accessing the Thornhill Elementary School, which is located in the opposite direction of the crosswalk. There were no observed pedestrian-vehicle conflicts at these intersections or at the mid-block crosswalk.

*Photo 1 - Parking on west side of Thornhill Drive between Alhambra Lane and mid-block pedestrian crossing*

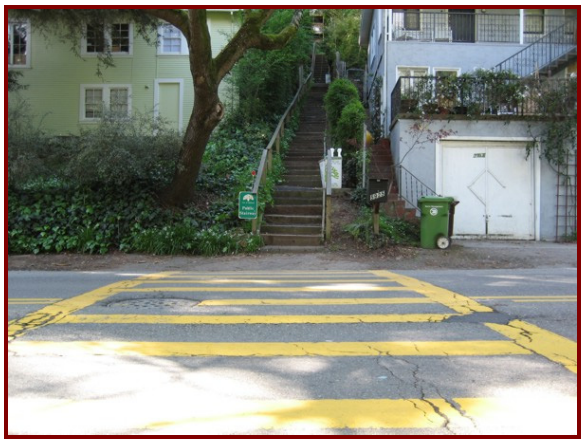


*Photo 2 – Mid-block pedestrian crossing and public staircase*

Parking

St. John's Church currently has 225 seats and its parking lot contains approximately fifty-six (56) designated stalls, but is able to accommodate more parked vehicles in undesignated locations on-site. Figure 2 displays existing parking areas.

**Project Impacts**

The new driveway for the proposed project (Intersection 3) meets Thornhill Drive about 180 feet south of Gouldin Road and 40 feet north of the mid-block pedestrian crossing.

Weekday Traffic Operations

Volumes for proposed project driveway were derived from counts at the adjacent intersections. It was assumed that all northbound right-turning vehicles and southbound left-turning vehicles at Gouldin Road were associated with the school. Likewise, it was assumed that all westbound left- and right-turning vehicles at Alhambra Lane were associated with the school. For the impact analysis, these turning movement volumes were shifted to the new driveway, which results in higher volumes at the new driveway since some traffic could still use Alhambra Lane to exit the church parking lot. Southbound through volumes at the new driveway were derived from volumes at Gouldin Road and northbound through volumes at the new driveway were derived from volumes at Alhambra Lane.

As shown in Table 1 above, the new driveway on Thornhill Drive would operate at acceptable levels of service during the AM drop-off and PM pick-up associated with the Thornhill Elementary School.

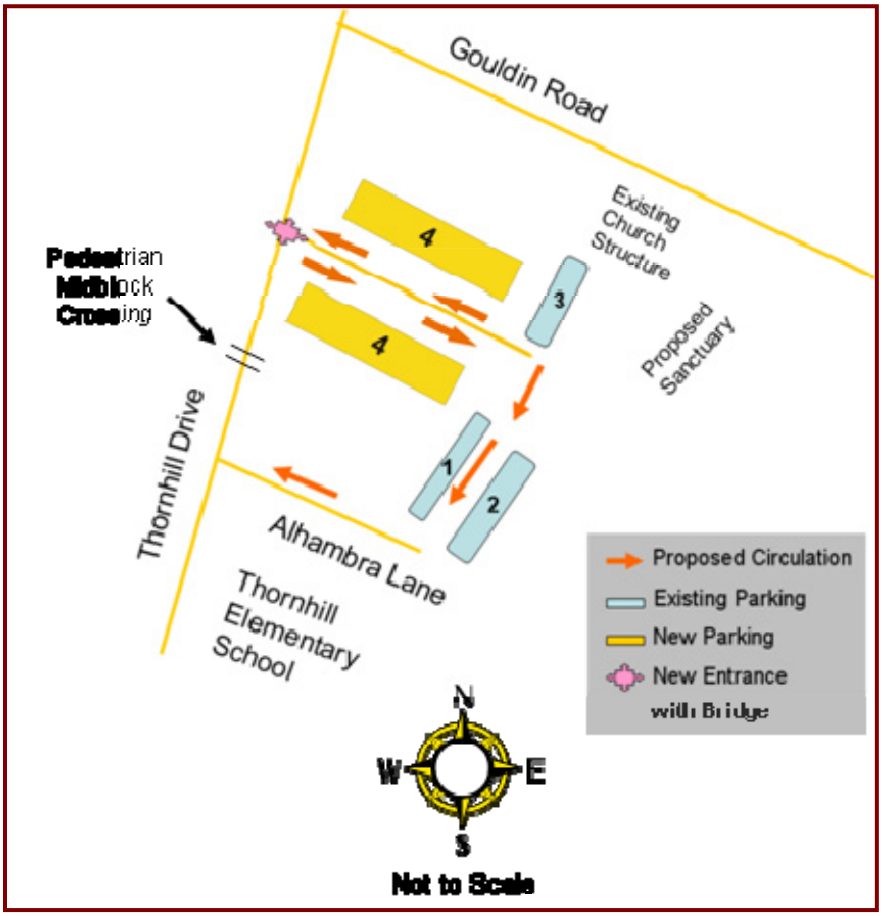
School Circulation and Access

With implementation of the proposed project, the school circulation pattern in the parking lot of St. John's will be altered. All vehicles will enter at the new driveway off of Thornhill

Drive and may exit onto Thornhill Drive from either the driveway or Alhambra Lane. Sight distances at the new driveway on Thornhill Drive will be better than existing sight distances at the Thornhill Drive intersections with Alhambra Lane and Gouldin Road. Thus, Figure 3 displays the proposed circulation changes.

The new driveway is located approximately 40 feet north of the existing mid-block crosswalk. Given the use of this crosswalk, particularly during the morning drop-off, there is the potential for increased conflict between vehicles entering and exiting the new driveway and pedestrians crossing the street. Specifically, vehicles exiting the new driveway and making left-turns would need to watch for pedestrians crossing Thornhill Drive near or in the crosswalk as well as for gaps in traffic on Thornhill Drive. Appropriate signage to "watch for pedestrians" and improving the visibility of the crosswalk as well as advanced warning signs indicating the presence of the crosswalk as well as the new driveway should be provided as a mitigation.

**Figure 3: Proposed Site Circulation and Parking Areas**



Parking

The Church is not located in a specialized zoning area, according to the City of Oakland's General Plan map. Oakland's municipal code states that the off-street parking requirement for a church is one (1) parking stall for each ten (10) seats. 1 Regular-sized parking stalls are to be at least 18 feet long and 8.5 feet wide, whereas compact-sized parking stalls are to be at least 16 feet long and 7.5 feet wide. [2] The proposed expansion of St. John's Church will have 259 seats (a 15% increase), which means that 26 off-street parking stalls are required. According to the St. John's Episcopal Church: Renovation Phase 1 drawings dated November 1, 2006, there will be fifty-two (52) off-street parking stalls, including two (2) handicap-accessible stalls. Thus, the Church is provides twice as many parking stalls as is required by the City of Oakland's municipal codes.

A count conducted by Dowling Associates on Sunday, March 18, 2007 found that sixty-two (62) cars were parked in Church's parking lot at its peak. A 15% increase in parked vehicles would mean seventy-one (71) parked cars could be anticipated for its Sunday peak-hour. The proposed 52 spaces on-site would not meet the existing or projected parking demand and may result in on-street parking by Church attendees.

To mitigate this impact, the church should explore reciprocal relationship with the Thornhill Elementary School to utilize school parking during the Sunday services to accommodate the increased demand for parking with the expansion. It may also initiate valet parking and / or tandem parking in the undesignated spaces.

[1] City of Oakland, Municipal Code. Passed February 5, 2008. Code 17.116.070 Off-Street Parking – Civic Activities.
[2] City of Oakland, Municipal Code. Passed February 5, 2008. Code 17.116.200 Parking space dimensions.

Mr. Noack
**Supplemental Transportation Study for St. John's Church Renovation Memorandum**
July 15, 2008

Attachment: Summary of Counts – Page 1 of 2

**Count Date:** 13-May-08 **Count Day:** Tuesday
**Surveyor:** Debbie Chan Yueh **Weather:** Warm, sunny, clear
**Intersection:** **North/South** Thornhill Drive
**East/West** Alhambra Lane

| | Vehicle | | | | | | | Bike (Approach) | | | | Pedestrian (Crossing Leg) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Time** | **SBT** | **SBL** | **WBL** | **WBR** | **NBR** | **NBT** | | **SB** | **WB** | **NB** | | **North** | **East** | **South** |
| **8:15-8:30 AM** | 143 | 0 | 3 | 15 | 0 | 90 | | 0 | 0 | 0 | | 4 | 26 | 0 |
| **8:30-8:45 AM** | 135 | 0 | 11 | 16 | 0 | 109 | | 0 | 0 | 0 | | 2 | 24 | 0 |
| **Total** | 278 | 0 | 14 | 31 | 0 | 199 | | 0 | 0 | 0 | | 6 | 50 | 0 |
| | | | | | | | | | | | | | | |
| **2:45-3:00 PM** | 58 | 0 | 2 | 4 | 2 | 65 | | 0 | 0 | 0 | | 2 | 8 | 0 |
| **3:00-3:15 PM** | 89 | 0 | 9 | 17 | 0 | 84 | | 0 | 0 | 0 | | 2 | 12 | 2 |
| **Total** | 147 | 0 | 11 | 21 | 2 | 149 | | 0 | 0 | 0 | | 4 | 20 | 2 |

**Notes:**

On Thornhill south of Alhambra, there were 10 coned spaces for student loading between 8 AM and 4
2 school gates on Thornhill are open.
In the AM, one car dropped off student then did a U-turn at the intersection of Thornhill and Alhambra to head SB on Thornhill. It was not included in the count.
In the AM, there was a spike in vehicles heading WB between 8:42 to 8:45 when the count finished. The PM in WB direction was more consistent.
In the AM, three NBT vehicles made U-turns on Thornhill north of Alhambra to park, then crossed midblock not in the crosswalk
In the PM, the pickup areas are separated, with a sign stating "Rooms 1-6 back door, Rooms 7-14 front
In the PM, one NBR made 3-point turn at intersection
In the PM, one U-turn observed south of Alhambra on Thornhill
Some drivers park outside of the loading zone and wait for students in PM

Mr. Noack
**Supplemental Transportation Study for St. John's Church Renovation Memorandum**
July 15, 2008

Attachment: Summary of Counts – Page 2 of 2

**Count Date:** 13-May-08 **Count Day:** Tuesday
**Surveyor:** Kamala Parks **Weather:** Warm, sunny, clear
**Intersection:** **North/South** Thornhill Drive
**East/West** Gouldin Road

| | Intersection | | | | | | | | | | | | Midblock | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vehicle | | | | | | Bike (Approach) | | | Peds (Crossing Leg) | | | Peds | |
| Time | SBT | SBL | WBL | WBR | NBR | NBT | SB | WB | NB | North | East | South | In Xwalk | Not in Xwalk |
| 8:15-8:30 AM | 113 | 14 | 30 | 0 | 19 | 73 | 0 | 0 | 0 | 0 | 4 | 0 | 10 | 9 |
| 8:30-8:45 AM | 107 | 12 | 26 | 0 | 31 | 87 | 0 | 0 | 0 | 0 | 13 | 0 | 9 | 1 |
| Total | 220 | 26 | 56 | 0 | 50 | 160 | 0 | 0 | 0 | 0 | 17 | 0 | 19 | 10 |
| | | | | | | | | | | | | | | |
| 2:45-3:00 PM | 47 | 8 | 12 | 0 | 17 | 50 | 0 | 0 | 0 | 0 | 4 | 0 | 5 | 0 |
| 3:00-3:15 PM | 72 | 2 | 12 | 0 | 18 | 77 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 2 |
| Total | 119 | 10 | 24 | 0 | 35 | 127 | 0 | 0 | 0 | 0 | 11 | 0 | 7 | 2 |

**Notes:** From 3:00 to 3:15, three vehicles counted as NBR made 3-point turns at the intersection to head southbound on Thornhill

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Dowling Associates, Inc.

**Date:** September 23, 2008

# Memorandum

**To:** Steve Noack, Design, Community, & Environment (DC&E)

**From:** Alice Chen and Kamala Parks, Dowling Associates, Inc.

**Reference #:** P08054 Billing Group 2

**Subject:** Addendum to the Supplemental Transportation and Parking Study for the Renovation at St John's Episcopal Church, Oakland

Dowling Associates has prepared this memorandum as an addendum to the transportation and parking studies previously completed for the Proposed Project at St. John's Episcopal Church. This memorandum addresses comments made by the City of Oakland to the Administrative Draft Environmental Impact Report for the transportation section. The focus of this addendum is to:

- Analyze existing and project site access points,
- Summarize existing Sunday usage
- Analyze collisions in the study area; and
- Conduct a speed study.

Following the City of Oakland's orientation standards, roadways that run parallel to the Oakland hills are considered east-west, while those that run perpendicular are north-south. Thus, orientations of all roadways in or near the study area are as follows:

| North-South | East-West |
|---|---|
| Thornhill Drive | Gouldin Road |
| Alhambra Court | Alhambra Lane |

## Access Points Analysis

For this task, Dowling Associates evaluated intersection sight distances, the turning radii for fire trucks at the Church's parking lot, and pedestrian access to the Church.

### *Intersection Sight Distances*

Dowling Associates surveyed sight distances in the field at the following locations:

1. St. John's Church driveway entrance at Gouldin Road
2. St. John's Church driveway exit at Alhambra Lane
3. Alhambra Lane at Thornhill Drive

4. Mid-block crosswalk on Thornhill Drive between Alhambra Lane and Gouldin Road
5. Proposed project driveway at Thornhill Drive, located 40 feet north of the mid-block crosswalk between Alhambra Lane and Gouldin Road

Analysis of sight distances was conducted using Caltrans' *Highway Design Manual*. [1]

**Location 1 – St. John's Church driveway entrance at Gouldin Road**

The Church's access off of Gouldin Road is an entrance-only lane into the parking lot. The driveway entrance is about 15 feet wide and is characterized by a curved, steep downhill grade of 26%. There is no posted speed limit on the entrance. Sight distance from Gouldin Road turning into the driveway is about 69 feet due to foliage and roadway curvature, which means that sight distance standards for stopping is about 11 miles per hour.[2] Photo 1 shows the sight distance from Gouldin Road onto the driveway entrance. Table 201.1 – extrapl 10 MPH

**Location 2 – St. John's Church driveway exit at Alhambra Lane**

Alhambra Lane dead-ends at the Church's driveway, which is an exit-only lane out of the parking lot. Thus, vehicular movements are limited to right turns out of the driveway. The driveway exit onto Alhambra Lane is characterized by a steep downhill grade of 22%. There is no posted speed limit coming out of the driveway or on Alhambra Lane. Sight distance from the driveway turning onto Alhambra Lane is about 53 feet due to foliage, fencing, and roadway curvature, which means that sight distance standards for stopping is about 8 miles per hour.[3] Photo 2 shows the sight distance from the driveway exit onto Alhambra Lane. 10 MPH

**Location 3 – Alhambra Lane at Thornhill Drive**

Alhambra Lane at Thornhill Drive is a T-intersection. Thus, vehicular movements are limited to left and right turns from Alhambra Lane onto Thornhill Drive. The posted speed limit on Thornhill Drive is 25 miles per hour and the Alhambra Lane approach is stop-controlled. Sight distance was measured 17 feet from the edge of the northbound travel lane on Thornhill Drive where there is a painted shoulder line with delineators. This location meant that most vehicles would block the east leg crosswalk while waiting for a gap in traffic on Thornhill Drive. Looking to the south, sight distance was measured as 145 feet due to a fixed refuse can and occupied on-street parking spaces. Looking to the north, sight distance was measured as 77 feet, primarily due to foliage and the intersection off-set.

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[1] *Highway Design Manual.* California Department of Transportation. Chapter 200 – Geometric Design and Structure Standards, January 4, 2007 and Chapter 400 – Intersections At-Grade, July 1, 2008.

[2] *Highway Design Manual.* California Department of Transportation. Chapter 200 – Geometric Design and Structure Standards, January 4, 2007, Table 201.1 – Sight Distance Standards for stopping distance extrapolated from the 20 mile per hour design speed.

[3] *Highway Design Manual.* California Department of Transportation. Chapter 200 – Geometric Design and Structure Standards, January 4, 2007, Table 201.1 – Sight Distance Standards for stopping distance extrapolated from the 20 mile per hour design speed.

According to the *Highway Design Manual*, corner sight distance should be 275 feet in each direction at this unsignalized intersection.[4] Thus, the corner sight distance at this intersection is sub-standard. Photos 3 and 4 show the sight distances from Alhambra Lane onto Thornhill Drive.

**Location 4 – Mid-block crosswalk on Thornhill Drive between Alhambra Lane and Gouldin Road**

The yellow mid-block crosswalk on Thornhill Drive between Alhambra Lane and Gouldin Road provides access from public staircase on the western side to the roadway shoulder on the eastern side of Thornhill Drive. There is a street light located about 25 feet north of the crosswalk, but it does not appear to illuminate the crosswalk itself. Additionally, the crosswalk is located under a canopy of trees, which serves to obscure pedestrians even in the daytime. Vehicles are allowed to park on the eastern side of Thornhill Drive on weekends and school holidays and after 4 PM on weekdays. Parking signage on the western side of Thornhill Drive is somewhat confusing, but it appears that vehicles are not allowed to park there. Nonetheless, parked vehicles were observed on the western side of Thornhill Drive in close proximity to the mid-block crosswalk during all site visits.

Sight distances in the southbound and northbound directions are greater than 500 feet when there are either no cars parked or pedestrians stand at the edge of the travel lane. When cars are parked and pedestrians are standing in the parking lane, sight distance is reduced to 50 feet. According to the *Highway Design Manual*, the stopping sight distance should be at least 150 feet in each direction at the mid-block crosswalk.[5] Thus, when cars are parked, adequate sight distances of motorists stopping for pedestrians are compromised and most likely sub-standard. Photos 5 and 6 show sight distances from the mid-block crosswalk onto Thornhill Drive.

**Location 5 – Proposed Project driveway at Thornhill Drive, located 40 feet north of the mid-block crosswalk between Alhambra Lane and Gouldin Road**

The Proposed Project driveway will be a T-intersection at Thornhill Drive. Thus, vehicle movements will be restricted to left and right turns onto Thornhill Drive with the driveway approach stop-controlled. Sight distances at the Proposed Project driveway will be similar to results shown at the mid-block crosswalk of Location 4. If foliage and parking is removed from the eastern side of the roadway, sight distances are greater than 500 feet. If cars are parked on the eastern side of the roadway or if the foliage is not removed, sight distance would be reduced to about 50 feet. According to the *Highway Design Manual*, corner sight distance should be 275 feet in each direction at this unsignalized intersection.[6] Thus, the corner sight distance at this intersection would be sub-standard if foliage is not removed or

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[4] *Highway Design Manual.* California Department of Transportation. Chapter 400 – Intersections At-Grade, July 1, 2008, Table 405.1A – Corner Sight Distance (7.5 Second Criteria)
[5] *Highway Design Manual.* California Department of Transportation. Chapter 200 – Geometric Design and Structure Standards, January 4, 2007, Table 201.1 – Sight Distance Standards.
[6] *Highway Design Manual.* California Department of Transportation. Chapter 400 – Intersections At-Grade, July 1, 2008, Table 405.1A – Corner Sight Distance (7.5 Second Criteria)

vehicles parked on the eastern side of the roadway. Photo 7 shows the sight distance from the Proposed Project driveway if vehicles are parked on the eastern side of Thornhill Drive.

*Photo 1 – Location 1: St. John's Church driveway entrance from Gouldin Road*

*Photo 2 – Location 2: St. John's Church driveway exit onto Alhambra Lane*

*Photo 3 – Location 3: Alhambra Lane looking southbound onto Thornhill Drive*

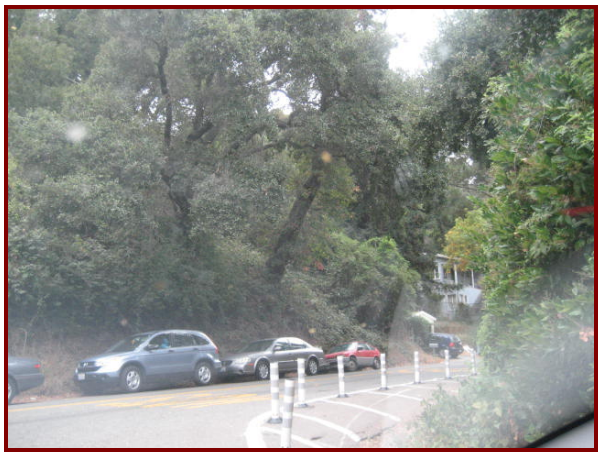

*Photo 4 – Location 3: Alhambra Lane looking northbound onto Thornhill Drive*

*Photo 5 – Location 4: Eastside of Thornhill Drive at mid-block crosswalk looking southbound onto Thornhill Drive*

*Photo 6 – Location 4: Westside of Thornhill Drive at mid-block crosswalk looking northbound onto Thornhill Drive*

*Photo 7 – Location 5: Eastside of Thornhill Drive at Proposed Project driveway looking southbound onto Thornhill Drive with parked car*

## *Pedestrian Access to Church*

In the study area, there are partial sidewalks located on Thornhill Drive and Alhambra Lane, but there are no pedestrian facilities located along the Church's driveways. The steep grades and narrow widths of the existing driveway entrance off of Gouldin Road and driveway exit onto Alhambra Lane create challenges for providing walkways that are compliant with the Americans with Disabilities Act (ADA). The Proposed Project would provide ADA compliant sidewalks along one side of the driveway from Thornhill Drive to the Church buildings and to the ADA parking spaces. Should existing driveway access

remain, further study would be required to determine if ADA compliant pedestrian access could be provided at the northwestern section of the property off of Gouldin Road where the Church's playground is located, as shown in Photo 8.

*Photo 8 – Possible location for pedestrian access to St. John's Church off of Gouldin Road if existing driveway access to remain*

### *Fire Truck Turning Radii*

According to the City of Oakland's 2008 Fire Code, fire trucks need a minimum 20-foot wide driveway for turning, and this width must be maintained for at least 25 feet in length in hilly areas.[7] With these standards, the existing entrance driveway to St. John's Church from Gouldin Road does not meet the current minimum for driveway access, as it is only 15 feet wide. The Proposed Project driveway off of Thornhill Drive, however, would be built to current fire truck access standards.

## Existing Sunday Usage

Dowling Associates employed the traffic counting firm Wiltec to conduct a count on a typical Sunday at St. John's Church, which was done on September 21, 2008. They conducted an inventory of parking spaces, both on- and off-street, as well as collected person attendance at the Church's main building entrance, and parking and vehicle occupancies at each religious service. Religious services take place on a typical Sunday at 7:45, 9:00, and 10:45 AM. Additionally, the Church had "Education for All Ages" classes at 10:00 AM on the survey date, as is also typical. Parking occupancy surveys were conducted on-street (as shown in Figure 1), in the Church parking lot, and in the Thornhill Elementary School blacktop. Parking occupancy surveys were conducted at 7:00 AM, 8:00 AM, 9:15 AM and 11:00 AM. Vehicle occupancy surveys were conducted at the Church's

[7] Visit to the City of Oakland Fire Department, Fire Prevention Bureau on September 19, 2008, Page 527.9, Figures 8 and 9, "Y" and "L" Turnarounds respectively, of Oakland's 2008 Fire Code provided by Oakland staff.

driveway entrance and person attendance counts were counted at the Church's building entrance from 7:30-8:00 AM, 8:45-9:15 AM, 10:30-11:00 AM.

Average occupancies of vehicles entering St. John's parking lot from Gouldin Road was 1.6 persons per vehicle. The service with the highest number of attendees entering the building was the 9:00 AM service with 83 persons, whereas the 7:45 AM and 10:00 AM services had 21 and 41 attendee entrances, respectively.

Parking occupancies at on-street locations ranged from 38% at 7:00 AM to 56% at 11:15 AM, with most of the increase found on Thornhill Drive between Alhambra Lane and Grisborne Avenue. It cannot be ascertained, however, whether the parking occupancy increase on-street was attributed to Church patrons, non-Church activity, or a combination thereof. However, if it were conservatively assumed that all increases in parking occupancy on-street were attributable to Church patrons, than the maximum number of Church-related vehicles parked on-street would be 13.

Parking occupancy percentages at the off-street locations were more difficult to ascertain. Parking stalls at St. John's Church are generally unmarked and the blacktop at Thornhill Elementary School is marked as a playground rather than a parking lot. However, earlier studies of the parking lot of St. John's Church indicate that there are 56 designated stalls.[8] We estimated vehicle parking capacity at Thornhill Elementary School's blacktop at 60 using aerial imagery and measurements. The 7:00 AM count showed only 3 vehicles parked at St. John's Church and none parked at Thornhill Elementary School. The greatest volume of parked vehicles at these parking lots was counted at 11:15 AM, with 59 vehicles in the St. John's lot and 20 vehicles on the Thornhill Elementary school blacktop. Parking occupancy percentages for St. John's, Thornhill Elementary, and both lots combined at 11:15 AM was 105%, 33%, and 68%, respectively.

It should be noted that the highest attended religious service (9:00 AM) does not correspond to the highest parking occupancies surveyed (11:15 AM). This may be due, in part, to 9:00 AM religious service attendees remaining on-site to attend the "Education for All Ages" classes at 10:00 AM.

As described above, the parking at St. John's lot is already over-capacity, but there is excess capacity at the Thornhill Elementary School to handle the existing overflow. With the proposed 15% increase in seats (34 seats) and the reduction in parking supply at the church of 5 spaces, an additional 26 spaces would be required to meet the future demand.[9] The Thornhill Elementary School's blacktop can accommodate this increased demand. A more formal shared parking agreement with Thornhill Elementary School would allow the school to use the church parking during the school week and the church to use the school blacktop during Sunday services. Other parking options, such as valet parking or tandem parking, to increase the parking supply would not be necessary.

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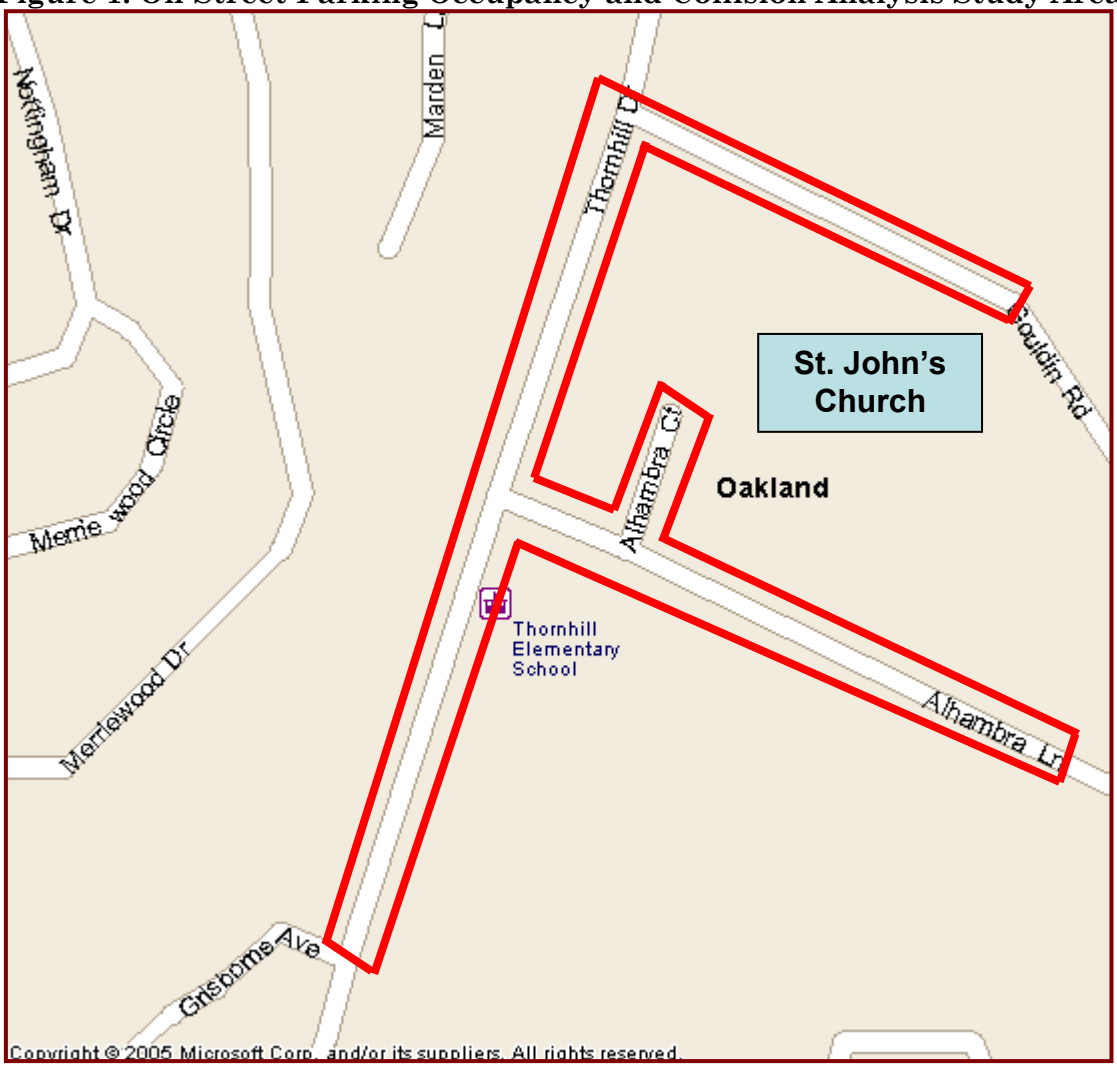
[8] Dowling Associates Memorandum to DC&E, July 17, 2008. *Supplemental Transportation and Parking Study for the Renovation at St John's Episcopal Church, Oakland*

[9] The 34 seats would generate a demand for 21 parking spaces, assuming the average vehicle occupancy of 1.6 passengers per vehicle.

**Figure 1: On-Street Parking Occupancy and Collision Analysis Study Area**



## Collision Analysis

The City of Oakland provided Dowling Associates with the most recent five-years (from October 1, 2002 through September 30, 2007) of reported collisions in the study area, as delineated in Figure 1. One collision was reported in the study area on Thornhill Drive forty feet south of Gouldin Road in 2004. It occurred at 8:45 AM. It involved two vehicles, was a sideswipe collision, and its primary collision factor was unsafe starting or backing. Another collision was reported in close proximity to the study area on Gouldin Road three hundred feet east of Alhambra Avenue in 2007. It occurred at 3:15 AM and involved one vehicle colliding with a fixed object and its primary collision factor was also unsafe starting and backing. There were no vehicles that involved pedestrians or bicyclists and there does not appear to be an identifiable pattern of reported collisions in the study area.

## Vehicle Speed Study

Dowling Associates employed the traffic counting firm Wiltec to conduct 24-hour tube-machine counts for vehicle speeds on Thornhill Drive on a typical weekday. Tubes were located for the vehicle approach on each side of the mid-block crosswalk located between Alhambra Lane and Gouldin Road. The count was conducted on Tuesday, August 26, 2008, which was the first week that Oakland Unified School District students were back at school. Posted speed limits are 25 miles-per-hour along Thornhill Drive in the study area. Table 1 displays a summary of the results from the speed survey.

**Table 1: 24-Hour Speed Summary on Thornhill Drive between Gouldin Road and Alhambra Lane**

| | | | | Miles Per Hour | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Percentile Speed | | 1 to 24 | | 25 to 34 | | 35 to 44 | | >= 45 | |
| Direction | Volume | 50th | 85th | Volume | Percent | Volume | Percent | Volume | Percent | Volume | Percent |
| **Northbound** | 3,878 | 29.1 | 35.1 | 817 | 21.1% | 2,473 | 63.8% | 578 | 14.9% | 10 | 0.3% |
| **Southbound** | 3,587 | 30.0 | 35.6 | 545 | 15.2% | 2,446 | 68.2% | 583 | 16.3% | 13 | 0.4% |

24-hour machine tube counts conducted by Wiltec on Tuesday, August 26, 2008

*Dowling Associates, Inc.*

Over a twenty-four hour period, it was found that the 85th percentile speed ranged from 35.1 to 35.6 miles per hour (in other words, 85% of the vehicles surveyed were traveling at or under these speeds). About 79% of vehicles in the northbound direction and 85% in the southbound direction were traveling at or above the posted speed limit of 25 miles per hour. However, between the hours of 8:00 and 9:00 AM when children are arriving at school, speeds averaged 22 miles per hour in the northbound direction and 25 miles per hour in the southbound direction.

Mr. Noack

**Addendum to the Supplemental Transportation Study for St. John's Church Renovation Memorandum**

September 23, 2008

Appendices

**WILTEC**

Phone: (626) 564-1944 Fax: (626) 564-0969 E-mail: info@wiltecusa.com

**ON-STREET PARKING OCCUPANCY SURVEY**

| | | |
|---|---|---|
| CLIENT: | | DOWLING ASSOCIATES |
| PROJECT: | | ST. JOHN'S EPISCOPAL SCHOOL COUNTS |
| DATE: | | SUNDAY SEPTEMBER 21, 2008 |
| PERIOD: | | 7:30-8:00 AM, 8:45-9:15 AM AND 10:30-11:00 AM |
| LOCATION: | N/S | THORNHILL DRIVE |
| | E/W | GOULDIN ROAD/ALHAMBRA LANE |

**HOURLY COUNTS**

| | THORNHILL DRIVE | | | | | | | | GOULDIN ROAD | | ST. JOHN'S CHURCH | ALHAMBRA COURT | ALHAMBRA LANE | | THORNHILL ELEMENTARY SCHOOL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EAST SIDE OF STREET -SOUTH OF DRIVEWAY | | | WEST SIDE OF STREET -SOUTH OF DRIVEWAY | | EAST SIDE OF STREET -NORTH OF DRIVEWAY | WEST SIDE OF STREET -NORTH OF DRIVEWAY | | NORTH SIDE OF STREET - WEST OF DRIVEWAY | SOUTH SIDE OF STREET - WEST OF DRIVEWAY | MAIN PARKING LOT | SMALL PARKING LOT | CUSTODIAN | PRINCIPAL PARKING | BLACKTOP PARKING | |
| Type of spaces | Regular | Drop Off | Handicap | Regular | Apartment | No Parking | Regular | Private | Private | No Parking | Regular | Private | Regular | Regular | Regular | TOTAL |
| Available spaces | 10 | 10 | 1 | 9 | 9 | 0 | 6 | 4 | 11 | 0 | * | 6 | 1 | 1 | * | |
| 7:00 AM | 4 | 0 | 0 | 5 | 4 | 0 | 1 | 3 | 5 | 1 | 3 | 3 | 0 | 0 | 0 | 29 |
| 8:00 AM | 4 | 0 | 0 | 5 | 4 | 0 | 1 | 3 | 5 | 1 | 17 | 3 | 0 | 0 | 3 | 46 |
| 9:15 AM | 5 | 1 | 0 | 5 | 3 | 0 | 2 | 3 | 5 | 1 | 53 | 3 | 0 | 0 | 14 | 95 |
| 11:15 AM | 7 | 7 | 0 | 8 | 3 | 0 | 1 | 3 | 5 | 1 | 59 | 3 | 0 | 0 | 20 | 117 |

* Unmarked Spaces for both the St. John's Church main parking lot and the Thornhill Elementary blacktop.

Mr. Noack
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WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 E-mail: info@wiltecusa.com


VEHICLE OCCUPANCY AND ATTENDANCE SURVEYS

| | | |
|---|---|---|
| CLIENT: | | DOWLING ASSOCIATES |
| PROJECT: | | ST. JOHN'S EPISCOPAL SCHOOL COUNTS |
| DATE: | | SUNDAY SEPTEMBER 21, 2008 |
| PERIOD: | | 7:30-8:00 AM, 8:45-9:15 AM AND 10:30-11:00 AM |
| LOCATION: | N/S | THORNHILL DRIVE |
| | E/W | DRIVEWAY ENTRANCE TO THE CHURCH |

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 730-745 | 8 | 5 | 0 | 0 | 13 | 17 | 0 |
| 745-800 | 2 | 0 | 0 | 0 | 2 | 4 | 0 |
| VEHICLES | 10 | 5 | 0 | 0 | 15 | | |
| PASSENGERS | 10 | 10 | 0 | 0 | 20 | 21 | 0 |

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 845-900 | 9 | 14 | 1 | 2 | 26 | 34 | 9 |
| 900-915 | 9 | 9 | 1 | 1 | 20 | 49 | 7 |
| VEHICLES | 18 | 23 | 2 | 3 | 46 | | |
| PASSENGERS | 18 | 46 | 6 | 12 | 82 | 83 | 16 |

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 1030-1045 | 12 | 10 | 0 | 0 | 22 | 31 | 3 |
| 1045-1100 | 4 | 1 | 0 | 0 | 5 | 10 | 0 |
| VEHICLES | 16 | 11 | 0 | 0 | 27 | | |
| PASSENGERS | 16 | 22 | 0 | 0 | 38 | 41 | 3 |

Mr. Noack
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CALCULATION WORKSHEET

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 730-745 | 8 | 5 | 0 | 0 | 13 | 17 | 0 |
| 745-800 | 2 | 0 | 0 | 0 | 2 | 4 | 0 |
| VEHICLES | 10 | 5 | 0 | 0 | 15 | | |
| PASSENGERS | 10 | 10 | 0 | 0 | 20 | 21 | 0 |
| Avg Veh Occ | | | | | 1.333333333 | | |

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 845-900 | 9 | 14 | 1 | 2 | 26 | 34 | 9 |
| 900-915 | 9 | 9 | 1 | 1 | 20 | 49 | 7 |
| VEHICLES | 18 | 23 | 2 | 3 | 46 | | |
| PASSENGERS | 18 | 46 | 6 | 12 | 82 | 83 | 16 |
| Avg Veh Occ | | | | | 1.782608696 | | |

| | NUMBER OF PEOPLE PER VEHICLE | | | | | ATTENDANCE AT THE CHURCH BUILDING ENTRANCE | |
|---|---|---|---|---|---|---|---|
| TIME: | 1 | 2 | 3 | 4+ | GRAND TOTAL | IN | OUT |
| 1030-1045 | 12 | 10 | 0 | 0 | 22 | 31 | 3 |
| 1045-1100 | 4 | 1 | 0 | 0 | 5 | 10 | 0 |
| VEHICLES | 16 | 11 | 0 | 0 | 27 | | |
| PASSENGERS | 16 | 22 | 0 | 0 | 38 | 41 | 3 |
| Avg Veh Occ | | | | | 1.407407407 | | |
| | | | | | | | |
| Total Vehicles | | | | | 88 | | |
| Total Passengers | | | | | 140 | | |
| Avg Veh Occ | | | | | 1.590909091 | | |

Mr. Noack
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PARKING OCCUPANCY - CALCULATIONS

HOURLY COUNTS

| Roadway | THORNHILL DRIVE | | | | | | | | GOULDIN ROAD | | ALHAMBRA CT | ALHAMBRA LN | | Total On-Street Parking Occupancy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Between Alhambra Ln and Grisborne Ave | | | | | Between Gouldin Rd and Alhambra Ln | | | Between Thornhill Dr and St. John's Driveway | | Between Alhambra Ln and end | Between St. John's Driveway and Thornhill Dr | | | |
| Description | Eastside | | | Westside | | Eastside | Westside | | Northside | Southside | All | All | All | | |
| Type of space | Regular | Drop Off | Handicap | Regular | Apartment | No Parking | Regular | Private | Private | No Parking | Private | Custodian | Principal | Total | Percent |
| Available spaces | 10 | 10 | 1 | 9 | 9 | 0 | 6 | 4 | 11 | 0 | 6 | 1 | 1 | 68 | 100% |
| 7:00 AM | 4 | 0 | 0 | 5 | 4 | 0 | 1 | 3 | 5 | 1 | 3 | 0 | 0 | 26 | 38.2% |
| 8:00 AM | 4 | 0 | 0 | 5 | 4 | 0 | 1 | 3 | 5 | 1 | 3 | 0 | 0 | 26 | 38.2% |
| 9:15 AM | 5 | 1 | 0 | 5 | 3 | 0 | 2 | 3 | 5 | 1 | 3 | 0 | 0 | 28 | 41.2% |
| 11:15 AM | 7 | 7 | 0 | 8 | 3 | 0 | 1 | 3 | 5 | 1 | 3 | 0 | 0 | 38 | 55.9% |

HOURLY COUNTS

| Parking Lot | ST. JOHN'S CHURCH | THORNHILL ELEMENTARY SCHOOL | Total Parking Lot Occupancy | |
|---|---|---|---|---|
| Description | Main Parking Lot | Blacktop Parking | | |
| Type of space | Unmarked | Unmarked | Total | Percent |
| Available spaces [1] | 56 | 60 | 116 | 100% |
| 7:00 AM | 3 | 0 | 3 | 2.6% |
| 8:00 AM | 17 | 3 | 20 | 17.2% |
| 9:15 AM | 53 | 14 | 67 | 57.8% |
| 11:15 AM | 59 | 20 | 79 | 68.1% |

[1] Available spaces are approximated at both St. John's Church and Thornhill Elementary School lots because parking stalls are unmarked

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**City of Oakland**

**Transportation Services Division**

9/4/2008
Page 1

**Traffic Collision History Report**
**Midblock Collisions**

**Street:** GOULDIN ROAD
**Limit 1:** THORNHILL DRIVE
**Limit 2:** END1

**Date Range Reported:** 10/1/2002 - 9/30/2007

| Report No. | Date Time | Dist/Dir | Location | Type of Collision | Motor Veh. Involved With | DOT1 | MPC 1 | DOT2 | MPC 2 | PCF | # Inj | # Kld |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3109186 | 3/21/07 0 03:15 | 300' 0 East of | GOULDIN ROAD/ALHAMBRA AV ENUE | Hit Object | Fixed Object | West | | | | Backing king | Unsafe Starting or Bac | |

**Total Number of Collisions:** 1 **Segment Length:** 0.40 miles (2,138')

Mr. Noack
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## City of Oakland

### Transportation Services Division

### Traffic Collision History Report

**9/4/2008**
**Page 1**

**Location: Thornhill Drive / Gouldin Road**
**Date Range Reported: 10/1/2002 - 9/30/2007**

| Report No. | Date | Time | Dist. | Dir. | Type of Collision | Motor Veh. Involved With | Direct. of Travel 1 | Movement Prec. Coll. 1 | Direct. of Travel 2 | Movement Prec. Coll. 2 | PCF | Inj. | Kil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1302939 | 3/2/04 | 08:45 | 40 | South | Sideswipe | Other Motor Vehicle | West | Entering Traffic | North | Proceeding Straight | Unsafe Starting or Backing | 0 | 0 |

**Total Number of Collisions: 1**

Mr. Noack
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**Memorandum**
September 23, 2008

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# WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

## SPEED SURVEYS

CLIENT: DOWLING ASSOCIATES
PROJECT: OAKLAND 24-HR SPEED SURVEY
DATE: TUESDAY, AUGUST 26, 2008
LOCATION: THORNHILL DRIVE BETWEEN ALHAMBRA LANE AND GOULDIN ROAD
CITY: OAKLAND
DIRECTION: NORTHBOUND
SPEED LIMIT: 25

| BEGIN TIME | TOTAL | 0-14 MPH | 15-19 MPH | 20-24 MPH | 25-29 MPH | 30-34 MPH | 35-39 MPH | 40-44 MPH | 45-49 MPH | 50-54 MPH | 55-59 MPH | 60-64 MPH | 65-69 MPH | 70-99 MPH | AVG SPEED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0:00 | 21 | 0 | 0 | 0 | 5 | 11 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| 1:00 | 11 | 0 | 0 | 0 | 2 | 1 | 5 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 37 |
| 2:00 | 4 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 3:00 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| 4:00 | 4 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 33 |
| 5:00 | 7 | 1 | 0 | 0 | 1 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 6:00 | 28 | 0 | 0 | 3 | 7 | 8 | 7 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 32 |
| 7:00 | 106 | 3 | 6 | 15 | 44 | 20 | 14 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| 8:00 | 281 | 14 | 80 | 112 | 56 | 15 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| 9:00 | 173 | 0 | 6 | 22 | 73 | 57 | 13 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 10:00 | 156 | 1 | 4 | 22 | 60 | 46 | 21 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 11:00 | 207 | 0 | 6 | 32 | 70 | 68 | 29 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 12:00 | 196 | 0 | 0 | 36 | 75 | 49 | 29 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 13:00 | 205 | 0 | 1 | 22 | 71 | 72 | 37 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 14:00 | 257 | 2 | 11 | 70 | 107 | 53 | 10 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 27 |
| 15:00 | 359 | 1 | 16 | 96 | 158 | 72 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 16:00 | 329 | 0 | 2 | 39 | 137 | 103 | 44 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 17:00 | 378 | 0 | 6 | 52 | 137 | 136 | 42 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 18:00 | 383 | 1 | 6 | 37 | 141 | 122 | 69 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 19:00 | 274 | 3 | 12 | 30 | 51 | 106 | 56 | 15 | 1 | 0 | 0 | 0 | 0 | 0 | 31 |
| 20:00 | 215 | 0 | 0 | 14 | 82 | 79 | 34 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 31 |
| 21:00 | 146 | 2 | 2 | 16 | 42 | 52 | 27 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 30 |
| 22:00 | 82 | 0 | 2 | 5 | 22 | 24 | 24 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 32 |
| 23:00 | 53 | 1 | 0 | 5 | 9 | 21 | 12 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 32 |
| DAILY TOTALS: | **3878** | **29** | **160** | **628** | **1354** | **1119** | **501** | **77** | **8** | **2** | **0** | **0** | **0** | **0** | **29** |
| PERCENT TOTALS: | | **0.7%** | **4.1%** | **16.2%** | **34.9%** | **28.9%** | **12.9%** | **2.0%** | **0.2%** | **0.1%** | **0.0%** | **0.0%** | **0.0%** | **0.0%** | |

PERCENTILE SPEEDS:

| 10% | 15% | 50% | 85% | 90% |
|---|---|---|---|---|
| 21.6 | 23.1 | 29.1 | 35.1 | 37.0 |

| SPEED EXCEEDED: | 45 MPH | 55 MPH | 65 MPH |
|---|---|---|---|
| PERCENTAGE: | 0.3 | 0.0 | 0.0 |
| TOTALS: | 10 | 0 | 0 |

10 MPH PACE SPEED: 25-35
NUMBER IN PACE: 2473
% IN PACE: 63.8

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# WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

## SPEED SURVEYS

CLIENT: DOWLING ASSOCIATES
PROJECT: OAKLAND 24-HR SPEED SURVEY
DATE: TUESDAY, AUGUST 26, 2008
LOCATION: THORNHILL DRIVE BETWEEN ALHAMBRA LANE AND GOULDIN ROAD
CITY: OAKLAND
DIRECTION: SOUTHBOUND
SPEED LIMIT: 25

| BEGIN TIME | TOTAL | 0-14 MPH | 15-19 MPH | 20-24 MPH | 25-29 MPH | 30-34 MPH | 35-39 MPH | 40-44 MPH | 45-49 MPH | 50-54 MPH | 55-59 MPH | 60-64 MPH | 65-69 MPH | 70-99 MPH | AVG SPEED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0:00 | 11 | 0 | 0 | 0 | 1 | 6 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 34 |
| 1:00 | 4 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 34 |
| 2:00 | 5 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 38 |
| 3:00 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 |
| 4:00 | 12 | 0 | 0 | 0 | 2 | 2 | 4 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 37 |
| 5:00 | 50 | 0 | 1 | 2 | 12 | 19 | 11 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 32 |
| 6:00 | 133 | 0 | 2 | 7 | 39 | 47 | 30 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 32 |
| 7:00 | 348 | 3 | 3 | 30 | 117 | 134 | 53 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 8:00 | 456 | 7 | 41 | 162 | 184 | 52 | 8 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |
| 9:00 | 255 | 0 | 6 | 41 | 92 | 86 | 25 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 29 |
| 10:00 | 260 | 0 | 0 | 23 | 108 | 96 | 28 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 11:00 | 226 | 0 | 0 | 22 | 69 | 88 | 43 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 12:00 | 207 | 0 | 1 | 14 | 67 | 76 | 39 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 13:00 | 190 | 0 | 2 | 19 | 66 | 70 | 29 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 30 |
| 14:00 | 201 | 0 | 3 | 37 | 86 | 50 | 20 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| 15:00 | 253 | 2 | 8 | 39 | 109 | 78 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| 16:00 | 230 | 0 | 4 | 21 | 68 | 87 | 46 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 17:00 | 223 | 0 | 0 | 8 | 69 | 104 | 36 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 18:00 | 189 | 0 | 0 | 11 | 56 | 75 | 38 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 31 |
| 19:00 | 136 | 0 | 0 | 3 | 50 | 51 | 27 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 31 |
| 20:00 | 90 | 0 | 0 | 6 | 26 | 37 | 19 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 31 |
| 21:00 | 60 | 0 | 0 | 9 | 19 | 19 | 10 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 22:00 | 33 | 0 | 0 | 6 | 6 | 12 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| 23:00 | 13 | 0 | 0 | 2 | 3 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 |
| DAILY TOTALS: | **3587** | **12** | **71** | **462** | **1251** | **1195** | **499** | **84** | **11** | **2** | **0** | **0** | **0** | **0** | **30** |
| PERCENT TOTALS: | | **0.3%** | **2.0%** | **12.9%** | **34.9%** | **33.3%** | **13.9%** | **2.3%** | **0.3%** | **0.1%** | **0.0%** | **0.0%** | **0.0%** | **0.0%** | |

PERCENTILE SPEEDS:

| 10% | 15% | 50% | 85% | 90% |
|---|---|---|---|---|
| 23.0 | 24.9 | 30.0 | 35.6 | 37.4 |

| SPEED EXCEEDED: | 45 MPH | 55 MPH | 65 MPH |
|---|---|---|---|
| PERCENTAGE: | 0.4 | 0.0 | 0.0 |
| TOTALS: | 13 | 0 | 0 |

10 MPH PACE SPEED: 25.35
NUMBER IN PACE: 2446
% IN PACE: 68.2

**St John's Episcopal Church Calendar - Church Services, Meetings, and Gatherings for October 2010**

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|
| **4-Oct** | **5-Oct** | **6-Oct** | **7-Oct** | **8-Oct** | **9-Oct** | **10-Oct** |
| | 9:30 am - 12:30 pm Music Together (20 per hour)<br>12:00 - 1:00 pm Alanon Meeting (50)<br>12:30 - 1:30 pm Pastoral Care Team (6)<br>6:00 - 8:15 pm Youth Choir Rehearsal (20) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>Noon - 1:00 pm Eucharist (5)<br>7:00 - 9:00 pm Ministry Catalysts Meeting (10)<br>8:00 - 9:00 pm Montclair AA Group (40) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>8:00 - 9:00 pm Clinton AA Group (40) | 9:30 - 11:30 am Music Together (20 per hour)<br>7:00 - 9:00 pm CVC Team Meeting (6) | 8:30 - 10:30 am Practice These Principles AA Group (100)<br>10:00 am - 12:00 pm Altar Guild Set-up (2) | 7:45 - 8:30 am Early Eucharist (30)<br>9:00 - 9:45 am Family Eucharist (75)<br>10:45 am - 12:00 pm Choral Eucharist (100) |
| **11-Oct** | **12-Oct** | **13-Oct** | **14-Oct** | **15-Oct** | **16-Oct** | **17-Oct** |
| 7:00 - 9:00 pm CVC Team Meeting (6) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>12:00 - 1:00 pm Alanon Meeting (50) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>Noon - 1:00 pm Eucharist (5)<br>8:00 - 9:00 pm Montclair AA Group (40) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>8:00 - 9:00 pm Clinton AA Group (40) | 9:30 - 11:30 am Music Together (20 per hour) | 8:30 - 10:30 am Practice These Principles AA Group (100)<br>10:00 am - 12:00 pm Altar Guild Set-up (2) | 7:45 - 8:30 am Early Eucharist (30)<br>9:00 - 9:45 am Family Eucharist (75)<br>10:45 am - 12:00 pm Choral Eucharist (100)<br>5:30 - 8:30 pm Prayin' Chicks (8) |
| **18-Oct** | **19-Oct** | **20-Oct** | **21-Oct** | **22-Oct** | **23-Oct** | **24-Oct** |
| 7:00 - 10:00 pm Vestry Meeting (12) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>12:00 - 1:00 pm Alanon Meeting (50)<br>5:00 - 9:30 pm Men's Group Dinner Meeting (30)<br>6:00 - 8:15 pm Youth Choir Rehearsal (20) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>Noon - 1:00 pm Eucharist (5)<br>8:00 - 9:00 pm Montclair AA Group (40) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>8:00 - 9:00 pm Clinton AA Group (40) | 9:30 - 11:30 am Music Together (20 per hour) | 8:30 - 10:30 am Practice These Principles AA Group (100)<br>10:00 am - 12:00 pm Altar Guild Set-up (2) | 7:45 - 8:30 am Early Eucharist (30)<br>9:00 - 9:45 am Family Eucharist (75)<br>10:45 am - 12:00 pm Choral Eucharist (100) |
| **25-Oct** | **26-Oct** | **27-Oct** | **28-Oct** | **29-Oct** | **30-Oct** | **31-Oct** |
| | 9:30 am - 12:30 pm Music Together (20 per hour)<br>12:00 - 1:00 pm Alanon Meeting (50) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>Noon - 1:00 pm Eucharist (5)<br>8:00 - 9:00 pm Montclair AA Group (40) | 9:30 am - 12:30 pm Music Together (20 per hour)<br>5:30 - 9:00 pm Women's Group Gathering (30)<br>8:00 - 9:00 pm Clinton AA Group (40) | 9:30 - 11:30 am Music Together (20 per hour) | 8:30 - 10:30 am Practice These Principles AA Group (100)<br>10:00 am - 12:00 pm Altar Guild Set-up (2) | 7:45 - 8:30 am Early Eucharist (30)<br>8:15 - 9:00 am Youth Choir Rehearsal (20)<br>9:00 - 9:45 am Family Eucharist (75)<br>10:45 am - 12:00 pm Choral Eucharist (100)<br>5:30 - 8:30 pm Prayin' Chicks (8) |

Approximate attendance numbers, provided by Dennis Reeve, administrator at St. John's Church, appears in parantheses

Sundays "Java Corps" not listed in calendar because it draws predominantly from parishioners already at the Church for Sunday service

Dowling Associates, Inc

St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Scenario Report

| | |
|---|---|
| Scenario: | AM Existing |
| Command: | AM Existing |
| Volume: | AM Existing |
| Geometry: | Existing |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | D | 31.5 | 0.480 | D | 31.5 | 0.480 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | C | 16.2 | 0.126 | C | 16.2 | 0.126 | + 0.000 D/V |





St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |

St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 | 0 1 | 0 | 0 1 | 0 0 | 0 | 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 320 | 100 | 52 | 440 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 31.5 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=1.0]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=114]
SUCCEED - Approach volume greater than or equal to 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=1026]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 | 0 1 | 0 | 0 1 | 0 0 | 0 | 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 320 | 100 | 52 | 440 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |

Major Street Volume: 912
Minor Approach Volume: 114
Minor Approach Volume Threshold: 244

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 1 | 0 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 398 | 0 | 0 | 556 | 0 | 0 | 0 | 0 | 28 | 0 | 62 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 16.2 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.4]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=90]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=1044]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 1 | 0 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 398 | 0 | 0 | 556 | 0 | 0 | 0 | 0 | 28 | 0 | 62 |

Major Street Volume: 954
Minor Approach Volume: 90
Minor Approach Volume Threshold: 232

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 3.9 Worst Case Level Of Service: D[ 31.5]

| Street Name: | Thornhill Drive | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 | 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Volume Module: >> Count Date: 13 May 2008 << 8:15-8:45 AM multiplied by 2 | | | | | | | | | | | | |
| Base Vol: | 0 | 320 | 100 | 52 | 440 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 320 | 100 | 52 | 440 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 348 | 109 | 57 | 478 | 0 | 0 | 0 | 0 | 122 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 348 | 109 | 57 | 478 | 0 | 0 | 0 | 0 | 122 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 457 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 1010 | 993 | 402 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1115 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 268 | 247 | 652 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1115 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 254 | 234 | 652 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.05 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.48 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.2 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 8.4 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 256 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 2.4 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 8.4 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 31.5 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | D | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 31.5 | | |
| ApproachLOS: | * | | | * | | | * | | | D | | |

Note: Queue reported is the number of cars per lane.





St. John's Church EIR
AM Weekday Existing
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 1.4 Worst Case Level Of Service: C[ 16.2]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 | 1 | 0 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Volume Module: >> Count Date: 13 May 2008 << 8:15-8:45 AM multiplied by 2 | | | | | | | | | | | | |
| Base Vol: | 0 | 398 | 0 | 0 | 556 | 0 | 0 | 0 | 0 | 28 | 0 | 62 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 398 | 0 | 0 | 556 | 0 | 0 | 0 | 0 | 28 | 0 | 62 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 433 | 0 | 0 | 604 | 0 | 0 | 0 | 0 | 30 | 0 | 67 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 433 | 0 | 0 | 604 | 0 | 0 | 0 | 0 | 30 | 0 | 67 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 1067 | 1037 | 433 |
| Potent Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 248 | 233 | 627 |
| Move Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 242 | 233 | 627 |
| Volume/Cap: | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | 0.13 | 0.00 | 0.11 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | * | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 419 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.9 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 16.2 | xxxxx |
| Shared LOS: | * | * | * | * | * | * | * | * | * | * | C | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 16.2 | | |
| ApproachLOS: | * | | | * | | | * | | | C | | |

Note: Queue reported is the number of cars per lane.

St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Scenario Report

| | |
|---|---|
| Scenario: | PM Existing |
| Command: | PM Existing |
| Volume: | PM Existing |
| Geometry: | Existing |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | B | 14.3 | 0.120 | B | 14.3 | 0.120 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | B | 12.2 | 0.063 | B | 12.2 | 0.063 | + 0.000 D/V |

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St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |





St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

**********

Intersection #1 Thornhill Drive at Gouldin Road

**********

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | | South Bound | | | | East Bound | | | | West Bound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - | T | - | R | L | - | T | - | R | L | - | T | - | R | L | - | T | - | R |
| Control: | Uncontrolled | | | | | Uncontrolled | | | | | Stop Sign | | | | | Stop Sign | | | | |
| Lanes: | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1! | 0 | 0 |
| Initial Vol: | 0 | 254 | | 70 | | 20 | 238 | | 0 | | 0 | | 0 | | 0 | 48 | | 0 | | 2 |
| ApproachDel: | xxxxxx | | | | | xxxxxx | | | | | xxxxxx | | | | | 14.3 | | | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=50]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=632]
FAIL - Total volume less than 650 for intersection
with less than four approaches.

SIGNAL WARRANT DISCLAIMER

This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 254 | 70 | 20 | 238 | 0 | 0 | 0 | 0 | 48 | 0 | 2 |

Major Street Volume: 582
Minor Approach Volume: 50
Minor Approach Volume Threshold: 364

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 298 | 4 | 0 | 294 | 0 | 0 | 0 | 0 | 22 | 0 | 42 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.2 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=64]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=660]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 | 0 1 | 0 | 0 | 1 0 | 0 | 0 | 0 0 | 0 | 0 | 1! 0 |
| Initial Vol: | 0 | 298 | 4 | 0 | 294 | 0 | 0 | 0 | 0 | 22 | 0 | 42 |

Major Street Volume: 596
Minor Approach Volume: 64
Minor Approach Volume Threshold: 357

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 1.4 Worst Case Level Of Service: B[ 14.3]

| Street Name: | Thornhill Drive | | | | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | | | | |
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R | | | |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | | | | |
| Rights: | Include | | | Include | | | Include | | | Include | | | | | |
| Lanes: | 0 | 0 0 1 | 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 | | | |
| Volume Module: >> Count Date: 13 May 2008 << 2:45-3:15 PM multiplied by 2 | | | | | | | | | | | | | | | |
| Base Vol: | 0 | 254 | 70 | 20 | 238 | 0 | 0 | 0 | 0 | 48 | 0 | 2 | | | |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |
| Initial Bse: | 0 | 254 | 70 | 20 | 238 | 0 | 0 | 0 | 0 | 48 | 0 | 2 | | | |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | | |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | |
| PHF Volume: | 0 | 276 | 76 | 22 | 259 | 0 | 0 | 0 | 0 | 52 | 0 | 2 | | | |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| FinalVolume: | 0 | 276 | 76 | 22 | 259 | 0 | 0 | 0 | 0 | 52 | 0 | 2 | | | |
| Critical Gap Module: | | | | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 | | | |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 | | | |
| Capacity Module: | | | | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 352 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 633 | 616 | 314 | | | |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1218 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 447 | 409 | 731 | | | |
| Move Cap.: | xxxx | xxxx | xxxxx | 1218 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 434 | 401 | 731 | | | |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.02 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.12 | 0.00 | 0.00 | | | |
| Level Of Service Module: | | | | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | | | |
| Control Del: | xxxxx | xxxx | xxxxx | 8.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | | | |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * | | | |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | | | |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 442 | xxxxx | | | |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.4 | xxxxx | | | |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 8.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 14.3 | xxxxx | | | |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * | | | |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 14.3 | | | | | |
| ApproachLOS: | * | | | * | | | * | | | B | | | | | |

Note: Queue reported is the number of cars per lane.

St. John's Church EIR
PM Weekday Existing
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 1.2 Worst Case Level Of Service: B[ 12.2]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 0 | 1 | 0 0 | 0 0 0 | 0 | 0 | 0 0 | 1! | 0 0 |
| Volume Module: >> Count Date: 13 May 2008 << 2:45-3:15 AM multiplied by 2 | | | | | | | | | | | | |
| Base Vol: | 0 | 298 | 4 | 0 | 294 | 0 | 0 | 0 | 0 | 22 | 0 | 42 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 298 | 4 | 0 | 294 | 0 | 0 | 0 | 0 | 22 | 0 | 42 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 324 | 4 | 0 | 320 | 0 | 0 | 0 | 0 | 24 | 0 | 46 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 324 | 4 | 0 | 320 | 0 | 0 | 0 | 0 | 24 | 0 | 46 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 676 | 646 | 326 |
| Potent Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 422 | 393 | 720 |
| Move Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 412 | 393 | 720 |
| Volume/Cap: | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | 0.06 | 0.00 | 0.06 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | * | * | * | * | * | * | * | * | * |
| Movement: | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 572 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.4 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 12.2 | xxxxx |
| Shared LOS: | * | * | * | * | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.2 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Scenario Report

| | |
|---|---|
| Scenario: | Sunday Existing |
| Command: | Sunday Existing |
| Volume: | Sunday Existing |
| Geometry: | Existing |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | B | 12.9 | 0.200 | B | 12.9 | 0.200 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | B | 14.4 | 0.155 | B | 14.4 | 0.155 | + 0.000 D/V |





St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |

St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Peak Hour Delay Signal Warrant Report

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 137 | 84 | 3 | 203 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.9 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=67]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=494]
FAIL - Total volume less than 650 for intersection
with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 137 | 84 | 3 | 203 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |

Major Street Volume: 427
Minor Approach Volume: 67
Minor Approach Volume Threshold: 446

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

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St John's Church EIR
Sunday Existing
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Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 250 | 1 | 1 | 279 | 0 | 0 | 0 | 0 | 28 | 0 | 1 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 14.4 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.1]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=29]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=560]
FAIL - Total volume less than 650 for intersection
with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 250 | 1 | 1 | 279 | 0 | 0 | 0 | 0 | 28 | 0 | 1 |

Major Street Volume: 531
Minor Approach Volume: 29
Minor Approach Volume Threshold: 388

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 2.6 Worst Case Level Of Service: B[ 12.9]

| Street Name: | Thornhill Drive | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 1 0 | 0 0 | 0 | 0 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Volume Module: >> Count Date: 18 Mar 2007 << 11:30 am - 12:30 pm | | | | | | | | | | | | |
| Base Vol: | 0 | 137 | 84 | 3 | 203 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 137 | 84 | 3 | 203 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 0.92 | 0.92 | 0.92 | 0.92 | 1.00 | 1.00 | 1.00 | 1.00 | 0.57 | 0.57 | 0.57 |
| PHF Volume: | 0 | 149 | 91 | 3 | 221 | 0 | 0 | 0 | 0 | 114 | 0 | 4 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 149 | 91 | 3 | 221 | 0 | 0 | 0 | 0 | 114 | 0 | 4 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 240 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 439 | 422 | 195 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1338 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 579 | 526 | 852 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1338 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 570 | 525 | 852 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.00 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.20 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 7.7 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 576 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.8 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 7.7 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 12.9 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.9 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.





St John's Church EIR
Sunday Existing
Dowling Associates, Inc.

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 1.6 Worst Case Level Of Service: B[ 14.4]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 1 0 | 0 0 | 0 | 0 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 250 | 1 | 1 | 279 | 0 | 0 | 0 | 0 | 28 | 0 | 1 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 250 | 1 | 1 | 279 | 0 | 0 | 0 | 0 | 28 | 0 | 1 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 0.92 | 0.92 | 0.92 | 0.92 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 |
| PHF Volume: | 0 | 272 | 1 | 1 | 303 | 0 | 0 | 0 | 0 | 70 | 0 | 3 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 272 | 1 | 1 | 303 | 0 | 0 | 0 | 0 | 70 | 0 | 3 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 273 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 608 | 578 | 272 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1302 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 462 | 430 | 771 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1302 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 451 | 429 | 771 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.00 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.16 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 7.8 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 457 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.6 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 7.8 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 14.4 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 14.4 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

**Intersection Level of Service and Peak-Hour Warrants Calculation Sheets**

Existing + Project



St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Scenario Report

| | |
|---|---|
| Scenario: | AM Existing + Project |
| Command: | AM Existing + Project |
| Volume: | AM Existing + Project |
| Geometry: | Proposed |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | D | 25.4 | 0.413 | D | 25.4 | 0.413 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | C | 19.3 | 0.061 | C | 19.3 | 0.061 | + 0.000 D/V |
| # 3 Thornhill Dr & Proposed St. Jo | B | 13.7 | 0.095 | B | 13.7 | 0.095 | + 0.000 D/V |

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St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |
| # 3 Thornhill Dr & Proposed St. John's | No / No | ??? / ??? |

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St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 320 | 40 | 22 | 470 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 25.4 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.8]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=114]
SUCCEED - Approach volume greater than or equal to 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=966]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 320 | 40 | 22 | 470 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |

Major Street Volume: 852
Minor Approach Volume: 114
Minor Approach Volume Threshold: 262

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 1 | 0 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 398 | 0 | 0 | 580 | 0 | 0 | 0 | 0 | 14 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 19.3 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.1]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=16]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=994]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 1 | 0 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 398 | 0 | 0 | 580 | 0 | 0 | 0 | 0 | 14 | 0 | 2 |

Major Street Volume: 978
Minor Approach Volume: 16
Minor Approach Volume Threshold: 225

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.7 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.3]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=74]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=1117]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |

Major Street Volume: 1043
Minor Approach Volume: 74
Minor Approach Volume Threshold: 208

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 3.2 Worst Case Level Of Service: D[ 25.4]

| Street Name: | Thornhill Drive | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 | 0 1 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 0 | 1! 0 | 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 320 | 40 | 22 | 470 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 320 | 40 | 22 | 470 | 0 | 0 | 0 | 0 | 112 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 348 | 43 | 24 | 511 | 0 | 0 | 0 | 0 | 122 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 348 | 43 | 24 | 511 | 0 | 0 | 0 | 0 | 122 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 391 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 928 | 928 | 392 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1178 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 300 | 270 | 661 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1178 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 295 | 264 | 649 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.02 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.41 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 8.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 298 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 2.0 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 8.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 25.4 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | D | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 25.4 | | |
| ApproachLOS: | * | | | * | | | * | | | D | | |

Note: Queue reported is the number of cars per lane.





St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 0.3 Worst Case Level Of Service: C[ 19.3]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 | 1 | 0 0 | 0 0 | 1 | 0 0 | 0 0 | 0 | 0 0 | 0 0 | 1! 0 | 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 398 | 0 | 0 | 580 | 0 | 0 | 0 | 0 | 14 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 398 | 0 | 0 | 580 | 0 | 0 | 0 | 0 | 14 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 433 | 0 | 0 | 630 | 0 | 0 | 0 | 0 | 15 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 433 | 0 | 0 | 630 | 0 | 0 | 0 | 0 | 15 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 1063 | 1063 | 473 |
| Potent Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 249 | 225 | 596 |
| Move Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 249 | 225 | 576 |
| Volume/Cap: | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | 0.06 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | * | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 268 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.2 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 19.3 | xxxxx |
| Shared LOS: | * | * | * | * | * | * | * | * | * | * | C | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 19.3 | | |
| ApproachLOS: | * | | | * | | | * | | | C | | |

Note: Queue reported is the number of cars per lane.

St. John's Church EIR
AM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Average Delay (sec/veh): 1.1 Worst Case Level Of Service: B[ 13.7]

| Street Name: | Thornhill Dr | | | | | | Proposed St. John's driveway | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 1 0 | | | 0 1 0 0 0 | | | 0 0 0 0 0 | | | 0 0 1! 0 0 | | |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Volume: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 400 | 61 | 30 | 552 | 0 | 0 | 0 | 0 | 14 | 0 | 60 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 461 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 1043 | 1043 | 431 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1111 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 256 | 231 | 629 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1111 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 251 | 225 | 629 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.03 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.06 | 0.00 | 0.10 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 8.3 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 490 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.5 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 8.3 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 13.7 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.7 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Scenario Report

| | |
|---|---|
| Scenario: | PM Existing + Project |
| Command: | PM Existing + Project |
| Volume: | PM Existing + Project |
| Geometry: | Proposed |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | B | 13.3 | 0.108 | B | 13.3 | 0.108 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | B | 13.1 | 0.028 | B | 13.1 | 0.028 | + 0.000 D/V |
| # 3 Thornhill Dr & Proposed St. Jo | B | 11.2 | 0.056 | B | 11.2 | 0.056 | + 0.000 D/V |





St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |
| # 3 Thornhill Dr & Proposed St. John's | No / No | ??? / ??? |

St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 254 | 20 | 6 | 252 | 0 | 0 | 0 | 0 | 48 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.3 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=50]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=582]
FAIL - Total volume less than 650 for intersection
with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 254 | 20 | 6 | 252 | 0 | 0 | 0 | 0 | 48 | 0 | 2 |

Major Street Volume: 532
Minor Approach Volume: 50
Minor Approach Volume Threshold: 388

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 298 | 4 | 0 | 305 | 0 | 0 | 0 | 0 | 11 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.1 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.0]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=13]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=620]
FAIL - Total volume less than 650 for intersection
with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 0 1 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 298 | 4 | 0 | 305 | 0 | 0 | 0 | 0 | 11 | 0 | 2 |

Major Street Volume: 607
Minor Approach Volume: 13
Minor Approach Volume Threshold: 353

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 11.2 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=51]
FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=716]
SUCCEED - Total volume greater than or equal to 650 for intersection with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |

Major Street Volume: 665
Minor Approach Volume: 51
Minor Approach Volume Threshold: 328

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 1.2 Worst Case Level Of Service: B[ 13.3]

| Street Name: | Thornhill Drive | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 1 0 0 | 0 | 0 0 0 | 0 0 | 0 | 0 | 0 1! | 0 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 254 | 20 | 6 | 252 | 0 | 0 | 0 | 0 | 48 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 254 | 20 | 6 | 252 | 0 | 0 | 0 | 0 | 48 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 276 | 22 | 7 | 274 | 0 | 0 | 0 | 0 | 52 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 276 | 22 | 7 | 274 | 0 | 0 | 0 | 0 | 52 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 298 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 574 | 574 | 309 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1275 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 484 | 432 | 736 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1275 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 482 | 430 | 722 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.01 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.11 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 7.8 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 488 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.4 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 7.8 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 13.3 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.3 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.





St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 0.3 Worst Case Level Of Service: B[ 13.1]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 0 1 | 0 | 0 0 0 | 0 0 | 0 | 0 | 0 1! | 0 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 298 | 4 | 0 | 305 | 0 | 0 | 0 | 0 | 11 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 298 | 4 | 0 | 305 | 0 | 0 | 0 | 0 | 11 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PHF Volume: | 0 | 324 | 4 | 0 | 332 | 0 | 0 | 0 | 0 | 12 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 324 | 4 | 0 | 332 | 0 | 0 | 0 | 0 | 12 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 658 | 658 | 366 |
| Potent Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 432 | 387 | 684 |
| Move Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | 432 | 387 | 661 |
| Volume/Cap: | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | xxxx | 0.03 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | * | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 457 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.1 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 13.1 | xxxxx |
| Shared LOS: | * | * | * | * | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 13.1 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

St. John's Church EIR
PM Weekday Existing + Project
Dowling Associates, Inc

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Average Delay (sec/veh): 1.0 Worst Case Level Of Service: B[ 11.2]

| Street Name: | Thornhill Dr | | | | | | Proposed St. John's driveway | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 1 0 | | | 0 1 0 0 0 | | | 0 0 0 0 0 | | | 0 0 1! 0 0 | | |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Volume: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 300 | 51 | 14 | 300 | 0 | 0 | 0 | 0 | 11 | 0 | 40 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 351 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 654 | 654 | 326 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1219 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 435 | 389 | 720 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1219 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 431 | 385 | 720 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.01 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.03 | 0.00 | 0.06 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 8.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 629 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.3 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 8.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 11.2 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 11.2 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Scenario Report

| | |
|---|---|
| Scenario: | Sunday Existing + Project |
| Command: | Sunday Existing + Project |
| Volume: | Sunday Existing + Project |
| Geometry: | Proposed |
| Impact Fee: | Default Impact Fee |
| Trip Generation: | Default Trip Generation |
| Trip Distribution: | Default Trip Distribution |
| Paths: | Default Path |
| Routes: | Default Route |
| Configuration: | Default Configuration |

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Impact Analysis Report
Level Of Service

| Intersection | Base LOS | Base Del/ Veh | Base V/ C | Future LOS | Future Del/ Veh | Future V/ C | Change in |
|---|---|---|---|---|---|---|---|
| # 1 Thornhill Drive at Gouldin Roa | B | 11.1 | 0.100 | B | 11.1 | 0.100 | + 0.000 D/V |
| # 2 Thornhill Drive and Alhambra L | B | 12.5 | 0.038 | B | 12.5 | 0.038 | + 0.000 D/V |
| # 3 Thornhill Dr & Proposed St. Jo | B | 12.5 | 0.041 | B | 12.5 | 0.041 | + 0.000 D/V |

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Signal Warrant Summary Report

| Intersection | Base Met [Del / Vol] | Future Met [Del / Vol] |
|---|---|---|
| # 1 Thornhill Drive at Gouldin Road | No / No | ??? / ??? |
| # 2 Thornhill Drive and Alhambra Lane | No / No | ??? / ??? |
| # 3 Thornhill Dr & Proposed St. John's | No / No | ??? / ??? |

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 11.1 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.2]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=67]
   FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=421]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Thornhill Drive at Gouldin Road

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 0 | 0 1! | 0 0 |
| Initial Vol: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |

Major Street Volume: 354
Minor Approach Volume: 67
Minor Approach Volume Threshold: 496

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

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St. John's Church EIR
Sunday Existing + Project
Dowling Associates, Inc

Peak Hour Delay Signal Warrant Report

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 1 | 0 0 | 0 0 |
| Initial Vol: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.5 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.1]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=19]
   FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=570]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





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Peak Hour Volume Signal Warrant Report [Urban]

Intersection #2 Thornhill Drive and Alhambra Lane

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | - T | - R | L | - T | - R | L | - T | - R | L | - T | - R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 | 0 0 | 1 0 | 0 | 1 0 | 0 0 | 0 | 0 0 | 0 0 | 1 | 0 0 | 0 0 |
| Initial Vol: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |

Major Street Volume: 551
Minor Approach Volume: 19
Minor Approach Volume Threshold: 378

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

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Peak Hour Delay Signal Warrant Report

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 0 0 1 0 | | | 0 1 0 0 0 | | | 0 0 0 0 0 | | | 0 0 1! 0 0 | | |
| Initial Vol: | 0 | 250 | 88 | 1 | 267 | 0 | 0 | 0 | 0 | 20 | 0 | 1 |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.5 | | |

Approach[westbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.1]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=21]
   FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=3][total volume=627]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.





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Sunday Existing + Project
Dowling Associates, Inc

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Base Volume Alternative: Peak Hour Warrant NOT Met

| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Lanes: | 0 0 0 1 0 | | | 0 1 0 0 0 | | | 0 0 0 0 0 | | | 0 0 1! 0 0 | | |
| Initial Vol: | 0 | 250 | 88 | 1 | 267 | 0 | 0 | 0 | 0 | 20 | 0 | 1 |

Major Street Volume: 606
Minor Approach Volume: 21
Minor Approach Volume Threshold: 353

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

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Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #1 Thornhill Drive at Gouldin Road

Average Delay (sec/veh): 1.8 Worst Case Level Of Service: B[ 11.1]

| Street Name: | Thornhill Drive | | | | | | Gouldin Road | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 1 0 0 | 0 | 0 0 0 | 0 | 0 | 0 0 | 1! | 0 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Volume: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 137 | 7 | 2 | 208 | 0 | 0 | 0 | 0 | 65 | 0 | 2 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | 6.5 | 6.2 |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | 4.0 | 3.3 |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 144 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 353 | 353 | 163 |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1451 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 649 | 576 | 888 |
| Move Cap.: | xxxx | xxxx | xxxxx | 1451 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 649 | 575 | 871 |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.00 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.10 | 0.00 | 0.00 |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 7.5 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | * | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | 653 | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 0.3 | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 7.5 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | 11.1 | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | B | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 11.1 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #2 Thornhill Drive and Alhambra Lane

Average Delay (sec/veh): 0.4 Worst Case Level Of Service: B[ 12.5]

| Street Name: | Thornhill Drive | | | | | | Alhambra Lane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L | T | R | L | T | R | L | T | R | L | T | R |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 | 1 | 0 | 0 | 1 0 0 | 0 | 0 0 0 | 0 | 0 | 1 | 0 | 0 0 |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| Growth Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Initial Bse: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| User Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Adj: | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PHF Volume: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| Reduct Vol: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FinalVolume: | 0 | 250 | 1 | 1 | 299 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx | xxxx | xxxxx | 4.1 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 6.4 | xxxx | xxxxx |
| FollowUpTim: | xxxxx | xxxx | xxxxx | 2.2 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 3.5 | xxxx | xxxxx |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx | xxxx | xxxxx | 251 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 552 | xxxx | xxxxx |
| Potent Cap.: | xxxx | xxxx | xxxxx | 1326 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 499 | xxxx | xxxxx |
| Move Cap.: | xxxx | xxxx | xxxxx | 1326 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 498 | xxxx | xxxxx |
| Volume/Cap: | xxxx | xxxx | xxxx | 0.00 | xxxx | xxxx | xxxx | xxxx | xxxx | 0.04 | xxxx | xxxx |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxx | xxxx | xxxxx | 0.1 | xxxx | xxxxx |
| Control Del: | xxxxx | xxxx | xxxxx | 7.7 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | 12.5 | xxxx | xxxxx |
| LOS by Move: | * | * | * | A | * | * | * | * | * | B | * | * |
| Movement: | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT | LT - | LTR - | RT |
| Shared Cap.: | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx | xxxx | xxxx | xxxxx |
| SharedQueue: | xxxxx | xxxx | xxxxx | 0.0 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| Shrd ConDel: | xxxxx | xxxx | xxxxx | 7.7 | xxxx | xxxxx | xxxxx | xxxx | xxxxx | xxxxx | xxxx | xxxxx |
| Shared LOS: | * | * | * | A | * | * | * | * | * | * | * | * |
| ApproachDel: | xxxxxx | | | xxxxxx | | | xxxxxx | | | 12.5 | | |
| ApproachLOS: | * | | | * | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #3 Thornhill Dr & Proposed St. John's driveway

Average Delay (sec/veh): 0.4 Worst Case Level Of Service: B[ 12.5]

| Street Name: | Thornhill Dr | | | | | | Proposed St. John's driveway | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach: | North Bound | | | South Bound | | | East Bound | | | West Bound | | |
| Movement: | L - T - R | | | L - T - R | | | L - T - R | | | L - T - R | | |
| Control: | Uncontrolled | | | Uncontrolled | | | Stop Sign | | | Stop Sign | | |
| Rights: | Include | | | Include | | | Include | | | Include | | |
| Lanes: | 0 0 0 1 0 | | | 0 1 0 0 0 | | | 0 0 0 0 0 | | | 0 0 1! 0 0 | | |
| Volume Module: | | | | | | | | | | | | |
| Base Vol: | 0 250 | 88 | | 1 267 | 0 | | 0 0 | 0 | | 20 0 | 1 | |
| Growth Adj: | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | |
| Initial Bse: | 0 250 | 88 | | 1 267 | 0 | | 0 0 | 0 | | 20 0 | 1 | |
| User Adj: | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | |
| PHF Adj: | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | | 1.00 1.00 | 1.00 | |
| PHF Volume: | 0 250 | 88 | | 1 267 | 0 | | 0 0 | 0 | | 20 0 | 1 | |
| Reduct Vol: | 0 0 | 0 | | 0 0 | 0 | | 0 0 | 0 | | 0 0 | 0 | |
| FinalVolume: | 0 250 | 88 | | 1 267 | 0 | | 0 0 | 0 | | 20 0 | 1 | |
| Critical Gap Module: | | | | | | | | | | | | |
| Critical Gp: | xxxxx xxxx xxxxx | | 4.1 | xxxx xxxxx xxxxx | | | xxxx xxxxx | | 6.4 | 6.5 | 6.2 | |
| FollowUpTim: | xxxxx xxxx xxxxx | | 2.2 | xxxx xxxxx xxxxx | | | xxxx xxxxx | | 3.5 | 4.0 | 3.3 | |
| Capacity Module: | | | | | | | | | | | | |
| Cnflict Vol: | xxxx xxxx xxxxx | | 338 | xxxx xxxxx | | | xxxx xxxx xxxxx | | 563 | 563 | 294 | |
| Potent Cap.: | xxxx xxxx xxxxx | | 1232 | xxxx xxxxx | | | xxxx xxxx xxxxx | | 491 | 438 | 750 | |
| Move Cap.: | xxxx xxxx xxxxx | | 1232 | xxxx xxxxx | | | xxxx xxxx xxxxx | | 491 | 438 | 750 | |
| Volume/Cap: | xxxx xxxx | xxxx | 0.00 | xxxx | xxxx | | xxxx xxxx | xxxx | 0.04 | 0.00 | 0.00 | |
| Level Of Service Module: | | | | | | | | | | | | |
| 2Way95thQ: | xxxx xxxx xxxxx | | 0.0 | xxxx xxxxx | | | xxxx xxxx xxxxx | | xxxx | xxxx | xxxxx | |
| Control Del: | xxxxx xxxx xxxxx | | 7.9 | xxxx xxxxx | | | xxxx xxxx xxxxx | | xxxxx | xxxx | xxxxx | |
| LOS by Move: | * * * | | A | * * | | | * * | * | | * * | * | |
| Movement: | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | | LT - LTR - RT | | |
| Shared Cap.: | xxxx xxxx xxxxx | | xxxx | xxxx xxxxx | | | xxxx xxxx xxxxx | | xxxx | 499 | xxxxx | |
| SharedQueue: | xxxxx xxxx xxxxx | | 0.0 | xxxx xxxxx | | | xxxxx xxxx xxxxx | | xxxxx | 0.1 | xxxxx | |
| Shrd ConDel: | xxxxx xxxx xxxxx | | 7.9 | xxxx xxxxx | | | xxxxx xxxx xxxxx | | xxxxx | 12.5 | xxxxx | |
| Shared LOS: | * * * | | A | * * | | | * * | * | | B | * | |
| ApproachDel: | xxxxxx | | xxxxxx | | | | xxxxxx | | | 12.5 | | |
| ApproachLOS: | * | | * | | | | * | | | B | | |

Note: Queue reported is the number of cars per lane.

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