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Section 1:
DEFINITIONS

DEFINITIONS

Whenever the following terms or titles are used in this manual or in any document or instrument where these standards govern, the intent and meaning shall be as specified in the City of Folsom Standard Design and Construction Specifications, and herein defined:

1. **Capital Improvement Program (CIP)** – Shall mean a listing of projects, budgeted and non-budgeted for public improvements.
2. **City Arborist** – shall mean the City staff assigned responsibility over all issues related to trees in the City of Folsom.
3. **City** – Shall mean the City of Folsom and its authorized representatives.
4. **City Resident Engineer** - Shall mean City staff assigned responsibility over construction of a CIP project.
5. **City Construction Inspector -** Shall mean City staff assigned responsibility over inspection of on- and off-site improvements both public and private associated with a private development project and for a publicly-funded CIP Project.
6. **City Building Inspector** – Shall mean City staff assigned responsibility over inspection of building-related structures associated with a public or private development project.
7. **Community Development Department – Building Division** – Shall mean the division in the Community Development Department responsible for issuing all building permits in the City of Folsom.
8. **Community Development Department** – **Engineering Division –** shall mean the division in the Community Development responsible for reviewing all private development public and private improvement plans, parcel and final maps, lot mergers and lot line adjustments and issuing all grading, encroachment and transportation permits in the City of Folsom.
9. **Consulting Engineer** – Shall mean a person or persons, firm, partnership, or corporation legally authorized to practice civil, mechanical, or electrical engineering in the State of California who prepares or submits improvement plans and specifications to the City of Folsom for approval.
10. **Contractor** – Shall mean an individual or firm duly licensed by the State of California to perform work as shown on a set of improvement plans approved by the City.
11. **Project Engineer** – Shall mean the City staff engineer assigned responsibility over the design of a CIP project or private development project.
12. **Developer/Owner** – Shall mean any person or persons, firm, partnership, corporation, or combination thereof, financially responsible for the work involved in the construction of a private development project.

13. **Development** – Shall mean the act or process of construction on real property, residential, commercial, office, multifamily or industrial subdivisions as well as buildings on individual lots or parcels. Development also includes construction of public improvements within public
rights-of-way required as a condition of approval for a private development project.
14. **Engineer** – Shall mean the City Engineer of the City of Folsom acting either directly or through the Director of the appropriate Department of the City, or their authorized representative.
15. **His** – The term "his" used in this manual shall mean both "his" and "her" and is used solely for simplicity in this document.
16. **Laboratory** – Shall mean any testing agency or testing firm which has been approved by the City.
17. **Standard Specifications** – Shall mean the latest edition of the Standard Construction Specifications for the City of Folsom, approved by the City Council governing the construction of roads, streets, sanitary sewers, storm drainage, concrete structures, water supply, traffic signals, street lighting, landscaping and other facilities within the City to provide for proper development.
18. **Standard Drawings** – Shall mean the standard details as set forth in the Standard Construction Specifications and those details included herein, and as modified, revised, or added.
19. **State Standard Specifications** – Shall mean the Standard Specifications of the State of California, Department of Transportation. (2010 Edition)
20. **State Standard Plans** – Shall mean the Standard Plans of the State of California, Department of Transportation (2010 Edition)
21. **Subdivider** – A developer/owner who submits an application to the City to develop a parcel of undeveloped or developed land in the City of Folsom and requests approval of the City for either a parcel or final map to subdivide the parcel.

Section 2:
CAPITAL IMPROVEMENT PROJECTS

CAPITAL IMPROVEMENT PROCEDURES

2.1 PURPOSE

The purpose of this chapter is to provide an outline for the development of projects from pre-project proposal to awarding the construction contract. This chapter is meant to be a guide to the Consulting Engineer and not an absolute mandate. It is anticipated that conditions will vary that will require deviation from standard procedures. However, deviation from standard procedures should receive prior supervisory approval.

2.2 PRE-PROJECT PROPOSAL

The pre-project proposal is the Consulting Engineer's presentation of the project need and proposed solution, design process, schedule, and costs. The Consulting Engineer should perform a field review of the proposed project in order to develop his initial scope of what is required to design the project. Photographs are very helpful for future reference during design. The Consulting Engineer should evaluate various alternative solutions to the engineering problem and then make a recommendation as to the most cost-effective solution. This alternative analysis should include the evaluation of potential environmental impacts of each alternative as well as the engineering comparison of each alternative.

The following is an outline of the various topics that need to be discussed in the pre-project proposal:

A. Project history and need
B. Alternative analysis
C. Project scope and definition (recommended alternative)
D. Project Tasks
    1) Environmental Documentation
    2) Data Gathering
        a) Surveying Geotechnical Research of Records
    3) Design parameters
    4) Right-of-way requirements and costs
    5) Required permits and agreements
    6) Required Project Reviews
    7) Others as required
E. Special Considerations
F. Project Scheduling
    1) Critical Path for complex projects
    2) Work Plans

a) Estimate of hours per task
b) Estimated total hours required for project
c) Estimated completion date for the project

G. Estimated total project costs versus project budget (if any).

The pre-project proposal is to be submitted to the specified City Representative for review and approval. The Director of Public Works should circulate the pre-project proposals for review, comment, and coordination with operating divisions followed by approval. Written comments are always preferred to formalize reviews by the operating divisions.

It is important that the Consulting Engineer be flexible to meet unexpected situations during the design of a project. Therefore, the Work Plans or Critical Path scheduling should be updated periodically to communicate changes to supervisory staff.

2.3 DESIGN REVIEW

Design reviews facilitate input by City Engineering staff concerning the concept and/or details of a project design. It is important that these reviews are timely and comprehensive. The review is where the combined expertise of the Department is employed to produce a design that is technically correct and meets the needs of the operating divisions.

The following are the recommended reviews prior to the advertising of the project for bids:

Review	Normal Time to Perform
Schematic Review	When Engineer completes his initial schematic design. (Preferred for technically complex projects i.e., pump stations, etc.)
50 Percent Design Specifications Review	When design has been delineated to include draft
Final Design Review	When Plans, Specifications, and Estimates are complete. All previous comments have been satisfied and project is ready for approval.

2.4 PROJECT ADVERTISEMENT

Project advertisement is the culmination of all the design efforts. The procedures discussed below must be followed to insure proper advertisement and funding.

BIDDING ANALYSIS

From the date the City Engineer approves the project and calls for bids, 3 to 4 weeks are given to the potential contractors to prepare their proposals. Additional time may be allotted as conditions dictate. Upon receipt of these proposals the City of Folsom publically announces the results of the bidding and the apparent low bidder. All proposals are then tabulated and verified for responsiveness of each bidder. This is accomplished by the Consulting Engineer reviewing each bid for accuracy and completeness together with the verification of the Contractor's license. Upon determination that the low bidder is responsive, the Project Engineer evaluates the bidding results to determine the quality of bids received and whether or not rejection of all bids and re-advertising is in the best interest of the City. The Project Engineer's recommendations are then reviewed by the supervisory staff and submitted through the Director of Public Works to City Council for approval and awarding of the contract to the low bidder, awarding to another bidder, or rejecting all bids and re-advertising.

2.5 PROJECT AWARD

Based on the recommendations of the City Engineer, the City Council awards the construction contract. From that point the project is assigned a Construction Inspector and the Project Engineer's role turns to construction management.

Section 3:
CONSULTANT SELECTION

3.1 POLICY STATEMENT

Policy for the selection of professional consultants has been formally adopted by the City Council located in Title 2, Chapter 2.36 – Folsom Municipal Code. In general, the policy provides for a selection committee to send Requests for Proposals (RFPs), an interview process, and an agreement. Consultant Services Agreements in excess of $41,750 must be approved by the City Council.

Selection preference will be given to Folsom area and Sacramento region based firms on the premise that adequate professional service generally can be obtained locally. Only fully qualified individuals or firms will be considered for each specific project. In the case of those projects that require unusual and/or highly specialized services, professional firms outside the local area will also be considered. Insofar as practical and consistent with the City's interest, available work will be equitably distributed among the local qualified individuals or firms.

Operational services exempt from the selection process are as follows:

1. Engineering
   a. Aerials
   b. Drafting
   c. Surveys
   d. Topography

2. Testing
   a. Soils
   b. Water
   c. Air
   d. Materials

A. 3. Inspection
   b. Welding
   c. Concrete
   d. Soils
   e. Miscellaneous

B. 4. Others
   f. Reports
   g. Investigations
   h. Photography
   i. Data Processing

3.2 SELECTION PROCEDURES

The selection procedures will normally be as follows, however, special cases may deviate from these general procedures.

Requests for Proposals will be prepared and sent, subject to pre-selection process, to qualify individuals and firms. Proposals received will then be evaluated by a selection review panel normally comprised of the Project Manager and two other individuals with experience in the type of project requiring services. Panels may be larger and include City Council selected individuals, and/or other public agency or industry representatives, depending on the scope or special nature of the project. After the proposals are reviewed, the most qualified individuals or firms (normally 3 to 4) may be invited for interviews for final selection. A Consultant Services Agreement will then be negotiated and executed with the selected individual or firm in accordance with current City policy.

Section 4:
PRIVATE DEVELOPMENT PROJECTS

4.1 PLANS BY AN APPROPRIATE ENGINEER

All plans and specifications for improvements, both public and private, including private on-site water, sewer, drainage, grading, streets, driveways, parking areas, street lighting, traffic signing and striping, site electrical and site accessibility shall be prepared by a Consulting Engineer of the appropriate branch of engineering (i.e., Civil, Electrical, etc.)

4.2 APPROVED PLANS

Complete plans and specifications for all proposed streets, bikeways, grading, drainage facilities, sewerage, street lighting, water distribution systems, industrial developments, commercial developments, residential subdivisions, including any necessary dedications, easements, and rights-of-entry, shall be submitted to the City for approval. This approval shall be substantiated by the signature of the Engineer or his authorized representative prior to the beginning of construction of any such improvements. The Engineer or his authorized representative shall order any Contractor to cease work on any project if said Contractor does not have properly approved plans in his possession.

4.3 APPROVED PLANS AND THE BUILDING PERMIT PROCESS

Building plans for the construction of private residential structures shall be reviewed and approved by the Community Development Department – Building Division. (For private residential custom home structures, the submittal process and plan review and approval process by the Community Development Department – Engineering Division shall be in accordance with Section 4.4 below). Building plans for the construction of commercial, industrial, office, and multifamily structures shall also be reviewed and approved by the Community Development – Building Division. However, the Building Division approval shall be for the structure plus 5 feet beyond the structure footprint only.

Improvement plans for public and private improvements associated with a building permit outside the 5-foot structure envelope shall be reviewed and approved by the Community Development Department-Engineering Division. Site improvement plans may include both public off-site improvements and private on-site improvements. All required site improvement plans including both off-site public and on-site private improvements associated with a building permit shall be reviewed and approved by the Community Development Department-Engineering Division prior to the issuance of a building permit for a private development project. In addition, the City requires various site improvements typically included on the site improvement/grading plans to be constructed on a private development project prior to issuance of a completed building permit. These improvements generally include an all-weather access around a building pad, an underground water system that has been pressure-tested and is operable, including fire hydrants that are capable of delivering fire flows, and building pad elevations and lot compaction certifications.

Note: The City will not accept a building permit application for a private commercial, industrial, office and multifamily development project for review and approval without the submittal of a complete set of site improvement plans. A complete set of site improvement plans for a private development project consists of grading and civil site improvement plans, site electrical/lighting plans, site landscape and irrigation plans and site accessibility plans.

4.4 APPROVED PLANS AND THE BUILDING PERMIT PROCESS (PRIVATE RESIDENTIAL CUSTOM HOME STRUCTURES)

A. Improvement Plan/Grading Plan Submittal Requirements

To begin the plan review process for a private residential custom home structure, the Developer/Contractor shall submit a completed Plan Check & Building Permit Application form available from the Community Development-Building Division and pay the required plan check fees in accordance with the City's current fee ordinances and resolutions. In addition, the application will require the submittal of three (3) complete sets of building plans. The building plans shall include a site grading plan. For new private custom home residential structures, the Community Development Department-Engineering Division will review the site grading plan for compliance with the City standards and specifications.

For new private custom home residential projects, the Community Development Department-Engineering Division will review the site grading plans and provide red-lined comments on a plan-check set and/or written comments attached to the plan-check set. In either case, these comments will be routed to the Building Division, and the Building Division will return the comments, together with all other comments from various City departments and divisions, directly to the Developer/Contractor. The Developer/Contractor is required to provide a written response to all comments provided by the City and is required to resubmit the plan-check set(s) with the re-submittal of revised plans. Re-submittal of revised plans without all of the comments being addressed and/or without the original red-lined plan-check sets being included will result in delays in the Developer/Contractor obtaining a building permit. In addition, the City requires various site improvements typically included on the site grading plans to be constructed on a new custom home residential project prior to issuance of a building permit. These improvements generally include lot compaction certification, building pad elevation certification and property corner verification.

Note: The Developer/Contractor will resubmit all revised building and site grading plans for new private custom home residential structures directly to the Building Division and not directly to the Engineering Division or any other City department or division. This is unlike the plan review process for commercial, industrial, office and multifamily improvement/ grading plans which require the Consulting Engineer to revise and resubmit plans checked by the Engineering Division directly to the Engineering Division and not to the Building Division. This requirement is essential to ensure the timely review of the site grading plans and to avoid delays in the Developer/Contractor obtaining a building permit.

4.5 REFERENCE TO CITY SPECIFICATIONS AND STANDARD

The General Notes and Special Provisions on all plans shall include the following note:

All construction and materials shall conform to these plans and shall be in accordance with the latest edition of the City of Folsom Standard Construction Specifications.

4.6 WORK IN CITY RIGHTS-OF-WAY AND EASEMENTS

Possession of a complete set of City-approved improvement plans, together with an encroachment permit (See Section 4.20 ENCROACHMENT PERMIT REQUIREMENTS), shall allow a Contractor that is duly licensed by the State of California to perform work specified on the plans in the City rights-of-way and easements. The Contractor shall be bonded as required by the Engineer and shall possess comprehensive general liability and automobile insurance in the amount designated by the City. The Contractor shall also be required to submit Certificates of Insurance for general liability and automobile policies naming the City of Folsom as an additional insured under these policies.

Performance and payment bonds for the encroachment permit will be required as directed by the City.

A note shall be placed on the approved plans directing the Contractor to obtain an encroachment permit for the work performed within the City rights-of-way and easements. When approved by the Engineer, minor work within City right-of-way and easements may be performed with an encroachment permit or other authorized permit without City –approved improvement plans.

4.7 IMPROVEMENT/GRADING PLAN SUBMITTAL REQUIREMENTS

A. Plan Submittal

To begin the improvement/grading plan review process for a private development project, a Development Application Form shall be fully completed by either the Developer/Owner or the Consulting Engineer and submitted to the Community Development Department-Engineering Division. The Development Application Form, available from the Community Development Department-Engineering Division, includes a checklist of items which are required to accompany the improvement plans submittal. The checklist included on the Development Application Form includes a brief description of the required submittal item together with the required number of copies of the submittal item.

The Development Application Form requires the Consulting Engineer preparing the plans to certify that the submittal of the plans, calculations, reports, etc. which are a part of the submittal are 100% complete and ready for construction in accordance with industry standards. A signed Submittal Completion Form signed by the Consulting Engineer shall be included with the Development Application Form at the time of submittal of plans for review. In addition, the Consulting Engineer shall be required to submit a signed Submittal Completion Form for each subsequent re-submittal of revised plans.

B. Engineer’s Construction Cost Estimate

Improvement plan submittals for private development projects shall also include a detailed engineer’s construction cost estimate for all of the required improvements shown on the improvement plans. The engineer’s construction cost estimate shall be prepared by the Consulting Engineer and shall be signed and stamped by the Consulting Engineer.

Note: The Engineer shall review and approve the engineer's construction cost estimate to verify that all quantities are accurate and that all unit prices are commensurate with current construction cost indices and industry standards.

C. Engineering Fees

Engineering plan check and inspection fees shall be charged in accordance with the City's current fee ordinances and resolutions adopted by the City Council. The engineering plan check and inspection fee shall be paid in full at the time of the initial submittal of plans for review.

Improvement plans for private development projects will not be accepted by the Community Development Department-Engineering Division without a fully completed Development Application Form, submittal of required data, plans, reports and documents on the Development Application Form, a completed Submittal Completion Form, signed by the Consulting Engineer, a detailed engineer's construction cost estimate signed and stamped by the Consulting Engineer and the payment of the required plan check and inspection fees.

4.8 SUBDIVISION FINAL AND PARCEL MAP SUBMITTAL REQUIREMENTS

Final map and parcel map submittal requirements shall be in accordance with Chapter 16.20.060 for final maps and Chapter 16.24.090C for parcel maps of the Folsom Municipal Code and as specified herein.

A. Map Submittal

To begin the map review process for a private development project, a Development Application Form shall be fully completed by either the Developer/Owner or the Consulting Engineer and submitted to the Community Development Department-Engineering Division. The Development Application Form available from the Community Development Department-Engineering Division includes a checklist of items which are required to accompany the map submittal (See submittal requirements below). The checklist included on the Development Application Form includes a brief description of the required submittal item together with the required number of copies of the submittal item. In addition, the Consulting Engineer shall be required to submit a signed Submittal Completion Form for each subsequent re-submittal of a revised map.

The submittal requirements for both parcel and final maps are as follows:

- A copy of a complete set of approved improvement plans for the project (if applicable).
- A copy of the most current Soils/Geotechnical Report for the project.
- A copy of the current title report showing the legal owners and dated within 90 days of the date of submittal of the map for review.
- Copies of recorded deeds for off-site easements or rights-of-way required for roadway and/or public utility purposes which are required for proposed improvements which are outside the boundaries of the project.

- Copies of all record information identified in the title report.
- Traverse closure computations in a computerized form approved by the Land Surveyor, giving bearings, distances and coordinates, and showing the mathematical closure.
- Copies of all current vesting deeds.
- Copies of the approved conditions of approval for the subdivision.
- A copy of the approved tentative subdivision or parcel map.
- A copy of any deed restrictions for the project.
- A guarantee of title or letter from the title company, certifying that the signatures of all persons whose consent is necessary to pass a clear title to the land being subdivided and all acknowledgements thereto, appear and are correctly shown on the proper certificates, and are correctly shown on the final map; both as to consents for the making thereof and the affidavit of dedication.
- A copy of all protective covenants, restrictions, or affirmative action obligations in the form in which the same are to be recorded, when approval thereof by an officer of the City has been required as a condition of approval of the Tentative Map.

The Development Application Form requires the Consulting Engineer preparing the map to certify that the submittal of the map together with the required submittal items listed above is 100% complete and ready for approval in accordance with industry standards. A signed Submittal Completion Form signed by the Consulting Engineer shall be included with the Development Application Form at the time of submittal of the map for review. In addition, the Consulting Engineer shall be required to submit a signed Submittal Completion Form for each subsequent re-submittal of a revised map.

B. Engineering Fees

Engineering map check fees shall be charged in accordance with the City's current fee ordinances and resolutions adopted by the City Council. The engineering map check fee shall be paid in full at the time of the initial submittal of the map for review.

Subdivision final and parcel maps for private development projects will not be accepted for review by Community Development Department-Engineering Division without a fully completed Development Application Form, a completed Submittal Completion Certification Form signed by the Consulting Engineer, submittal of the required data, plans, reports and documents as noted herein and the payment of the required map checking fees.

4.9 PREPARATION OF IMPROVEMENT/GRADING PLANS

A. Public Improvement Plans

All public improvement plans for private development projects that will be constructing improvements that are to be constructed in public rights-of-way and/or public easements and that will be accepted by the City for operation and maintenance shall be prepared in accordance with Section 5 Drafting Standards and Sheet Layout of these Design Standards.

Private development projects that are required to construct public improvements in the public rights-of-way and/or public easements that will be accepted by the City for operation and maintenance shall prepare a set of public improvement plans that are separate from the improvement plans for the private on-site improvements. If the required improvements consist only of utility connections to existing water, sanitary sewer and/or storm drainage pipes already stubbed to the project, the installation of concrete sidewalks adjoining or adjacent to existing concrete curb and gutter, the installation of a new driveway to the project and/or minor changes to the existing public street right-of-way, this requirement may be waived with prior approval by the Engineer.

B. Private Site Improvement Plans

Site improvement plans for private development projects shall be drawn to scale and shall be on sheets that are 24”x36” in size and shall be prepared in accordance with applicable sections of these Design Standards. Plan sizes other that 24”x36” may be allowed with the prior approval from the Engineer. All site improvement plans shall include a cover sheet and shall include all applicable plan sheets for civil site/grading improvements, site electrical/ lighting, site landscape and irrigation and site accessibility. Site improvement plan cover sheets and applicable plan sheets shall, at a minimum, contain the following information:

1) Cover Sheet

A cover sheet is required for all site improvement plans. The cover sheet, as a minimum, shall include:

a) Project location/vicinity map showing the project’s general location in the City and a site plan in a scale to show the entire project site.
b) City standard general notes.
c) Wet stamp/signature of licensed professional.
d) Sheet index showing all plan sheets in the improvement plan set.
e) Typical legend, North Arrow, and Revision Block.
f) Contact information with the names, addresses and phone numbers of the project’s developer/owner, consulting engineer, soils/geotechnical engineer and utility company representatives.
g) Temporary and Permanent Benchmark information.
h) City of Folsom signature block (See Section 4.15 City Review and Approval of Improvement/Grading Plans for additional information).
i) City Tree Permit Number (if applicable), City Grading Permit Number (if applicable) and State Waste Discharge Identification Number (if applicable).

2) Civil Site Improvement/Grading Plan Sheets

a) Existing and proposed building pad and finished floor elevations. In addition, the site improvement/grading plans shall include the existing grades on the project site and proposed sub-grade, finished pavement grades and top back of curb/sidewalk grades within the project drive aisles, parking areas, pedestrian walkway areas and landscape areas.

b) Existing topography shall be shown with light line weights and proposed topography will be shown with bold line weights. Existing topography will extend a minimum of 50 feet into all adjoining parcels.

c) Lot and adjacent land drainage. Adjacent lot grades shall be shown for a minimum of 50 feet from the project boundary with adequate detail to define existing drainage patterns.

d) All underground utilities (domestic and fire water, sanitary sewer, and storm drainage) including connections to the existing public systems. This shall include domestic and fire water facilities, existing and proposed pipe sizes, lengths, material types, and designations and existing and proposed finished grades of valves, blow-offs, backflow prevention assemblies and other related water systems appurtenances. This shall also include the existing and proposed storm drainage and sanitary sewer facilities, existing and proposed pipe invert and rim elevations of structures, drain inlets, manholes and cleanouts.

e) All existing and proposed improvements within the public street right-of-way including, but not limited to, concrete sidewalk, curb and gutter, street lights, fire hydrants, driveways, water meters, domestic and fire water backflow preventers, fire department connections, water valves, sanitary sewer laterals and cleanouts, storm drain inlets/manholes and any other appurtenances associated with the project.

f) All on-site surface improvements including curbing, gutters, fencing, trash enclosures, barrier walls, walkways, rock walls/outcroppings, retaining walls, with appropriate typical cross-sections and details.

g) Existing and proposed traffic signing and striping, pavement markings, pavement markers, regulatory and warning signs, fire lane signing and striping, parking stalls, both regular and compact, and all other signing and striping required for the site development.

h) Typical cross-sections at <u>all</u> property lines. The typical cross-sections shall include, but not be limited to, structures, fences, retaining walls, drainage swales, drainage pipes and property lines and shall include dimensions measured from the property line to each of the noted improvements.

i) Typical cross-sections and construction details for all proposed pavement surfaces including driveways, drive aisles, parking stalls loading ramps, fire lanes, etc., within the project site.

j) All existing trees on the project site and other trees, together with their corresponding tree protection zones (TPZ), which will be impacted by the proposed grading and/or construction. If the TPZ is proposed to be encroached upon, then show the extent of the proposed limits of excavation or grading within the TPZ. The plan shall also include a table showing tree species, size of the tree at diameter at standard height (DSH) and the current status or condition of the tree to be removed and/or preserved.

k) Typical cross-sections and construction details for all proposed retaining walls. The plan shall include top and bottom of wall elevations at the beginning and end of all walls and at all changes in wall height or no more than every 25 feet. The typical cross-sections shall include all construction details of the wall, footing sizes and dimensions, steel/rebar schedules, backfill, drainage pipes, etc.

l) Existing and proposed public and/or private utility easements, wells, drainage ditches, drainage channels, floodplains and/or floodway boundaries and other existing improvements, landmarks, buildings, structures and underground and overhead utilities related to the construction of the proposed development.

m) Wet stamp/signature of the licensed professional preparing the plan sheet.

Note: Private development projects shall be required to prepare plan and profile sheets for any public water, sanitary sewer and storm drainage improvements even if these improvements are constructed within private streets and/or within private property. The requirement to prepare profile sheets for these improvements within private streets and/or within private development projects may be waived with prior approval of the Engineer.

Note: Private development projects that construct public water, sanitary sewer and storm drainage improvements within private streets and/or within private property shall be required to dedicate public easements to the City for these improvements. The public easement dedication, submittal requirements and procedures shall be in accordance with Section 8 Right-of-Way Engineering and Acquisition of these Design Standards. The public easements shall be dedicated to the City and shall be recorded with the Sacramento County Recorder prior to acceptance of the improvements by the City and prior to approval of a building permit and/or prior to issuance of a Certificate of Occupancy for a private development project

3) Site Electrical/Lighting Plan Sheets

a) A site power plan showing the proposed power distribution system from the serving public utility provider to all proposed electrical equipment on the project site. The plan shall also include all pull boxes, splice boxes, service points, transformers and panel boards.

b) A table/schedule showing all proposed conduits and wires together with their sizes, types, and insulation. The plan shall also include a trench detail for all proposed conduits showing conduit placement and coverage, conduit trench depth and width and sizes and types of conduit trench backfill material(s).

c) A photometric plan for the entire project site.

d) A lighting plan including a one-line diagram and circuiting to all proposed light poles and lighting fixtures. The plan shall also include a detail of the proposed lighting fixtures including a schedule of fixtures, types, manufacturers, numbers, lamp types, and numbers and wattage per fixture and the total wattage of the lighting system.

e) Lighting control systems including photocells, time clocks, contactor cabinets, etc.

f) Required “”OLTG” energy compliance documentation.

g) Wet stamp/signature of the licensed professional preparing the plan sheet.

4) Site Landscape and Irrigation Plan Sheets

a) A table/schedule showing all irrigation valves, mains and laterals, controllers, sprinklers, including the manufacturer and description, the pressure and flow rate and the precipitation rate for the sprinklers.
b) A planting legend that includes all plants common and botanical names including their sizes (or container sizes), water use and quantity.
c) Irrigation Controller and emitter schedules.
d) Water use calculations, as required by the California Model Water Efficient Landscape Ordinance.
e) Planting and irrigation notes and construction details.
f) Parking area shade calculations

5) Site Accessibility Plan Sheets

Site accessibility plans shall be a complete and separate plan sheet with only site accessibility information on it, pertaining to the accessibility requirements as set forth by the California Title 24, Part 2, California Building Code and shall include the following information:

a) Existing and/or proposed property lines.
b) Building and/or facility footprints with all entrances and exits clearly identified.
c) Existing and/or proposed public street improvements including concrete curb, gutter and sidewalk along the frontage of or adjoining the boundaries of the parcel being developed.
d) Parking stalls with all accessible stalls detailed including required "Van Accessible" stalls and "Accessible" stalls.
e) Accessible route of travel along the public way from the nearest public transportation stop to the building and/or facility entrances and exits.
f) Accessible route of travel from the accessible parking stalls and any unloading areas to the building and/or facility entrances and exits.
g) Accessible route of travel between multiple buildings and/or facilities on the same project site.
h) Ramps including percent slope and cross-slope, landings, handrails and their length and width, along with details for their construction and installation.
i) Stairs including rise and run, nosing and riser details, tread striping for the visually impaired, landings and handrails and their length and width along with details for their construction and installation.
j) Slopes and cross-slopes (including actual slope percentages) along all route(s) of travel to the building and/or facility entrances and exits.
k) Legend to delineate any symbols or abbreviations included on accessibility plans and construction details.
l) Construction details for all proposed route(s) of travel, ramps, detectable warnings, concrete walkways, stairs, landings, hand rails, signing and striping and all other details needed to complete the construction of the improvements shown on the approved site accessibility plan.
m) Wet stamp/signature of the licensed design professional preparing the site accessibility plan.

4.10 CUSTOM HOME RESIDENTIAL GRADING PLAN REQUIREMENTS

Grading plans for custom home residential lots that are generally less than one (1) acre in size shall be prepared in accordance with and shall include the following requirements:

A. A Title Block showing a minimum of the project/owner, project address, date, scale (min. of 1”=20’), sheet number(s), north arrow, vicinity map, index and sheet legend. Grading plan sheets shall be 24”x36” unless otherwise approved by the City.

B. City Standard Grading Notes. The grading notes can be obtained from the Community Development Department-Engineering Division.

   Note: Certain areas within the City have soils which are known to contain naturally occurring asbestos. For lots/parcels within these areas additional grading notes provided by the Sacramento Metropolitan Air Quality Management District (SMAQMD) shall be required to be shown on the grading plan.

C. Wet Stamp/Signature of Licensed Professional. Grading plans shall be signed and stamped by a California Registered Civil Engineer or California Licensed Architect, if applicable. Refer to Section 6731 and 6735 of the Business and Professional Code for the State of California for grading plan preparation requirements.

D. Proposed Grading Quantities. Grading plans shall include a table which includes grading quantities for excavation, cut, fill and import and/or export volumes in cubic yards.

E. Engineer’s Cost Estimate. The estimate shall include costs for proposed grading as well as site improvements including driveways, utilities laterals and proposed retaining walls which do not require the issuance of a building permit. The cost estimate shall be prepared by the licensed engineer if applicable and shall be signed and stamped.

F. Existing/proposed topography at one (1) foot intervals. Existing topography shall be shown with light line weights and proposed topography will be shown with bold line weights. The existing topography shall extend a minimum of 50 feet into all adjoining parcels.

G. Property lines for entire lot/parcel. Property lines shall be shown with bold line weights. All property corners for the lot/parcel shall be described on the plan and elevations shall be shown where applicable.

H. All existing street/frontage improvements for the lot/parcel including concrete curb, gutter and sidewalk, streetlights, fire hydrants, water meter/services, sanitary sewer cleanouts/services, manholes, drain inlets, valve boxes, and other utility connections.

I. All existing trees on the lot/parcel and other existing trees together with their corresponding tree protection zones (TPZ) which will be impacted by the proposed grading or construction. Existing tree protection zone (TPZ) shall be shown with dashed lines.

   Note: Grading plans shall include tree protection zones (TPZ) for existing trees located on adjoining lot/parcels which are impacted by the grading. The plan shall also include a table showing species, size at diameter at standard height (DSH) and the status or condition of all existing and impacted trees (to be removed or to be preserved).

J. Existing fences, drainage swales, drainage patterns, retaining walls, rockwalls/ outcroppings, public and/or private utility easements, buildings and/or structures within the boundaries of the lot/parcel and no less than 50 feet into all adjoining parcels.

K. Typical cross-sections at all property lines. The typical cross-sections shall include structures, fences, retaining walls, drainage swales, drainage pipes and shall include dimensions measured from the property line to each of these noted improvements.

L. Proposed retaining walls. The plans shall include cross-sections and construction details for all proposed retaining walls. The plan shall include top and bottom of wall elevations at the beginning and end of all walls and at all changes in wall height or no more than every 25 feet.

M. Proposed retaining wall plan sheets. Proposed retaining wall plans are required to be attached to the grading plan if the wall plan is prepared by another licensed professional. All retaining wall plans shall include a typical cross-section of all walls. The typical cross-section shall include all construction details of the wall, footing sizes and dimensions, steel/rebar schedule, backfill, drainage pipes, etc. In addition, typical cross-sections for retaining walls shall include dimensions to existing fences, property lines, drainage swales, structures, and other improvements which may be impacted by the retaining wall construction.

N. Proposed drainage swales and patterns including grades, elevations, and slopes. All drainage swales shall be a minimum of 1%. All proposed drainage swale slopes that exceed 10% shall be cobble-lined in accordance with the City Standard drainage swale Standard Detail SD-14.

O. Driveways including grades, elevations, slopes and material type. The plan shall also include a driveway profile for the entire length of the driveway. The profile shall include a slope transition at the street and at the entrance to the garage. The driveway profile shall confirm to City Standard Detail RD-21. Asphalt concrete (AC) driveways shall not be permitted unless approved by the Engineer.

4.11 PREPARATION OF FINAL AND PARCEL MAPS

Final and parcel maps for private development projects shall be prepared in conformance with the State Subdivision Map Act, Title 16 SUBDIVISIONS of the Folsom Municipal Code and these Design Standards. See Section 4.8 of these Design Standards for additional requirements for Final and Parcel Maps.

4.12 APPROVAL OF FINAL AND PARCEL MAPS

A. Final Map Approval Requirements

Final Map review and approval shall be in accordance with Chapter 16.20 Final Subdivision Maps – Five or More Parcels of the Folsom Municipal Code and the standards herein. If the required improvements for the subdivision have not been completed and accepted and the one year warranty period completed to the satisfaction of the City prior to the recordation of the Final map, the subdivider shall enter into a subdivision improvement agreement (SIA) with the City. The Community Development Department-Engineering Division (reviews final subdivision maps and is responsible for preparing staff reports to the City Council for approval of the final map. Below is a summary of the requirements which must be satisfied prior to the final subdivision map being approved by the City Council.

All final subdivision maps are required to be accompanied by a subdivision improvement agreement (SlA). The SIA is prepared by the Community Development Department-Engineering Division and it shall be in accordance with Chapter 16.36.080 Improvement Agreements of the Folsom Municipal Code. In order to prepare the SIA, the Subdivider shall be required to satisfy the following requirements:

1) All public and/or private improvement plans for the subdivision shall be reviewed and approved by the City.
2) Submittal of a detailed and itemized engineer's estimate of construction costs for all required public and/or private improvements. The cost estimate shall be prepared by and signed and stamped by a licensed professional engineer. The cost estimate shall be 8 ½"x11" in size and shall be titled "Exhibit A." In accordance with the terms of the SIA, the cost estimate shall also include, but not limited to, costs for survey monumentation, public utility improvements, (e.g. joint trench) and landscape and irrigation. In addition, the estimate shall include a 10% cost contingency.
3) Submittal of the Subdivider's and surety's name and address, and the name and title of the person(s) who will be notified should the City of Folsom be requested to provide a notification to either the Subdivider or surety.
4) Submittal of the signed and executed original Mylar of the final map. Prior to the execution of the final map by the Subdivider, the map shall be reviewed and approved by the CDD – Engineering Division. The Community Development Department-Engineering Division will retain the executed original Mylar of the map until the City Council formerly approves the final map.
5) Payment of the fee required in accordance with the City's current fee ordinances and resolutions adopted by the City Council for the preparation of the SIA.
6) At such time the above-listed items are submitted, the Community Development Department-Engineering Division will prepare the SIA (3 copies). The SIA will include the performance and labor and materials bond forms (1 copy each). The SIA and the bond forms will be forwarded to the subdivider for execution. The Subdivider will execute and have notarized the SIA and the bond forms and return the fully-executed SIA and bonds to the Community Development Department-Engineering Division. The subdivider shall also be required to submit the following items, together with the fully-executed SIA and bonds.
    a) Payment of the $3,000 final map deposit.
    b) Complete insurance forms and endorsements. The required insurance forms shall include separate endorsements naming the City of Folsom as an additional insured for both the automobile and general liability policies.

    Note: The City of Folsom has specific insurance requirements, and these insurance requirements shall be satisfied prior to the final map being scheduled for City Council approval.

c) Fully-executed notary acknowledgments for all persons signing the SIA and performance and labor and materials bonds.

The Community Development Department-Engineering Division will review the fully-executed SIA, the performance bond and labor and materials bonds and the insurance forms and endorsements. Once these items have been reviewed and approved for accuracy, completeness, and compliance with City requirements, the Community Development Department-Engineering Division will proceed with preparing the staff report to the City Council for approval of the final map.

The City has specific requirements for the preparation and content of staff reports which are presented to the City Council for approval. The City requires written response to all conditions of approval. The subdivider will be required to provide a written response to all conditions of approval stating specifically how each condition was satisfied. The written response shall include specific information such as receipt numbers, dates of approval, etc.

Note: The City will not proceed with approval of any final map until all applicable conditions of approval have been completed to the satisfaction of the City.

The City also requires the subdivider to provide reduced copies (8 ½"x11") of both the tentative subdivision map and the final map. The reduced copies may be submitted electronically in .pdf format. The reduced copies of the tentative subdivision map and the final map are required attachments to the staff report which will be presented to the City Council.

After receipt of the written responses to the conditions of approval, together with the reduced copies of the tentative subdivision map and final map, the Community Development Department-Engineering Division will prepare the staff report to the City Council. The City requires the staff report, together with all the required attachments, to be completed approximately two (2) weeks prior to any regularly-scheduled City Council meeting. Failure to meet this deadline may result in a delay in approving the final map of up to two (2) additional weeks.

Once the final map is approved by the City Council at a regularly scheduled City Council meeting, the Community Development Department-Engineering Division will:

- Route the original signed Mylar of the final map to the City Engineer, the City Surveyor, and the City Clerk for approval. After approval of the original signed Mylar of the final map by the City Engineer, City Surveyor, and City Clerk, the Community Development Department-Engineering Division will route the final map to the subdivider's title company. The final map will be routed to the title company within two (2) working days from the date of approval by the City Council. The subdivider's title company is required to have the final map recorded at the Sacramento County Recorder's Office within ten (10) days from the date of approval of the final map by the City Council.

- Route the executed SIA to the City's Community Development Director, City Attorney, City Clerk, and Mayor for approval. The City will route the fully executed SIA to the Sacramento County Recorder's Office for recordation. The Community Development Department-Engineering Division will provide one (1) original recorded copy of the SIA to the subdivider and retain the other (2) recorded original copies of the SIA for City use.

B. Parcel Map Approval Requirements

Parcel Map review and approval shall be in accordance with Chapter 16.24 Parcel Maps – Four or Less Parcels of the Folsom Municipal Code and the standards herein. The Community Development Department-Engineering Division is responsible for reviewing and approving parcel maps submitted to the City (See Section 4.8 of these Design Standards for Parcel Map submittal requirements).

Note: Parcel maps are approved by the City Engineer and therefore are not required to be presented to the City Council for approval.

Below is a summary of the requirements which must be satisfied prior to the parcel map being approved by the City:

Parcel maps which include conditions of approval that require the installation and construction of both public and private improvements and if the subdivider requests that the parcel map be approved prior to completion and acceptance by the City of those improvements, the parcel map approval shall be contingent upon the execution of a Deferred Improvement Agreement (DIA). The DIA is prepared by the Community Development Department-Engineering Division and it shall be in accordance with Chapter 16.36.030 Deferred Improvement Agreements of the Folsom Municipal Code. In order to prepare the DIA, the Subdivider shall satisfy the following requirements:

1) All public and/or private improvement plans for the required improvements shall be reviewed and approved by the City.
2) Submittal of a detailed and itemized engineer's estimate of construction costs for all required public and/or private improvements. The cost estimate shall be prepared by and signed and stamped by a licensed professional engineer. The cost estimate shall be 8 ½"x11" in size and shall be titled "Exhibit A." The cost estimate shall also include, but not be limited to, costs for survey monumentation, public utility improvements, (e.g. joint trench) and landscape and irrigation. In addition, the estimate shall include 10% cost contingency.
3) Submittal of the Subdivider's and surety's name and address, and name and title of the person(s) who will be notified should the City of Folsom be requested to provide any notification to either the Subdivider or surety.
4) Submittal of the signed and executed original Mylar of the parcel map. Prior to the execution of the parcel map by the subdivider, the map shall be reviewed and approved by the Community Development Department-Engineering Division. The Community Development Department-Engineering Division will retain the executed

original Mylar of the map for the approval of the parcel map by the City Engineer, City Surveyor, and City Clerk.

5) Payment of the fee required in accordance with the City's current fee ordinances and resolutions adopted by the City Council for the preparation of the DIA.

6) At such time the above-listed items are submitted, the Community Development Department-Engineering Division will prepare the DIA (1 copy). The DIA will include the performance and labor and materials bond forms (1 copy each). The DIA and the bond forms will be forwarded to the subdivider for execution. The Subdivider will execute and have notarized the DIA and the bond forms and return the fully-executed DIA and bonds to the Community Development Department-Engineering Division. The subdivider shall also be required to submit the following items, together with the fully-executed DIA and bonds.

7) Payment of the $1,000.00 parcel map deposit.

8) Fully-executed notary acknowledgments for all persons signing the DIA and performance and labor and materials bonds.

The City requires a written response to all conditions of approval. The subdivider will be required to provide a written response to all conditions of approval stating specifically how each condition was satisfied. The written response shall include specific information such as receipt numbers, dates of approval, etc. Please note that the Community Development Department-Engineering Division will not proceed with approval of any parcel map until all applicable conditions of approval have been completed to the satisfaction of the City.

The Community Development Department-Engineering Division will review the fully-executed DIA, the performance bond and labor and materials bond and the written responses to the conditions of approval. Once these items have been reviewed and approved for accuracy, completeness, and compliance with City requirements, the Community Development Department-Engineering Division will proceed with approval of the parcel map.

Once the parcel map is ready for approval, Community Development Department-Engineering Division will:

- Route the original signed Mylar to the City Engineer, the City Surveyor and the City Clerk for approval. After approval of the original, signed Mylar of the parcel map by the City Engineer, City Surveyor, and City Clerk, the Community Development Department-Engineering Division will route the parcel map to the Subdivider's title company. The parcel map will be routed to the title company within two (2) working days from the date of approval by the City. The Subdivider's title company is required to have the parcel map recorded at the Sacramento County Recorder's Office within ten (10) days from the receipt of the parcel map from the Community Development Department-Engineering Division.
- Route the executed DIA to the City's Community Development Director, City Attorney, City Clerk and City Manager for approval. The City will route the fully-

executed DIA to the Sacramento County Recorder's Office for recordation. The Community Development Department-Engineering Division will provide one (1) original recorded copy of the DIA to the subdivider and retain a recorded copy of the DIA for City use.

4.13 PRIVATE DEVELOPMENT STANDARDS

The purpose of establishing design and construction standards for private site developments is to ensure that minimum standards of construction are maintained to protect the health, safety, and general welfare of the public. These standards are intended to minimize the potential of: contamination to the potable water system by cross-connections, ground water intrusion into the sanitary sewer and storm drainage systems, ground water contamination resulting from leakage of sanitary sewer systems, damage to habitable structures caused by flooding and structural failure of pavement areas subjected to vehicle loads.

The City of Folsom requires that private on-site parking areas, drive aisles and their appurtenances and water, sanitary sewer and storm drainage system improvements within the private development project site and up to within five (5) feet of the proposed structure(s) to be designed and constructed in accordance with the City's Design and Construction Standards and Specifications.

A. Pavement and Structural Section Requirements

1) Pavement structural section design by a soils/geotechnical engineer shall be required on all private development projects. The design for pavement structural sections shall be a part of a Soils/Geotechnical Report. The report shall be submitted in an 8½"x11" bound folder and shall include, but not be limited to, an analysis of the site suitability, proposed foundation design for all proposed structures, and roadway and pavement design. The Soils/ Geotechnical Report shall be signed and stamped by a licensed Soils/Geotechnical Engineer.

2) The minimum traffic index (TI) required for on-site pavement structural sections subjected mainly to vehicular traffic shall be 4.0. The minimum traffic index (TI) required for on-site pavement structural sections subjected mainly to truck traffic shall be 6.0. However, it is recommended that the developer/owner of the project design and construct a pavement structural section that provides maximum strength and durability for the project's anticipated traffic loads.

3) The minimum cross-slope of all pavements shall be one percent (1%).

4) The Soils/Geotechnical Engineer, his or her designated representative, or the project construction materials testing firm shall be on-site during construction to monitor parking lot and site grading, foundation grading and compaction for all proposed structures, pavement, and base construction and placement and sub grade and structural section compaction.

5) Written certification of lot pad compaction for all proposed structures from the Soils/Geotechnical Engineer shall be provided to the City prior to issuance of a building permit for the structure(s)

6) Written certification of pavement grades by a registered Civil Engineer or licensed Land Surveyor and written certification of the structural section and compaction by a registered Soils/Geotechnical Engineer shall be required prior to the issuance of a

Certificate of Occupancy for a private development. A Certificate of Occupancy will not be issued for any building if the pavement structural section or compaction does not conform to the requirements specified in the Soils/Geotechnical Report.

B. Water System Design Requirements

1) The on-site domestic water, irrigation water and fire protection systems for the project shall be privately owned and maintained. The fire protection system and the irrigation system shall be separate from the domestic water system. The fire system shall be constructed to meet the National Fire Protection Association Standard 24 and shall be in accordance with Section 17 of these Design Standards. The domestic water and irrigation systems shall be metered in accordance with City standards and requirements.

2) The on-site domestic water and irrigation service laterals shall be sized (i.e. diameter) consistent with the size of the meters and the backflow prevention assemblies. In no case shall the meter size (diameter) not be consistent with the size (diameter) of the service lateral. Backflow prevention assemblies may be upsized from the service lateral and meter size with prior approval of the Engineer.

3) The irrigation water service shall be separate from the domestic water service for a private development project that will install more than 5,000 square feet of irrigated landscape. This requirement does not apply to single-family residential water connections.

4) The plan shall include pipe diameters, length, slope and material type and designation.

5) A to-scale profile view of all on-site private water mains and laterals is not required. The plan view shall include bottom and top of pipe elevations at various locations, depth of gate and butterfly valves, etc.

6) Water system design calculations shall be signed and stamped by a licensed professional engineer prior to City approval of private development improvement plans.

C. Sanitary Sewer System Requirements

1) The on-site sanitary sewer system for the project shall be privately owned and maintained.

2) The minimum size of any on-site sanitary sewer line shall be four (4) inches in diameter. Pipe depths to finished grade and/or sub grade shall be in conformance with the specifications of the pipe manufacturer.

3) A to-scale profile view of all on-site private sewer mains and laterals is not required. The plan view shall include invert and rim elevations in and out of all on-site manholes, cleanouts, flusher branches, etc.

4) The plan shall include pipe diameter, length, slope and material type and designation.

5) Sanitary sewer system design calculations shall be signed and stamped by a licensed professional engineer prior to approval of private development improvement plans.

D. Storm Drainage System Design Requirements

1) The on-site storm drainage system for the project shall be privately owned and maintained.

2) The minimum size of any on-site storm drain line shall be four (4) inches in diameter. Pipe depths to finished grade and/or sub grade shall be in conformance with the specifications of the pipe manufacturer.

3) Drain inlets for impervious areas for on-site storm drainage shall be 12 inches in the least dimension. All drain inlets for on-site use that are not included in the City standard details shall be clearly shown and dimensioned on the plans. All grates shall be designed to provide adequate safety for automobile traffic, bicycles, and pedestrians.

4) A to-scale profile view of all on-site private storm drainage mains and laterals is not required. The plan view shall include invert and rim elevations in and out of all on-site manholes, drain inlets, junction structures, etc.

5) The plan shall include pipe diameters, length, slope and material; type and designation.

6) Storm run-off from paved surfaces on-site and outside the City rights-of-way shall be routed to the City underground storm drain system via on-site catch basins and an underground storm drainage system. No surface run-off shall be routed to any adjoining property unless approved by the City and/or authorized by a fully executed reciprocal drainage and maintenance easement or agreement. The pavement at the driveway entrance(s) to the project may be constructed so as to allow storm drainage to cross the driveway apron provided that the high point of the pavement is situated a maximum distance of thirty (30) feet measured from the back of driveway apron or sidewalk. In order to contain storm drainage run-off in the street, the pavement at the parking lot entrance may be crowned a maximum height of six (6) inches.

7) Landscaped areas along the frontage of public street rights-of-way may sheet drain over the public street sidewalk, curb and gutter provided that storm run-off from these landscape areas are not placed in a storm drain conduit prior to being conveyed across the public street sidewalk, curb, and gutter.

8) The finished floor elevation of all habitable structures within a private development project shall be at least 24 inches above the 100-year frequency storm water surface elevation as determined by the storm drainage analysis and in accordance with Chapter 14.32 Flood Damage Prevention of the Folsom Municipal Code. In addition, the on-site storm drainage system and the grading plan shall be designed to route the storm run-off from the project site to an off-site storm drain system without impact to the existing or proposed habitable structures within the project site assuming that the proposed storm drain conduit system is completely blocked and unavailable for use during a storm event. This concept of overland release shall be shown on the plans for the private development project.

9) Storm drainage system design calculations shall be signed and stamped by a licensed professional engineer prior to approval of the private development improvement plans.

4.14 DEVELOPER RESPONSIBILITY FOR IMPROVEMENT TO STREETS

The following requirements apply to private development projects adjacent to or surrounded by existing and proposed streets.

The Developer is required to provide frontage improvements along existing and proposed roadways at the developer's sole expense. Frontage improvements include, but are not limited to, sidewalk, curb and gutter, sufficient pavement widening in order to meet the required one-half width of the ultimate width of the street, additional pavement width for intersection widening (including acceleration and deceleration lanes, bus turnouts, widening for dual left turns, etc.) drainage systems, landscaping , sound walls, street lighting, roadway signing and striping, and all utilities (including traffic signal interconnect if applicable). At the discretion of the City Engineer, partial streets may be permitted along the boundary of the subdivision or other private development where the full required right-of-way cannot be dedicated. When permitted, the developer/subdivider shall, as a minimum, dedicate sufficient public right-of-way and construct a full one-half street section for the appropriate class of street section with a four-foot-wide gravel shoulder along the opposite side of the street and minor collector streets only.

Where the design centerline grade of an existing street is proposed to be higher than the existing street, the Developer shall extend the proposed asphalt concrete overlay beyond the centerline of the street and shall neatly conform to the existing surface grade on the other side of the street. The Developer shall also be responsible for providing an asphalt concrete overlay for any low areas where the new pavement is proposed to meet the existing pavement to maintain a uniform cross slope.

When making a connection to an existing stub street, the Developer shall be responsible for removing and reconstructing up to a maximum of 20 feet of the existing roadway to make a satisfactory connection as required by the City Engineer.

When widening to complete an existing partial street to its ultimate width along the frontage of a development project, the Developer shall be responsible for saw cutting and removing a narrow strip along the outside portion of the pavement to provide a lean and stable pavement section against which to construct. The width to be removed shall be at the discretion of the City Engineer.

All temporary approaches to existing streets required as a result of the development shall be at the Developer's sole expense. The temporary approaches shall be constructed to meet these Design Standards and will be removed when no longer required unless specific permission is granted by the City Engineer.

The Developer shall be responsible for relocating existing traffic signals and streetlights, and installing new traffic signals and streetlights required to facilitate the construction of the approved plans.

The Developer shall be responsible for constructing or modifying median island curbs where required by these standards, or when required for traffic control as a result of the development, as determined by the City Engineer.

The Developer shall be responsible for all water, sanitary sewer, drainage system improvements (bridges, pipes, culverts, service laterals, etc.) of new streets or the extension of such improvements for the widening of existing streets within or adjacent to the project.

The Developer shall be required to place underground, all existing overhead utility lines within and along the street frontage of the proposed private development project unless those existing overhead utility lines are exempted by public utilities commission (PUC) regulations. Those overhead utility lines that are exempted from undergrounding by PUC regulations, typically overhead lines that are 69kv and greater, shall be relocated from a proposed roadway section if the existing poles would be in conflict with a proposed street widening. The relocated poles and overhead lines shall be placed outside the limits of the public right-of-way for the appropriate street classification. In addition, relocated poles for overhead lines shall not be permitted within any existing or proposed concrete sidewalk.

The Developer shall be responsible for all necessary modifications within the public street right-of-way along the project frontage to comply with the current State and Federal standards for accessibility for the disabled including, but not limited to, curb ramps, bus stops and traffic signal modifications.

4.15 CITY REVIEW AND APPROVAL OF IMPROVEMENT/GRADING PLANS

The Community Development Department-Engineering Division is responsible for the review and approval of all public off-site improvement plans, private on-site improvement plans and all other plans associated with a private development project. The Community Development Department–Building Division is responsible for the review and approval of building plans for private development projects. The Engineering Division is responsible for routing all submitted improvement/grading plans for private development projects to the appropriate City departments and divisions for review and comment. The appropriate City departments and divisions will review the plans and provide comments to the Engineering Division. The Engineering Division will compile all comments and return these comments to the Consulting Engineer. The comments provided by the City may be in the form of a written letter or they may be red-lined comments on the plans or a combination of both. In either case, the Consulting Engineer is responsible for providing all original comments and/or original red-lined copies of the plans when resubmitting the plans for review. The Engineering Division will not accept a re-submittal of revised plans without the original copies of the written comments and red-lined plan sets being included in the re-submittal. This plan review procedure will be repeated until such time that all the comments have been addressed and the plans are ready for approval by the City.

Note: The Consulting Engineer shall provide all improvement/grading plan submittals directly to the Community Development Department-Engineering Division and <u>not</u> the Building Division. Improvement/grading plan submittals provided directly to the Building Division will not be reviewed and will result in substantial delays in the private development project obtaining a building permit from the City. The improvement/grading plan review process and the building plan review process are two separate and distinct reviews. Please refer to Section 4.3 <u>Approved Plans and The Building Process</u> for additional information.

The Community Development Department – Engineering Division has established plan review times for the review of public off-site improvement plans, private on-site improvement plans and all other plans associated with a private development project. A minimum of 20 working days shall be allowed for the initial review of plans. A minimum of 15 working days shall be allowed for the second review of the plans and a minimum of 10 working days shall be allowed for each successive review of plans. Additional review time may be required depending on the extent and nature of the improvements and the current workload of the Engineering Division at the time of submittal.

No plans will be approved nor construction authorized until such time as the Engineer signifies his approval by his signature on the set of plans. The Engineer will sign and date the original plan set in the space provided on the cover sheet, after the Consulting Engineer has signed and stamped all sheets within the plan set including the cover sheet with his professional seal. The Engineer's approval is valid for a period of 12 months. Should work not commence within the 12-month period, the plans shall be resubmitted for approval.

A note adjacent to or within the Engineer approval block shall state:

This approval is valid for a period of 12 months unless extended by the Engineer.

Upon approval of the plans by the Engineer, the Consulting Engineer shall provide six (6) complete copies of the approved plans to the Engineer for approval stamping. The Engineer shall stamp the complete sets with the Community Development-Engineering Division approval stamp and retain the six (6) complete copies of the plans for City use during construction. The Consulting Engineer shall also provide as many complete copies as needed for the Developer/Contractor's use during the course of construction. The Engineer will provide approval stamping for the additional copies of the approved plans.

4.16 IMPROVEMENT PLAN REVISIONS DURING CONSTRUCTION

Should changes become necessary during construction of private development projects, the Consulting Engineer shall first obtain the consent of the Engineer and shall then resubmit the title sheet and the plan sheets affected for approval.

The changes on the plans shall be made in the following manner:

A. The Consulting Engineer shall submit two (2) copies of the proposed changes clouded with a revision number.
B. Following review and approved by the Engineer of the proposed change, the Consulting Engineer shall submit the affected plan sheets of the approved plan in reproducible form showing the proposed change.
C. The Engineer shall indicate approval of the change by initialing and dating the plans in the revision block.
D. The Consulting Engineer shall provide the Engineer with three (3) copies of the affected sheets.
E. The original proposal shall not be eradicated from the plans but shall be lined out.

F. In the event that eradicating the original proposal is necessary to maintain clarity of the plans, approval shall be first obtained from the Engineer.

G. The changes shall be clearly shown on the plans with the changes and approval noted on a revision signature block. The changes shall also be clouded on the plans in their entirety for clarification purposes.

H. The changes shall be identified by the revision number in a triangle delineated on the plans adjacent to the change and the revision signature block.

The Engineer may order changes in the plans in order to conform to the City Design Standards, the Standard Construction Specifications, the Standard Details or accepted engineering standards. The procedure for making changes to the plans ordered by the Engineer shall conform to the above outlined process.

4.17 CONFLICTS, ERRORS, AND OMISSIONS ON APPROVED PLANS

Excepted from approval are any features of the plans that are contrary to, in conflict with, or do not conform to any California State Law, Folsom City Code or Resolution, conditions of approval, or generally accepted engineering practice in keeping with the standards of the profession, even though such errors, omissions, or conflicts may have been overlooked in the City's review of the plans.

4.18 OTHER AGENCY PLAN APPROVAL

When improvement plans are submitted for review to the City that include various improvements for other public agencies (i.e. San Juan Water District, Sacramento County Regional Sanitation District, etc.) within the jurisdiction of the City of Folsom, said plans will not be approved by the Engineer until such time the plans are signed approved by the affected utility unless otherwise approved by the Engineer. The Consulting Engineer is responsible for acquiring all required approvals and/or permits from affected public utilities prior to approval of the plans by the Engineer.

4.19 GRADING PERMIT REQUIREMENTS

All approved grading plans will require the issuance of a grading permit. The Developer/ Contractor shall submit a completed Grading Permit Application form to the Community Development Department-Engineering Division.

A. Grading Permit requirements for single-family residential custom home parcels and other minor grading on parcels generally less than one (1) acre in size are as follows:

Submit a completed Grading Permit Application form and provide three (3) copies of the proposed grading plans for review by the Community Development Department-Engineering Division. The City may require additional information to be submitted with the proposed grading plans. The additional information may include plans and specifications, a geotechnical/soils report, an arborist's report and/or an engineering geology report. In addition, grading permit fees are required to be paid prior to issuance of a grading permit. The fees for the grading permit shall be in accordance with the City's current fee ordinances and resolutions adopted by the City Council.

Note: Grading plans that include proposed retaining walls may require the issuance of a building permit for the retaining walls. If a building permit is required for any retaining wall on the proposed grading plan, the grading permit will be issued concurrently with the retaining wall building permit.

Grading plans that include potential impacts to existing protected trees may require a tree permit (See Section 4.21 Tree Permit Requirements). If a tree permit is required, the tree permit shall be issued concurrently with the grading permit. The permit number assigned by the City for the tree permit shall be clearly designated on the grading plans prior to approval of the grading plans by the City.

Grading plans for residential lots within the City of Folsom that are located in a geologic unit which is likely to contain naturally occurring asbestos shall be required to adhere to requirements established by the Sacramento Metropolitan Air Quality Management District (SMAQMD) prior to approval of any grading plan and/or grading permit for the lot.

All grading plan and grading permit requirements for residential lots shall be in accordance with Chapter 14.29 Grading, and Chapter 14.33 Hillside Development Standards of the City's Municipal Code.

B. Grading permit requirements for commercial, industrial, office and multifamily private development projects are as follows:

Submit a completed Grading Permit Application form and provide four (4) copies of the proposed grading plans for review by the Community Development Department-Engineering Division. Submit two (2) copies each of the plans and specifications for the grading, the geotechnical/soils report, an arborist's report (if applicable), an engineering geology report (if applicable) and structural calculations and construction details for any proposed retaining walls (if applicable). In addition, grading permit fees are required to be paid at the time of submittal of the grading plans for review by the Community Development Department-Engineering Division. The fees for the grading permit shall be in accordance with the City's current fee ordinances and resolutions adopted by the City Council.

Grading plans that include proposed retaining wall(s) do not require a separate building permit for the retaining wall(s). The proposed retaining walls will be reviewed and approved by the Community Development Department-Engineering Division as part of the review of the grading plan.

Grading plans that include potential impacts to existing protected trees may require a tree permit (See Section 4.21 Tree Permit Requirements). If a tree permit is required, the tree permit shall be issued concurrently with the grading permit. The permit number assigned by the City for the tree permit shall be clearly designated on the grading plans prior to approval of the grading plans by the City.

Grading plans that may impact rivers, creeks, streams, lakes, wetlands or any other environmentally sensitive area may require a permit from an appropriate local, State, or Federal Agency having jurisdiction over the environmentally sensitive area. The grading plans will not be approved and a grading permit will not be issued by the City until the

Developer/Contractor has obtained any required permits from the appropriate agency for the environmentally sensitive area.

Grading plans for the areas with the City of Folsom that are located in a geologic unit which is likely to contain naturally occurring asbestos shall require approval from the Sacramento Metropolitan Air Quality Management District (SMAQMD) prior to approval of any grading plan and/or grading permit for the project. The owner/ applicant shall provide to the City with a copy of the written approval from SMAQMD prior to approval of grading plan and/or issuance of any grading permit.

Prior to issuance of a grading permit, the Developer/Contractor shall provide two (2) copies of the project's approved Storm Water Pollution Prevention Plan (SWPPP). In addition, the City requires the submittal of a copy of the project's Notice of Intent which is submitted to the State Water Resources Control Board (SWRCB) and the grading plan shall include the Waste Discharge Identification Number (WDID#) assigned by the SWRCB.

Prior to issuance of a grading permit, the Developer/Contractor shall provide the City with a grading permit bond in the amount of no less than 10% of the estimated cost of grading of the improvements shown on the grading plans. This amount is intended to represent the typical costs of winterization and erosion and sedimentation control. The grading permit bond may be in the form of a performance bond, a cash deposit, a letter of credit or any other approved form of security. Securities other than a performance bond or cash deposit will be subject to approval of the City Attorney. Performance securities submitted for grading permits will not be released by the City until all work shown on the grading plans is complete to the satisfaction of the City and the project site has implemented all required erosion and sedimentation control measures included as part of the project's Storm Water Pollution Prevention Plan (SWPPP).

All grading plan and grading permit requirements shall be in accordance with Chapter 14.29 Grading of the City's Municipal Code.

4.20 ENCROACHMENT PERMIT REQUIREMENTS

An encroachment permit shall be obtained from the Community Development Department-Engineering Division for any work within a public right-of-way (street) or other public easement or for work that may affect these areas. This work generally includes, but is not limited to, the construction of curbs, gutters, sidewalks and driveways, connections to the public sanitary sewer, water and storm drainage systems and the removal and replacement of damaged concrete curbs, gutters, sidewalks and driveways. All work required for an encroachment permit shall be completed to the satisfaction of the Engineer prior to approval of a building permit final and/or issuance of a Certificate of Occupancy for a building. All encroachment permit requirements shall be in accordance with Chapter 12.20 Use of City Property of the City's Municipal Code.

The following items are prerequisites for issuance of a City of Folsom Encroachment Permit:

A. Submit a completed Encroachment Permit Application form and provide three (3) copies of the proposed construction plans for review by the Community Development Department-Engineering Division.

B. Payment of an encroachment permit fee in accordance with the City's current ordinances and resolutions adopted by the City Council.

   Note: For commercial, industrial, office and multi-family private development projects where the Community Development-Engineering Division has reviewed and approved site improvement plans that include public off-site improvements within public street rights-of-way and/or public utility easements, the encroachment permit fee shall not be charged. The encroachment permit fee is paid through the payment of the required plan check and inspection fee.

C. Complete and valid insurance certificates and endorsements. This may be accomplished by the insurance carrier of the owner, developer, or contractor for the work. The Contractor shall be bonded as required by the Engineer and shall possess comprehensive general liability and automobile insurance in an amount designated by the City. The Contractor shall also be required to submit Certificates of Insurance and additionally insured endorsement forms for general liability and automobile policies naming the City of Folsom as additionally insured under these policies.

D. A performance bond, cash deposit, letter of credit or other approved form of security shall be submitted in an amount equal to 100% of the value of the work performed within the City public right-of-way or public easement with a minimum of $500 to assure completion of the work. Securities in a form other than a performance bond or cash deposit will be subject to the approval of the City Attorney.

E. A complete traffic control plan prepared in accordance with the latest edition of the Manual of Traffic Controls for Construction and Maintenance Work Zones and the City of Folsom Standard Construction Specifications.

F. The State of California contractor's license number of the party to perform the work shall be entered on the permit. The class of license shall be according to the State of California Licensing Board, appropriate for the type of work anticipated.

   Note: Performance securities submitted for issuance of the encroachment permits will not be released until all improvements have been completed and the encroachment permit has been approved and signed off by the Engineer.

   Note: Performance securities provided for encroachment permits for trenching and excavation with the public street roadway section are required to remain in place for a period of one year (i.e. one-year warranty period). The one-year warranty period for trenching and excavation within a public street roadway section shall commence on the date the City Construction Inspector approves the completed trenching and excavation and finals the encroachment permit and extends for a period of no less than one year. Upon completion of the one-year warranty period, the City Construction Inspector will conduct a warranty review of the completed trenching and excavation to verify that there are no defects in workmanship and materials. Upon final warranty review and verification that there are no defects in workmanship and/or materials, the City Construction Inspector will authorize release of the performance security (i.e. warranty bond).

4.21 TREE PERMIT REQUIREMENTS

Improvement/grading plans that include potential impacts to existing protected trees shall require the Developer/Contractor to obtain a tree permit. Potential impacts to protected trees may include trees on the property to be improved and/or graded or trees on adjoining properties whose tree protection zone (TPZ) encroaches on the property proposed to be improved and/or graded. To obtain a tree permit, the Developer/ Contractor shall submit to the Community Development Department a completed Tree Permit Application and provide a Tree Permit Application fee in accordance with the City's current fee ordinances and resolutions. The City will review the Tree Permit Application and may require a Tree Protection and Mitigation Plan to be submitted by the Developer/ Contractor in order to evaluate the potential impacts to the existing protected trees. The Tree Protection and Mitigation Plan shall:

A. An improvement/grading plan showing the extent of the proposed impacts to the existing protected trees.

B. An Arborist Report to survey the trees, assess the proposed development impacts, and prescribe the management actions to take place during the project necessary to reduce impacts for trees to be preserved.

C. Where the removal of protected trees is proposed, a planting and irrigation plan shall be included illustrating the species, location, and irrigation methods of trees to be planted as mitigation.

The approval of the tree permit shall be prior to or concurrent with the issuance of a grading permit, encroachment permit and/or a building permit.

Tree permit processing and the tree permit requirements shall be in accordance with Chapter 12.16 Tree Preservation of the City's municipal Code.

4.22 TEMPORARY WATER USE PERMIT REQUIREMENTS

Any City water use for construction purposes will require a temporary water use permit issued by the City. To obtain a temporary water use permit, the Developer/Contractor shall submit to the Utilities Department a completed Temporary Water Use Application and provide a temporary water use application fee in accordance with City's current fee ordinances and resolutions. Depending on the duration of the construction of the private development project, the Developer/Contractor may ultimately receive monthly invoices from the City for the water use during construction.

The City Construction Inspector will verify that the Developer/Contract has obtained a temporary water use permit prior to commencement of construction and installed the required temporary water use meter prior to connecting to the City's public water system.

Prior to approval of a building permit and/or permit to issuance of a Certificate of Occupancy on a private development project, the City Construction Inspector will verify that the Developer/ Contractor has paid any and all outstanding temporary water use invoices in full and has returned the temporary water use meter to the Utilities Department.

4.23 EXISTING UTILITIES

All existing public utilities shall be shown on the plans. In addition, the Consulting Engineer shall submit copies of the preliminary plans and approved plans to the utility companies in order for the affected public utilities to properly plan for the potential relocation of their facilities and to provide additional facilities if necessary. Copies of notification letters to affected public utilities are a plan submittal requirement as noted on the Development Application Form.

4.24 PRE-CONSTRUCTION MEETING REQUIREMENTS

Prior to commencement of construction, the Contractor shall be required to attend a pre-construction meeting with the City. The pre-construction meeting shall be arranged by the City Construction Inspector and the meeting will take place at the job site. The City Construction Inspector will be responsible for having all appropriate City departments and divisions at the pre-construction meeting. The Contractor shall be responsible for providing a safe access to the job site for the meeting and inviting any needed personnel that are not employees of the City. The City will not conduct the pre-construction meeting until a minimum of 48 hours after the receipt of the approved plans for the site improvements associated with the private development project. No work on the job site shall occur until after completion of the required pre-construction meeting.

4.25 INSPECTION REQUIREMENTS

The Community Development Department-Engineering Division shall inspect all public off-site and private on-site improvements for private development projects during construction. The Community Development Department-Building Division shall provide inspections for all residential, commercial, industrial, office and multifamily structures and to a point 5 feet from the building envelope. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases.

Any improvements constructed without inspection as provided above or constructed contrary to the approve site and building plans will be deemed as not complying with the Standard Construction Specifications and will not be approved by the City of Folsom. The City will not issue any Certificate of Occupancy for any building for which site improvements are not constructed in accordance with the approved plans and/or have been constructed without inspection by the City.

Proper facilities for safe access for inspection to all parts of the job site and/or work areas shall at all times be maintained for the necessary use of the Engineer and other agents of the City, and agents of the Federal, State, or local government at all reasonable hours for inspection by such agencies to ascertain compliance with all applicable laws and regulations.

The Engineer and/or his authorized representative will observe the progress and quality of the work and determine, in general, if the work is proceeding in accordance with the approved plans and the City construction specifications. The Engineer shall not be required to make comprehensive or continuous inspections to check the quality of work, and he shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work.

The Contractor is solely responsible for providing adequate notice to the City for required inspections of the work on a private development project during the course of construction. The Contractor will request all required inspections a minimum of 24 hours in advance of the needed inspection.

The Inspector may, at his discretion, visit any active work site if work is progressing and inspections have not been requested. Any work constructed and/or covered without benefit of inspection may be rejected at the sole discretion of the City Engineer.

4.26 OVERTIME INSPECTION SERVICES

Any inspection services provided by the City beyond normal working hours, or on weekends or on City recognized holidays at the request of the Developer/Contractor shall constitute overtime inspection work. The Developer/Contractor shall provide payment in advance of the overtime inspection being provided by the City. The hourly rate for the overtime inspection fees shall be in accordance with the City's current fee ordinances and resolutions. Granting of the request to provide overtime inspection shall be at the sole discretion of the Engineer and shall be subject to the availability of inspection personnel. Payments for overtime inspection services shall be paid by the Developer/Contractor upon request by the City. Any outstanding overtime inspection fees to be paid by the Developer/Contractor shall be made to the City prior to issuance of a building permit final, encroachment permit final, grading permit final or issuance of a Certificate of Occupancy for a private development project.

4.27 SPECIAL NOTICES AND PERMITS

The Consulting Engineer shall be responsible for advising the Contractor to give the following notices and have in his possession the following permits and plans:

A. Contractor shall be in receipt of City-approved plans and required permits prior to construction.

B. The Contractor is responsible for the exact location and protection of underground facilities and for the repair of damaged facilities. Contractor shall notify "Underground Service Alert" (Phone: 1-800-642.2444), 48 hours in advance before any digging. Work area shall be marked in white paint.

C. Contractor shall be responsible for the protection of all existing monuments and shall notify the Engineer of any damaged or removed City, State, or Bureau monuments.

D. Other agency permits (i.e. General Construction Activities Storm Water Permit, State Department of Fish & Game – 1603, Army Corp of Engineers – 404 Permit, etc.).

4.28 FINAL ACCEPTANCE AND COMPLETION REQUIREMENTS

A. Grading Permits

1) Residential Lots

a) Prior to acceptance and completion of grading plans/permits and prior to Engineering Division approval of a building permit final, all work shown on the approved grading plans shall be completed to the satisfaction of the City.

b) The owner/developer shall obtain a building permit final from the Building Division for all retaining walls on the grading plan prior to the Engineering Division approval of the grading permit final.

c) The owner/applicant shall provide to the City a copy of a written certification from a licensed Soils/Geotechnical Engineer that all grading and compaction on the grading plan are in conformance with the Soils/Geotechnical Engineer that all grading and compaction on the grading plan are in conformance with the Soils/Geotechnical Report prepared for the private development project.

d) The owner/developer shall obtain a tree permit final from the City Arborist prior to the Engineering Division approval of the grading permit final.

2) Commercial, Industrial, Office and Multifamily Residential Projects

a) Prior to acceptance and completion of grading plans/permits and prior to Engineering Division approval of a building permit final and/or prior to issuance of a Certificate of Occupancy, all work shown on the approved grading plans shall be completed to the satisfaction of the City.

b) The developer/owner shall provide to the City a copy of a written certification from a licensed Land Surveyor, or a licensed Civil Engineer that all grades on the grading plan, including the lot pad elevation are in conformance with the approved plans.

c) The developer/owner shall provide to the City a copy of a written certification from a licensed Soils/Geotechnical Engineer that all grading and compaction on the grading plan are in conformance with the Soils/Geotechnical Report prepared for the private development project.

d) The developer/owner shall provide the City with an electronic version of the "Record Drawings" of the approved grading plans together with three (3) copies of the "Record Drawings." If the project's approved improvement plans do not include a separate set of plans approved for grading only the "Record Drawings" are not required to be submitted until the improvements are ready for City acceptance.

B. Encroachment Permits

1) Residential Lots

a) Prior to acceptance and completion of improvements in the public right-of-way and/or public utility easements and prior to Community Development Department-Engineering Division approval of a building permit final and/or prior to issuance of a Certificate of Occupancy, all work shown on the approved improvement/grading plans shall be completed to the satisfaction of the City.

b) The developer/owner shall schedule an encroachment permit final inspection by the Community Development Department-Engineering Division Construction

Inspector. The Construction Inspector will final the encroachment permit and will forward the encroachment permit to the appropriate City departments to process a refund of the encroachment permit bond and/or cash deposit.

c) The Construction Inspector will forward a final approval to the Community Development Department-Building Division inspector prior to approval of the building permit final and/or issuance of a final Certificate of Occupancy for the residential structure.

d) The developer/owner shall be required to provide written evidence to the Construction Inspector that any and all outstanding overtime inspection fees have been paid in full to the City.

e) The developer/owner shall be required to return the project temporary construction water meter to the city Utilities Department and submit written evidence to the Construction Inspector that any and all outstanding temporary construction water use fees have been paid in full.

f) The developer/owner shall be required to plant and maintain in perpetuity the required amount of "street trees".

2) Commercial, Industrial, Office and Multifamily Residential Projects

a) Prior to acceptance and completion of improvements in the public right-of-way and/or public utility easements and prior to Community Development Department-Engineering Division approval of a building permit final and/or prior to issuance of a Certificate of Occupancy, all work shown on the approved grading/improvement plans shall be completed to the satisfaction of the City.

b) The developer/owner shall schedule an encroachment permit final inspection by the Community Development Department–Engineering Division Construction Inspector. The developer/owner may request from the Construction Inspector a written final punch list of outstanding items required prior to final approval of an encroachment permit. The Construction Inspector will not conduct a final inspection and prepare a final written punch list until such time that less than ten (10) outstanding items are required to be completed by the developer/owner.

c) The Construction Inspector will forward a final approval to the Community Development Department-Building Division inspector prior to approval of the building permit and/or issuance of a final Certificate of Occupancy for the structure(s).

d) The developer/owner shall provide to the City a copy of a written certification from a licensed Land Surveyor and/or suitably licensed Civil Engineer that all grades on the improvement plan, including the lot pad elevation are in conformance with the approved plan.

e) The developer/owner shall provide to the City of copy of a written certification from a licensed Soils/Geotechnical Engineer that all grading and compaction on the grading plan are in conformance with the Soils/Geotechnical Report prepared for the private development project.

f) The developer/owner shall be required to return the project temporary construction water meter to the City Utilities Department and submit written evidence to the Construction Inspector that any and all outstanding temporary construction water use fees have been paid in full.

g) The developer/owner shall be required to provide written evidence to the Construction Inspector that any and all outstanding overtime inspection fees have been paid in full to the City.

h) The developer/owner shall provide the City with an electronic version of the "Record Drawings" of the approved grading plans together with three (3) copies of the "Record Drawings."

i) The developer/owner shall be required to plant and maintain in perpetuity the required amount of "street trees" and parking lot shade trees.

Note: These requirements apply to all private development projects including residential subdivisions, and multifamily residential projects include single-family residential subdivisions with more than two-single family residential lots.

4.29 SAMPLE FORMS

A. Acceptance of Offer of Dedication

B. Certificate of Acceptance

C. Certificate of Compliance – Lot Line Adjustment

D. Certificate of Compliance – Parcel Merger

E. Notary

F. Drainage Easement

G. Grant Deed

H. Landscaping Easement Deed

I. Pedestrian Easement Deed

J. Public Utility Easement Deed

K. Road Right of Way Easement Deed

L. Sewer Line Easement Deed

M. Water Line Easement Deed

WHEN RECORDED RETURN TO:
City Clerk
City of Folsom
50 Natoma Street
Folsom, CA 95630

NO FEE DOCUMENT
Per Government Code 6103

THIS SPACE FOR RECORDER'S USE ONLY

ACCEPTANCE OF OFFER OF DEDICATION

Whereas, an Irrevocable Offer of Dedication of an interest in real property having been made by , to the City of Folsom and recorded in the Office of the Recorder of Sacramento County, State of California;

Whereas, the undersigned officer having been authorized to accept the Offer of Dedication pursuant to the authority conferred by Resolution No. 2435, adopted July 18, 1988, by the City Council of the City of Folsom.

NOW, THEREFORE, said Offer of Dedication is hereby accepted by the undersigned officer for the purpose of a Public Highway or Road, and all necessary utilities, under upon and across that land in the City of Folsom, County of Sacramento, State of California described as
follows:

See EXHIBIT " " attached hereto and made a part hereof.

Any use of said easement and right of way by Owners, their assignees or successors in interest which is not compatible with or interferes with said easement and right of way and the rights and privileges herein accepted shall not be allowed.

Elaine Andersen

Date

City Manager, City of Folsom

CITY OF FOLSOM
CERTIFICATE OF ACCEPTANCE

This is to certify that the interest in the real property conveyed by the within Deed, the provisions of which are incorporated by this reference as though fully set forth in this Certification, to the City of Folsom, a political subdivision of the State of California, is hereby accepted by the undersigned officer pursuant to authority conferred by Resolution No. 2435 of the City Council of said City adopted on July 18, 1988, and the grantee consents to recordation thereof by its duly authorized officer.

Dated: ____

Elaine Andersen
City of Folsom
City Manager

CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

State of California
County of Sacramento }

On ____________________________, before me, ______________, Notary Public, Personally appeared Elaine Andersen

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of State of California that the forgoing paragraph is true and correct.

WITNESS my hand and official seal.

SIGNATURE___________________________

PLACE NOTARY SEAL ABOVE

For the benefit of the City of Folsom pursuant to
Government Code Section 6103

RECORDING REQUESTED BY

City of Folsom **No.**

WHEN RECORDED MAIL TO:

MAILING ADDRESS: City of Folsom
50 Natoma Street
CITY, STATE, ZIP CODE: Folsom, CA 95630

Attn: City Clerk

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

CITY OF FOLSOM
CERTIFICATE OF COMPLIANCE - LOT LINE ADJUSTMENT (GOV. CODE SECTION 66499.35)
CITY OF FOLSOM, COUNTY OF SACRAMENTO, STATE OF CALIFORNIA

This certificate relates only to issues of compliance or noncompliance with the Subdivision Map Act and local ordinances enacted pursuant thereto. The parcel described herein may be sold, leased, or financed without further compliance with the Subdivision Map Act or any local ordinance enacted pursuant thereto. Development of the parcel may require issuance of a permit or permits, or other grant or grants of approval.

Acting at the request of

the Planning Commission of the City of Folsom, pursuant to Section 66499.35, has authorized Steven R. Krahn, of the City of Folsom, to issue this Certificate of Compliance with respect to that certain real property situated in the City of Folsom, County of Sacramento, State of California, and commonly know as:

19.1

And more particularly described on:

Exhibits

Assessor's Parcel Numbers:

CITY OF FOLSOM

By: ____________________________________ Date of Issuance: ______________________
Steven R. Krahn RCE 49291

Technical Review By:

By: ____________________________________ Date of Issuance: ______________________
Gerald A. Young L.S. 3852

For the benefit of the City of Folsom pursuant to
Government Code Section 6103

RECORDING REQUESTED BY

City of Folsom **No.**

WHEN RECORDED MAIL TO:

MAILING ADDRESS: City of Folsom
50 Natoma Street
CITY, STATE, ZIP CODE: Folsom, CA 95630

Attn: City Clerk

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

CITY OF FOLSOM
CERTIFICATE OF COMPLIANCE - PARCEL MERGER (GOV. CODE SECTION 66499.35)
CITY OF FOLSOM, COUNTY OF SACRAMENTO, STATE OF CALIFORNIA

This certificate relates only to issues of compliance or noncompliance with the Subdivision Map Act and local ordinances enacted pursuant thereto. The parcel described herein may be sold, leased, or financed without further compliance with the Subdivision Map Act or any local ordinance enacted pursuant thereto. Development of the parcel may require issuance of a permit or permits, or other grant or grants of approval.
Acting at the request of
the Planning Commission of the City of Folsom, pursuant to Section 66499.35, has authorized Steven R. Krahn, of the City of Folsom, to issue this Certificate of Compliance with respect to that certain real property situated in the City of Folsom, County of Sacramento, State of California, and commonly know as:

19.2

And more particularly described on:

Exhibits

Assessor's Parcel Numbers:

CITY OF FOLSOM

By: ____________________________________ Date of Issuance: ______________________
Steven R. Krahn RCE 49291

Technical Review By:

By: ____________________________________ Date of Issuance: ______________________
Gerald A. Young L.S. 3852

State of California
County of Sacramento

On ____________________________, before me, _______________, Notary Public, Personally

appeared ___________________________________

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of State of California that the forgoing paragraph is true and correct.

WITNESS my hand and official seal.

SIGNATURE____________________________

PLACE NOTARY SEAL ABOVE

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $______________________________

______________COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,
______________OR COMPUTED ON FULL VALUE LESS LIENS AND
______________ENCUMBRANCES REMAINING AT THE TIME OF SALE.

Signature of Declarant or Agent Determining Tax Firm Name

DRAINAGE EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Drainage Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement and right of way for the Installation, Repair, Removal, or Replacement of Underground Drainage Lines, Detention Ponds or Basins, Canals, and Ditches or Swales together with and and all appurtenances perthining thereto, on, over, under, and across that portion of real property described as follows:

See the Attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On __________________, before me____________________
Notary Public,
personally appeared_________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

____

____

____

I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature______________________________________

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME

STREET ADDRESS

CITY STATE ZIP

City Clerk
City of Folsom
50 Natoma Street
Folsom, CA 95630

This Order No. ____________ Escrow No. ___________

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $________________________________

________________**COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,**
________________**OR COMPUTED ON FULL VALUE LESS LIENS AND**
________________**ENCUMBRANCES REMAINING AT THE TIME OF SALE.**

Signature of Declarant or Agent Determining Tax Firm Name

GRANT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to
the following described real property in the City of Folsom, County of Sacramento, State of California, described as follows:

See the attached Exhibit "A"

BY:

____

CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

State of California
County of Sacramento

On ________________________________, before me, ___________, Notary Public, Personally appeared _____________

____

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.
I certify under PENALTY OF PERJURY under the laws of State of California that the forgoing paragraph is true and correct.

WITNESS my hand and official seal

SIGNATURE____

PLACE NOTARY SEAL ABOVE

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $_____________________________

______________COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,
______________OR COMPUTED ON FULL VALUE LESS LIENS AND
______________ENCUMBRANCES REMAINING AT THE TIME OF SALE.

Sianature of Declarant or Aaent Determinina Tax Firm Name

LANDSCAPE EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Landscape Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement and right of way for the Installation, Repair, Removal, or Replacement of Landscaping together with and and all appurtenances perthining thereto, on, over, under, across, and above that portion of real property described as follows:

See the Attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On __________________, before me____________________
Notary Public,
personally appeared_________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

____

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I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature______________________________________

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $______________________________

_______________COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,
_______________OR COMPUTED ON FULL VALUE LESS LIENS AND
_______________ENCUMBRANCES REMAINING AT THE TIME OF SALE.

Sianature of Declarant or Aaent Determinina Tax Firm Name

PEDESTRIAN EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Pedestrian Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
A Public Easement and right of way for Pedestrian Walkways on, over and across that portion of real property hereinafter described for the purpose of installing, replacing, and maintaining Pedestrian Walkways, together with any and all appurtenances pertaining thereto.

See the attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On _________________, before me____________________
Notary Public,
personally appeared_________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

____

____

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I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature____

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name Street Address City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $______________________________

______________COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,
______________OR COMPUTED ON FULL VALUE LESS LIENS AND
______________ENCUMBRANCES REMAINING AT THE TIME OF SALE.

Signature of Declarant or Agent Determining Tax Firm Name

PUBLIC UTILITY EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Public Utility Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement and right of way for Public Utilities upon, over, under, through, across and above that portion of real property hereinafter described for the purpose of installing, replacing, maintaining, and operating Public Utilities.

See the attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

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____

____

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On __________________, before me_____________________
Notary Public,
personally appeared__________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature______________________________________

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $________________________________

________________**COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,**
________________**OR COMPUTED ON FULL VALUE LESS LIENS AND**
________________**ENCUMBRANCES REMAINING AT THE TIME OF SALE.**

Sianature of Declarant or Aaent Determinina Tax Firm Name

ROAD RIGHT OF WAY EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Road Right of Way and Utility rights in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement for road purposes and incidentals thereto, including the utility rights on, over under across, and above the following:

See the attached Exhibit

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On __________________, before me____________________
Notary Public,
personally appeared_________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature____

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(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE: IF NO PARTY SO SHOWN. MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

RECORDING REQUESTED BY:

And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $___________________________

________________**COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,**
________________**OR COMPUTED ON FULL VALUE LESS LIENS AND**
________________**ENCUMBRANCES REMAINING AT THE TIME OF SALE.**

Sianature of Declarant or Aaent Determinina Tax Firm Name

SEWER LINE EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Sewer Line Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement and right of way for the Installation, Repair, Removal, or Replacement of Underground Sewer Lines together with and and all appurtenances perthining thereto, on, over, under, and across that portion of real property described as follows:

See the Attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On _________________, before me____________________
Notary Public,
personally appeared________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

____

____

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I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature_____________________________________

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

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And When Recorded Mail This Deed and, Unless Otherwise Shown Below, Mail Tax Statements To:

NAME	City Clerk
STREET ADDRESS	City of Folsom 50 Natoma Street
CITY STATE ZIP	Folsom, CA 95630

For the benefit of the City of Folsom pursuant to Government Code 6103

SPACE ABOVE THIS LINE FOR RECORDERS USE

DOCUMENTARY TRANSFER TAX $____________________________

______________**COMPUTED ON FULL VALUE OF PROPERTY CONVEYED,**
______________**OR COMPUTED ON FULL VALUE LESS LIENS AND**
______________**ENCUMBRANCES REMAINING AT THE TIME OF SALE.**

Sianature of Declarant or Aaent Determinina Tax Firm Name

WATER LINE EASEMENT DEED

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Hereby **GRANT(S)** to The City of Folsom
the following described Water Line Easement in the City of Folsom, County of Sacramento, State of California, described as follows:
An easement and right of way for the Installation, Repair, Removal, or Replacement of Underground Water Lines together with and and all appurtenances perthining thereto, on, over, under, and across that portion of real property described as follows:

See the Attached Exhibit

Together with the perpetual right of ingress to and egress from said property for the purpose of exercising and performing all of the rights and privileges herein granted.

____

____

____

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO
On __________________, before me____________________
Notary Public,
personally appeared__________________________who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and

Witness my hand and official seal.
Signature____

(Space above for official seal)

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SO SHOWN, MAIL AS DIRECTED ABOVE

Name	Street Address	City & State

Section 5:
DRAFTING STANDARDS AND SHEET LAYOUT

5.1 SCOPE

This Section defines drafting requirements for various drawings. It is important that plans be neat, orderly, legible, and easy to follow. The City requires all improvement plans for public owned facilities (i.e. roads, water, sewer, and drainage facilities) and all final maps to be prepared using Computer Aided Drafting Design (CADD). These drawings shall be submitted in a drawing file format (i.e. .dwg extension, not .dxf) that is compatible and directly usable by the City's software. It is understood that the City will hold harmless the design consultant for any use or reuse of any reports designs, or details for purposes other than the project associated with this project unless the City obtains a validation of that use or reuse from the Consultant. The signed and stamped original Mylars and recorded maps will have precedence over digital format copies.

All fonts and hatch patterns that are used in the drawings shall be those that were furnished with AutoCAD. City Standard dwg blocks and symbols are shown on Plates 5-A – 5-E and are available through the City. All drawing blocks will be colored by layer and not by entity. A layer listing each drawing file shall be submitted with the drawing files indicating layer names, status (on, off, frozen, thawed), color and line type. For base layering standards, refer to the following list (Note: this is a partial list and new layer names may be added (with a description enclosed) using the same format :

A. Layering Configuration – Improvement Plans

   Layering of drawing files must allow the separation of the various aspects of the improvements (i.e. Water, Sewer, Drainage, Roadway, Proposed, Existing, etc.)

B. Layering Configuration – Final Maps

   As a minimum, the following layering must be used for final and parcel maps.

   BOUNDARY – Subdivision boundary
   BORDR-Sheet border
   NOTES – Sheet title and notes
   CENTERLINE – Centerline of streets
   LOTLINES- Lot lines
   NARW – North arrow
   PUE – Public Utilities Easement Line
   RW – Right-of-way lines
   ST_NAME - Street Names
   BEAR_DIST – Bearings and Distances.

5.2 PARCEL AND FINAL MAP

The size of each sheet of a final map shall be 18”x26”. A marginal line shall be drawn completely around each sheet, leaving an entirely blank margin of 1 inch. Layering shall be in accordance with Section 5.1.2 of these standards. The particular number of the sheet and the total number of sheets composing the map shall be stated on each sheet, and its relation to each adjoining sheet shall be clearly shown. The City Engineer’s, City Surveyor’s and City Clerk’s certificate statements shall be as follows:

City Engineer’s Statement

I hereby state that I have examined this map of ____________________________________
and find it to be substantially the same as the tentative map approved by the City Council of the City of Folsom and that all provisions of the Subdivision Map Act and all applicable City ordinances have been complied with.

Dated: ________________________________ _______________________________________

Principal Civil Engineer

City Surveyor’s Statement:

I hereby state that I have examined this map of ________________ and that I am satisfied that said map is technically correct.

Dated: ________________________________ _______________________________________

City Surveyor

City Clerk’s Statement:

I hereby state that the City Council of the City of Folsom has approved this map of_______________ ____ and has accepted subject improvement on behalf of the public all of the lands, rights-of-way and easements shown hereon and offered for dedication.

Dates: ________________________________ _______________________________________

City Clerk

The Owner’s Statement shall be as follows:

The undersigned do hereby state that I (we) is (are) the only person(s) having any record title interests in the real property included within the boundaries of this subdivision, ”(insert name of map)”, as shown upon this map, and they hereby consent to the preparation and recording of this map; and do hereby declare that the consent of no other person is necessary; and offer for dedication and do herby dedicate as public right-of-way, and as public utility easements the ways, circles, courts, streets, etc. hereon and offer for dedication and do hereby dedicate for specific purposes the following:

(Use the following language as applicable)

1. Public easements for installation and maintenance of water, gas, sewers and drainage pipes, and for traffic control appurtenances, poles and overhead and underground wires, conduits for electric, television, and telephone services together with any and all appurtenances pertaining hereto on, over, under, and across those trips of land 12.5 feet in width lying contiguous to the ways, circles courts and streets shown hereon and designed “Public Utility Easement” (P.U.E.).
2. Public easements for pedestrian traffic and for installation and maintenance of sound attenuation devices, electroliers, traffic control appurtenances, drainage, sewer, water and gas pipes for underground wires and conduits for electric, television and telephone services, together with any and all appurtenances pertaining thereto, on, over, under and across lot __ _____ shown hereon and designated “Public Utility Easement” (P.U.E.).
3. Lot _______ a public easement for flood protection, channel maintenance and for pedestrian and bike paths.
4. Public easements for the installation and maintenance of underground and overhead wires and conduits for electric, television and telephone services together with any and all appurtenances pertaining thereto on, over, under, and across the 5-foot strip of land shown hereon and designated “Public Utility Easement” (P.U.E.).
5. Public easements for the installation and maintenance of electroliers, drainage, water, sewer and gas pipes, for underground and overhead wires for electric, television and telephone services, together with any and all appurtenances pertaining thereto on, over, under, and across Lot(s) _____ shown hereon.
6. Lot _______ as public landscape easement.
7. Lot _______ is reserved for the City of Folsom (Or Home Owner’s Association) as open space.

____ ______________________________________

Name Title

Maps shall be developed using the North American Datum 27 (NAD-27) for horizontal control. The map shall conform to all requirements of the latest revision to the Subdivision Map Act or as approved.

5.3 IMPROVEMENT PLANS

All public improvement plans shall be prepared using City of Folsom standard title block unless specified otherwise (See Plates 5-A and 5-B). Drawing size shall be 24”x36”. The Engineer, prior to initiating the drawing may approve the use of other drawing sizes. Lettering and numerals shall be 1/8-inch minimum. Final drawing shall be plotted on velum or Mylar using City approved layers and fonts (see Section 5.1, Scope; Section 5.5, Water Plan Standards; and Section 5.6, Traffic Signal and Street Lighting Plans, for specific drafting requirements for water and electrical facilities). At the completion of construction, a Mylar copy plus the drawing files containing record information will be submitted to the City prior to final acceptance of the improvements. The drawing files included with the plans shall have all base information.

A. Cover Sheet

A cover sheet is required on projects exceeding three sheets in the set and shall include:

1) Project Location – shows general location in the City.
2) Sheet Index.
3) Legend – See Plates 5-C, 5-D, and 5-E.
4) Bench Marks – Plans will not be approved unless an approved benchmark is used. Contact the City for location and elevation of the nearest approved benchmark.
5) Signature Block – Project Engineer/Consulting Engineer shall coordinate with the City for required signatures.
6) Site Map – Shows entire subdivision, project, or assessment district. When applicable show city limits, street names, section lines, and existing/ proposed sanitary sewers and drainage lines. Water lines are shown on separate plans.
7) Estimated Quantities – A tabulated estimate of quantities of the various elements included in the improvements shall be shown on the Cover Sheet. The quantity estimate shall provide a breakdown of the lineal feet of water distribution main, sanitary sewer, storm drain pipelines to be placed with a quantity given for each size of pipe. The estimate shall also provide the quantities of certain appurtenances to be installed as part of the system improvements such as manholes, gate valves, fire hydrants, blow-offs, and water services. An example of an "Estimate of Quantities" is shown on Plate 5-F.

   Gate vales for the fire hydrants and the lengths of pipe that make up the branch leads are considered part of the fire hydrant installation and are not included in quantity estimates for gate valves or water main.

B. Plan and Profile Sheet

1) Topography

   All pertinent topographic features shall be shown, such as elevations, underground utilities, poles, ditches, edge of pavement, curb and gutter, sidewalk, structures, building pad elevations, trees, and other features of the area which may affect design. All existing features should be shown using light lines. (See legend Plates 5-C, 5-D, and 5-E)

2) Proposed Improvements

   All proposed improvements shall be shown using heavy lines. (See legend Plates 5-C, 5-D, and 5-E)

3) Scale

   A scale of 1" = 40' horizontal and 1' = 4' vertical is recommended for most projects. For alleys, small improvements, or when a large amount of detail is required, a scale of 1" = 20' horizontal and 1" = 2' vertical is recommended.

4) Right-of-Way

All right-of-way lines, easements, section lines, and temporary construction easements both existing and proposed shall be shown on the plans. All right-of-way and easement lines shall be properly dimensioned.

5) Street Dimensions

All proposed streets shall be dimensioned from centerline to lip of gutter, face of curb, back of sidewalk, and to right-of-way. On rolled (Type 1) curb and gutter, the face is considered to be 6 inches from the back of curb. On vertical (Type 2) curb and gutter, the face is considered to be 8 inches from back of curb. Dimension radius on round corners shall be shown.

6) Stationing

The stationing is typically placed on the street centerline and reads from south to north and from west to east insofar as possible.

7) Profile

Profile area shall include the following information:

a) Existing centerline and proposed centerline with percent of grade labeled.
b) Existing and proposed gutter flow lines.
c) Existing improvements and proposed improvements – provide stationing of manholes, label pipe sizes, and pipe length.
d) A station should be shown for all intersections, curve returns, beginning of curve (BC), point of compound curve (PCC), point of reverse curb (PRC) and end of curve (EC).

C. Grading Plan

a) All existing pertinent topographic features shall be shown. The proposed elevations, pad elevations, and on-site drainage shall be shown (required for all subdivisions).

D. Tree Protection and Mitigation Plan

a) Projects with protected trees on-site or in proximity to the proposed regulated activity shall prepare a Tree Protection and Mitigation Plan.

E. Detail Sheet

1) Typical Section

A typical section for each type of street within the improvements is required. See Section 11 for typical street cross section information.

2) Details

A detail is required for any item that is not shown in the City of Folsom Standard Construction Specifications, Latest Edition.

3) Cross Sections

Include as necessary.

5.4 PLAT MAPS

Refer to Section 8, Right-of-Way Engineering and Acquisition.

5.5 WATER PLAN STANDARDS

A. Scale of Drawings

A scale of 1" = 100' is the preferred scale of water distribution system improvement plans. For small improvement projects such as replacement of water mains in alleys or short length main extensions or for projects where a large amount of detail is required, scales of 1" = 20' / 1" = 40' / or 1" = 50' are acceptable.

B. Plan Orientation

The layout of the water system water plan sheet should be arranged to indicate the North arrow is directed towards the top of the sheet or to the left or right edge of the sheet.

C. Plan and Profile

Construction plans for water distribution systems should indicate in plan view the layout of existing and proposed water mains as well as the location of all gate valves, fire hydrants, blow-offs, water services, etc., and any special details. Stationing along the centerlines of streets and at street intersections should appear on all water plans. The location of in-line gate valves, fire hydrants, water services, and blow-offs at the terminus of dead end water mains shall be indicated by engineer's station or by dimensions from property lines.

Plans for water distribution systems shall include the geometric alignment and right-of-way width of all dedicated streets, existing and proposed curbs, gutters, sidewalks, and existing aboveground and underground utilities. In addition, water plans shall show all existing and proposed obstructions that
will interfere with the placement of water main pipe such as bridges, culverts, open channels, traffic islands, underground vaults, etc.

A profile is normally not required to be shown for water plans of distribution mains. However, a profile may be required for the segments of water distribution main crossing beneath railroads or major drainage channels. Other situations, such as limited clearances to existing or proposed utilities, may also require a profile of a segment of the distribution main to be shown on the water plans. A profile is required for projects involving water transmission lines (16 inch and larger).

D. Required Details

Applicable standard drawings not included in the published Standard Construction Specifications shall be shown on water plans.

E. Water Drafting Notes

Descriptive drafting notes are to be used on water distribution system improvement plans to convey specific information relating to the "tie-in" connections, installation of water services, appurtenances such as fittings and gate valves, and the installation of fire hydrants. A copy of these descriptive notes is included at the end of Section 5. Under certain conditions, the Project Engineer may require supplemental notes.

F. Water Standard Notes and Special Notes

Standard Water notes and certain special notes are to be used on all water plans to convey specific information common to all water distribution system projects. In addition, for private on-site fire systems, the consultant will need to coordinate with the City's Fire Plan Checker for current notes.

The following "Drafting Notes" are to be used in the preparation of water distribution system improvement plans.

1) Tie-In Connections to Existing Water Mains
   a) After disinfection, Contractor shall install _____" diameter tapping sleeve with ______"tapping G.V. on existing water main.
   b) After disinfection Contractor shall "cut-in" tee on existing water main and provide_____________" diameter G.V./B.V.

2) Extension of Existing Water Distribution Mains
   a) Remove blow-off from end of existing main. Connect mains after disinfection.
   b) Remove plug from existing tee/cross fitting and install _______" diameter G.V./B.V. Connect mains after disinfection.

3) Installation of Water Services
   a) (Services 1 inch through 2 inches). Place ______ inch service per standard detail WR-1.
   b) (Service 3 inches and larger). Place __________ inch service per standard detail WR-2.
   c) (Residential Services). The City will install meters 2 inches and smaller. The Contractor will be responsible to install meters 3 inches and larger Meters will be provided by City upon payment of fees.
   d) (Commercial Development). The City will install meters 2 inches and smaller. The Contractor will be responsible to install meters 3 inches and larger. Meters will be provided by City upon payment of fees.
   e) (For 5,000 SF and greater of irrigated landscape). Place ____ inch service per standard detail WR-1 (or WR-2 as appropriate).

4) Fire Hydrants
   a) Place standard F.H.
   b) Place ____" x 6" tee with standard F.H.
   c) Relocate existing fire hydrant.
   d) Remove existing hydrant and place Standard F.H.

5) (Special) Since this subdivision is not contiguous to existing development, the property owner or developer of this subdivision shall be responsible for the construction of any required off-site water main extensions as determined by the City Development Services Division provided construction of improvements for the adjacent subdivision are not provided for at the time of construction of this subdivision.

6) (Special) All existing fire hydrants to be relocated by the Contractor shall be inspected by the Construction Inspector prior to the relocation of the hydrant.

7) (Special) Existing gate valves, risers or standpipes, and valve boxes shall be abandoned in place where indicated on the Plans. The gate valves shall be left in a closed position, the riser or standpipe removed, and the void filled with crushed rock or Class 2 aggregate base.

8) (Special) All water service taps to existing water mains to be installed by the Contractor shall be made while keeping the existing water main in service and under pressure. Shutdown of the existing water main to facilitate the installation of water service taps shall not be permitted.

5.6 TRAFFIC SIGNAL AND STREET LIGHTING PLANS

All traffic signal and street lighting plans shall be prepared on City of Folsom standard title block Mylar sheets 24”x36”. The Engineer prior to initiating the drawing shall approve the use of other drawing sizes.

A. Traffic Signal Cover Sheet

Traffic Signal Cover Sheet shall comply with Section 14.3 A of this manual.

B. Traffic Signal Plan Sheet

Each set of traffic signal plans shall include, but is not limited to, the following sheets:

1.	Traffic Signal Intersection Sheet	1” = 20’ (110 ± from stopbar in each direction)
2.	Traffic Signal Intersection Sheet	1” = 40’ (325 feet ± from stopbar in each direction for loops, lighting)
3.	Signing and Striping Sheet	1” = 40’
4.	Underground Utilities Sheet	1” = 40”
5.	Interconnect Sheet (if applicable)	1” = 100’
6.	Street Improvements (if applicable)	as required

C. Traffic Signal Intersection Sheets

The Traffic Signal Intersection Sheets shall show the following information:

- Existing and Proposed Phase diagram
- Conduit and Conductor Schedule
- Equipment and Pole Schedule

- Standard mounted street name sign
- Existing topography
- Loop detectors
- Conduits and pull boxes

D. Topography

All pertinent topography features in the immediate vicinity of the project shall be shown – edge of pavement, back of sidewalk, back of curb, existing topography such as fences, street lights, signal poles, planters, pullboxes, fire alarm pedestals, service pedestals, controller cabinets, power poles, striping, median islands, and other geometric features, obstructions, or traffic control features that may affect the proposed intersection design. Existing striping shall be properly dimensioned.

E. Proposed Improvements

Proposed improvements shall be shown in solid heavy lines as shown on the plates of Section 5. Proposed improvement information from the 1” = 20’ plan shall be copied to the 1” = 40’ plan and shall include the proposed signal poles, signal and pedestrian heads, controller, service, phasing of signal heads, controller, conduit, and proposed loops.

F. Right-of-Way

All right-of-way lines, easements, section lines, and temporary construction easements both existing and proposed shall be properly dimensioned.

G. Special Details

A detail is required if an area of the plan needs to be enlarged for clarity, or if any item is not shown on the most current issue of the City of Folsom Standard Construction Specifications or Caltrans standard plans.

H. Plan Sheet Format

Shall generally conform to the following:

Refer to Standard Plan Sheet Plan Sheet Plate 5-A through 5-F.

I. Construction Notes

A set of construction notes shall appear on each sheet applicable to the work on that sheet only. General notes that are applicable to all sheets may be on the first sheet on which the notes apply and then be referred to on the remaining sheets. Construction notes shall be placed in consecutive order in the upper right-hand quadrant of the plan sheet.

Caltrans abbreviated notes shall not be used with City projects but may be used when required by the State for joint City/State projects. If Caltrans abbreviations are used, a legend describing each abbreviation shall be shown on the Plans. Plan sheets shall be checked for consistency and continuity between notes and symbols on different sheets.

J. Conductor Schedule

Conductor schedule shall be in the lower left-hand quadrant of the plan sheet.

K. Pole Schedule

Pole and equipment shall be in the lower left-hand quadrant of the plan sheet.

L. Luminaire Schedules

Luminaire schedules, if required, shall be shown in tabular form and should indicate, but not be limited to, the amount and type luminaires on each new or existing service, the service location and voltage, the number of lights removed or added from an existing service, and any other pertinent information affect the service load.

M. Signing and Striping Plan Sheet

Shall include the following information:

1) Existing striping and proposed striping.
2) Existing signing and proposed signing.
3) Signature block for signature of the Director of Public Works.
4) Interconnect Sheets

Shall include the following information:

1) Existing street lighting electroliers and conduit, pullboxes, intersection conduit controller cabinets, and service pedestals along the arterial to be interconnected.
2) All intersections to be interconnected, using match lines where necessary.

N. Street Light Plan Sheets

1) Scale

   A scale of 1” = 100’ horizontal is recommended for most street lighting plan sheets.

2) Existing Topography

   Existing topography shall include existing service points, power lines, trees, conduit runs and street lighting in the immediate vicinity of the project.

3) Proposed Improvements

   Proposed street lights to be installs shall be shown in solid heavy liens with conductors shown.

4) Right-of-Way

   All right-of-way lines, easements, section lines, and temporary construction easements, both existing and proposed, shall be properly dimensioned. Any public utility easements shall be noted.

5) Subdivision and Lot Details

Subdivision plans shall show lot numbers and frontage measurements, intersection property lines of adjacent properties, and names and plan numbers of adjacent subdivision. Service details shall be shown as applicable.

6) Luminaire Schedules

Luminaire schedules shall be shown in tabular form and should indicate, but not limited to, the amount and type of luminaires on each new or existing service, the service location and voltage, the number of lights removed or added from an existing service, and any other pertinent information affecting the service load.

Note on Plans: “No tree to be planted within 20’ of a light standard”.

5.7 RECORD DRAWINGS (AS-BUILTS)

After completion of construction and prior to final acceptance by the City of a subdivision or other improvement projects, record drawings of all improvements reflecting revisions made in the field shall be made for submission to the City. A Mylar copy of the record drawings together with the drawing files diskette shall be submitted to the City prior to issuance of the final acceptance.

5.8 PLATES

A. Plate 5-A Standard Plan Sheet

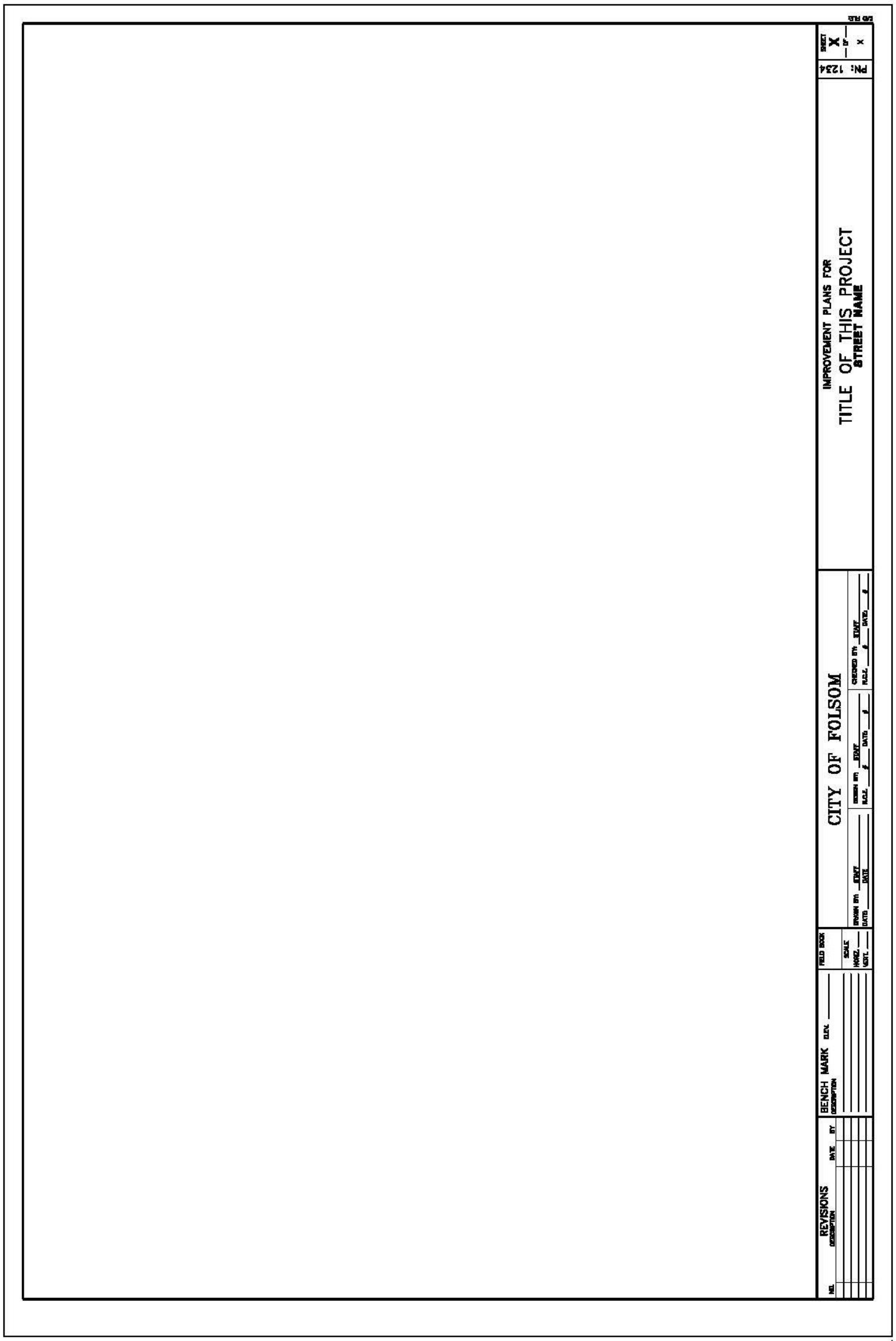
B. Plate 5-B Standard Plan/Profile Sheet

C. Plate 5-C Standard Symbols

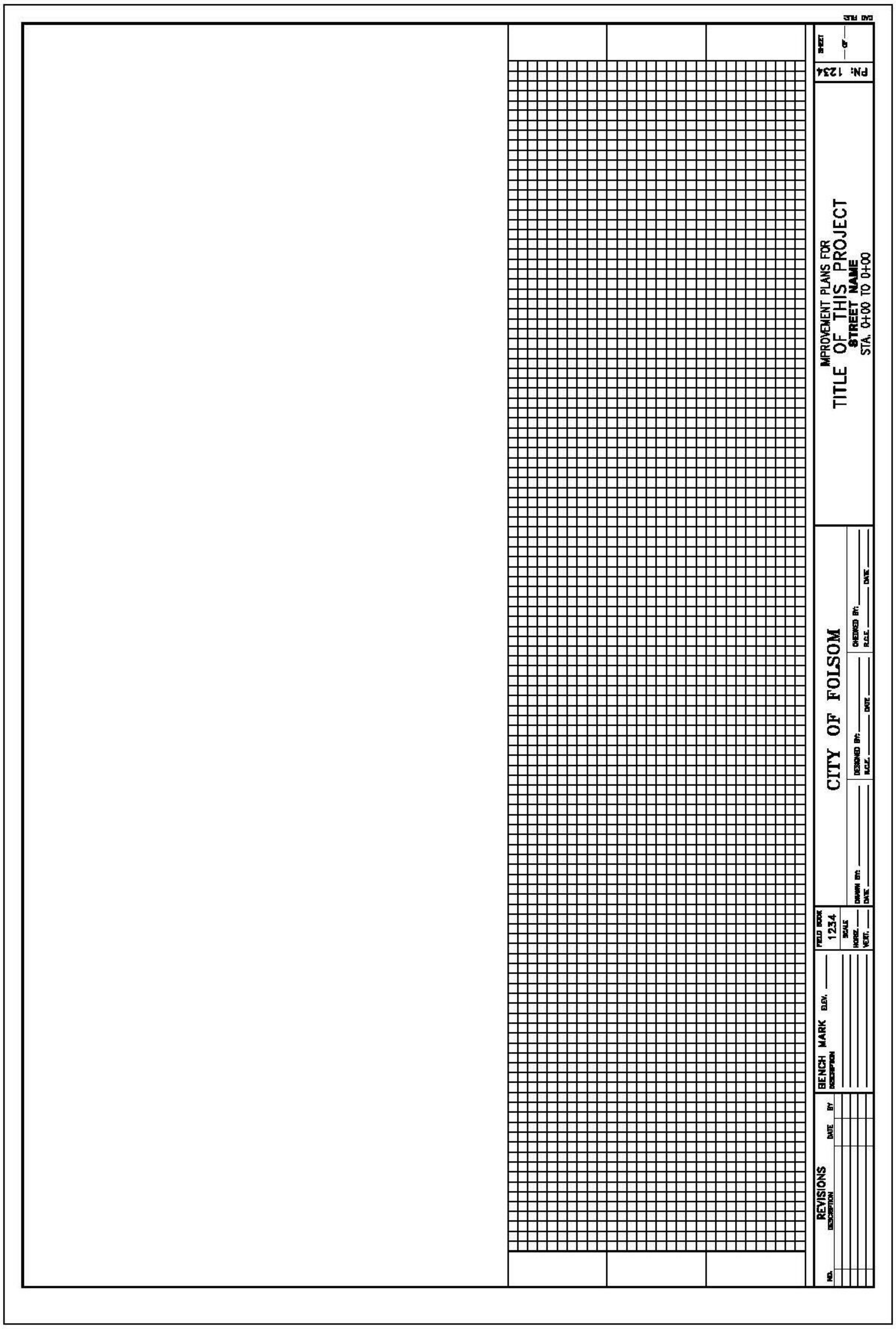
D. Plate 5-D Standard Symbols

E. Plate 5-E Standard Symbols

F. Plate 5-F Estimate of Quantities



STANDARD PLAN SHEET
PLATE 5-A



STANDARD PLAN/PROFILE SHEET

PLATE 5–B

CITY OF FOLSOM
STANDARD SYMBOLS

NAME	PEN WIDTH	EXISTING	PEN WIDTH	PROPOSED
DROP INLET	0.35 MM (S)		0.25 MM	
MANHOLE	0.35 MM (S)		0.25 MM	
SEWER CLEANOUT	0.35 MM (S)		0.25 MM	
STORM DRAIN (LINE)	0.65 MM (S1)	18" S.D.	0.65 MM	18" S.D.
SANITARY SEWER (LINE)	0.50 MM (S1)	8" S.S.	0.50 MM	8" S.S.
WATER MAIN (LINE)	0.35 MM (S)	6" W	0.35 MM	6" W
GATE VALVE	0.35 MM (S)		0.25 MM	
STANDARD FIRE HYDRANT	0.35 MM (S)		0.25 MM	
WHARF HYDRANT	0.35 MM (S)			
AIR RELEASE	0.35 MM (S)		0.25 MM	
BUTTERFLY VALVE	0.35 MM (S)		0.25 MM	
CHECK VALVE	0.35 MM (S)		0.25 MM	
BLOW-OFF	0.35 MM (S)		0.25 MM	
POWER POLE	0.35 MM (S)	PP	0.25 MM	PP
POWER POLE W/ GUY	0.35 MM (S)	PP	0.25 MM	PP
JOINT POLE	0.35 MM (S)	JP	0.25 MM	JP
STREET LIGHT	0.35 MM (S)		0.25 MM	
PULL BOX	0.35 MM (S)	PB	0.25 MM	PB
SIGNAL POLE	0.35 MM (S)		0.25 MM	
SMUD (UNDERGROUND)	0.35 MM (S)	SMUD	0.25 MM	SMUD

ALL PROPOSED BLOCKS (I.E MANHOLES, SEWER BOATS, ETC) SHALL USE PEN WIDTH 0.25 MM.
ALL EXISTING BLOCKS (I.E MANHOLES, SEWER BOATS, ETC) SHALL USE PEN WIDTH 0.35 MM (SCREENED).

(S) = 50% SCREEN
(S1) = 30% SCREEN

STANDARD SYMBOLS
PLATE 5-C

CITY OF FOLSOM
STANDARD SYMBOLS

NAME	PEN No.	EXISTING	PEN No.	PROPOSED
ELECTRICAL	0.35 MM (S)	E	0.25 MM	E
GAS VALVE	0.35 MM (S)		0.25 MM	
GAS MAIN	0.35 MM (S)	G	0.25 MM	G
TELEPHONE	0.35 MM (S)	T	0.25 MM	T
CABLE TELEVISION	0.35 MM (S)	CTV	0.25 MM	CTV
FIRE ALARM	0.35 MM (S)	F.A.	0.25 MM	F.A.
STREET SIGN	0.35 MM (S)		0.25 MM	
FENCE	0.18 MM	x x	0.25 MM	x x
MAIL BOX	0.35 MM (S)	M.B.	0.25 MM	M.B.
RETAINING WALL	0.35 MM (S)		0.35 MM	
FLOW LINE	0.18 MM		0.25 MM	
CONTOUR	0.35 MM (S)	20	0.25 MM	20
EDGE OF PAVEMENT	0.35 MM (S)		0.25 MM	
CURB, GUTTER & SIDEWALK	0.35 MM (S)		0.25 MM	
RIGHT-OF-WAY	0.50 MM (S1)	R/W	0.50 MM	R/W
CENTER LINE	0.35 MM (S)	℄	0.18 MM	℄
PROPERTY LINE	0.35 MM (S)		0.25 MM	
SLOPE BANK	0.35 MM (S)		0.25 MM	
ELEVATION	0.18 MM	23.10 x EX. 23.10 EX. 23.10 x EX.	0.18 MM	23.10 x 23.10 23.10
BENCH MARK	0.18 MM	40.21 x B.M.		
TEMPORARY BENCHMARK	0.18 MM	TBM		
SURVEY MONUMENT	0.18 MM	SM	0.18 MM	SM
HEDGE	0.35 MM (S)		0.18 MM	TO BE REMOVED
TREE	0.35 MM (S)	TP2 21" #69	0.25 MM	

STANDARD SYMBOLS
PLATE 5-D

(S) = 50% SCREEN
(S1) = 30% SCREEN

CITY OF FOLSOM
STANDARD SYMBOLS

NAME	PEN No.	EXISTING	PEN No.	PROPOSED
BUILDING	0.35 MM (S)		0.25 MM	
ELECTROLIER FOR POST TOP LUMINAIRE	0.35 MM (S)		0.25 MM	
ELECTROLIER W/ MAST ARM MOUNTED LUMINAIRE	0.35 MM (S)		0.25 MM	
OVERHEAD CONDUCTOR	0.35 MM (S)		0.50 MM	
CONDUIT (HASH MARKS INDICATE No. OF WIRES ST. LT. PLANS ONLY)	0.50 MM (S1)		0.80 MM	
PULL BOX (5 UNLESS OTHERWISE NOTED)	0.35 MM (S)		0.18 MM	
SERVICE PEDESTAL	0.35 MM (S)		0.25 MM	
SMUD SERVICE POLE	0.35 MM (S)		0.18 MM	
SMUD SERVICE SIDEWALK BOX	0.35 MM (S)		0.25 MM	
TYPICAL I.E.S. LIGHT PATTERN OF LUMINAIRE	0.25 MM	TYPE III	0.25 MM	TYPE III
INDICATES CONSTRUCTION NOTE No. 1	0.35 MM (S)	1	0.18 MM	1
INDICATES ELECTROLIER LOCATION (DETAIL A)	0.35 MM (S)	A	0.18 MM	A
FIRE ALARM PEDESTAL	0.35 MM (S)	F	0.25 MM	F
CONTROLLER CABINET	0.35 MM (S)		0.25 MM	
CONDUIT RUN (TRAFFIC SIGNAL PLANS)	0.35 MM (S)	1	0.18 MM	1
DETECTOR HANDHOLE	0.35 MM (S)	DH	0.25 MM	DH

(S) = 50% SCREEN
(S1) = 30% SCREEN

STANDARD SYMBOLS
PLATE 5–E

ESTIMATE OF QUANTITIES
(SAMPLE)

______________	LF	12" DIA. WATER MAIN
______________	LF	8" DIA. WATER MAIN
______________	LF	12" DIA. GATE VALVE
______________	EACH	8" DIA. GATE VALVE
______________	EACH	STANDARD FIRE HYDRANT
______________	EACH	2" DIA. BLOW-OFF
______________	EACH	8" DIA. WATER SERVICE
______________	EACH	2" DIA. WATER SERVICE
______________	LF	8" DIA SANITARY SEWER
______________	EACH	48" SANITARY SEWER MANHOLE
______________	LF	12" DIA STORM DRAIN
______________	EACH	48" STORM DRAIN MANHOLE
______________	EACH	TYPE "B" DROP INLET

ESTIMATE OF QUANTITIES
PLATE 5-F

Section 6:
EXISTING UTILITIES

6.1 SCOPE

The purpose of this Section is to assist in the gathering and interpretation of information concerning the location of existing utilities, both above and below ground, that affect the design and preparation of plans for public and private improvements.

Such public and private improvements include the installation of storm drain lines, sanitary sewer lines, water mains, gas, electrical, CATV, telecommunications and new streets. Also included is the widening of existing streets, construction of bridges, pump stations, open channels, and the installation of traffic signals and street lighting systems.

The guidelines contained herein are intended to help the project manager or Project Engineer either avoid conflicts in alignment and elevation or resolve conflicts in alignment and elevation that often occur between proposed public improvements and existing utilities.

This Section covers only the technical aspects of avoiding or resolving conflicts with existing utilities. The handling of utility conflicts with regard to prior rights, financial responsibility for relocation of existing utilities, etc. is beyond the scope of this Section. Discussion of responsibility between the City and a contractor for a public improvement project concerning the location and identification of existing utilities is outlined in the Standard Construction Specifications, General Provisions, Article 6.

6.2 BACKGROUND

The avoidance or resolution of conflicts between proposed public improvements and existing utilities, particularly underground utilities, is a crucial part of the design process. Research concerning the location of existing utilities, careful planning, and close attention to detail are useful tools in determining the degree of impact that existing utilities will have on the horizontal and vertical alignment of proposed water mains, storm drain lines, and sanitary sewer lines. The location of above and below ground utilities may also affect the design of the geometric alignment of streets as well as the alignment and typical cross section of open drainage channels.

Information on the type, location, alignment, length, height, and depth of existing public, municipal, and privately owned utilities may be obtained from the owner of the utility. The information comes in the form of maps, plans, drawings, and other records kept by the utility's owner as well as public improvement plans from past projects. In addition, field trips to the site of a proposed public improvement project and the performance of field investigations such as "potholing" provide accurate firsthand knowledge of the location of existing utilities.

6.3 TYPES OF UTILITIES

Utilities may be classified according to ownership (public or private) and location (overhead or underground).

A. Above Ground (overhead) Utilities

Common overhead public utility lines include electrical power (Sacramento Municipal Utilities District, Pacific Gas & Electric Company, etc.) and communication such as telephone (American Telephone and Telegraph, Pacific Bell, etc.) cable TV (Sacramento Cable Company and TV).

B. Underground Utilities

Underground public utilities include electrical power in the form of duct banks (stacked ducts made of or encased in concrete) or direct burial cable (Sacramento Municipal Utility District). Communication lines may also be places underground in the form of duct banks or buried insulated cable (Pacific Bell, Sacramento Cable, etc). Natural gas pipelines (Pacific Gas & Electric) are generally underground. At stream crossings, however, natural gas lines may be mounted on bridges.

C. Municipal Utilities

Municipal utilities serving urban and suburban areas are also included in the category of public utilities. Examples of underground municipal utilities include storm drain and sanitary sewer lines, both gravity and pressure (force mains), as well as water transmission and water distribution mains.

D. Privately Owned Utilities

Privately owned utility lines include pipelines used to transmit petroleum products such as lines owned by Southern Pacific Transportation Company, Chevron Corporation, or Unocal Corporation. In addition manufacturing companies may have their own pipelines for transmitting natural gas or other gases to their plants for future use.

Railroads often have pole lines within their rights-of-way running parallel to their tracks that support overhead wires for operation of switches, gates at grade crossing, signals, communication and other operational equipment that must be identified during design and protected during construction.

6.4 FIELD VISITS TO PROJECT SITES

Knowing what to look for when visiting project sites in the field can provide considerable insight as to the potential impact existing utilities and related facilities may have on a proposed public improvement project.

A. Electrical Power (Overhead and Underground)

1) Overhead Electrical Power

Overhead facilities for the distribution of electrical power are rather obvious in the field and include poles (mostly wood but sometimes steel), conductors (wires and cables), pole mounted transformers, guy wires and anchors, etc. Most power pole lines are placed within street right-of-way, although they may also be located in easements.

High voltage transmission lines supported on tall steel poles as well as towers are also a type of overhead facility used for the distribution of electrical power. Many of these high voltage transmission lines run through one part of town to another within their own easements.

The wooden power pole with supported wires and related hardware is the most common type of overhead electrical power distribution facility normally encountered in the field. Besides ordinary line poles, however, certain other types of poles are frequently encountered in the field.

B. Joint Poles

Power poles supporting telephone lines are often referred to as joint poles. Joint use power poles may also be supporting lines for the fire alarm and cable TV in addition to overhead electrical and telephone lines.

C. Power Mounted Risers

Some power poles have conduit risers strapped to the pole that originate near the top of the pole, run down the side, and continue underground. The conduit risers contain electrical wires or cables that connect to a pole mounted transformer or to power lines supported by the pole and extend underground to electrical service panels of buildings, ground mounted transformers, service pedestals for street lighting and traffic signals systems, etc.

D. Pole Mounted Transformers

Power poles may have one or more electrical transformers mounted near the tops of the poles.

E. Switch Poles

Certain poles, designated as switch poles, may have manually operated throw switches situated near the tops of the pole. Switch poles may be recognized by the presence of a lever positioned 10 or 12 feet above ground level connected by galvanized steel bar linkage to the switch at the top of the pole. There may also be a steel grounding plate located at ground level near the base of the pole beneath the switch operating handle.

F. Dead End Poles and Guyed Poles

Poles located at the termination of overhead electrical power lines are dead end poles and are restrained by guy wires. The guyed poles resist the horizontal thrust (pull) exerted by the electrical power lines supported on a run of line poles. Guy wires are also used to stabilize individual poles placed at angle points in the alignment of a pole line.

A type of dead end pole may also be placed at intervals along a series of line poles. Although the power lines supported by this type of dead end pole extended away from the pole in opposite directions, the power lines may actually terminate at the pole. Electrical continuity is provided by a form of jumper wire that connects the opposing ends of the individual power lines terminating on each side of the pole. This type of dead end pole is not guyed as the horizontal pull exerted by the power lines cancel out.

This positioning of the ceramic insulators on the wooden cross arms of power poles is a clue in the identification of any type of dead end pole (besides the presence of a guy wire). The insulators of ordinary line poles are mounted on the top of the wooden cross arms whereas the insulators for dead end poles are mounted on the sides of the cross arms. The positioning of the insulators is directly related to the need to resist the horizontal pull of the power lines supported by the pole.

G. Relocation of Power Poles

The existence of any of the various types of power poles may affect how readily and expeditiously the poles will be relocated if the existing location of the poles is determined to be in the way of a proposed public improvement project. There may be a cost to a project for any existing poles incorrectly relocated or if the existing poles are situated within their own easement lying outside the original public right-of-way. In addition, certain pole lines may support conductors carrying high voltage electricity that can be shutdown at specific times of low demand such as during weekends or holidays.

6.5 UNDERGROUND ELECTRIC POWER LINES

Underground electrical distribution facilities include direct burial insulated cables as well as uninsulated grounding cables. Along streets in new subdivisions these cables are most often placed within the 12.5 foot wide public utility easement located behind the street right-of-way line.

In certain areas, underground electrical power lines are placed within stacked multiple duct banks. Underground vaults are placed at electrical service points and junctions of these duct banks. These underground vaults may be found in the street within the traveled way or they may also be found within the sidewalk area.

As mentioned previously, power poles may support conduit risers extending the full height of the pole and continuing underground. Poles with conduit risers can be readily seen in the field. The direction and/or length of the underground portion of the conduit may or may not be so obvious but they may interfere with the placement of shallow municipal utility lines such as water and sewer services as well as leads from drainage inlets. The alignment and depth of such underground lines can only be accurately determined by “potholing.”

6.6 TELEPHONE (OVERHEAD AND UNDERGROUND)

A. Overhead telephone lines often share the same poles as electrical power lines and are referred to as joint poles as mentioned previously. The telephone lines are mounted several feet below the electrical power lines. Poles supporting both power and telephone lines are usually owned by SMUD.

   Conduit risers for underground telephone service lines may also be mounted on telephone poles. The depth and/or alignment of the underground portion of the conduit riser may interfere with the placement of shallow municipal lines such as water and sewer services as well as leads from drainage inlets.

B. Underground Telephone

Underground telephone facilities consist of direct burial insulated cable as well as single or multiple duct banks. The buried cables are not usually encased in concrete while the ducts, there are several in number, usually are encased in concrete. Telephone ducts installed in the recent past are plastic and are often 4 inches in diameter. Older duct banks may consist of precast concrete units made with tubular voids that when placed end-to-end form continuous underground-enclosed conduits.

When telephone ducts are encased in concrete they are usually grouped of stacked to form a duct bank. The pattern of the ducts within the duct bank is generally in the form of columns and rows and may be two or three ducts wide and two to six or more ducts deep.

Concrete encased duct banks can present somewhat impenetrable barrier to the desired placement of storm drain lines and sanitary sewer lines. Although the telephone company may have fairly accurate records on the size, number, and possibly the arrangement of the ducts making up a particular duct bank, the actual depth of cover and the extent or thickness (top and bottom elevation) of this type of underground telephone facility is best determined by “potholing.”

The buried cables and the duct banks often pass through, join other cables and duct banks from different directions, or terminate at telephone manholes. Telephone manholes may appear innocuous when viewing the distinctive manhole covers on the ground or pavement surface. In reality, telephone manholes may be sizeable underground vaults that could very well interfere with the placement of storm drain lines, drain inlet leads, sanitary sewer lines, sewer services, and water mains as well as water services. Should a grade conflict occur at a crossing of a proposed storm drain line or sanitary sewer line with an existing underground telephone duct bank and the slope of the drain or sewer line is critical, in some instances, it may be possible for the existing telephone facility to be splayed into two separate (upper and lower) parts. This will allow the drain or sewer line to pass between the divided duct bank while maintaining the desired vertical alignment.

Splaying involves the excavation and exposure of a suitable length of the existing duct bank in each direction from the location of the conflict to gain slack. This is followed by separating the ducts apart far enough to create an opening large enough for the sewer or drain pipe to pass through. The splaying of an underground telephone duct bank is an expensive and time consuming solution to a grade conflict and should only be used if there is no other vertical alignment option for the proposed drain line or sewer line.

Other telephone facilities observed in the field are pedestals mounted at ground level or on telephone poles. The pedestals are fabricated from sheet metal and are generally painted a light green color. The pedestals often contain terminal boards and no doubt indicate the presence of underground telephone facilities.

Worded signs warning of the existence of underground telephone facilities are often seen spaced at intervals along the alignment of underground cables and duct banks.

6.7 NATURAL GAS (UNDERGROUND)

Generally natural gas mains and gas service lines are installed underground. At stream crossings, gas lines may be mounted on the superstructure of bridges constructed across the watercourse.

Gas meters are mounted above ground near the point where the gas service line enters the customer's premises and thus are clues of the presence and location of underground gas services.

At railroad grade crossings of city streets, any gas mains crossing beneath the tracks are placed inside steel pipe casings. All pipe casings for gas mains are required to be vented at one or both ends by 1- or 2-inch diameter steel pipes routed to one side of the street somewhat opposite the ends of the casing. The existence of casing vent pipes at railroad grade crossings is a clue of the presence of an underground gas main extending under the track(s) and beyond.

6.8 UNDERGROUND SERVICE ALERT (USA) COLOR CODE

Contractors are required to have the location of all underground utilities marked on the ground within the limits of any excavation prior to beginning the excavation. The alignment and size, if applicable, of the underground utilities are marked on the ground or pavement surface in a specific color according to the type of utility. The standardized color code used to mark and identify existing utilities in the field is as follows:

RED	Underground electrical power lines in the form of ducts (concrete encased or non-encased), cables, or conduits. Also includes conduits for traffic signal and street lighting systems.
YELLOW	Natural gas mains and services as well as pipelines carrying petroleum products.
ORANGE	Underground telephone and other communication, fire alarm, railroad signal, telegraph, etc. lines in the form of ducts (encased and non-encased), cables, and conduits.
BLUE	Water mains and water services as well as landscape irrigation liens.
GREEN	Sanitary sewer lines and sewer services as well as storm drain lines.
PURPLE	Reclaimed or untreated water.

The markings made in the field by the representatives of the owner of the underground utility indicate only the approximate location of the underground facility. The markings do not signify the exact location but only indicate the particular underground utility is located somewhere within a strip of land not more than two feet on either side of the exterior surface of the underground installation. Information on the depth of an existing utility is normally not given, only location and alignment.

6.9 UTILITY INFORMATION AND NOTIFICATION

It is important to obtain accurate and factual information concerning the location of existing aerial and underground utilities early in the design process.

For private development projects, the design professional shall demonstrate their coordination with public/private utilities and submit certification that this coordination has been accomplished.

In the preparation of construction plans for public capital improvement projects (CIP), the various utility companies are to be notified in writing according to the following procedure:

> A Letter - Send a minimum of six months in advance of the anticipated bid date for the project. It is beneficial to send this letter as soon as preliminary design is complete. Provide information on location and limits of project, scope or description of the work, etc. Include vicinity map, typical sections, right-of-way requirements, and if available preliminary plans with survey notes plotted.
>
> B Letter - Send a minimum of two months prior to bid date. However, in certain cases where significant relocation may be involved, the utilities may need more lead time to prepare their plans and relocate their facilities.
>
> C Letter - Send at time of advertising project for bids. Copies of complete plans that have been signed are sent with this letter. Include date bids are to be received and date of construction is expected to begin.

Blank copies of these utility notification letters are included as Exhibits at the end of this Section.

For many projects the sending of the three standard notification letters may need to be supplemented with visits to the field, “potholing,” telephone calls, and the arrangement of meetings with utility company representatives. This is to insure that any required relocation of existing utilities not to be performed by the contractor will be completed in a manner that will not delay a contractor constructing a project. This is especially important for large projects where utility relocations may be numerous and time consuming.

Early receipt and thorough analysis of utility location information (size, alignment, depth, etc.) as related to the design and construction of new public improvements should greatly reduce the number of change orders, construction delays, and contractor claims resulting from conflicts with existing utilities encountered in the field.

As part of the design work for a public improvement project, an effort should be made to identify, locate, (by “potholing” if necessary), and arrange a time schedule for the relocation of existing utilities found to be in conflict with any proposed improvement elements.

UTILITY REQUEST - A LETTER

Date

NAME
COMPANY
ADDRESS
CITY, STATE, ZIP

Re: (Project Name), **Utility Letter “A”**

Dear (Name):

For your information, enclosed are two sets of preliminary prints showing the areas where improvements will be constructed as part of the (Project Name) Project. The improvements include the following:

1. (PROPOSED IMPROVEMENTS – project description)

The anticipated advertising date for the subject project is (Date).
On one of the copies of the enclosed plans, please verify the location, size and depth, if underground, of any of your Company’s existing facilities that may be affected by the proposed work. Also, please indicate any pending new facilities that are expected to be installed within the next year. Within 15 days of receiving this letter, please return the marked up copy of our consultant who is acting on behalf of the client. You can mail the information to our consultant at:

(Designer)
(Address)
Attn: (Engineering Contact)

Thank you for your prompt assistance in this matter. If you desire further information concerning the proposed work, please call me at (Phone).

Sincerely,

(Designer)

UTILITY REQUEST - B LETTER

DATE

NAME
COMPANY
STREET
CITY, STATE, ZIP

Re: (PROJECT NAME), **Utility Letter “B”**

Dear (Name):

Preliminary prints showing the public improvements to be made in the (Project Name Here) project are enclosed for your information. The anticipated advertising date for the subject project is (Adv. Date here), with construction expected to begin (Constr. Date Here). As a minimum, these plans include the necessary information required to initiate potential utility relocation design.

Please respond in writing within 30 calendar days using the enclosed Utility Information Form. Unless otherwise indicated or agree, we assume that within 60 days of receipt of these plans, all planning and engineering of relocations will be accomplished.

If you desire further information concerning the proposed work, please call me at (Phone).

Sincerely,

(Designer)

(Engineering Contact)

(Title)

Enclosure

UTILITY REQUEST – C LETTER

DATE

NAME
COMPANY
CITY, STATE, ZIP

Re: (PROJECT NAME), **Utility Letter "C"**

Dear (Name):

Enclosed for your use are final approved plans for the (…………..) project. The following significant revisions to the project schedule or plans have been accomplished since the delivery of the "B" plans:

Unless otherwise discussed or agreed, we are allowing a minimum of 60 calendar days from the date of this letter, or a maximum of 120 days since Utility Letter "B" was sent, (…………) for your utility to schedule and construct relocations. Please respond in writing within 10 calendar days to confirm this schedule.

If you desire further information concerning the proposed work, please call me at (Phone).

Sincerely,

(DESIGNER)

(Engineering Contact)
(Title)

Enclosure

UTILITY INFORMATION FORM

(To be sent with “C” Plans – Schedule Confirmation)

DATE:

FROM: Engineer’s Name
(Designer)
(Address)

TELEPHONE: (Phone)
FAX NO.: (Fax or Email)

TO: (Company)

PROJECT TITLE:

CONSTRUCTION LIMITS:

BRIEF DESCRIPTION OF UTILITY

CONFLICTS:____

____

____

____

____

____

____

TENTATIVE SCHEDULE FOR UTILITY RELOCATIONS (IF DIFFERENT FROM “B” PLAN GUIDELINES):

____

____

____

____

____

____

____

____

UTILITY COMPANY REPRESENTATIVE DATE____________TELEPHONE__________

UTILITY INFORMATION FORM

Date: ____________________________

To: ______________________________
(PAC BELL, PG&E, SMUD, etc.)

From: _______________________________ Address: ____________________________________
Phone: _____________________________________

Developer: ___________________________ Address: ____________________________________
Attn: Phone: _____________________________________

Project: ______________________________

TO BE FILLED IN BY UTILITY COMPANY

Utility Representative: _______________________________________ Phone: _________________

Date Plans Received: ____

Do facilities require relocation or removal? ___________ YES __________ NO

If yes, give location: ____
____
____
____

Comments:
____
____

Time required to engineer project: ____________ Working days

Time required to schedule and complete
Construction after payment of relocation
Cost (if required). ____________ Working days
TOTAL: ____________ Working days

If poles, are they jointly owned? _________ YES _________ NO

If yes, jointly owned with: ____
(PAC BELL, PG&E, etc.)

____ _____________
Signature of Utility Representative Date

NOTE: This form is to be returned to (Design Consultant).

Section 7:
AGENCY PERMITTING REQUIREMENTS PURPOSE

The following chapter discusses criteria for various agency permits that are required to construct various types of projects. Permit application forms should be obtained from the permitting agencies in order to ensure the use of the most current forms and the proper completion of those forms.

It is important that all required permits are identified during the design phase of a project. Failure to obtain permits can cause costly delays during construction.

7.1 PERMITTING AGENCIES

The following is a listing of the more common permits and the criteria that mandates the issuance of each permit.

Agency Permit	Criteria
Caltrans Encroachment	Any work that encroaches upon a state highway or right-of-way. This includes City streets that are designated State highways.
U.S. Army Corps of Engineers	Any work that involves excavation of materials within a navigable waterway to the mean high water level requires a permit under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act. Navigatable waterways include very small streams. Section 404 of the Clean Water Act requires permits for fill material, which is to be placed within the high tide line of tidal waters, plus neighboring or adjacent wetlands. Contact the Corps for verification of jurisdiction.
State Department of Fish & Wildlife	Under Section 1601 of the Fish & Game Code, any work that will alter a stream bed within the State of California.
Central Valley Regional Water Quality Control Board	Any work that involves the discharge of materials into waterways of the State. They provide certification of the Corps of Engineers 404 permits. In addition, they issue waste discharge control permits under the State's Porter-Cologne Act and the Federal Clean Water Act.
State Lands Commission	The State Lands Commission has exclusive jurisdiction over all un-granted sovereign tide and submerged lands and the beds of navigable lakes and streams under Public Resources Code Section 6301. A permit may be required for dredging activities under Division 6 of the Public Resources Code.

Agency Permit	Criteria
Public Utilities Commission	Any work that involves modifications to railways or railway structures or relocation of covered utility facilities.
State Water Resources Control Board General Construction Activities Storm Water Permit (NPDES)	Any work or construction activity that results in the disturbance of at least 1 acre or is part of a larger common plan of development. Activities include clearing, grading, excavation, reconstruction of existing facilities, and dredging.
Sacramento Air Quality Management District	Any work or construction activity that results in disturbance of any naturally occurring asbestos.

7.2 AGENCY PERMITTING REQUIREMENTS

Final jurisdictional determinations should be obtained in writing to prevent problems during later phases of a project. Written clearance or issued permits will be required prior to approval of the improvement plans by the Engineer.

Section 8:
RIGHT-OF-WAY ENGINEERING AND ACQUISITION

8.1 SCOPE

This Section provides information concerning the preparation of exhibits for the acquisition of real property (land) in the form of right-of-way, easements, and rights-of-entry needed for many public improvement projects. The exhibits to be prepared include location maps, property descriptions, and plat maps. This Section also outlines the steps involved in the acquisition of easements and rights-of-way under the law of eminent domain.

8.2 DEFINITIONS

The meaning of the terms used in this section and in other matters involving the acquisition or transfer of ownership of real property are given as follows:

A. Conveyance - A document or instrument transferring fee title or lesser interest in real property.

B. Description - A means of delineating the boundaries and/or exact location of a subject property in terms of "metes and bounds", "township-section", or "lots, blocks, or tracts". The legal description of real property. The area of the described real property should also be a part of the description.

C. Easement - Provides a granted right to use real property for a specific purpose.

D. Easement (Permanent) - A description of, and the allowed use of real property for a specific purpose. A right or interest held by one individual, group of individuals, partnership, corporation, etc, for an indefinite period of time, on land owned by another.

E. Easement (Temporary Construction) - The right to enter a delineated area of land owned by another during a specified period of time for the purpose of constructing a public improvement. Upon completion of the construction activity for the improvement, the surface of the land within the limits of the temporary easement must be restored, as nearly as practical, to its original condition or improved to a condition mutually agreeable to the parties.

F. Easement (Slope) - The right to construct on land owned by another a permanent change in the elevation or surface contour of the land (excavation or embankment slope) over a predetermined portion thereof.

G. Fee Title - Full unencumbered ownership of real property with no limitations as to what purpose or use the property may be put.

H. Index Map - A map showing the location and identification of those parcels from which an easement or additional right-of-way is to be acquired. An index map also gives the location of each individual lot or parcel of land affected by an easement or right-of-way acquisition relative to the location of all of the other lots or parcels of land within the limits of a project.

I. Location Map - A one page exhibit on which is drawn a small-scale vicinity map and a larger scale location map. The large-scale vicinity map more or less indicates the geographical area of the City the proposed project is to be located. The smaller scale location map gives the limits of the project relative to existing major streets.

J. Metes and Bounds - Measurements and boundaries. Refers to the specific description of a parcel or tract of land that has not been subdivided.

K. Plat Map - A drawing that accompanies the legal description of real property showing the size and configuration of the lot, parcel, or tract of land being described. Plat maps of lots or parcels affected by a right-of-way acquisition also show the dimensions and extent of the "take area".

L. Right-of-Way - The right to use or cross over the property of another.

M. Right-of-Entry - The temporary and limited right to enter onto the land of another for the purpose of performing a specific task or activity.

N. Take Area - Refers to that portion of the affected tract of land that is to be acquired. In some cases, the "take area" may include the whole parcel. The area of the "take" should be calculated to the nearest square foot when the take area is less than 20,000 square feet and to the nearest 0.001 acre when the area to be acquired exceeds 20,000 square feet.

O. Title - The evidence of ownership.

P. Vest -Determination of the way title to property is held and by whom.

Q. Vesting -A statement of owner's names and terms of ownership.

8.3 BACKGROUND

An important aspect of many capital improvement projects is the acquisition or the taking of land by the City that is owned by private individuals, partnerships, corporations, railroad companies, utility companies, other public agencies, etc. In many cases the land to be acquired is obtained from the property owner by dedication, direct purchase, or exchange upon completion of any required appraisals, selling price negotiations, and the signing and recording of sales contracts and deeds.

There are cases, however, when it becomes necessary for the City to obtain real property (land) needed for a public improvement project through the use of eminent domain proceedings. Since the acquisition of real property through the exercise of power of eminent domain involves the City Attorney's office, the exhibits used in such proceedings (namely: location maps, property descriptions, and plat maps) must be prepared according to a specific format.

In the interest of uniformity, location maps, property descriptions, and plat maps for all right-of-way and easement acquisitions are to be prepared according to this same format. Sample location maps, property descriptions, and plat maps as listed below are included in this Section for purposes of illustration.

Sample Forms

1. Easement for Public Road and Public Utilities
2. Sample Round Corner Exhibits
3. Right-of-Entry Form

4. Right-of-Entry Form for Contractor

Sample Right-of-Way Acquisition Exhibits

1. Index Map
2. Location Map
3. Right-of-Way Diagram
4. Plat Map
5. Right-of-Entry Exhibit

8.4 PREPARATION OF RIGHT-OF-WAY ACQUISITION EXHIBITS

A typical set of exhibits for the acquisition of a right-of-way or easement consists of a location map, a property description, and a plat map. Each right-of-way or easement exhibit shall be made on 8-½"x11" copy ready paper or other type of reproducible original. A one-inch clear margin shall be provided at the top of each exhibit drawing or description.

A separate set of exhibits shall be prepared for each piece of real property affected by the proposed project. Adjoining properties under the same ownership shall each have a separate set of exhibits prepared.

Each individual piece of property or tract of land affected by a right-of-way acquisition shall have a distinguishing number assigned to it. The number shall consist of the project name and an ascending number beginning with the number one, i.e. Natoma Ditch-1, etc. Slope easements or temporary construction easements within the same piece of property shall be assigned an alphabetical subparcel number i.e., Natoma Ditch-1 a, 1b, etc.

Larger capital improvement projects involving the acquisition of rights-of-way or easements from several parcels may require the preparation of an index or strip map showing the limits of the entire project and the relative location of all of the parcels. The index map should be drawn to a scale not greater than one inch to 500 feet. The location of each individual parcel with its assigned number should be shown on the index map. The index map should be drawn in a manner that it may be folded to 8-½"x11" in size. The maximum size of the drawing shall be 24"x36".

8.5 PROCEDURES FOR THE ACQUISITION OF RIGHTS-OF-WAY AND EASEMENTS THROUGH THE EXERCISE OF POWER OF EMINENT DOMAIN

Prior to the initiation of any right-of-way acquisition, environmental clearance and project funding must be secured. The steps involved in the acquisition of rights-of-way or easements for public improvement projects are outlined as follows:

Step 1. Project design is completed in sufficient detail to permit precise definition of real property to be acquired (number of individual parcels affected by right-of-way acquisition and the take area from each parcel). Prepare the right-of-way documents described below in this Section.

Step 2. Public Works obtains appraisals for each of the parcels affected by the right-of-way acquisition.

Step 3. City Council determines or fixes "just compensation" for the real property to be acquired, based on appraisals.

Step 4. City attempts to obtain the required real property from the property owners(s) through negotiation. A written offer as required by Gov. Code §7267 is given to property owner(s) as well as a written summary of the basis of the appraisal the offer is based on.

Step 5. City Council adopts Resolution of Intent to adopt a Resolution of Necessity, and sets a date for a future public hearing to be held in approximately five weeks. Notice to property owners must be given as required in Civil Procedure Code §1245.235,

Step 6. At the public hearing, the City Council considers protests by property owners affected by right-of-way acquisition, if the City Council determines the project should go forward as planned, the Council adopts a Resolution of Necessity with appropriate findings.

The City Council must adopt the Resolution of Necessity by a two-thirds vote. The condemnation resolution must contain all of the following elements:

A. A general statement of the public use for which the real property is to be taken and a reference to the statute that authorizes the City Council to acquire the real property by eminent domain.

B. A description of the general location and extent of the real property to be taken with sufficient detail for reasonable identification of the physical extent of the taking and the interest sought.

C. A declaration that the City council has "found and determined" each of the following:

1) The public interest and necessity require the proposed project.

2) The proposed project is planned or located in a manner that will be most compatible with the greatest public good and the least private injury.

3) The real property described in the Resolution is necessary for the proposed project.

4) A written offer required by Section 7267 of the Government Code has been made to the property owner, or the offer has not been made because the owner cannot be located with reasonable diligence.

Step 7. Un-acquired real property is referred to the City Attorney's office for initiation of eminent domain proceedings immediately following City Council adoption of the Resolution of Necessity.

Step 8. City Attorney's office prepares and files complaints on parcels with un-acquired right-of-way. If necessary, City Attorney applies for a court order at the same time, authorizing the City to take "immediate" possession of the real property. The court order, once secured, must be served upon every person with a legal or equitable interest in the property. The minimum possession dates are as follows:

a) Ninety days after service for property with an occupied dwelling unit, farm, or business operation.
b) Thirty days after service for vacant land.
c) Three days in case of emergency.

In the acquisition of real property through the exercise of power of eminent domain, the adoption of a Resolution of Necessity by the City Council should occur fairly early in the sequence of events for any project for which easements or additional right-of-way is required. Once the Resolution for Necessity for a given project has been adopted, the City has a period not to exceed 6 months within which to file condemnation action on an individual parcel, in order to avoid automatic pre-condemnation damages.

8.6 RIGHT-OF-WAY

The term "right-of-way" as used in this Section is intended to imply perpetual ownership of an exclusive interest of real property with no restrictions or limitations as to what purpose the property may be used. For example, the land within the right-of-way for a public street or a drainage channel is not available for any other purpose so long as the street or drainage channel is in use.

The term "easement" as used in this Section is intended to imply the perpetual ownership of a lesser interest in real property that allows the property to be used for a specific purpose. For example, an easement for a publicly owned and maintained storm drain line across private property may grant a public agency the right to construct, operate, and maintain an underground pipeline within the area of the easement but still allow the owner of the property to use the area within the easement for landscaping or parking.

8.7 PERMANENT EASEMENTS AND TEMPORARY CONSTRUCTION EASEMENTS

Descriptions of "take areas" for both permanent easements and temporary construction easements are written with the same degree of formality. Both types of easements are recorded in the County Recorder's Office.

Permanent easements are what the name implies, permanent. The acquisition of a permanent easement may involve the transfer of complete ownership (full interest) such as for a street, a site for pump station, or the right-of-way for a drainage channel. At other times the acquisition of a permanent easement may involve the transfer of a right (partial interest) for a particular but limited type of use such as for an underground storm drain or sanitary sewer line or a slope easement.

Temporary construction easements are for limited periods of time which may vary from a few weeks or months or as long as it takes to complete a contract for the construction of a given public improvement. Temporary construction easements are acquired to facilitate the construction of a public improvement project by providing a staging area and/or work space for a contractor.

8.8 RIGHT-OF-ENTRY

A right-of-entry is a type of license giving a contractor of a given public improvement projects the right to enter private property for the purpose of performing a particular phase of the work. Rights-of-entry do not transfer any title, interest, or estate in the real property. Rights-of-entry are signed by the parties involved and should be recorded.

8.9 WRITING PROPERTY DESCRIPTIONS

The writing of property descriptions is as much of an art as it is a science. There may be several ways to write a description for a particular piece of real property and all of them will be correct and accepted for recording. Property descriptions of "take areas" for right-of-way and easement acquisitions may be written by using one or more of the three description formats (metes and bounds, township-section, or lots, blocks, and tracts).

The "take area" within individual lots, parcels, or tracts of land affected by the acquisition of easements and rights-of-way may take on a variety of shapes and configurations. Common shapes include narrow strips (both curved and straight), rectangles, squares, long trapezoids, and long triangles. The right-of-way "takes areas" for round corners at street intersections may be in the shape of crescents or small triangles besides the more common shape of the area outside a quarter circle but inside a quarter square.

A. Checklist for Property Descriptions

As an aid in the writing of property descriptions for easements and rights-of-way the following checklist is given.

Introduction of Description

Identify title and general location of area described including any of the following:

1) *Name of city, county, and state.*
2) *Section number, township, range, etc.*
3) *Name of subdivision, parcel map, record of survey, rancho, land grant, etc, with recording data (map book and page number and date of recording).*
4) *Court or record documents such as recorded deeds, contracts of sale, etc on which the subject property description depends.*

Body of Description

The body of the description contains specific quantifying information (i.e. bearings, distances, east one-half, northerly 20 feet, etc.) delineating the boundaries of the tract of land being described.

1) *Point of commencement, if any, compatible with previous deed descriptions or deed descriptions of adjacent properties.*
2) *True point of beginning positively identified to recorded reference points such as section corners, lot corners of subdivisions, etc.*

3) *Direction of travel (i.e. clockwise, north to south, etc.) is important when writing "metes and bounds" or centerline descriptions.*

4) *Basis of bearing should be the same throughout the description.*

5) *Method of giving direction of the boundary lines or courses or should remain the same throughout the description. For example, the description should not begin with bearings and then change to azimuths or deflection angles.*

6) *The units of length used for the course distances should be consistent throughout the body of the description.*

7) *The degree of precision when giving distances or directions should be consistent wherever possible. Changing from two to three decimal places should not be done without reason.*

8) *The area of the described tract of land should be stated as more or less, except when the area controls the size (dimensions) of the parcel.*

9) *A "metes and bounds" description of an enclosed area should return to the point of beginning.*

Review of Descriptions

A civil engineer or land surveyor holding the proper license under the law should review all property descriptions.

8.10 EXAMPLE PROPERTY DESCRIPTIONS

The example descriptions that follow illustrate the differences in format between "metes and bounds", "township-section", and "lots, blocks, and tracts" descriptions and will serve as a guide in writing property descriptions for the acquisition of rights-of-way and easements for public improvement projects.

Metes and Bounds Description

<u>Example Description</u>

All that certain real property situated in Buchanan County, State of Iowa, being a portion of the Northeast 114 of the Northwest ¼ of Section 10, Township 88 North, Range 9 West of the 5Th P M, more particularly described as follows:

Beginning at a point from which the Northwest corner of said Section 10 bears South 90° West, 2024.10 feet; thence from said point of beginning Easterly along the Northerly line of said Section 10 North 90° East 649.90 feet; thence South 00° West, 695.40 feet; thence North 86° 54' West 651.70 feet; thence North 00° East 660.20 feet to the point of beginning, containing 10.113 acres, more or less.

Township-Section Description

Example Description

All that certain real property situated in the City of Folsom, County of Sacramento, State of California, being a portion of Section 25, Township 10 North, Range 7 East, MDB&M, more particularly described as follows:

The North 15.00 feet of the North one-half of the South one-half of the Northwest one-quarter of said Section 25, containing 0.909 acres, more or less.

Example Description

Ali that certain real property situated in the City of Folsom, County of Sacramento, State of California, being a portion of Section 25, T 10 N, R 7 E, MDB&M, more particularly described as follows:

The North 15.00 feet of the South one-half of the West one-half of the East 60 acres of the Northeast one-quarter of said Section 25, containing 7392 square feet, more or less.

Lots, Block's, and Tracts Description

Example Description

All that real property situated in the City of Folsom, County of Sacramento, State of California described as follows:

Lot 31 as shown on the Official Plat of "HAMNER'S DAIRY SUBDIVISION", recorded in the office of the County Recorder of Sacramento County on July 22, 1977 in Book 114 of Maps, Page No. 2.

Example Description

All that certain real property situated in the City of Pasadena, County of Los Angeles, State of California, more particularly described as follows:

Lot 11, Block "E", Tract 8075, as shown in Book 99 of Maps, Pages 93-94, recorded in the office of the County Recorder of Los Angeles County.

Example Description

All that certain real property situated in the City of Altadena, County of Los Angeles, State of California, more particularly described as follows:

Lot 21 and the Westerly 2-112 feet of Lot 22 of the Denton Tract, recorded in the office of the County Recorder of Los Angeles County. EXCEPTING therefrom;

The Westerly 5 feet of said Lot 21.

Descriptions Referenced to Recorded Documents

Example Description

All that certain real property situated in the City of Folsom, County of Sacramento, State of California, described as follows:

All that portion of real property described in the Grant Deed recorded in Book 810227 of Official Records, Page 1368, being a portion of Lot 10, "Nimbus Acres", the official plat of which is recorded in the office of the County Recorder of Sacramento County in Book 8 of Maps, Map No. 29, more particularly described as follows:

The North 20.00 feet of the South 30.00 feet, containing 2129 square feet, more or less.

Example Description

All that certain real property situated in the City of Folsom, County of Sacramento, State of California, being a portion of Parcel 2 described in Book 68-02-06 of Official Records, Page 539, and shown on Record of Survey recorded in Book 28 of Surveys, Page 18, more particularly described as follows:

Beginning at the Northeast corner of said Parcel 2, with said corner being a point on the Northerly line of Section 26, Township 10 North, Range 7 East, M D B & M, and running thence South 00° 39' 15" East, 172.00 feet along the Easterly line of said Parcel 2; thence South 89° 20' 45" West, 15.00 feet; thence North 00° 39' 15" West, 172.00 feet to a point on the Northerly line of said Parcel 2; thence North 89° 21' 32" East, 15.00 feet along said North line of said Parcel 2 to the point of beginning, containing 2130 square feet, more or less.

Centerline Description

Example Description

All that certain real property situated in the City of Folsom, County of Sacramento, State of California, being a portion of Lots 9 and 10 as shown on the "Plat of NIMBUS ACRES", recorded in Book 8 of Maps, Map No 29, official records of said County, more particularly described as follows:

A strip of land 20.00 feet in width, the centerline of which is described as follows:

Commencing at the Southwest comer of said Lot 9 and running thence along the West line of Said Lot 9 to the true point of beginning; thence from said true point of beginning North 89° 28' 43" East, 558.54 feet to a point on the East line of that certain land described in the Grant Deed recorded in Book 4015 of Official Records, Page 565, containing 0.256 acres, more or less.

8.11 PLAT MAP GRAPHIC STANDARDS

The method of indicating property lines on plat maps prepared as exhibits for right-of-way and easement acquisitions shall be similar to that used for assessment maps. Lot lines of original subdivisions, if any, shall be delineated as solid lines. Property lines representing subsequent "cuts" shall be delineated with dashed lines and shall be flagged to indicate where lots cut across original lot lines.

Plat maps for right-of-way and easement acquisition exhibits should also show both existing and proposed street right-of-way lines as well as section corners, section lines, and property corners of recorded subdivisions. Any offset distances from the centerlines of streets to major breaks in the right-of-way lines of streets, drainage channels, etc. should also be shown on the plat maps.

Plat maps should also indicate the property lines of adjacent parcels, names of surrounding subdivisions, and the name of the property owner(s) of the affected parcel. On the plat map of the affected parcel the "take area" may be distinguished from the rest of the area of the parcel by cross hatching or light shading.

8.12 RIGHT-OF-WAY LINES SHOWN ON PUBLIC IMPROVEMENT PLANS

Street right-of-way lines and right-of-way lines for drainage channels, easement lines for storm drains, sanitary sewers, power transmission lines, etc., as well as section lines, land grant lines, should all be shown on public improvement plans. The limits of any temporary construction easements should also be shown on the improvement plans. All right-of-way and easement lines should be properly dimensioned on the plans.

If a public improvement project, such as a street widening project, involves the acquisition of additional right-of-way, only the new right-of-way lines need to be shown on the improvement plans. The right-of-way lines that existed prior to the new acquisition need not be shown.

8.13 SAMPLE FORMS

B. Easement for Public Road and Public Utilities

C. Sample Round Corner Exhibits

D. Right-of-Entry Form

E. Right-of-Entry Form for Contractor

8.14 PLATES

A. Plate 8-A Index Map

B. Plate 8-B Location Map

C. Plate 8-C Right-of-Way Diagram

D. Plate 8-D Plat Map

E. Plate 8-E Right-of-Entry Exhibit

FORM 8A EASEMENT FOR PUBLIC ROAD AND PUBLIC UTILITIES

DESCRIPTION

All that certain real property situated in the City of Folsom, County of Sacramento, State of California, being a portion of Block F, as said block is shown on the official "Map of Blaser, Subdivision No. 5, Folsom" filed in the office of the Recorder of Sacramento County, State of California, on January 30, 1993, in Book 11 of Maps, Map No. 36 and No. 37, more particularly described as follows:

Beginning at a point on the south right-of-way line of South Avenue, formerly known as Wool Street, from which point the northwest corner of said Block F bears north 89D10'30" West a distance of 50 feet; thence from said point of beginning South 89°10'30" East 9.00 feet; thence South 55°02'24" West 8.55 feet; thence South 00°05' West 158.24 feet; thence South 84°37'30" West 2.01 feet; thence North 00°05' East 163.46 feet to the point of beginning, containing 344 square feet, more or less.

FORM 8B SAMPLE ROUND CORNER EXHIBITS

<u>DESCRIPTION</u>

All that real property situated in the State of California, County of Sacramento, City of Folsom described as follows:

> *Commencing at the southwesterly corner of Lot 13 as said corner is described in that Grant Deed to Austin Thomas in Book 67-01-18, Page 95 in the office of the County Recorder of Sacramento County.*
>
> *Thence from said corner North 89°02'30" East 94.72 feet to the true point of beginning. Thence from said true point of beginning along the arc of a curve to the left having a radius of 20.00 feet and being subtended by a chord bearing North 48°42'30" East 25.89 feet; thence along a tangent line which bears North 08o22'30" East 6.73 feet; thence North 81°37'30" West 0.17 feet; thence South 08°22'30" West 5.00 feet; thence along the arc of a curve to the right having a radius of 18.50 feet and being subtended by a chord bearing South 48°42'30" West 23.95 feet; thence along a tangent line which bears South 89°02'30" West 5.00 feet; thence South 00°57'30M West 3.00 feet; thence North 89°02'30" East 3.41 feet to the true point of beginning, containing 57 square feet, more or less.*

FORM 8C RIGHT-OF-ENTRY FORM

RIGHT OF ENTRY

Project:	Humbug Creek Assessment District
Parcel No.	040-121-18.040-121-17
Date:	May 5,1994

City of Folsom (Department)

50 Natoma Street Folsom, CA 95630

Attention: (Enter City Staff)

Permission is hereby granted to enter upon our land described as: the West 10 feet of the East 306.00 feet of the North 20.00 feet of the South 68.65 feet of Lot 10 of Florin Acres for the purpose of constructing a 12-inch diameter storm drain line, manhole with drainage grate, and performing all required incidental work.

Very truly yours,

____

John Doe
Jane Doe

ACCEPTED:
City of Folsom
(Department)

RECOMMENDED FOR APPROVAL:

By ______________________________
(Staff Name)

By______________________________
Director

FORM 8D RIGHT-OF-ENTRY FORM FOR CONTRACTOR

<u>RIGHT OF ENTRY</u>

Date:

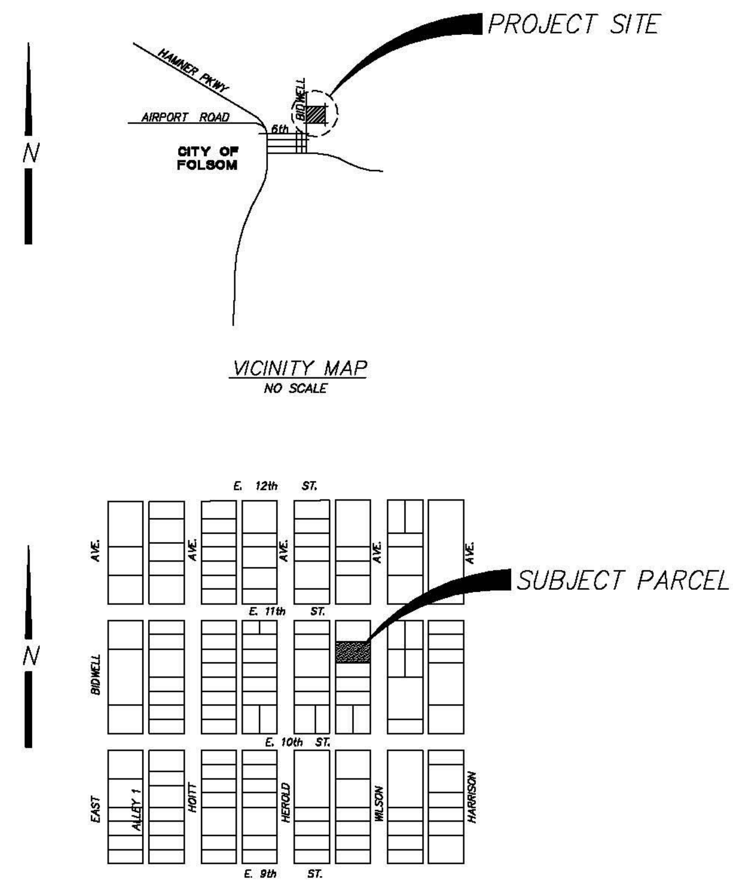
The undersigned, as owner of real property located at ____ ________________, hereby consents to allow the employees of the City of Folsom, and/or its duly authorized Contractor and his employees, to enter upon the real property the above address to do the necessary grading and concrete work which will eliminate the disparity in grade caused by the construction of curb, gutter, and sidewalk along the frontage of said property. It is understood the cost of eliminating said disparity in grade shall be paid by the City of Folsom.

INDEX MAP

EAST DEL PASO HEIGHTS No. 5
PARCEL No. 9638–1 THRU 9638–9

CITY OF FOLSOM DEPARTMENT OF PUBLIC WORKS

SAMPLE RIGHT-OF-WAY ACQUISTION EXHIBITS-INDEX MAP
PLATE 8–A



SCALE: N.T.S.

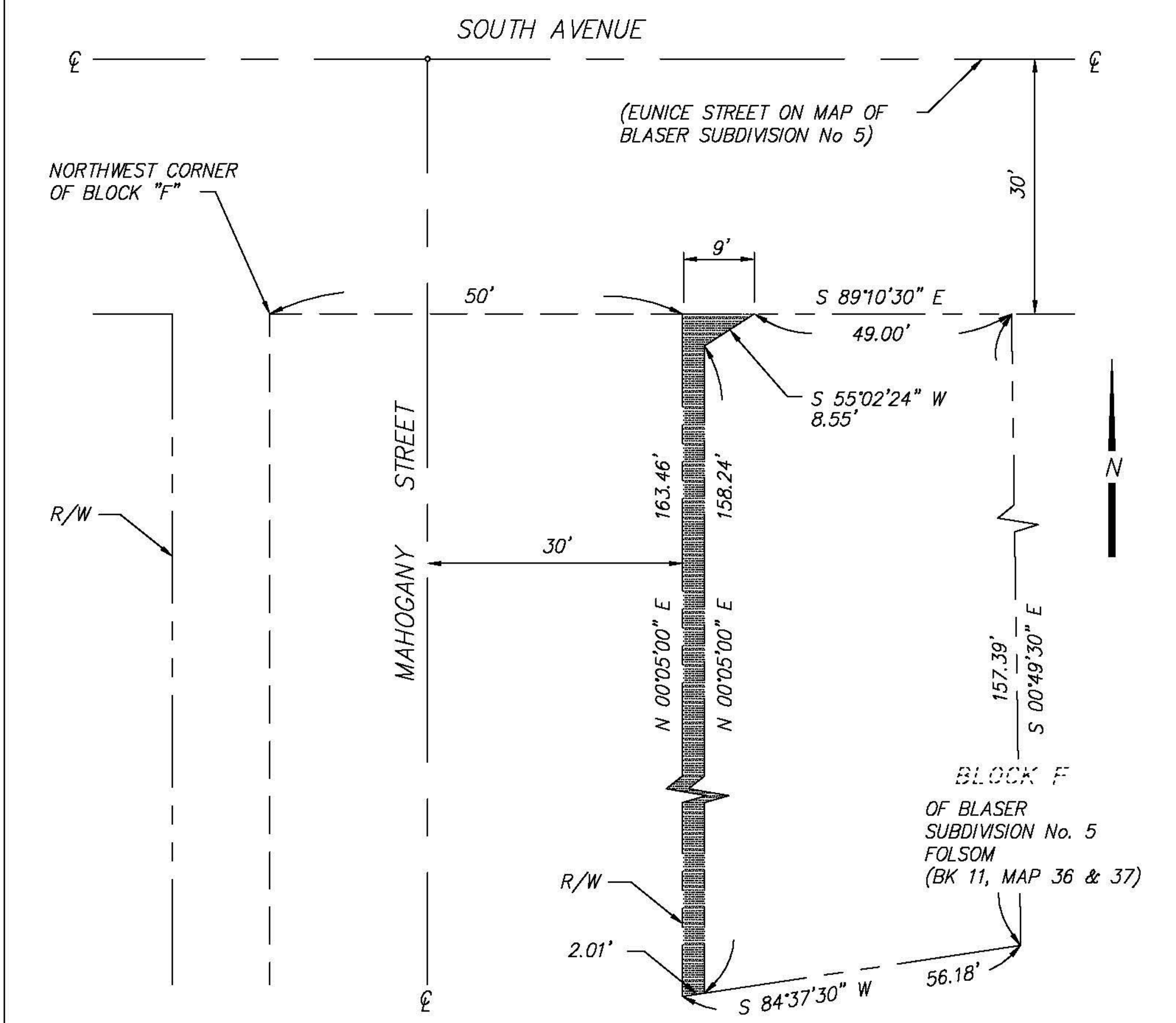
DATE: MARCH 2003

LOCATION MAP

EAST BIDWELL HEIGHTS No. 5
PARCEL No. 9638-9

CITY OF FOLSOM DEPARTMENT OF PUBLIC WORKS

LOCATION MAP
PLATE 8-B

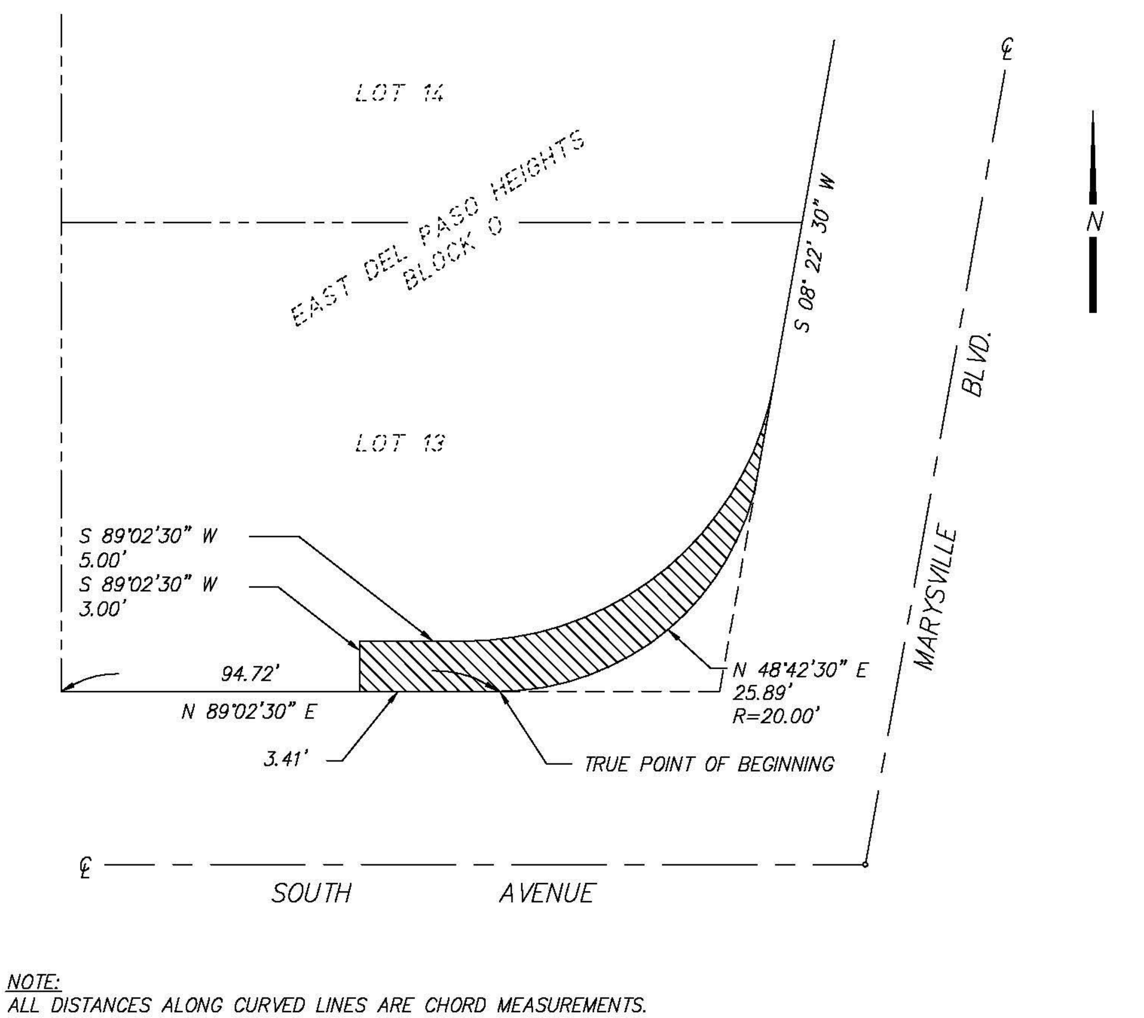


PLAT MAP

ASSESSOR'S PARCEL No. 252-2220-001
EAST DEL PASO HEIGHTS
PARCEL No. 9638-9

CITY OF FOLSOM DEPARTMENT OF PUBLIC WORKS

RIGHT-OF-WAY DIAGRAM
PLATE 8-C

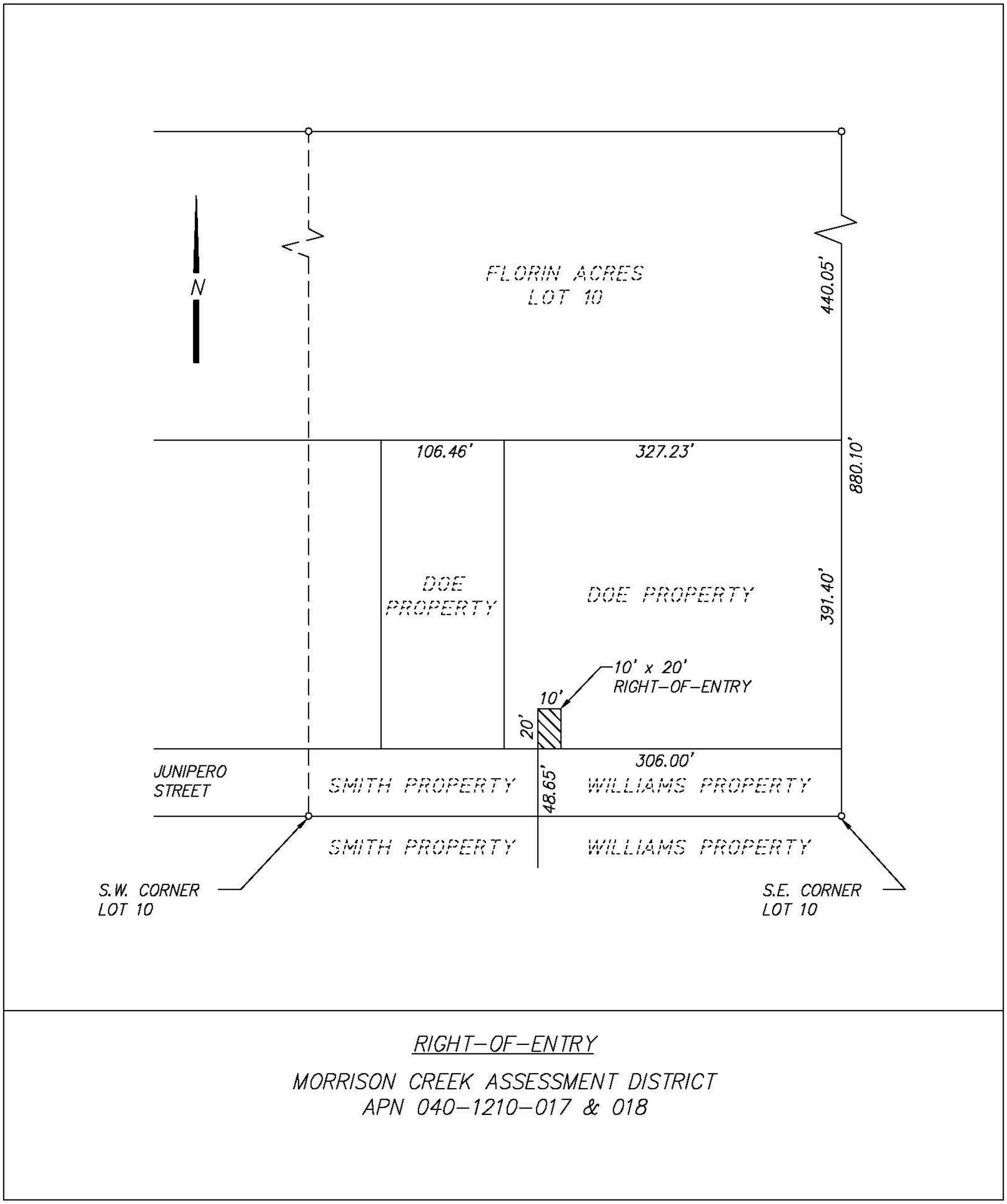


PLAT MAP

MARYSVILLE BOULEVARD AND SOUTH AVENUE
APN 251-0125-013

CITY OF FOLSOM DEPARTMENT OF PUBLIC WORKS

PLAT MAP
PLATE 8-D



RIGHT-OF-ENTRY EXHIBIT

PLATE 8-E

Section 9:
CONSTRUCTION PROCEDURES AND SPECIAL REQUIREMENTS

9.1 DEFINITIONS AND CHARACTERIZATIONS

A. Quality

For the purposes of these Design Standards, quality is defined as the totality of features, attributes and characteristics of a facility, product, process, component, service or workmanship that bear on its ability to satisfy a given need; fitness for purpose. It is usually referenced to and measured by the degree of conformance to a predetermined standard of performance. In simple terms, quality is meeting the requirements. Quality is obtained if the stated requirements are adequate and if the completed project conforms to the requirements. Quality in the constructed project is obtained by conscious application of a thoroughly planned quality assurance program implemented through a quality control procedure. Quality can be characterized as: meeting the requirements of the owner as to functional adequacy; completion on time and within budget; life-cycle costs and operation and maintenance; meeting the requirements of the design professional as to provisions of well-defined scope of work; use of a qualified trained and experienced staff; obtaining adequate field information prior to design; provisions for timely decisions by the Operating Division and others; meeting the requirements of the contractor as to provisions of the contract plans, specifications and other documents prepared in sufficient detail to permit a good competitive bid; timely decisions by the Construction staff and Design Section on authorizing and processing of change orders; fair and timely interpretation of contract requirements from field design and inspection; allowance for a reasonable schedule of work performance which permits a reasonable profit; meeting the requirements of regulatory agencies as to public safety and health and, environmental considerations; protection of public utilities and public property; and conformance with applicable laws, regulations, codes and policies. Quality in the constructed project is also characterized by complete and open communications among project parties; change orders less than 5 percent of the bid amount (except in cases of change of scope or changed construction conditions), and a rapid resolution of conflicts and disagreements in absence of litigation.

B. Lack of Quality

Lack of quality invariably results in a higher total cost. Though the initial cost may be less through the use of minimal design functions, substandard materials or unskilled workmanship, the total cost to the user over the life of the project will be greater. Since lack of quality inevitably results in frequent repairs, breakdowns and shorter useful life of the facility, resources are improperly allocated. Lack of quality damages and degrades the quality of life for the project's users; may result in injury to people and property; and frequently leads to conflict in litigation.

C. Resident Engineer

The term Resident Engineer as used in these Design Standards shall mean either the Resident Engineer or the Resident Construction Inspector appropriately assigned to the project by the

Construction Section. The Resident Engineer is one of the most critical persons in establishing and maintaining the quality control process on the site. Quality control is directly related to contractor integrity and how much observation the City is willing to perform (pay for). A Resident Engineer is the employee of the City whose duties, responsibilities, and limitations of authority are made a part of the construction contract documents. The Resident Engineer is required to: Review progress and shop drawing submittal schedules; consults with the designer about acceptability of the work; attends conferences and meetings with the contractor and prepares and circulates minutes; serves as the designer's liaison with the contractor; logs shop drawings and samples; logs interpretations and clarifications as well as substitute proposals and field orders; reviews work performed; disapproves defective work and verifies that tests and start up procedures as required by the contract documents are accomplished; accompanies the City's personnel or representatives of agencies having jurisdictional interests during site visits and receives requests for information from the contractor and transmits the designer's interpretations of the contract documents back to the contractor; considers and evaluates the contractor's suggested modifications to the contract drawings or specifications and reports to the designer; maintains orderly files of all job records; keeps a diary or log book of the weather conditions with names, addresses and telephone numbers of all contractors, subcontractors and major suppliers; submits to the appropriate designer or Construction Section personnel advice concerning major inspection and tests, drafts change orders, field orders and work directive changes; reviews payment requests with the contractor before sending them on for City processing.; submits to the contractor, before Notice of Completion is issued, a punch list of items that remain to be completed or corrected and conducts a final inspection with the designer or appropriate Construction Section or Operation and Maintenance Division staff; verifies that all items on the final punch list have been completed or corrected; determines if certificates, operating and maintenance manuals and other required data have been assembled by the contractor and forwarded to the designer or Operating Division as appropriate; prepares record drawings and specifications as required.

The Resident Engineer for the City of Folsom operates under a number of limitations of authority which are as important as the authorizations listed above. The Resident Engineer has no power or right to authorize any deviation from the contract documents or substitutions of materials and equipment except as specifically authorized by the designer or Operating Division; exceed the limitations of the City's authority outlined in the contract documents; assume any of the responsibilities of the contractors, subcontractors or their superintendents; advise on or issue instructions concerning the contractor's technique, sequences or other procedures of construction unless specifically required by the contract documents; advise, issue directions concerning, or take control over safety precautions and programs; accept shop drawings or samples from anyone other than the prime contractor; authorize the City to occupy the project in whole or in part as specified in the construction contract.

The above guidelines outline the Resident Engineer's conduct in construction administration and inspection and specifically state the Resident Engineer's position with respect to the designer, construction and owner team. For any team to function successfully all team members must focus on the project's goals. If the Resident Engineer observes the contractor using a method that will not produce an acceptable result, the Resident Engineer may inform the contractor's superintendent and log the event. One should never wait until faulty work is completed before reporting it. Delays in passing information, processing payment applications or similar actions invariably lower the quality of any project.

The above guidelines for the Resident Engineer apply to almost all situations except a catastrophe or imminent disaster. The Resident Engineer should report any unsafe method that he observes, but the Resident Engineer must never recommend or supervise corrective measures. Any member of the team that is aware of the unsatisfactory methods is expected to promptly respond to avoid or minimize serious consequences. When authority is given to the City's Resident Engineer, that authority should be respected during the administration of construction. The design professional should review changes affecting overall safety and structural integrity.

D. Superintendent

According to the contract documents, the contractor is responsible for providing a competent Superintendent. This individual supervises the construction work and has authority to act on the contractor's behalf. The Superintendent's competency and skill are critical elements in a quality construction team. All communications given to the Superintendent are binding upon the contractor. A Superintendent should fulfill the contractor's obligation to supervise and direct the work competently and efficiently and insure that proper techniques and procedures are used. Quality in construction is greatly assisted when a competent construction schedule is used and when the Superintendent and the Resident Engineer work well together. Any sign of a serious conflict among team members should be investigated promptly and resolved.

E. Testing and Inspection

Additional on-site personnel include representatives from the independent testing and inspection firms responsible for examining and testing various materials, procedures and equipment. Since they provide an unbiased evaluation of the materials or equipment, their evaluations and suggestions should be accepted and respected. If the Resident Engineer finds that a particular shipment of material or piece of equipment does not meet a certain quality level, that shipment shall be removed from the site immediately. The City retains the testing firms to assure compliance during construction. The testing firms should be under the direction but not under the control of the Resident Engineer. The City is responsible for quality assurance testing and inspection on the project.

F. Subcontractors

Most projects have a substantial number of subcontractors and each is responsible for only certain activities. On some private development projects the general contractor will only provide management and supervisory personnel and subcontracted firms do virtually all trade and craftwork. The City staff does not deal directly with subcontractors. Regardless of the business relationships established between the prime contractor and the various subcontractors, the prime contractor is responsible for the quality of the work and meeting quality control specifications in the contract documents. The responsibility for meeting those specifications cannot be delegated.

G. Suppliers

Suppliers are key members of the construction team. On any given project there may be many materials and equipment suppliers. Some supply basic raw materials for the construction process such as concrete, lumber, steel, asphalt and fencing. Others provide finish products and equipment, which are installed as they arrive at the site with no significant modification. The suppliers are responsible for the quality of their materials and equipment. Inferior materials and equipment should be rejected and removed from the site. If materials and equipment are delivered to a subcontractor, the subcontractor is responsible to the prime contractor for assuring that the items meet the specifications stipulated in the contract. Questions or disputes should be directed to the prime contractor's supervisory personnel.

H. Others Who Influence the Construction Process

There are other professionals who influence the construction less directly than the ones mentioned above. Especially important are the sections and individuals charged with the financing and accounting for the City, the insurers, the bondsmen, utility officials, government regulators or grant agencies, and attorneys.

9.2 GOAL OF CONSTRUCTION TEAM

The primary goal of the construction team, which consists primarily of the City's Design and Construction Sections and the Operation and Maintenance Divisions, is to build a quality project within budget, on time, and with little or no litigation.

9.3 PLANNING AND MANAGING CONSTRUCTION ACTIVITIES

A. Introduction

There are many ways to plan and manage construction activities. However, certain responsibilities may not be altered without threatening quality in the constructed project. These are:

1) The City, through the Construction Section, is responsible for activity coordination, contract enforcement, and stopping work (in emergencies).
2) The Design Engineer is responsible for design changes and interpretation of contract documents and submittal review and approval.
3) The prime contractor is responsible for construction methods, direction of labor, job safety and the construction related quality assurance and quality control program.

Essential elements of planning and managing construction include clear communications through planned reporting, scheduled meetings, memos, shop drawing processing and review of progress payment requests. Project management tools include formulating and regularly updating the construction plan and schedule, estimates and the quality control program.

B. Pre-Construction Meeting

Pre-Construction Meeting. The pre-construction meeting will be held at the Construction Section's office in most instances and should include key project team representatives from the City, the Design Engineer and the contractor. Representatives from principal subcontractors should also attend. Representatives of management with the authority to make decisions should be present to resolve problems. The Resident Engineer prepares a meeting agenda and accurate minutes are kept. The minutes are distributed to all attendees. Typical agenda items for a pre-construction meeting include introductions; lines of communications and submittals, including correspondence; site rules and regulations; procedures for issuing and revising design information and authorizing changes, survey information, constructor's designated area; methods of payment; security, clean up, safety and first aid; temporary facilities and services, project scheduled program, material handling; labor compliance; City's role and responsibilities; specific State and local laws and regulations; dispute procedures; claims; subcontractors' approval; community relations; critical specification status; and quality control.

If protected trees are involved, then the project arborists and city arborist shall be at the pre-construction meeting.

Depending on the size and nature of the City's project, weekly coordination meetings by the construction team are also recommended. The agenda would be similar to the pre-construction meeting but would focus on immediate project needs.

C. Construction Plan

When construction begins, the contractor should have completed most of the planning. A well-planned construction phase is essential if the contractors are to work efficiently and safely. A realistic plan and schedule will avoid schedule problems that could lower a project's quality.

The Resident Engineer should thoroughly review the contractor's initial and updated construction schedules. Duration of work items and a completion date should be reasonable. During the construction phase the schedule may be refined and expanded. The type, style and level of detail must be specified in the contract documents. Schedule updates must be re-analyzed for their impact on the critical path.

D. Coordination and Communication

A successful construction project requires coordination between the designer, the Construction Section and the contractor. The Construction Section is responsible for providing this coordination. Coordination and communications are enhanced if clear communication is established. Some basics are:

1) Only the contractor should direct labor.
2) Only the contractor should coordinate subcontractors. The City, through the Construction Section, is responsible for activity coordination, contract enforcement, and stopping work (in emergencies).

3) The Design Engineer is responsible for design changes and interpretation of contract documents and submittal review and approval.
4) The prime contractor is responsible for construction methods, direction of labor, job safety and the construction related quality assurance and quality control program.
5) Essential elements of planning and managing construction include clear communications through planned reporting, scheduled meetings, memos, shop drawing processing and review of progress payment requests. Project management tools include formulating and regularly updating the construction plan and schedule, estimates and the quality control program.
6) Coordination among the project team members is based on a realistic plan and schedule developed in the pre-construction phase and reviewed during the pre-construction meeting.

9.4 CONTRACT ADMINISTRATION PROCEDURES FOR CONSTRUCTION

There are at least two parties to every construction contract and each party has contract administration responsibilities. For the purposes of this discussion, the Resident Engineer is the City's representative who is responsible for cost control and quality assurance and progress reports of the constructed project. There are certain professional mandates, management principles and communication imperatives that apply to contract administration procedures for all construction projects. These are: quality commitments, payment and cost control, progress reports, timely and acceptable receipt of contract deliverables, liaison requirements, communication skills and record keeping and retrieval functions.

A. Quality Commitments

This Section discusses the Resident Engineer's responsibility to implement procedures for documenting the review and evaluation of quality requirements. Construction quality generally involves two broad aspects: specified properties for materials and workmanship.

B. Materials

Insitu (natural or original) materials typically include native soils and rock, and often require independent laboratory testing and engineering evaluation of material properties to determine their acceptability for project needs. Such laboratory reports and engineering evaluations should become part of the Resident Engineer's file. Re-testing and other necessary follow up analysis should also become part of the file.

Procured materials are manmade items and they can be evaluated and accepted by several considerations. The procurement specifications should outline the level of quality and the manner of qualification, if any that will be required. For example, a manufactured product such as a light bulb may be accepted based totally on the verification of brand name and catalog number, whereas a material such as a paint primer may require a whole series of physical and chemical analysis to verify that specified requirements have been met. The Special Provisions or the Standard Construction Specifications must outline the minimum standards accepted for compliance. It is the responsibility of the Resident Engineer to verify if the procurement qualification requirements are met. The Resident Engineer should determine if qualified individuals properly evaluated the results of such tests for specified acceptance standards. If the results of all tests were property recorded they should be documented in file. Each procured item of material or product should be represented by a file listing the qualification procedure and minimum requirements and include the type of test performed, the date the test was performed, the signature of the person performing the test, test results, any non-conformance reports and, if required, the location in the structure where the tested material or product is incorporated. Products are often purchased with performance warranties and certifications instead of specific qualifications or test requirements.

C. Workmanship

It should be understood that most specified properties and workmanship are identified with implied tolerances. It should be clearly stated in the contract specifications if the property or workmanship being specified is "nominal" to which tolerances may be applied or a specified minimum where tolerance consideration has already been included. The practices for determining compliance with the "minimum acceptable standards" definition are more varied than for specified properties. Where more subjective judgments apply such as with the standard of workmanship for concrete wall finish, then common sense and experience should suffice.

However, standards of measurements have been developed for virtually every conceivable physical product of construction. If minimum levels of acceptance for specified properties and workmanship are not identified, then the Resident Engineer should rely on typical industry standards.

D. Requests for Substitutions

Requests for substitutions of materials are common in contract administration. Such substitutions may be proposed by either party to the contract to save time, money, or improve quality. It is necessary to obtain approval from the designer for all but minor items change requests. In all situations, the Resident Engineer's role is to verify that the substitution is comparable in quality and utility to the original item. Requests for substitution should be responded to in a timely manner. Substitution of a specified item requires a formal letter by the Resident Engineer authorizing such a change. It is usually the contractor's right to offer substitutes and if they meet the specified criteria the owner should allow them or pay the cost differential to upgrade to the brand name originally specified. As with all factors bearing on quality, it is essential that the job record accurately reflect the items substituted, the original item, the reason for substitution, date of action, and whether a price adjustment was negotiated as a result of the change.

E. Cost Control, Payments, and Estimates

Reliable estimates of cash requirements to maintain construction are vital to the City and the contractors. Providing timely and correct payment for work accomplished is critical for contractors. One significant task of project administration is predicting, monitoring and controlling cash flow. Costs are divided into two broad categories: payment to the contractor and payment to others. Payment to the contractor is further divided into regular and periodic payments of originally contemplated work and extra work or change orders. Payments to others fall into several categories such as real estate payments for right-of-way acquisitions, payment to utility companies for relocation of various lines so construction can begin, testing laboratory fees and outside inspection laboratory fees and other construction related costs. A complete record of all change orders indicating the percentages of both change order costs to each contract and the total change order cost to the total project should be maintained. Periodic payments usually mean monthly payments to the contractor based on the amount of work accomplished. There are occasions when a payment is made only once, when the project is completed. However, for the majority of City construction contracts, monthly progress payments are normal. Under provisions of the City Standard Construction Specifications latest edition, the Resident Engineer is responsible for preparing the estimated value of the monthly pay estimate and the contractor reviews and acknowledges the amount due.

F. Types of Contracts

There are three principal types of contracts: unit price, lump sum and cost-plus (force account).

1) Unit Price Contracts

Unit price contracts are common in public works projects where the quantities of various kinds of materials and work segments are approximated and not precisely known. Under such a contract it is simple to measure the quantities involved for each item completed over the given period of time and record them for payment with the understanding that any errors will be automatically corrected in the next payment period. However, determining an accurate estimate on many unit priced contracts is sometimes difficult. The two parties should agree before work begins on a reasonable, responsible estimating parameter for interim periods. Normally, the City Standard Specifications will only allow for payment of material incorporated into the work. However, it is sometimes necessary to pay for materials that were delivered but not yet incorporated into the work provided the Special Provisions authorize such. Requesting copies of invoices of the materials usually determine the value of the material. Occasionally a situation arises that necessitates changing a unit price. Unforeseen circumstances, such as unknown soil conditions, or changes which greatly increase or decrease the amount of materials to be used, may require a renegotiation. As soon as the scope of the change is known, a revised material quantity should be calculated. If this change is over the preset limit (20 percent in accordance with City Standard Specs) a unit price change may be necessary. The new price may be more or less than the original price but it should reflect such factors as restocking charges, overhead amortization and suppliers' discounts. A contract duration change may also be necessary. A frequent cause of disputes on unit price contracts involves the estimated value of incomplete items. The important point to remember is that all work has value and estimating and paying for that value is a fundamental responsibility of the Resident Engineer. The Resident Engineer is responsible for recommending payment only for the stated value of the completed item less the cost to complete it. If there is any question on this, consult with the Senior Construction Engineer or the Construction Manager.

2) Lump Sum Contracts

In lump sum contracts, the contractor determines quantities of material. The contractor submits a single lump sum price for the completed structure. Typically, the successful contractor divides the contract into various components similar to a unit price contract. In such breakdowns it is important that mobilization or contract initiation costs be recognized and paid for. The Resident Engineer's responsibility is to determine if the various items of work included in the lump sum breakdown are properly balanced to avoid overpayment for completion of early items. Once the Resident Engineer has agreed upon the proper balance of items and cost the lump sum contract is similar to the unit price contract discussed above. When calculating the quantities in either case it is important to tabulate in each pay period the total quantity consumed or completed to date from the beginning of the project to the subject date. From this the total previously paid is subtracted. This process involves constantly reviewing the total quantities used and any errors in estimating are automatically discovered and corrected. Merely tabulating the amount added on each month usually results in compounding errors.

3) Cost-Plus Contracts (Force Account)

In cost plus contracts the contractor is reimbursed for actual cost plus an agreed upon rate for overhead and profit. Because the contractor is compensated for cost rather than for completed work, the emphasis on record keeping shifts from the amount of work completed to the cost for completing the work. Under this type of contract record keeping is more important and it is necessary to record each worker (direct, indirect and supervisory), the hours worked, the type of work and the wages paid. Moreover, methods must be established to record and file the large quantity of material invoices, delivery slips and other records required to verify the costs of the contractor to complete the work. This also includes equipment used in the project and the time the equipment was actually used. Further difficulties can occur when cost plus work is performed within a unit price contract such as when extra or unexpected work is encountered for which no unit price has been established. In such situations the mixed use of personnel and equipment can cause problems. For example, the cost involved in maintaining a superintendent on the project may be amortized among various unit priced items. If the same superintendent is engaged in supervising extra items, then a fair and reasonable determination of that time and effort may need to be added to the cost of performing the work. Similarly, equipment brought on to the project to perform unit priced items may be used for extra work. Again, a fair and reasonable allocation should be made.

G. Retainage

Retainage is withholding funds, usually a percentage of the work completed to date, in case an error in estimating, a lapse in meeting quality standards, or a construction error is discovered. It is important to understand that retainage is neither a penalty nor a license to alter the contract. In many areas retainage is used as an inducement to assure timely completion. However it is used, retainage is a temporary assessment against earned funds and it is recommended to reduce such withholding promptly after the cause of the assessment has been satisfactorily addressed. On the other hand, failure to withhold sufficient retainage in the event of an error, default, bankruptcy, or a similar event can be a serious matter. Premature payment of the contract funds by overpayment or premature release of retained funds can result in loss of the owner's rights under the performance bond in the event that the contractor fails to perform his contractual obligation and is in default. In such a situation the amount retained indicates project management's professional skill and judgment. Releasing earned funds fully and promptly while withholding all unearned funds is a constant challenge to a competent Resident Engineer.

H. Liquidated Damages

Liquidated damages are a predetermined value placed on a completed element of work, usually expressed in dollars per day. Liquidated damages, unlike retainage, generally are not related to contracted costs. Liquidated damages are intended to compensate the owner for additional costs incurred and loss of income because the project is not complete and the owners must retain staff and absorb redundant costs. Liquidated damages can be assessed only when the contractor can attribute the cause for the delay on a project to acts or omissions. If a project is delayed for reasons beyond the control of the contractor, then sufficient extensions of time should be granted to avoid the need for assessing liquidated damages.

I. Change Orders

Construction involves creating custom made products in the field. Consequently, the variety of foundation types, the weather and the abstract nature of materials, design fabrication and erection frequently dictate some deviation from the original plan. Quickly recognizing this will save both owners and contractors from unnecessary costs increases and schedule delays. All quality construction projects should have contingency for unforeseen circumstances. Ideally, changes should be recognized in sufficient time for materials, designs, fabrications and installations to be altered, estimated and performed, received and fair prices negotiated. Often this is not possible and the work must proceed before reasonable prices have been agreed upon. This latter case is somewhat common and neither the contract plans nor a particular individual is necessarily to blame. Changes do occur and there is often disagreement as to their value. Reaching a reasonable agreement is the prime responsibility of the Resident Engineer. In addition to changes to the original materials design and fabrication, it frequently becomes necessary or desirable to perform extra work on a project. This may entail providing more or less of an item than originally intended and utilizing the skills and resources of the contractor to perform work or implement a concept not originally planned. In such situations a change order is necessary.

Whether it is a change order or an extra work order the document should be clearly and promptly initiated and accurately reflect its nature and reason for the revision. The document should be signed by the contractor and the Construction Manager and forwarded to the appropriate City offices for completion. All change orders shall be numbered, dated, and includes relevant information 'such as a revised plan sheet, sketches, specifications and quotations. The document should address impacts of the changed work on the project schedule when appropriate. Additionally, change orders frequently are used to acknowledge changes in progress factors even where no physical change is evident.

J. Non-Contractor Invoices

The certification and recommendation for payment of various vendors' invoices is an important element in effective project cost management. All such invoices whether for utility relocations, purchase of equipment by the construction organization or testing of construction components must show the date that the purchase was made or the work was performed, the unit cost or prices involved, and the specifications or other quality criterion used in performing the work. Each vendor's invoice should be considered a separate contract and should provide the same information as in the construction contract.

K. Construction Progress

All major construction projects require the submittal of a progress schedule by the contractor prior to start of construction. Such schedules remind the contractor to consider carefully the timing required for the various elements of the work. The schedules are important to the Resident Engineer in establishing cash flow requirements, assessing personnel demands and coordinating contract work with adjacent activities. There are numerous ways to communicate the intent of progress. The most common kinds of schedules are bar charts, network analysis such as the critical path method, and S curves which relate progress to cumulative costs.

Bar charts are the simplest schedules to prepare and evaluate because they show time on the horizontal axis and various items of work on the vertical axis. Bar charts can become more detailed and complex simply by defining the time scale. The number of elements on the vertical scale also increases the complexity.

On the other hand, network analysis, in addition to the passage of time, recognizes the interrelationships of various construction elements. The elements of work are represented by an arrow symbol, which is generally un-dimensioned. The nodes representing the tail and head of the arrow can be tabulated for early or late start or early or late finish to represent a realistic picture of the variability that is common to construction. As with bar charts however, network analysis is not inherently simple or complex. The complexity derives from the number of elements chosen to be reflected in the various nodes.

L. Progress Reports

The three common types of construction reports are detailed reports, summary reports and subjective reports. Regularly scheduled progress or coordination meetings should be established and minutes taken. These minutes constitute a report and all team members should be involved. Detailed reports should be prepared on a scheduled basis, usually daily and involve tabulation of each item of work accomplished (equipment, materials and manpower used) during the defined period. Detailed reports from the substance of the Resident

Engineer's file and are the most important resource for paying requisitions, resolving disputes and recreating the job history. A preparation and review of detailed reports is one of the most significant tasks for the Resident Engineer.

Summary reports contain information from each detailed report and relate that information to project goals. Normally most City projects do not require a summary report.

Subjective reports need not be made periodically but should be filed when unusual or significant events occur during construction. An example would be an accident report or a letter describing an unusual incident or problem.

M. Records

The Resident Engineer is responsible for maintaining a complete and orderly file of all aspects of the contract. In addition to the reports mentioned previously, the entire correspondence file of memos and minutes and meetings is an important part of that record. Other important records not previously discussed are part of the job records. These are the shop and shop drawing logs, job photographs, videotapes, certified payroll records, and record drawings. Other documents such as change orders and field orders also must be maintained and filed. Job diaries and bidding documents are included as part of the permanent contract record.

N. Final Acceptance/Notice of Completion

When the project is completed, final acceptance is recommended to the City designee who will issue a final acceptance letter for subdivisions and a Notice of Completion for Capital Improvement projects. The Notice of Completion will in turn be recorded with the Office of the County Record.

Section 10:
GRADING

10.1 INTRODUCTION

The City's authority to regulate grading is provided by Chapter 14.29 of the Folsom Municipal Code (FMC). The FMC requires that a grading permit be obtained from the City prior to beginning any grading work unless the work meets certain exemptions specified in the FMC. This is necessary to ensure that on-site drainage is adequately accommodated, off-site drainage is conveyed through the project or project site, the proposed grading is compatible with adjacent property topography and adequate erosion and sedimentation control measures are addressed.

This Section specifies design and plan submittal requirements of grading plans for private developments (for additional grading permit and grading plan requirements see Sections 2.9, 2.10 and 2.19). This Section includes items pertinent for the City's review and reflects established professional engineering practice for preparation of grading plans. Questions and clarifications regarding this Section should be directed to the City Engineer.

Two types of grading plans are reviewed by the City; 1) grading plans for City capital improvement projects, residential subdivisions, commercial, industrial, office and multi-family residential private development projects and 2) grading plans for single-family residential custom home lots. Submittal requirements for either type of grading plan are included in Section 2.19 of these Design Standards.

10.2 PREPARATION

All grading plans shall be prepared by or under the direction of a licensed Civil Engineer. All grading plan sheets shall be stamped and signed by a Licensed Civil Engineer.

10.3 GRADING PLAN REQUIREMENTS

Grading plans for City capital improvement projects, residential subdivisions, commercial, industrial, office and multifamily residential private development projects shall be submitted as part of the improvement plans and shall include the following:

A. Existing and proposed building pad and finished floor elevations for all structures on the grading plan.

B. Typical lot grading details shall be included on the grading plan.

C. The proposed limits of grading shall be clearly shown on the grading plan. The limits of grading shall be designated with a bold line weight in order to clearly designate the limit of proposed grading.

D. Existing topography shall be shown with light line weights and proposed topography will be shown with bold line weights. Contour lines shall be in maximum increments of two feet. Existing topography will extend a minimum of 50 feet into all adjoining parcels and/or outside the limits of work on the grading plan.

E. Lot and adjacent land drainage. Adjacent lot grades shall be shown for a minimum of 50 feet from the project boundary with adequate detail to define existing drainage patterns. The grading plan shall also include flow directional arrows in sufficient number of clearly delineate any existing and/or proposed drainage patterns. All proposed drainage swales shall show a flow line elevation no greater than every 100 feet along with a slope grade.

F. Typical cross-sections at all property lines. The typical cross-sections shall include, but not limited to, structures, fences, retaining walls, drainage swales, drainage pipes and property lines and shall include dimensions measured from the property line to each of the noted improvements.

G. All existing trees on the project site and other trees, together with their corresponding tree protection zones (TPZ), which will be impacted by the proposed grading and/or construction. If the TPZ is proposed to be encroached upon, then show the extent of the proposed limits of excavation or grading within the TPZ. The plan shall also include a table showing tree species, size of the tree at diameter at standard height (DSH) and the current status or condition of the tree to be removed and/or preserved.

H. Typical cross-sections and construction details for all proposed retaining walls. The plan shall include top and bottom wall elevations at the beginning and end of all walls and at all changes in wall height or no more than every 50 feet. The typical cross-sections shall include all construction details of the wall, footing sizes and dimensions, steel/rebar schedules, backfill, drainage pipes, etc.

I. Existing and proposed public and/or private utility easements, wells, drainage ditches, drainage channels, floodplains and/or floodway boundaries and other existing improvements, landmarks, buildings, structures and underground and overhead utilities related to the construction of the proposed development.

J. A Certificate of Compliance for Grading with signature blocks for both the Registered Civil Engineer and the Geotechnical Engineer shall be provided stating the following:

Certificate of Compliance for Grading:

I hereby certify that the grades shown on these plans and approved the City Engineer have been constructed to with 1/10th of one foot of their indicated elevation for all lot pads and improvements shown.

Project Engineer License Number
Date

I hereby certify that the pads for the following lots for this project have been tested for compaction in accordance with generally accepted test methods and based upon the results of these tests, the compaction of said pads conform to the recommendations of this project's geotechnical report.

LOTS:____

I also state that our firm observed the grading operation to a sufficient extent to evaluate conformance with the project's geotechnical report as approved by the City, and further state that based upon our observations, the grading for this subdivision conforms to the recommendations of said soils report.

Geotechnical Engineer License Number
Date

K. All existing and proposed surface and subsurface drainage facilities including drain inlets, underground pipes, surface swales, channels, and any other drainage improvements proposed to be constructed with, or as part of, the proposed grading work.

L. Wet stamp/signature of the licensed professional preparing the plan sheet.

M. For City capital improvement projects, residential subdivisions, commercial, industrial, office and multifamily residential private development projects, the grading plan sheets shall clearly delineate the overland release between the buildings/units. The weir elevation at the overland release shall be clearly identified and labeled on the plans.

N. Maximum slope on a grading plan shall be 2:1 or as specified by the Geotechnical Engineer. All proposed slopes that are 4:1 or steeper shall be shown on the plans by some type of slope symbol delineation.

O. A fully executed right of entry and/or a construction easement shall be required for all proposed grading work that will impact any existing adjoining property. In some cases, a fully executed permanent easement shall be required for any work that is proposed to be constructed on any adjoining property. All required executed rights-of-entry and/or easements shall be submitted to the City prior to approval of the grading plans by the City.

P. All grading plans shall include an erosion and sedimentation control plan. Erosion and sedimentation control plans shall be prepared in accordance with Section D below.

Q. Names of all adjoining subdivisions including phase numbers, unit numbers, etc.

R. For all projects involving the export of soil material:

1) Location of spoiled disposal. If spoil area is outside the boundaries of the subdivision, a separate Grading Permit may be required if it is placed within the City of Folsom limits.

2) Spoil areas with the City of Folsom limits, shall meet all requirements of these standards.

Grading Notes – the following is a list of grading notes that shall be placed on grading plans prior to plan approval by the City.

a) All grading shall conform to Section 1803 of the California Building Code, latest edition, and to the recommendations of the geotechnical engineer report reference no__________ provided by:_________________, and dated ____________________.

b) Lots shall be graded with a constant slope along the frontage of the right-of-way, from the building setback line to back of sidewalk. All temporary and permanent slopes steeper than 4:1 along this frontage shall have erosion controls included.

c) Water shall be sprayed on all exposed earth surfaces during clearing, earth moving, and other site grading activities. The exposed earth material shall be watered throughout the day to minimize dust.

d) All unpaved construction areas shall be sprayed with water as often as necessary to assure that fugitive dust from this project does not impact adjacent properties. Spraying shall occur more frequently under hot, windy conditions.

e) Stockpiles of soil or other fine materials being left for period in excess of one day during site construction and grading shall be sprayed and track-walked after the stockpile is completed.

f) Construction equipment access shall be restricted to a defined entry and exit point to control the amount of soil deposition.

g) Paved areas at the controlled access points shall be swept and/or washed, if approved by the City, a minimum of once each day or more frequently as necessary. Haul trucks used for moving materials off the project site shall employ appropriate measures to minimize spillage.

h) Tarpaulins or other effective covers shall be used on all stockpiles of earth material and haul trucks to minimize dust.

i) The City shall have the authority to stop all grading operations, if in the opinion of the City, inadequate dust control measures are being practiced or excessive wind conditions contribute to excessive dust emission.

j) Street frontages shall be swept daily to remove silt and other dirt which is evident from construction activities.

k) Should grading operations uncover hazardous materials, or what appears to be hazardous material, the City of Folsom Fire Department shall be contacted immediately at (916) 984-2280 or 9-1-1 if an emergency exists.

l) The contractor is expected to comply with the regulations of the Sacramento Metropolitan Air Quality Management District.

10.4 EROSION AND SEDIMENTATION CONTROL

A site specific erosion and sedimentation control plan shall be submitted concurrently with the grading plans. In addition, for all projects that disturb more than 1 acre, the engineer shall be required to submit two copies of a prepared SWPPP report along with a copy of the project's Notice of Intent (NOI) and WDID # (include this number on the cover sheet of the plan set) to the City. The project engineer shall conform to Section 14.29.330 of the Folsom Municipal Code, Stormwater Quality Design Manual for Sacramento and South Placer Regions current edition, and as directed by the Community Development Department in the preparation of erosion and sedimentation control plans.

A. Criteria – The purpose of erosion and sedimentation control plans is to ensure protection of the following:

1) Water Quality – Measures shall be provided to prevent siltation of streams, rivers, etc.; avert in stream degradation due to turbidity and pollutant load; and prevent toxic materials from leaving construction sites.

2) Collection System – Methods shall be provided to prevent sediment from entering the storm drainage system.

3) Adjacent Properties – Methods shall be employed to prevent any damage to adjacent properties.

B. Plan Requirements – An erosion and sedimentation control plan shall be submitted along with all grading plans. These plans need not be on a separate sheet if all facilities and measures can be shown on the grading sheets without obscuring the clarity of either the grading plan or the erosion and sedimentation control plan. The erosion and sedimentation control plan shall contain the following.

1) Revegetation Plan – The revegetation plan should detail the location of revegetation, seeding mixture, type of fertilizer and rate of application, mulch and/or straw application rate along with method of application. All sites to be revegetated shall be completed by October 1 each year.

2) Runoff/Drainage Control Plan – The location of all existing and proposed storm water containment and/or conveyance systems shall be shown. Examples of such include diversion dikes and swales, grade stabilization structures (temporary pipe of slope drains), ditches, straw bale dikes, and sediment basins or traps. Sufficient calculations and supporting material to demonstrate the adequacy of such measures shall be provided.

3) Phasing of Erosion Control Measures – the City may require phasing of the grading plan to ensure that all necessary erosion control measures are in place. As an example, this may require the developer to construct sediment traps and basins during the first phase of grading.

C. Erosion and Sedimentation Control Notes – The following is a list of general notes that shall be placed on erosion and sedimentation control plans as erosion and sedimentation control measures:

1) All erosion and sediment control measures shall be constructed and maintained in accordance with the latest edition of the City of Folsom Design Standards and the County of Sacramento erosion and sediment control guidelines or as otherwise directed by the special provisions for this project.

2) Erosion control best management practices (BMPs) shall be installed and maintained year round and an effective combination of erosion and sediment control BMPs shall be installed and maintained during the wet season (October 1 through April 30) and prior to the onset of any storm.

3) All storm drain inlets within the work area, and offsite storm drain inlets with the potential to receive runoff from the project site, shall be adequately protected with sediment control BMPs to effectively remove sediment from runoff prior to discharge to the storm drain. Additional BMPs shall be used as needed to remove sediment from runoff. Upon completion of the project and acceptance of the improvements by the City, all sediment control BMPs shall be removed.

4) All stabilized construction access locations shall be constructed per the latest edition of the Sacramento County standards to effectively prevent tracking of sediment to paved areas. The stabilized access shall be maintained on a year-round basis until all areas are finally stabilized.

5) All areas disturbed during construction by grading, trenching, or other activities, shall be protected from erosion during the wet season (October 1 through April 30). Hydroseed, if utilized, shall ideally be placed by September 15. Hydroseed placed during the wet season shall be used as a secondary erosion protection method.

6) Protected areas and areas where existing vegetation is being preserved shall be protected with orange construction fencing. Additional signage may be required to identify the resource being protected and/or provide additional instructions to construction personnel. Erosion, sediment, and diversion control BMPs shall be installed and maintained to ensure that construction runoff does not enter the protected areas.

7) Sediment control BMPs shall be placed along the project perimeter wherever there is a potential for drainage to leave the project site. Perimeter sediment control BMPs shall be maintained year round until the construction is complete or the drainage pattern has been changed and no longer leaves the site at those locations.

8) Contractor shall maintain a log at the site of all inspections or maintenance of BMPs, as well as any corrective changes to the BMPs or to the erosion and sediment control plan.

9) Erosion and sediment control measures for this project shall be in substantial compliance at all times with the store water pollution prevention plan (SWPPP) prepared for the project in accordance with the State of California general construction permit. This permit requires that SWPPP be kept up to date to reflect the changing site conditions and the SWPPP is available on site at all times for review by state and local inspectors. The contractor shall be required to meet and follow all NPDES requirements in effect at the time of construction.

10) Sediment and trash accumulated in drainage or detention basins shall be removed as soon as possible. In addition, oil and material floating on water surface shall be skimmed weekly and the debris properly disposed of.

11) The contractor shall establish a specific site within the development for maintenance and storage of equipment or any other activity that may adversely contribute to the water quality of the runoff. This area shall have a berm located around its perimeter. This area shall be restored to acceptable condition upon completion of project.

12) If the project site is located in a geologic unit within the boundaries of the City of Folsom, which is likely to contain naturally occurring asbestos, the grading plan shall include the following note:

    The owner/applicant shall be required to obtain approval from the Sacramento Metropolitan Air Quality Management (SMAQMD) prior to approval of any grading and/or construction on the project site. The owner/applicant shall provide to the

Community Development Department a copy of the written approval from SMAQMD prior to approval of grading and/or site improvement plans.

D. Grading Near Existing Trees

No person shall conduct any activity within the Tree Protection Zone (TPZ) of a protected tree without an approved Tree Permit and an approved Grading Permit issued in conformance with the Tree Permit Conditions. Great care shall be exercised when work is conducted upon or around Protected Trees. The purpose of this section is to define procedures necessary to protect the health of the protected trees. The policies and procedures described in this section apply to all encroachments into the TPZ of protected trees. All Tree Permits shall be deemed to incorporate the provisions of this section except as the Tree Permit may otherwise specifically provide.

1) General

a) Trenching within the tree protection zone of a protected tree, when permitted, may only be conducted with hand tools, in order to avoid root damage.

b) Minor roots less than one inch in diameter may be cut, but damaged roots shall be traced back and cleanly cut behind any split, cracked or damaged area.

c) Major roots over one inch in diameter shall not be cut without approval of an arborist. Depending upon the type of improvement being proposed, bridging techniques or a new site design may need to be employed to protect the root and the tree.

d) An independent low-flow drip or micro-spray irrigation system may be used for establishing drought-tolerant plants within the tree protection zone of a native oak tree. Irrigation shall be gradually reduced and discontinued during the five (5) year establishment period.

e) Planting live material under native oak trees will not be permitted within 6 feet of the trunk of a native oak tree with a DBH of 18 inches or less, or within 10 feet of the trunk of a native oak tree with a DBH of more than 18 inches. Only drought tolerant plants will be permitted within the protected zone of native oak trees.

f) A minimum of 4-foot-high chain link or orange mesh fence shall be installed at the outermost edge of the tree protection zone of each protected tree or group of protected trees with stakes with spacing a maximum of 10 feet on center. The fence shall not be moved or removed until written authorization is received from the City Arborist. The fences shall be installed in accordance with the approved fencing plan prior to the commencement of any grading operations or such other time as determined by the approving body. The Developer shall call the Arborist for an inspection of the fencing prior to commencement of grading operations.

g) Waterproof tree protection zone signs shall be installed on the fence in four locations (equidistant) around each individual protected tree. The size of each sign shall be a minimum of 11 inches by 17 inches and shall contain language provide by the Community Development Department.

h) On tree protection zone fencing around a grove of protected trees, the signs shall be placed at no greater than 50-foot intervals.

i) Once approval has been obtained from the City Arborist, the tree protection zone fences shall remain in place throughout the entire construction period and may not be moved or removed without obtaining written authorization from the Community Development Department and/or City Arborist.

j) In cases where a Tree Permit has been approved for construction of a retaining wall(s) with the tree protection zone of a protected tree, the developer will be required to provide for immediate protection of exposed roots from moisture loss during the time prior to completion of the wall. The retaining wall shall be constructed within 72 hours after completion of the grading.

k) If required, preservation devices such as aeration systems, drains, special paving and cabling systems shall be installed per approved plans. Tree cabling, guying and bracing shall conform to ANSI A-300 and Companion ISA Best Management Practices.

l) Every effort shall be made to avoid cut and/or fill within or in the vicinity of the tree protection zone of any tree to be preserved.

m) No grade changes are permitted which cause water to drain to within twice the longest radius of the tree protection zone of any protected tree.

n) Any time there is activity on the project, the following shall be on site and available to City personnel, starting at the site planning meeting:

(1) Arborist's Report including all modifications.

(2) Tree location map with a copy of the tree protection zone fencing plan.

(3) Tree Permit.

(4) Approved construction plans.

(5) Tree preservation guidelines.

(6) Approved Planting and Irrigation drawings.

E. Tree Permit Construction Phase

1) All work conducted within the tree protection zone of any protected tree shall be performed as required by this section.

2) As a condition of the Tree Permit, the developer will be required to submit a utility trenching-pathway plan depicting all of the following systems: storm drains, sewers, easements, water mains, surface drainage V-swales, area drains, and underground utilities. Except undeveloped residential custom home subdivisions, the trenching-pathway plan shall show all lateral lines serving buildings. To be completely effective, the trench-pathway plan shall include the surveyed locations of all protected trees on the project as well as an accurate plotting of the tree protection zone of each protected tree and the full extent of the area that will be encroached into by the construction personnel, construction equipment and/or grading. The trenching-pathway shall be developed to avoid going into the tree protection zone of any protected tree on its path from the street to the building.

3) Where it is impossible to avoid encroachment, the design must minimize the extent of such encroachment. Encroachments and mitigation measures shall be addressed in a supplemental arborist's report.

4) Unless otherwise stated in the Tree Permit, regulated activity conducted within the TPZ of protected trees shall take place under the direct supervision of the project arborist.

5) All of the tree preservation measures required by the conditions of the discretionary project approval, the arborist's report and the Tree Permit, as applicable, shall be completed with required street tree planting prior to either building permit final or prior to issuance of a Certificate of Occupancy.

F. Retaining Walls

Retaining walls, when required, shall be shown on the grading plans and shall include all necessary information and details for construction. All retaining walls 24 inches in height and greater measured from the base of the wall to the top of the wall (i.e., exposed wall height) shall be masonry. Retaining walls less than 24 inches in exposed wall height may be pressured treated wood and shall be designed and constructed under the purview of the City Engineer. All retaining walls higher than 48 inches as measured from the base of foundation to top of wall (i.e., retained wall height) shall require structural calculations wet stamped by a Licensed Civil Engineer. These retaining walls will be reviewed and approved by the Community Development Department concurrently with the review and approval of the grading plans. The City will not approve the grading plans until such time that the proposed retaining walls have been approved as well. A building permit for retaining walls included on the grading plans and approved as part of the review and approval of the grading plans shall not require a building permit issued by the City.

G. Mitigation Monitoring Requirement

All mitigation measures and mitigation monitoring measures as required to mitigate environmental impacts shall be complied with. The developer is responsible for monitoring all mitigation measures and shall submit to the Community Development Department-Engineering Division and City Engineer a letter certifying compliance with such measures prior to beginning of construction. <u>For projects over 1 acre, a copy of the Storm Water Pollution Prevention Plan shall be available at the project site</u>.

H. Certifying Pad Elevations

Upon completion of the grading and prior to acceptance of the subdivision improvements or issuance of building permits by the City, the Consulting Engineer shall verify the final pad elevations. The elevations shall be verified at the center and the corners of each pad. Pad grades shall be certified to an accuracy of 0.1 feet. Slopes shall be within 6 inches of horizontal plan location.

A signature block (See Section 10.3), certifying that final graded elevations in the field are the same as those shown on the plans, shall be included on the grading plans. The

Consulting Engineer shall sign the signature block, certifying to the above, and shall provide three sets of record (as-built) grading plans to the City.

I. Maintenance of Access to Utility Facilities

Continuous, suitable access, as determined by the City Engineer, shall be maintained during all stages of construction and operation to any facility owned or operated by a utility/district providing essential services (i.e., sanitary sewer, water, drainage, electricity, gas, telephone, etc.)

10.5 DESIGN REQUIREMENTS

A. Rolling Terrain Grading

Grading of rolling terrain shall be accomplished in a manner whereby the effect of the rolling terrain is maintained as close to that which exists, to the extent practicable. Every effort shall be made to keep grading of rolling terrain to absolute minimum.

B. Boundary Grading

Special attention shall be given to grading adjacent to the exterior perimeter property line of a development. Fills and cuts adjacent to the exterior perimeter property line shall be designed in accordance with the following:

1) When grading along existing residential property, the grade should be, if at all possible, held equal to or lower than the existing property grades. When grades are to be raised higher than existing adjacent residential lots, a masonry retaining wall shall be used, regardless of the difference in elevation. The wall shall be located as close to the property line as is feasible for construction. If written permission can be obtained from the adjacent property owner(s), the wall should be placed on the property line or onto the lower lot and the fence relocated to the top of the wall. Written permission shall be submitted to the City prior to grading plan approval and/or building permit issuance for the wall.
2) If possible, all exterior slopes, fill or cut, shall be constructed off site, with the property line being situated a minimum of two (2) feet inside the higher elevation. If a right of entry cannot be obtained, a retaining wall shall be placed as near to the property line as noted above.
3) A recorded, notarized right of entry shall be required for all off-site fills and grading prior to plan approval. The right of entry record information shall be shown on the grading plan prior to plan approval.
4) Maximum slope shall be 2:1 or as specified by the Geotechnical Engineer.
5) All slopes steeper than 4:1 adjacent to the public right-of-way and private streets shall be protected with permanent erosion control measures.
6) All fill material shall achieve 90 percent relative compaction certified by a Registered Geotechnical or Civil Engineer.

7) When a drainage swale or ditch is proposed to run adjacent to the property line, a level area, minimum width of five (5) feet is required between the property line and the top of the slope bank.

8) A specific haul route shall be approved by the City Engineer when a large quantity of imported or exported soil is required. Where a haul route has not been determined at the time of plan approval, the permit shall be conditioned stating that no grading activities shall occur until haul route has been approved by the City Engineer.

C. Interior Grading

Differences in elevations across the interior property lines within a development, such that slopes or retaining walls are required, shall conform to the following:

1) Cross-lot drainage is not permitted unless specifically approved by the City Engineer. All single-family residential lots shall be Type "A" grading as shown on Standard Drawing RD-28 and RD-29 "Typical Lot Grading A-C." unless approved otherwise by the City Engineer. Type "B" and Type "C" lot grading for a single-family residential subdivision will require rear lot drainage conduits and/or concrete-lined drainage channels in accordance with the City design standards. Rear lot drainage improvements shall be placed in a private drainage easement and shall be maintained by the lot owner.

2) Retaining Walls shall be required whenever adjacent side lot elevations differ by more than ½-foot. In such cases, a minimum three (3) foot wide path shall be maintained adjacent to all side property lines. Any deviation to these requirements will be subject to the approval by the City Engineer.

3) Property lines shall be situated a minimum of 1-foot inside the top of fill or cut slopes when pad elevations differ by ½-foot or less. When retaining walls are used, the property lines shall be situated on the high side of the retaining wall with a minimum setback of 1 foot from the property line to the retaining wall. Where pad elevations differ by more than ½-foot and waiver of placement of retaining walls is required per the requirements stated above, property lines shall be situated a minimum of 2 feet inside the top of fill or cut slopes.

4) The maximum earth slopes allowed shall be 2:1 (horizontal to vertical). Minimum asphalt concrete surface slopes shall be 1% and minimum concrete surface slopes shall be 0.25%. All proposed slopes that are 3:1 or steeper shall be shown on the plans by some type of slope symbol delineation.

Section 11:
ROADWAY AND STREET DESIGN

11.1 GENERAL

Criteria not specifically addressed in these standards shall be consistent with California Department of Transportation design standards.

11.2 TYPICAL STREET CROSS SECTIONS

Typical cross sections of the various street types showing pavement widths, curb and gutter types and locations, and rights-of-way are shown on the Standard Details. The street designations and right-of-ways are as follows:

Designations	Right-of-Way Width (feet)
Alley	24
Residential/Cul-de-Sac	44
Minor Collector	50
Collector	64
Minor Arterial (Undivided)	78
Divided Major Arterial (Four Lanes)	82
Divided Major Arterial (Six Lanes)	106

A. **Alleys** – Alleys are considered a 20-foot wide street that is depressed in the center as shown in Standard Detail RD-22. Alleys are not permitted without prior approval of the City Council.

B. **Residential/Cul-de-Sac** – The length of cul-de-sac streets with or without separated sidewalk as measured from the centerline of the intersecting street to the center of the bulb, shall not exceed 500 feet, unless a secondary emergency vehicle access is provided to the rear of the cul-de-sac bulb area. Cul-de-sac streets longer than 200 feet shall have increased bulb radii per Standard Drawing RD-24.

   In the case of stub streets associated with phased development, the combined street lengths as measured from the dead end to the nearest through street shall be in accordance with the requirements for cul-de-sacs. Stub streets shall be terminated with a temporary bulb or a hammerhead which shall be designed and constructed in accordance with City Fire Department requirements. A barricade conforming to the City Standard details shall be installed at the end of the all streets that are proposed for future extension.

   For cul-de-sacs greater than 200 feet in length or where the end of the cul-de-sac is not visible from the centerline of the intersecting cross street a “NOT A THROUGH STREET” sign (W53) shall be installed at the beginning of the cul-de-sac.

C. **Minor Collector** – Residential streets serving fewer than 100 lots shall be classified as a minor collector street. Minor collector streets shall be permitted to have driveways serving single family residential and duplex units. Minor collector streets shall be constructed in accordance with Standard Detail RD-25.

D. **Collector** – Residential streets serving more than 100 lots shall be classified as a collector street. Driveways on Collector streets (Standard Detail RD-23 serving single family residential and duplex units shall not be permitted unless otherwise approved by the City Engineer. Additional right-of-way and pavement at intersections shall be provided on collector streets for deceleration lanes and tapers, bus turnouts and turn lanes if specified by the City Engineer.

E. **Minor Arterial (Undivided)/Minor Arterial (Divided)** – Minor Arterial streets shall require a four lane roadway. Minor Arterial streets (undivided) (Standard Detail RD-27) shall provide a center two-way left-turn lane. Minor Arterial streets (divided) (Standard Detail RD-27) shall provide a raised median. Additional right-of-way and pavement at intersections shall be provided on minor arterial (undivided) and minor arterial (divided) streets for deceleration lanes and tapers, bus turnouts and turn lanes if specified by the City Engineer.

F. **Major Arterial** – Major Arterial streets shall require a six lane roadway (Standard Detail RD-27). Major arterial streets shall provide a raised median. Additional right-of-way and/or pavement may be required for bus turnouts and at intersections and driveways for acceleration lanes, deceleration lanes, right-turn lanes and multiple left-turn lanes if required by the City Engineer.

11.3 RIGHT-OF WAY WIDTH

The right-of-way for residential/cul-de-sac, minor collector and collector streets shall be provided at the back of sidewalk regardless of whether or not the proposed streets have separated sidewalks. The right-of-way for minor and major arterial streets shall be provided at the back of curb.

Building setbacks, landscape requirements, parking requirements, etc. shall be based on the ultimate right-of-way regardless of the location of the public street improvements.

A minimum 12.5-foot public utility easement (P.U.E.) shall be dedicated adjacent to all public and private streets and shall include traffic control appurtenances. Additional easements for sewer, water, storm drainage, landscaping, fencing, and all other public utilities shall be provided as required by the utility companies, these Design Standards, and as specified by the City Engineer.

11.4 SIDEWALK REQUIREMENTS

Sidewalks for pedestrians shall be constructed adjacent to all public streets in accordance with the Standard Details. All concrete sidewalks shall be six (6) inches in depth and shall be constructed of Portland Cement Concrete, Class “B” five sack Type II mix at a minimum.

Sidewalk width on alleys, if applicable, residential/cul-de-sac, minor collector and collector streets shall be a minimum of four (4) feet. The width of the concrete curb shall not be considered as included in the width of the sidewalk. If the sidewalk is detached from the concrete curb and gutter on these streets, the sidewalk width shall be increased to a minimum of five (5) feet.

For streets that front park sites, commercial and retail areas, schools and other pedestrian oriented land uses, the sidewalk width may be increased to a minimum width of six (6) feet at the discretion of the City Engineer.

Sidewalk width on minor and major arterial streets shall be a minimum of six (6) feet. The width of the concrete curb shall not be considered as included in the width of the sidewalk. If the sidewalk is detached from the concrete curb and gutter on minor and major arterial streets, the sidewalk width shall be increased to a minimum of eight (8) feet.

Sidewalk barricades constructed in accordance with the Standard Details shall be required where satisfactory provisions as determined by the City Engineer cannot be made for pedestrians to safely continue beyond the terminus of the sidewalk.

For sidewalks that are constructed outside the limits of the public right-of-way, the City shall require the sidewalk to be placed within a public pedestrian easement of sufficient width to accommodate the proposed sidewalk. The public pedestrian easement shall be reviewed and approved by the City Engineer and shall be recorded with the Sacramento County Recorder.

11.5 CONCRETE CURB AND GUTTER REQUIREMENTS

Concrete curb and gutter shall be constructed adjacent to all public and private streets in accordance with the Standard Details. All concrete curb and gutter shall be Portland Cement Concrete, Class "B" five sack Type II mix.

A. **Type 1 Rolled Concrete Curb and Gutter** – Type 1 rolled concrete curb and gutter shall be constructed along the street frontage of single family residential and duplex development provided that the concrete curb and gutter is placed monolithically with the concrete sidewalk. If the concrete sidewalk is detached from the concrete curb and gutter, the concrete curb and gutter shall be required to be Type 2 vertical concrete curb and gutter. Type 1 rolled concrete curb and gutter shall not be constructed on any collector, minor arterial or major arterial street.

   Note: Any proposed residential/cul-de-sac or minor collector street with separated concrete sidewalk and Type 2 vertical curb will require prior approval of the City Engineer.

B. **Type 2 Vertical Concrete Curb and Gutter** – Type 2 vertical concrete curb and gutter shall be required on all collector, minor arterial and major arterial streets. Type 2 vertical concrete curb and gutter is required along the street frontages of park sites, open space parcels, schools and other related land uses regardless of the street designation. Also, Type 2 vertical concrete curb and gutter shall be constructed on all streets with detached concrete sidewalk regardless of the street designation.

C. **Type 6 Modified Concrete V-Gutter** – Type 6 modified concrete V-gutter may be used for alleys and/or public and private parking lots. Type 6 modified concrete V-gutter shall not be permitted in any public or private street without prior approval of the City Engineer.

D. **Type 3 Concrete Curb** – Type 3 concrete curb shall be constructed at the back of concrete sidewalk in accordance with the Standard Details. Type 3 concrete curb may be used in public and private parking lots but shall not be permitted in median islands within the public street right-of-way.

E. **Type 4 Concrete Curb** – Type 4 concrete curb shall be constructed at various locations in accordance with the Standard Details. Type 4 may be used for public and private parking lots but shall not be permitted in median islands within the public street right-of-way. Type 4 concrete curb may be constructed as median island curb in certain circumstances where turn restrictions, channelization requirements, etc. are required to be placed in existing un-raised paved medians. The City Engineer at his sole discretion may allow the use of Type 4 concrete curb in these situations.

F. **Type 5 Concrete Curb** – Type 5 concrete curb shall be required in all public streets for raised median construction.

11.6 INTERSECTIONS

Street centerlines shall intersect one another at an angle as near to a right angle as is possible by tangents not less than 100 feet in length. In unusual circumstances the City Engineer may waive this requirement.

Where two streets intersect, the centerline grade of the major street shall have a maximum centerline (longitudinal) grade of 3% for a minimum distance of 40 feet measured from the curb line of the intersecting street, except in unusually rough terrain, as determined by the City Engineer. The centerline of the minor street shall meet the crown slope at the projected lip of gutter. Crown slope shall be reduced to 1% within the intersection if necessary.

11.7 OFFSET INTERSECTIONS

The following requirements apply to all offset intersections. Any variation to these requirements shall be subject to the approval of the City Engineer. Distances are measured from centerline to centerline.

A. Residential/cul-de-sac streets intersecting another residential/cul-de-sac street from opposite sides shall have their centerlines meet, or the offset between intersections shall be a minimum of 150 feet.

B. Minor collector and collector streets intersecting residential/cul-de-sac streets and any other street from opposite sides shall have their centerlines meet or the offset between the intersections shall be a minimum of 200 feet.

C. Residential/cul-de-sac, minor collector and collector streets intersecting minor or major arterial streets from opposite sides shall have their centerlines meet. This condition shall not apply where a raised center median is provided on the minor or major arterial street separating conflicting turning movements.

D. Intersections between two minor and/or major arterials shall have their centerlines meet, or the offset between the intersections shall be a minimum of 1320 feet.

11.8 ON-STREET PARKING

On-street parking for collector, minor arterial and major arterial streets shall be prohibited unless otherwise approved by the City Engineer. On-street parking on these streets shall require additional right-of-way and pavement to accommodate the parking as approved by the City Engineer.

11.9 DESIGN SIGHT DISTANCES

A. Stopping Sight Distance - The minimum sight stopping distance over any segment of roadway shall be designed for the vehicle speeds listed in Table 11.1 unless specific approval for a lesser design speed is received from the City Engineer. Minimum stopping sight distance shall be consistent with that specified in the latest edition of Caltrans Highway Design Manual, Section 201.

The design stopping sight distance requirement for passenger cars is based on 3.5-foot height of eye and a 6-inch height of object.

TABLE 11.1

SIGHT DISTANCE STANDARDS

Design Speed (mph)	Stopping (ft)	Passing (ft)
20	125	800
25	150	950
30	200	1,100
35	250	1,300
40	300	1,500
45	360	1,650
50	430	1,800
55	500	1,950
60	580	2,100
65	660	2,300
70	750	2,500
75	840	2,600
80	930	2,700

B. Sight Distances at Intersections and Driveways – The design of all public streets, private streets, and major non-residential driveways shall provide minimum sight distance in accordance with the following requirements. Design speeds shall be as specified in Table 11.2 or as specified by the City Engineer. Minimum design sight distances are specified in Table 11.3 through 11.6. These requirements were extracted from the "Guidelines for Driveway Location and Design", published by the Institute of Transportation Engineers. The safe sight distance requirements for passenger cars are based on a 3.5-foot height of eye and 2.0-foot height of object. The distances for semitrailers are based on a 6-foot height of eye and 2.0-foot height of object, and shall apply to all streets intersecting arterial streets only. All measurements are from a vehicle located ten feet back of the traveled way. Special circumstances may preclude locations from meeting the requirements shown below, but in no case will the City allow the sight distance to be less than the minimum stopping sight distances per the State Highway Design Manual.

TABLE 11.2

Roadway Design Speeds

Street Classification	Roadway Design Speeds	Sight Distance Design Speeds
Alley/Residential/Cul-de-sac	20 mph	25 mph
Minor Collector	30 mph	35 mph
Collector	40 mph	45 mph
Minor Arterial	50 mph	55 mph
Major Arterial	60 mph	60 mph

TABLE 11.3

Design Sight DISTANCE FOR PASSENGER CAR

EXITING A SIDE STREET ONTO TWO-LANE ROADS

DESIGN SPEED (MPH)	DESIGN SITE DISTANCE - Left (Feet)	DESIGN SITE DISTANCE - Right (Feet)
20	150	130
25	250	195
30	350	260
35	440	350
40	530	440
45	635	570
50	740	700
60	950	1050

TABLE 11.4

Design Sight DISTANCE FOR PASSENGER CAR
EXITING A SIDE STREET ONTO FOUR AND SIX-LANE ROADS

DESIGN SPEED (MPH)	DESIGN SITE DISTANCE - Left (Feet)	DESIGN SITE DISTANCE - Right (Feet)
20	130	130
25	175	195
30	220	260
35	300	350
40	380	440
45	500	570
50	620	700
60	950	1050

TABLE 11.5

SIGHT DISTANCE FOR CARS ENTERING DRIVEWAYS/STREETS BY LEFT TURN

OPERATING SPEED (MPH)	2-LANE (SINGLE LANE)	4-LANE (2 LANES)	6-LANE (3 LANES)
20	150	160	170
25	190	205	220
30	230	250	270
35	300	320	345
40	370	390	420
45	445	470	500
50	520	550	580
60	700	740	780

TABLE 11.6

Design Sight DISTANCE FOR SEMI-TRAILERS
ENTERING ONTO FOUR AND SIX-LANE ROADS

DESIGN SPEED (MPH)	DESIGN SITE DISTANCE - Left (Feet)	DESIGN SITE DISTANCE - Right (Feet)
20	400	300
30	500	400
40	580	850
50	1600	1600
60	2500	2500

11.10 DRIVEWAYS

When driveways are abandoned or relocated, the driveway section shall be removed and replaced with curb, gutter, and sidewalk conforming to these standards. Parking is restricted within the throat depth of all driveways. All new driveways shall conform to the following requirements:

A. Types, Widths and Grades

1) <u>Single Family Residential and Duplex Driveways</u>; Driveways sections are not defined in residential subdivisions that have Type 1 or Type 1A rolled concrete curb and gutter. If residential subdivisions are designed with concrete sidewalk that is detached from the concrete curb and gutter, the driveway apron throat width excluding transitions shall be no less than 18 feet wide and no greater than 30 feet wide.

   Lot pads shall be graded to accommodate maximum driveway slopes of 15 percent measured from the back of right-of-way.

2) <u>Single Family Residential and Duplex Driveways</u>; Driveway slopes, construction requirements and the number of driveways serving custom home residential lots shall be in accordance with Chapter 14.33.180 the City's Hillside Grading Ordinance contained in the Folsom Municipal Code (FOLSOM MUNICIPAL CODE).

3) Commercial, Office, Multi-Family and Industrial Driveways; main entrances shall have a minimum throat width of 35 feet. The minimum throat width may be reduced to 25 feet if the driveway is a secondary access or restricted to right turn movements only. If a raised median is provided in the driveway throat, the driveway width shall be widened as necessary to accommodate the number of ingress and egress lanes required, with a minimum ingress lane width of 18 feet. The minimum driveway median width shall be 4 feet and the maximum width shall be 10 feet. The nose of the median shall be no less than 7 feet and no more than 15 feet from the gutter flow line.

Driveways located on collector streets shall be standard commercial driveways per the Standard Drawings unless the City Engineer deems a Type A-7 driveway appropriate for a particular project. Driveways on arterial streets shall be either at grade with appropriate drainage collection facilities or "Type A-7" per Standard Detail RD-03.

Driveway slopes shall have a maximum grade of 10 percent except from the edge of pavement to a distance 15 feet within the project. This area shall have a maximum slope of 2 percent. Unusual terrain condition may warrant waiver of this requirement subject to the approval of the City Engineer. If the driveway is other than a "Type A-7" driveway that provides cross gutters, a traffic control sign shall be provided.

B. Location — All aspects of site access (location of driveways, number of driveways allowed, spacing of driveways, etc.) are addressed in Section 12 Site Access of these Design Standards.

C. Sight Distance — Sight distance at driveways shall be as specified in Section 11.9 of these Design Standards.

11.11 MINIMUM RADIUS OF STREET CENTERLINE/ROW LINE AT CORNERS

The street designations and minimum radii are as follows:

Designations	Radius at ROW (feet)	Radius Centerline (feet)
Alley	20	200
Residential/Cul-de-Sac	20	200
Minor Collector	20	250
Collector	20	3
Minor Arterial (Divided/Undivided)	25	1,000
Major Arterial	25	1,500

No super-elevation is provided for curves.

11.12 BUS STOPS

Bus stops shall be constructed in accordance with Standard Detail RD-15 of the City Standard Details.

11.13 BIKE LANES

Bike lanes are required on all collector, minor and major arterial streets as shown on Plate 11-A and in the Standard Details.

11.14 MINIMUM AND MAXIMUM GRADES AND CROSS SLOPES

The following standards for the design of profiles for proposed improvements shall govern the preparation of plans for such improvements:

A. New Street

Minimum gutter grades shall be no less than 0.50% (maximum 12%) unless otherwise approved by the City Engineer. Minimum gutter grades for frontage improvements along existing streets shall be no less than 0.25% for vertical curb and gutter and 0.35% for roll curb and gutter with a preferable minimum of 0.50%.

Deviations may be approved by the City Engineer under special circumstances.

B. Street Grade Intersection/Vertical Curves

When two streets intersect, neither street shall have a grade greater than 3% for a minimum distance of 40 feet measured from the curb line of the intersecting street, except under unusually rough terrain as determined by the Engineer. The centerline of the lesser intersecting street shall meet the crown slope at the project lip of gutter. Crown slope may be reduced to 1% within the intersection, if necessary.

The minimum vertical curve length allowable at the intersection of two grades shall be 50 feet. Vertical curves on alleys, residential/cul-de-sac and minor collector streets may be omitted where the algebraic difference in grades does not exceed 2%. The minimum vertical curve data to be computed and shown on the plans shall consist of the point intersection elevation, the tangent gradients, the middle ordinate and the length of curve. The vertical curve data shall also include the elevation and stationing points of the beginning of vertical curve (BVC), end of vertical curve (EVC) and along 25 foot intervals.

C. Cul-De-Sacs

The maximum length of cul-de-sacs shall be 500 feet unless approved by the City Engineer. The minimum gutter grades around cul-de-sacs and blisters-type intersections shall be 0.50% (maximum 12%). On cul-de-sacs with gutter grades greater than 5%, special attention needs to be given to the grade at the top of the cul-de-sac. The crown shall be increased from the normal street crown to 0.80 feet minimum from the center of the cul-de-sac or blister to the flow line of the gutter. Typical dimensions are shown on Standard Detail RD-27.

D. Cross Slopes

Streets shall be crowned from centerline to gutter flow line as shown on the Standard Details. Standard cross slopes shall be a minimum of 2% on all streets. Cross slope on street widening shall be a minimum of 1.5% and a maximum of 4% (2% is preferred). Where a street constructed with a super elevation is to be widened, the cross slope shall be as specified by the City Engineer.

11.15 CONFORMING TO EXISTING PAVEMENT GRADES

Where proposed improvements meet existing improvements, the plans shall show all pertinent existing elevations along the pavement of the existing street, such as the gutter, flow line and/or edge of pavement grades and center of pavement elevations at sufficient intervals not exceeding 25 feet to ensure a smooth transition between the improvements. The maximum algebraic grade difference between existing pavement grades and new pavement grades shall be 2%. In certain circumstances, the City Engineer may require the saw cutting, grinding and/or removal of existing pavement grades of sufficient width to achieve a smooth transition.

11.16 PRIVATE STREET REQUIREMENTS

Private streets shall be designed to the same structural and geometric design requirements as those for public streets. Any proposed deviation from current City design and geometric standards shall require approval from the City Engineer and the City Fire Department.

11.17 PARTIAL WIDTH/HALF STREET IMPROVEMENTS

Construction of half streets and half alleys are not acceptable as City street improvements, unless otherwise permitted by the City Engineer. At the discretion of the City Engineer, partial width streets may be permitted along the boundary of a subdivision or other private development where the full required right-of-way cannot be dedicated. When permitted, the developer, at a minimum, shall dedicate sufficient right-of-way and construct a full ½-street section for the appropriate class of street along the frontage of the development and a 14-foot wide paved roadway with a 4-foot wide gravel shoulder on the opposite side of the street. The pavement crown and street centerline shall be placed at ultimate location. Construction of partial streets shall be limited to residential/cul-de-sac and minor collector streets only.

11.18 GEOTECHNICAL DESIGN REQUIREMENTS

A. **Structural Section** - All public streets to be constructed within the City of Folsom shall be asphalt concrete over aggregate base (AB) and, if required, aggregate sub-base (ASB). All pavement structural sections shall be designed on the basis of the resistance R-value as determined in accordance with the State of California, Department of Transportation design method and appropriate traffic indices (T.I.). If the subgrade has an R-Value of 10 or less, a geotextile fabric or other approved product shall be installed on the subgrade prior to placement of AB or ASB material. In addition, the City Engineer may require the installation of edge drains in soils where the "R" value of the subgrade is 10 or less. The Geotechnical Engineer may submit for treatment of the subgrade material, with lime or cement or other approved product if suitable soils exist. This may be considered in lieu of geotextile fabric and subbase material with approval of the City Engineer.

B. **Structural Section at Signalized Intersections** – Pavement sections shall be designed by a Registered Geotechnical Engineer. Where traffic signal loops are anticipated or will be installed, the minimum structural section shall include four (4) inches of asphalt concrete pavement on the minimum required aggregate base for a length of no less than 100 feet as measured from the curb return of the intersecting street. When installing signal loops, the slot depth shall be cut to achieve a minimum of one (1) inch cover over the signal loop.

C. **Traffic Index Determination** – the design of street structural sections shall conform to the following unless otherwise approved by the City:

Street Designation	T.I.*
Alleys	6.0
Residential/Cul-de-sac	6.0
Minor Collector	7.0
Collector	7.0
Minor Arterial (4-Lane)	9.0
Major Arterial (6-Lane)	10.0

* - The traffic index (T.I.) may be raised at the discretion of the City Engineer if traffic warrants a higher value.

D. **Minimum Street Structural Sections** - An absolute minimum structural section equivalent to 2½-inch asphalt concrete (AC) and 6-inch aggregate base (AB) for alleys, residential/cul-de-sac and minor collector streets, 3-inch AC and 8-inch AB for collector streets, and 4-inch AC and 10-inch AB for minor and major arterial streets or greater shall be required regardless of soil and traffic conditions.

11.19 SURVEY MONUMENTS

A. Survey monuments constructed in accordance with Standard Detail RD-19 shall be installed at the following locations:

1) At the intersection of all street centerlines.
2) At the beginning and end of curves on the street centerline and located such that there will be sight distance between the two monuments within the street right-of-way. These will normally be located at points of curvature not to exceed 1000 feet.
3) At the center of all cul-de-sacs and elbow points.
4) At the subdivision boundary corners and at such other locations so as to enable any lot or portion of the improvement to be retraced or located, as directed by the City Engineer.

B. Survey monuments shall also be as follows:

1) Subdivision boundary monuments except those in street pavement shall be not less than 1-inch solid steel or 1-¼ inch galvanized iron pipe 30 inches in length, capped and tagged.
2) Subdivision monuments in street pavement, other than those survey monuments required in Section A. above, shall be no less than a ¾-inch galvanized iron pipe, 18 inches in length. Top of pipe shall be driven flush with surface pavement.

3) Lot corners shall have a ½-inch rebar at all rear corners. The ½-inch rebar shall be capped and tagged with license number of the Engineer or Surveyor of Record. Front corner and side lot lines shall be projected and marked on back of sidewalk with a chisel mark.

4) Permanent survey monuments shall be placed by the Consulting Engineer at all section and quarter corners within the development. The section corner monuments shall be Class “B” concrete, poured in place, with minimum dimensions of 6" diameter x 24" deep, with a brass cap in accordance with Bureau of Land Management Standards.

   All such monuments shall be referenced to permanent objects located nearby and all ties shall be furnished to the City Engineer for general public use. Final acceptance of the public improvements will not be made until such ties have been furnished to the City Engineer.

   The Consulting Engineer shall also place a note on all construction plans stating that the Contractor is responsible for the protection of all existing monuments and other survey markers.

11.20 BENCHMARKS

In locations where a new benchmark will be required, as determined by the City Engineer, the developer's engineer will set in concrete a ¾-inch brass cap and shall run a second order, class two survey from an approved City of Folsom benchmark to establish the U.S.G.S. elevation of the cap. The level notes will be submitted to the City Engineer for approval. After approval of the notes, the developer's engineer will mark on the brass cap the City of Folsom benchmark number, the date, and R.C.E. or L.S. number of the person certifying the level notes.

Benchmarks shall be provided where specified by the City Engineer and at all culverts 60-inches or greater, bridge crossings passing a 100-year flow of 250 cfs or greater, and within subdivisions that are greater than 100 lots.

11.21 STREET NAMES, STREET NAME SIGNS AND BLOCK NUMBERS

Street names shall be proposed by the Developer and shall be shown on the tentative map when submitted for review and approval by the City. These names shall be subject to approval by the City Council. No duplication of names already in use or previously proposed or sound alike names will be permitted. The Developer may choose names from the City’s approved list of historic street names which do not require separate City Council approval. Street name signs shall be furnished and installed by the Developer. Street name signs shall be in accordance with Standard Detail RD-13 and street name signs shall be installed in accordance with Standard Details RD-14 through Standard Detail RD-17.

The City Standards call for the placement of block numbers on each street name sign within each project, including an arrow indicating the direction in which address numbers are increasing.

A table shall be provided on the improvement plans, typically the signing, striping and street light plan sheet, listing each street name sign location with a place for a block number for each street. The value of the block number will be provided by Community Development Department, based on the address map.

At some location on the plans, preferably the signing, striping and/or street lighting plan because it usually shows the overall street layout on one sheet and is typically uncluttered with other detail, the street name sign locations shall be shown with a circled number corresponding to the table. Two arrows will be shown radiating from each circle which point in the direction of increasing address numbers (typically north and east.) The block-number arrows placed on the street name signs shall be oriented to correspond with the direction of the arrows shown on the plan.

The Community Development Department will create the address map based on the final map as soon as the City has approved the final map. In the case where the improvement plans are ready for approval before the final map is approved, the spaces on the table for the block numbers shall be left blank and a note shall be added to the plans stating that:

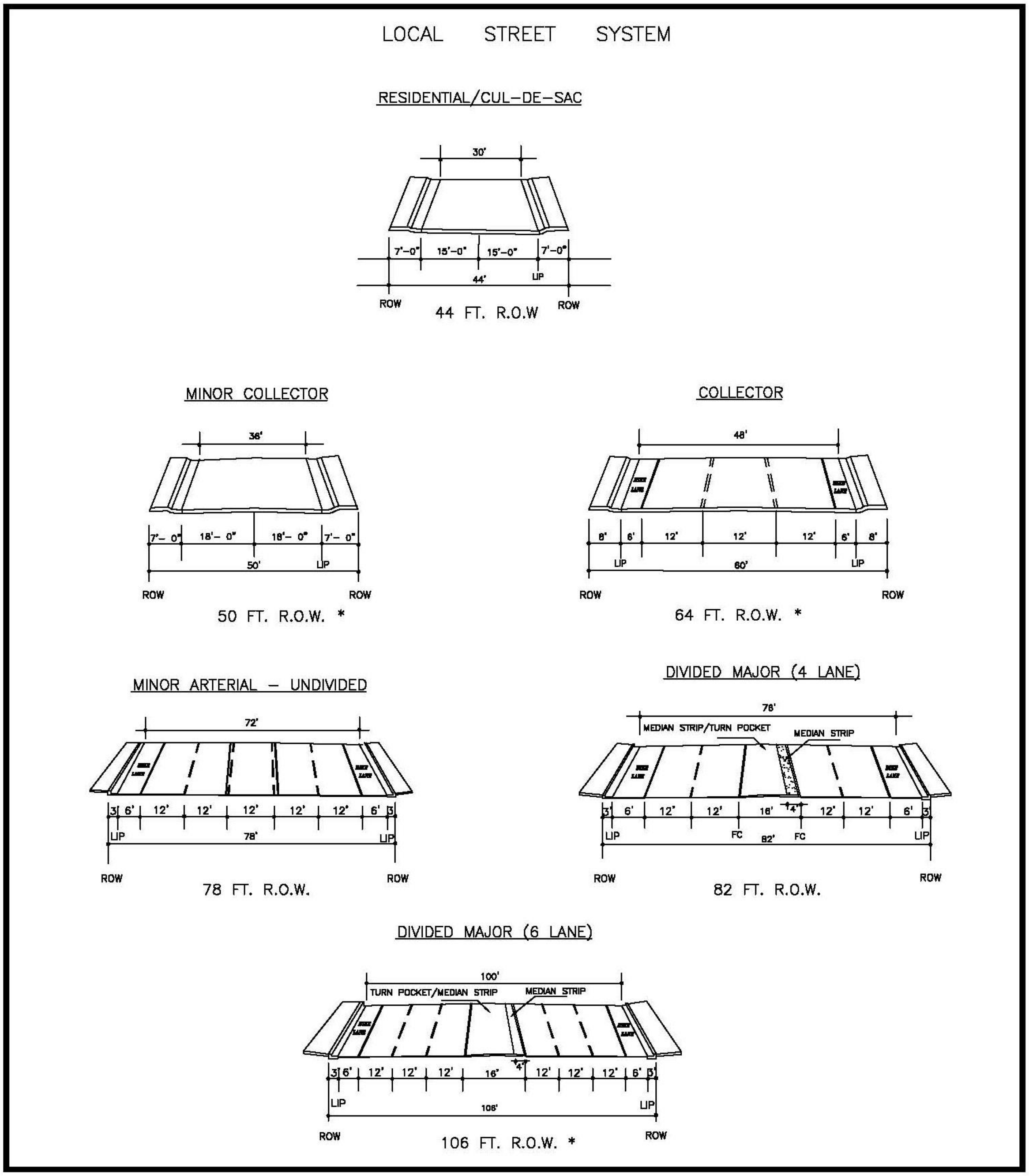
> *Street block numbers will be added by revision once they have been determined by the City, The contractor shall check with Community Development Department prior to ordering any street name signs.*

11.22 Plates

A. Plate 11-A Typical Cross Sections
B. Plate 11-B 90-Degree Intersection Elbow
C. Plate 11-C Cul-De-Sac
D. Plate 11-D Residential Cross-Sections
E. Plate 11-E Minor Arterial Cross-Section
F. Plate 11-F Divided Major Road Cross-Section

CITY OF FOLSOM

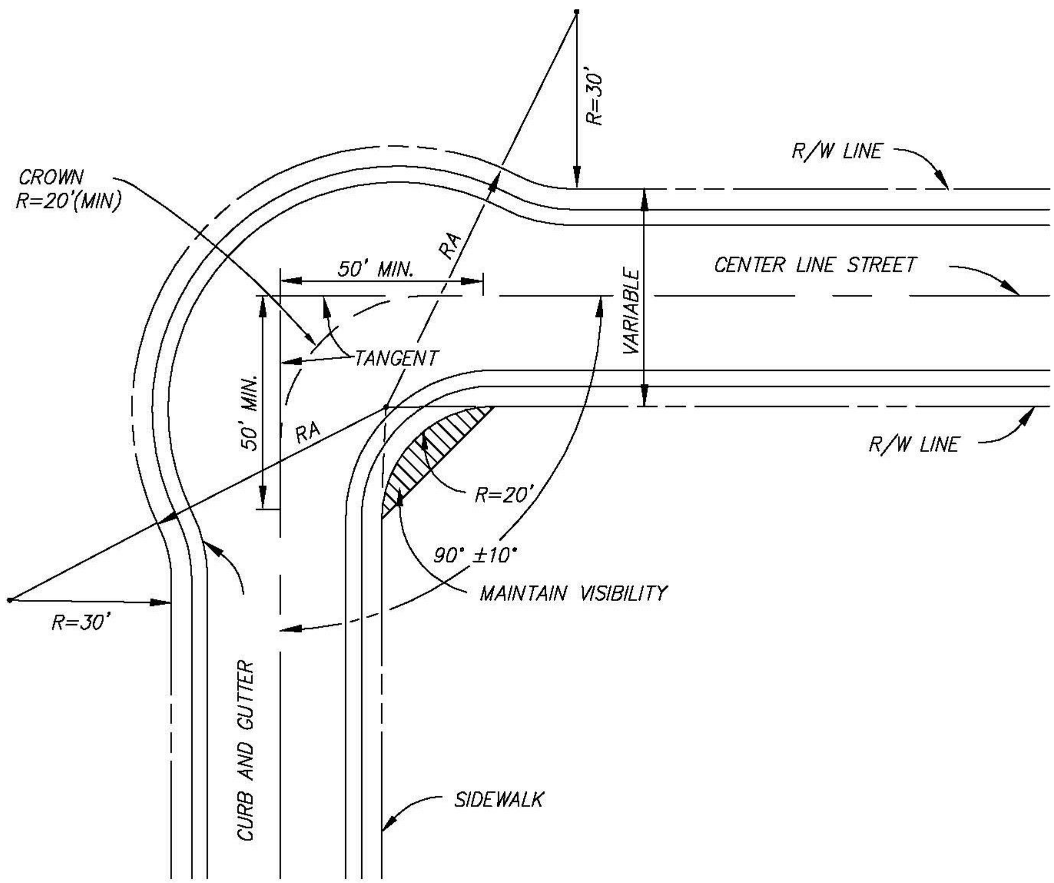
STREET SYSTEM STANDARDS



* NOTE: ROW MAY BE REDUCED TO BACK OF CURB IF SIDEWALK TO BE IN LANDSCAPE CORRIDOR.

TYPICAL CROSS SECTIONS

PLATE 11–A

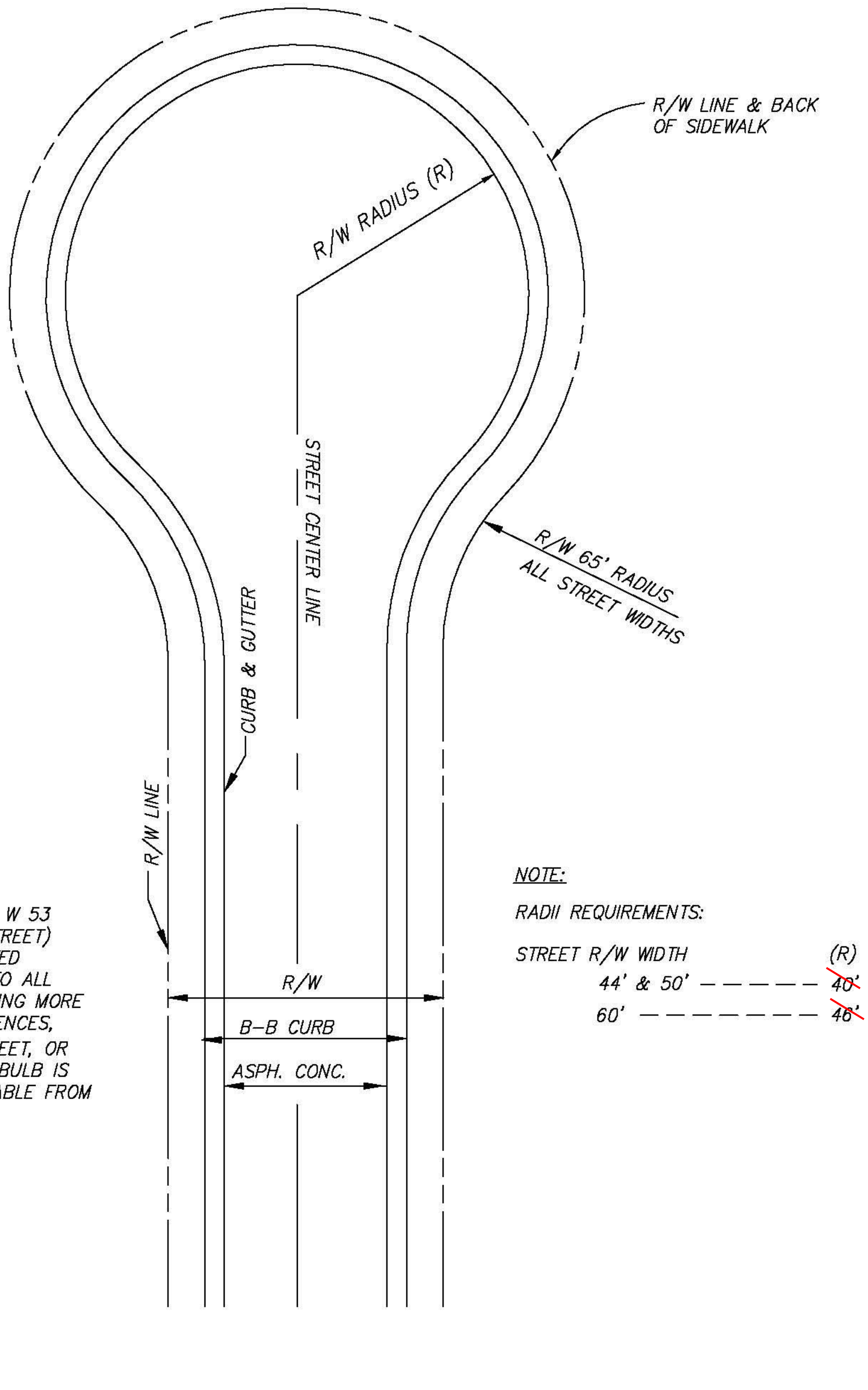


NOTES:

1. INTERSECTION BULBS ARE NOT REQUIRED ON STREETS WITH A CENTERLINE RADIUS OF 200' OR MORE.
2. ALL RADII SHOWN PERTAIN TO R/W LINES
3. RA = 50' ON 44' STREETS
   = 53' ON 50' STREETS
   = 66' ON 60' STREETS
4. RA FOR STREETS W/ R/W GREATER THAN 60' SHALL BE APPROVED ON A PROJECT BY PROJECT BASIS BY THE ENGINEER.
5. A MINIMUM OF 50' OF TANGENT IS REQUIRED FROM THE POINT OF INTERSECTION OF THE CENTERLINES.
6. INTERSECTION ANGLE SHALL BE 90° ±10°
7. DISTANCE BETWEEN R/W LINE AND BACK OF SIDEWALK VARIES.

90-DEGREE INTERSECTION ELBOW

PLATE 11-B



NOTE:

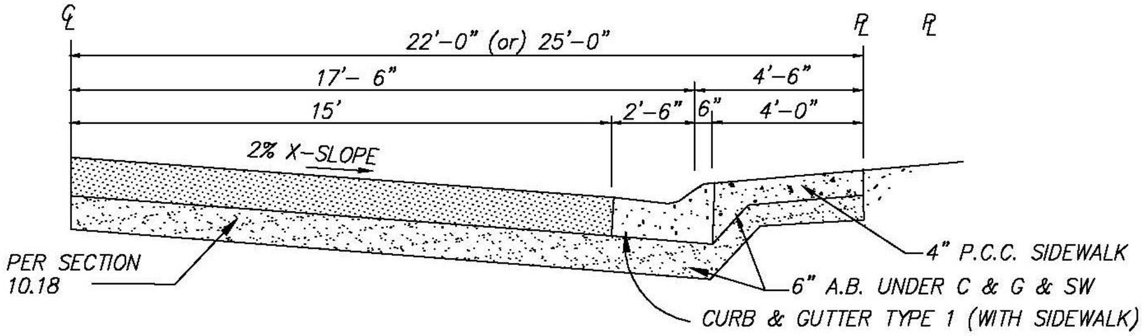
1. A UNIFORM SIGN NO. W 53 (NOT A THROUGH STREET) SIGN IS TO BE POSTED AT THE ENTRANCE TO ALL CUL-DE-SACS SERVING MORE THAN TWELVE RESIDENCES, LONGER THAN 200 FEET, OR WHERE END OF THE BULB IS OTHERWISE NOT VISIABLE FROM THE INTERSECTION.

NOTE:

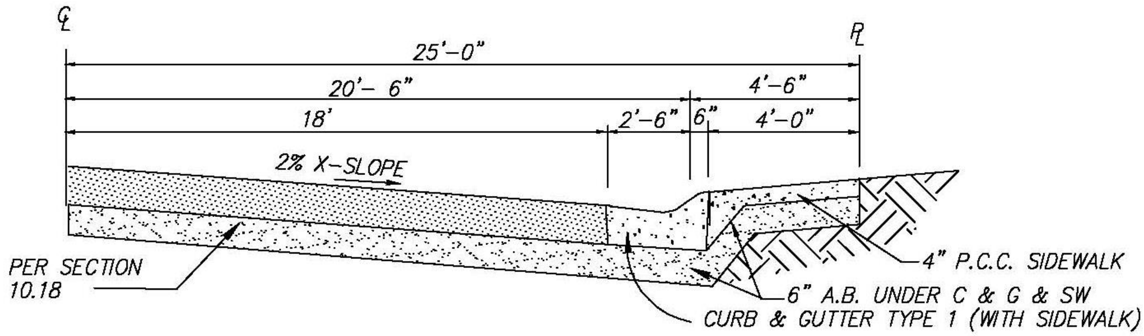
RADII REQUIREMENTS:

STREET R/W WIDTH	(R)
44' & 50'	~~40'~~
60'	~~46'~~

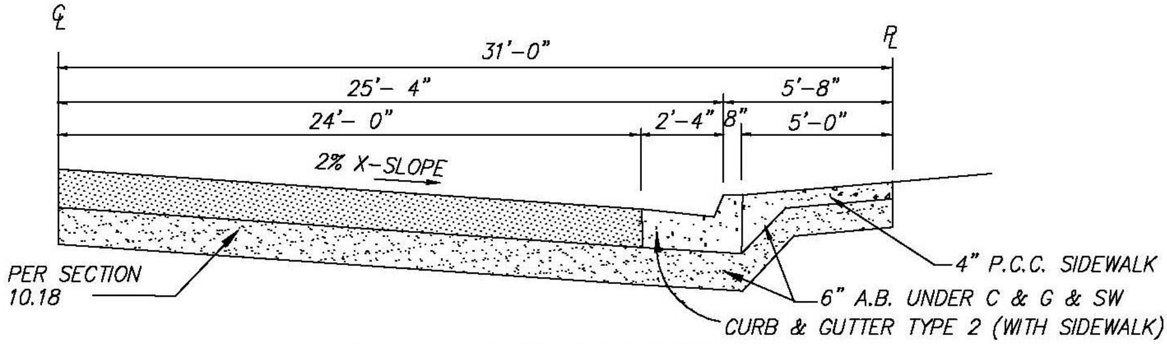
CUL-DE-SAC
PLATE 11-C



44 ft. R.O.W. RESIDENTIAL



50 ft. R.O.W. MINOR COLLECTOR

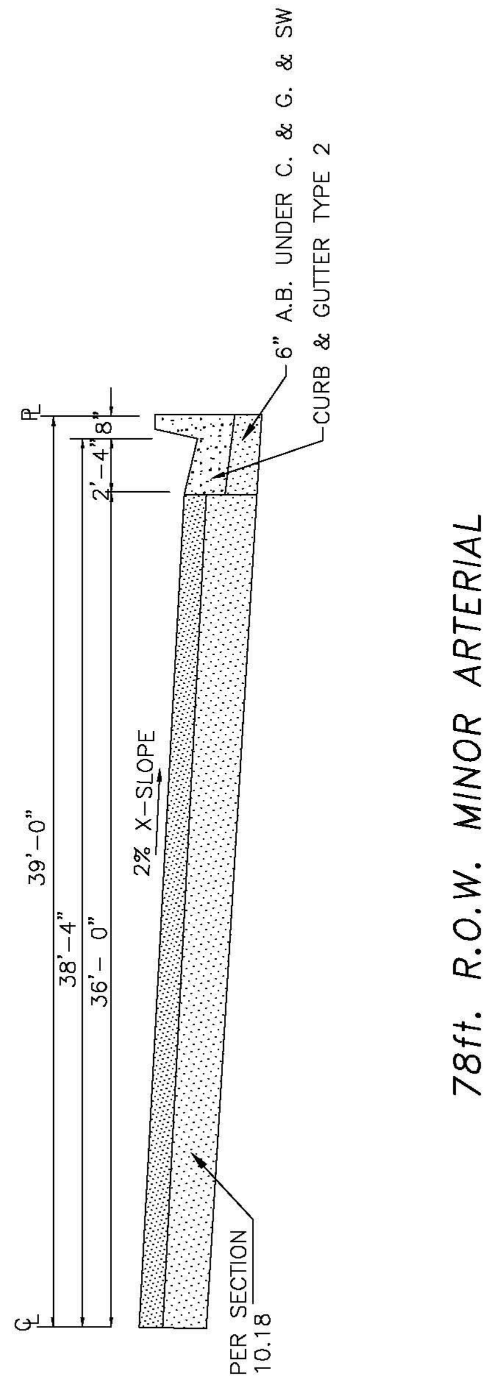


64 ft. R.O.W. COLLECTOR

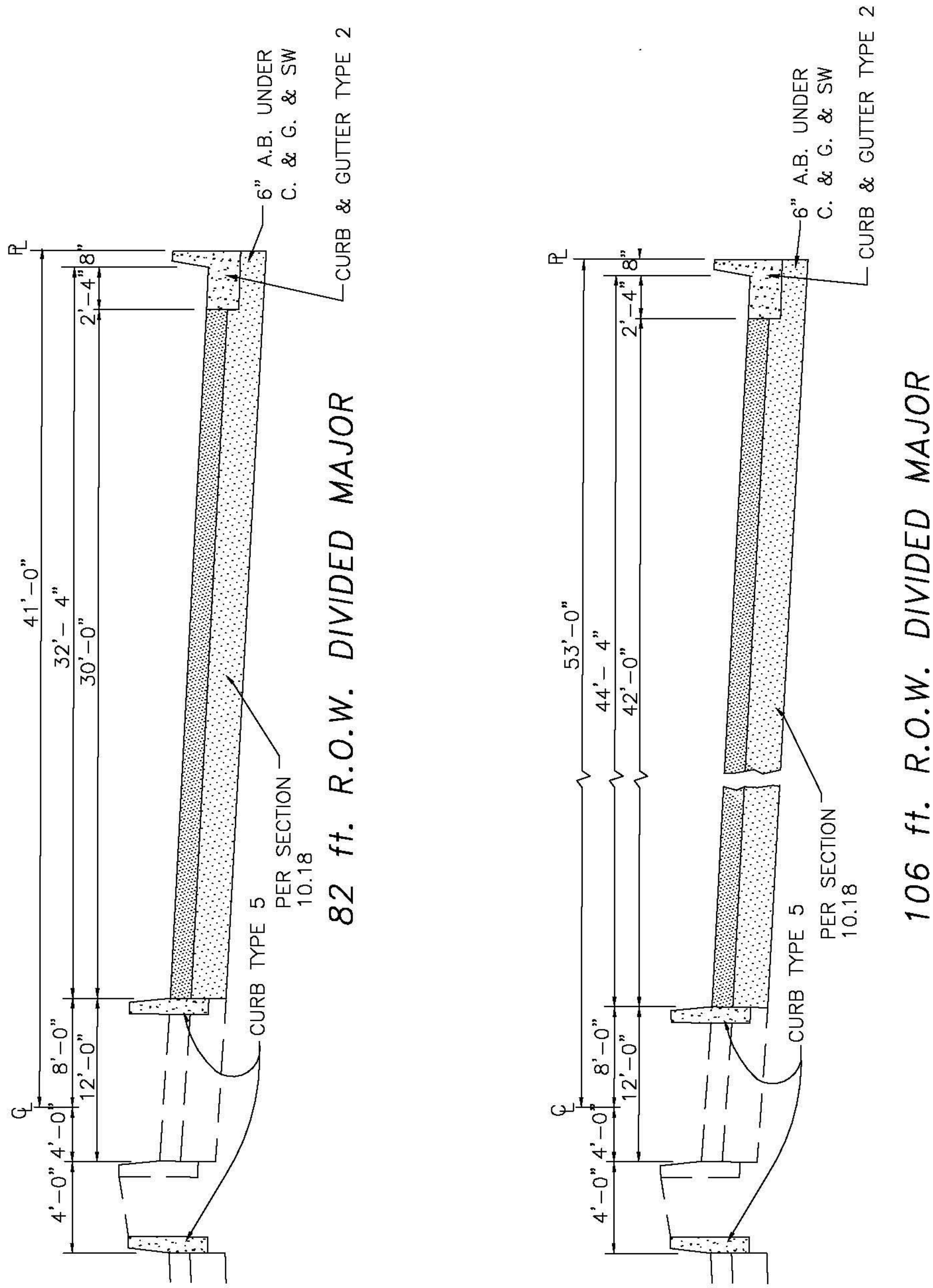
NOTE: IF SIDEWALK IS NOT ADJACENT TO CURB & GUTTER, TYPE 1 CURB & GUTTER MAY BE USED.

RESIDENTIAL CROSS-SECTIONS

PLATE 11-D



MINOR ARTERIAL CROSS-SECTION
PLATE 11-E



DIVIDED MAJOR ROAD CROSS-SECTIONS

PLATE 11-F

Section 12:
SITE ACCESS

This section establishes requirements for site access and driveway locations.

12.1 GENERAL

Driveways shall meet sight distance requirements as discussed in Section 11.9 of this manual for both ingressing and egressing movements. Driveway width, type and design shall conform to Section 11.10 of this manual.

Backing of vehicles out of driveways onto the roadway shall only be permitted for single family residential or duplex land uses on streets designated as either residential/cul-de-sac or minor collector. All other land uses shall be designed so both ingressing and egressing vehicles are traveling forward.

Driveways shall be located to provide at least 5 feet between the driveway's traveled way and appurtenances such as fire hydrants, street light and utility poles, and drop inlets. For the purposes of this requirement, the edge of driveway shall be considered the outer edge of the driveways transition for driveways constructed in streets with vertical concrete curb and gutter.

The City recognizes that infill projects (projects within older, previously developed areas such as the City's Historic District) may have certain constraints such as lot size, existing driveways near the property line on adjacent parcels, etc. which may deem it impractical to achieve the requirements contained in this manual for site access. Infill projects such as these will be evaluated on a case-by-case basis by the City. However, the goal will be to achieve the requirements contained herein to the maximum extent practicable.

NOTE: Distances discussed below are measured to driveway centerlines. Where distances refer to an intersection, the intersection's point of reference is the near curb return nearest to the driveway.

12.2 DRIVEWAY LOCATIONS ON RESIDENTIAL STREETS

For driveways on residential/cul-de-sac or minor collector streets, the following shall apply:

A. Driveways shall be at least 10 feet apart as measured edge to edge, except in cul-de-sac bulbs and the outside portion of elbows, where the minimum spacing shall be 5 feet. For corner parcels, the driveway shall front whichever street is projected to have a lower traffic volume, and the driveway shall be located as far from the curb return as possible, i.e., at the far side of the lot.

   Where the residential street intersects a collector or minor or major arterial street, the roadways shall be designed such that no driveways will occur within 100 feet of said intersection. This may be accomplished by designing a residential/cul-de-sac or minor collector street parallel to the collector, minor or major arterial street, and providing access to the lots via said residential street. In cases where this is not possible, there shall be no driveways on the residential street within 50 feet of said intersection.

For all land uses other than single family residential or duplex, the following shall apply:

A. Driveways shall be at least 100 feet apart. There shall be no driveways within 100 feet of an intersection. Where residential/cul-de-sac or minor collector streets intersect collector, minor or major arterial streets, there shall be no driveways on the said residential street within 150 feet of said intersection unless otherwise approved by the City Engineer.

12.3 DRIVEWAY LOCATIONS ON COLLECTOR, MINOR AND MAJOR ARTERIAL STREETS

There shall be no driveways along collector, minor and major arterial streets serving single family residential or duplex land uses.

Driveways fronting major arterial (6- lane) streets shall be at least 250 feet apart and shall be restricted to right-turn-in, right-turn-out only unless otherwise approved by the City Engineer. Left turn-in access from a major arterial street into a driveway may be permitted if there is sufficient distance in the median to allow a left-turn lane to be constructed. No portion of a driveway shall be allowed within the straight portion of an acceleration or deceleration lane or within a deceleration taper; however, driveways may be permitted within acceleration and deceleration lane bay tapers with prior approval of the City Engineer. No portion of a driveway shall be allowed within a separate bus turnout, including its taper transition.

Driveways shall be at least 200 feet apart on collector streets and at least 250 feet apart on minor and major arterial streets. Driveways shall be at least 150 feet from an intersection on collector streets.

12.4 NUMBER OF DRIVEWAYS SERVING A PARCEL OR SITE

For single family residential or duplex land uses, only one driveway per parcel shall be permitted, except where circular drives are proposed and approved by the City Engineer.

For other land uses, the number of driveways shall be minimized, but not to a point that could cause local congestion within the public right-of-way. Consolidation of driveways with adjacent parcels shall occur whenever possible. Where driveway location standards cannot be met for a parcel, the City may require the only access to that parcel to be achieved via cross access over an adjoining parcel. This shall satisfy legal requirements for access to a parcel, and the City, therefore, shall not be required to permit direct access to any parcel via a driveway along the parcel's frontage.

Where land uses other than single family residential or duplex are adjacent, the City typically requires cross access to minimize motorists having to use the street to get from one development to another.

For projects requiring a traffic study, the study shall evaluate the proposed site access for the project (see Section 13). The study shall discuss balancing the number of driveways for the project so the number of driveways is minimized, while still providing a sufficient number of access points to minimize congestion and delay.

12.5 RIGHT-TURN DECELERATION/ACCELERATION LANES FOR DRIVEWAYS

A right-turn deceleration lane shall be provided for a driveway if all of the following conditions are met:

A. The driveway is located on a minor or major arterial street.

B. Right-turn ingress volume in the driveway is expected to exceed 50 vehicles during peak hour flows on the roadway.

C. There is ample room and frontage to fit a deceleration lane as determined by the City Engineer.

D. The design speed of the roadway, as determined by the City Engineer, equals or exceeds 45 mph.

There may be cases where some of the above criteria are not met, but the City Engineer may still require a right-turn deceleration lane in the interest of safety.

A right-turn deceleration lane shall be constructed in accordance with Standard Detail RD-26. The length of a deceleration lane shall be 150 feet as measured from the beginning of the curb return to the beginning of the bay taper. The bay taper length shall be no less than 60 feet. The lengths of the deceleration lane and the bay taper may be increased if a traffic study demonstrates the need. The width of the deceleration lane shall be 12 feet. The 12 foot total width of the deceleration lane may include the width of the concrete gutter pan which is typically 2-½ feet.

There may be cases where it will be necessary to merge a deceleration lane with an existing acceleration lane. Where the beginning of a deceleration transition taper will be within 100 feet of the end of an acceleration bay taper, then the deceleration and acceleration lanes shall be merged to form a continuous auxiliary lane.

There may be cases where it is desirable to provide room for right-turn deceleration, but an entirely separate deceleration lane is either too difficult to install, due to design constraints, or is not reasonable in the opinion of the City Engineer. In these cases, a right-turn deceleration taper shall be provided.

Right-turn acceleration lanes for driveways shall not be provided.

12.6 RIGHT-TURN DECELERATION TAPER

A right-turn deceleration taper shall be provided for a driveway if all of the following conditions are met:

A. The driveway is located on a minor or major arterial street.

B. Right-turn ingress volumes in the driveway is expected to be between 10 and 50 vehicles during the peak hour flows on the roadway.

C. There is ample room and frontage to fit a deceleration taper as determined by the City Engineer.

D. The design speed of the roadway, as determined by the City Engineer, equals or exceeds 45 mph.

There may be cases where some of the above criteria are not met, but the City Engineer may still require a deceleration taper in the interest of safety.

A right-turn deceleration taper shall be constructed in accordance with Standard Detail RD-26.

12.7 LEFT-TURN DECELERATION/ACCELERATION LANES FOR DRIVEWAYS

Left-turn deceleration lanes (left-turn pockets) are not required on residential/cul-se-sac and minor collector streets and on collector or minor arterial-undivided streets where a two-way left-turn lane is provided.

On divided minor arterial and major arterial streets and where left turns will be permitted, a left-turn deceleration lane shall be provided. The minimum left-turn pocket length shall be 250 feet plus a 120 foot bay taper. Longer left-turn pockets may be required if a traffic study demonstrates the need.

Separate left-turn acceleration lanes may be required by the City Engineer for traffic safety.

12.8 MINIMUM OFFSET FOR OPPOSING DRIVEWAYS

For land uses other than single family residential or residential duplex, the centerline of driveways on opposite sides of the street shall either be direct line or have a minimum offset distance as listed below (measured from the centerline of the driveways):

A. For driveways on collectors, the minimum offset shall be 250 feet.

B. For driveways on minor and major arterials, the minimum offset shall be as approved by the City Engineer.

   Where a raised median is provided along the center of the street separating conflicting turning movements, the offset requirements as stated above will not apply.

12.9 RESTRICTED TURNING MOVEMENTS FOR DRIVEWAYS

Turning movement restrictions shall apply to unsignalized driveways on major arterial streets as listed below:

A. Left-turns out of driveways onto major arterial streets shall be prohibited.

B. On major arterial streets, driveways within 400 feet of an intersection containing left-turn pockets shall be right-turn in, right-turn out only. No driveways will be permitted in the bus turnout or deceleration/right-turn lane without prior approval of the City Engineer.

C. On major arterial streets, left-turns into driveways may be allowed if all of the following conditions are met:

   1) The standard left-turn lane length and bay taper can be achieved.

   2) Opposing traffic will not queue to the point of blocking the left turn in movement. Such a queuing calculation shall be provided by the consultant preparing the traffic

study for the project, and the analysis shall use the City's projected modeled traffic volumes for the model's horizon year.

3) The driveway is at least 400 feet downstream and 600 feet upstream of an intersection containing left-turn pockets.

D. Turning movements may be restricted for any driveway where deemed necessary by the City Engineer because of safety concerns.

12.10 SIGNALIZED DRIVEWAYS

The need for traffic signals at driveways shall be based on warrants contained in the latest, edition of the Caltrans Traffic Manual (see Section 13 of these Design Standards). Any such evaluation shall be performed by the consultant as a part of the traffic study for the project.

The City will typically deny a request for a new signal if spacing requirements cannot be met. Typical minimum spacing required between traffic signals is one-quarter (¼) of a mile.

The City does not share in the cost of design and construction of traffic signals which solely serve private property (i.e. a "tee" intersection where the driveway is situated as the "stem" of the "tee"). The developer shall bear all costs of providing signalization at the private access point, including design and construction. In the case where a private access point comprises the fourth leg of an intersection where the other three legs are public streets, the developer shall ultimately be 100% financially responsible for the private leg (or approximately one-fourth the cost of signalizing the intersection). This obligation is in addition to sharing in the cost of the remaining signal via payment of the City's Major Road Mitigation Fee (if applicable).

12.11 MINIMUM REQUIRED THROAT DEPTH

Driveways shall meet the minimum required throat depth (MRTD) requirements (see Section 13.2 H). In the case of "drive-thru" facilities, attention is directed to the latter part of Section 13.2 H for minimum on-site storage distances for ingressing vehicles.

On-site parking shall not be permitted within the MRTD area. The MRTD requirement does not apply to single family residential or duplex land uses.

In cases where a traffic study is not required, or in cases where there is insufficient data available to calculate the MRTD in accordance with Section 13.2 H, Table 12-1 shall be used to determine minimum required throat depth for access points for a site. In cases where a traffic study will be provided, but the access points have not yet been determined for a site, Table 12-1 shall be used to estimate the MRTD during the site design process. In these cases, the final MRTD, requirements shall be determined by the traffic study via the methodology in Section 13.2 H. The distances shown in Table 12-1 chart represent vehicle storage equivalents, which means the total required distance may be achieved by summing the throat depths for several access points if more than one access point is to serve the site. In these cases, the distance shown in Table 12-1 shall be prorated to each access point to the nearest 25 feet based on the estimated relative percent usage of each access point.

TABLE 12-1

MINIMUM THROAT DEPTH

LAND USE	SIZE			STREET RIGHT-OF-WAY		
				<60’	60’	>60’
Apartment, Condos, Mobile Homes, Planned Unit Development	0	-	80 Units	25’	50’	50’
	81	-	160	50’	50’	50’
		>	160	50’	50’	100’
Quality Restaurant	0	-	15,000 sf	25’	25’	25’
		>	15,000	25’	25’	100’
High Turnover/Sit Down Restaurant	0	-	8,000	25’	25’	25’
Drive-Thru Restaurant	0	-	2,000 sf	25’	25’	25’
	2,001	-	3,000	25’	50’	100’
	3,001	-	5,000	50’	75’	150’
		>	5,000	75’	100’	225’
Motel	0	-	150 rooms	25’	25’	25’
	151	-	400	25’	75’	125’
		>	400	25’	125’	175’
Convention Hotel	0	-	150 rooms	50’	50’	100’
	151	-	400	50’	150’	250’
		>	400	25’	125’	175’
Office Park	0	-	20,000 sf	25’	25’	25’
	20,001	-	50,000	25’	50’	75’
	50,001	-	100,000	25’	75’	175’
	100,001	-	150,000	75’	125’	250’
	150,001	-	300,000	125’	250’	500’
		>	300,000	200’	400’	825’
General Office	0	-	50,000 sf	25’	25’	50’
	50,001	-	100,000	25’	50’	100’
	100,001	-	150,000	50’	75’	175’
	150,001	-	200,000	50’	100’	225’
	200,001	-	300,000	75’	175’	350’
	300,001	-	400,000	125’	225’	450’
		>	400,000	150’	275’	575’

TABLE 12-1 (Continued)

MINIMUM THROAT DEPTH

LAND USE	SIZE			STREET RIGHT-OF-WAY <60’	60’	>60’
Light Industrial	0	-	100,000 sf	25’	25’	50’
	100,001	-	200,000	25’	50’	100’
	200,001	-	300,000	50’	75’	150’
	300,001	-	400,000	50’	100’	200’
		>	400,000	75’	125’	250’
Industrial Park	0	-	500,000 sf	25’	25’	50’
Discount Store	0	-	30,000 sf	25’	25’	25’
	30,001	-	50,000	25’	50’	75’
	50,001	-	75,000	125’	50’	125’
		>	75,000	50’	75’	175
Shopping Center	0	-	10,000 sf	25’	25’	50’
	10,001	-	20,000	25’	50’	125’
	20,001	-	30,000	50’	100’	175’
	30,001	-	40,000	75’	125’	225’
	40,001	-	100,000	75’	150’	250’
	100,001	-	150,000	100’	175’	375’
	150,001	-	200,000	125’	250’	500’
	200,001	-	250,000	150’	300’	625’
	250,001	-	600,000	175’	375’	750’
	600,001	-	700,000	200’	375’	750’
	700,001	-	800,000	225’	425’	875’
	800,001	-	900,000	250’	500’	975’
	900,001	-	1 million	275’	550’	1075’
		>	1 million	425’	825	1625’
Drive-In-Bank	0	-	10,000 sf	25’	25’	50’
	10,001	-	20,000	50’	50’	200’
	20,001	-	30,000	75’	150’	300’
	30,001	-	40,000	100’	200’	400’
		>	40,000	150’	250’	500’
Supermarket	0	-	20,000	25’	25’	50’
	20,001	-	30,000	25’	50’	75’
	30,001	-	40,000	25’	50’	100’
		>	40,000	25’	75’	150’
Medical Clinic	0	-	100 employees	25’	25’	50’

Section 13:
TRAFFIC IMPACT STUDIES

13.1 RESPONSIBILITY FOR TRAFFIC STUDIES

Traffic studies, when required by the City, shall adequately assess the impacts of a development proposal on the existing and/or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development shall rest with the Developer/Subdivider, not the City. All traffic studies shall be subject to review and approval of the City Engineer.

The flow chart shown in Figure 13-1 shall be used to determine when a traffic study is required for a proposed project. There are two types of traffic studies: short term and long-term. The only difference between the two is the short term study does not need to analyze the future scenarios as outlined in Section 13.2 E below. Short-term traffic studies shall include an explanation as to why the future scenario need not be analyzed (e.g., the proposed land use is consistent with the General Plan, therefore the project's long term traffic impact is already accounted for via the City's Capital Improvement Program which was derived from the City-wide traffic model). The primary purpose of a short-term traffic study is to identify the project's impact to the roadway network with existing traffic volumes, and to evaluate proposed site access. Where access points are not defined at the time the traffic study is prepared, additional traffic work may be required when the access points are defined.

The Consulting Engineer shall discuss proposed projects with the Planning and Public Works Departments prior to starting the study to identify which intersections to include in the study in addition to any other particular concerns or site specific issues.

TO DETERMINE WHEN A TRAFFIC STUDY IS REQUIRED

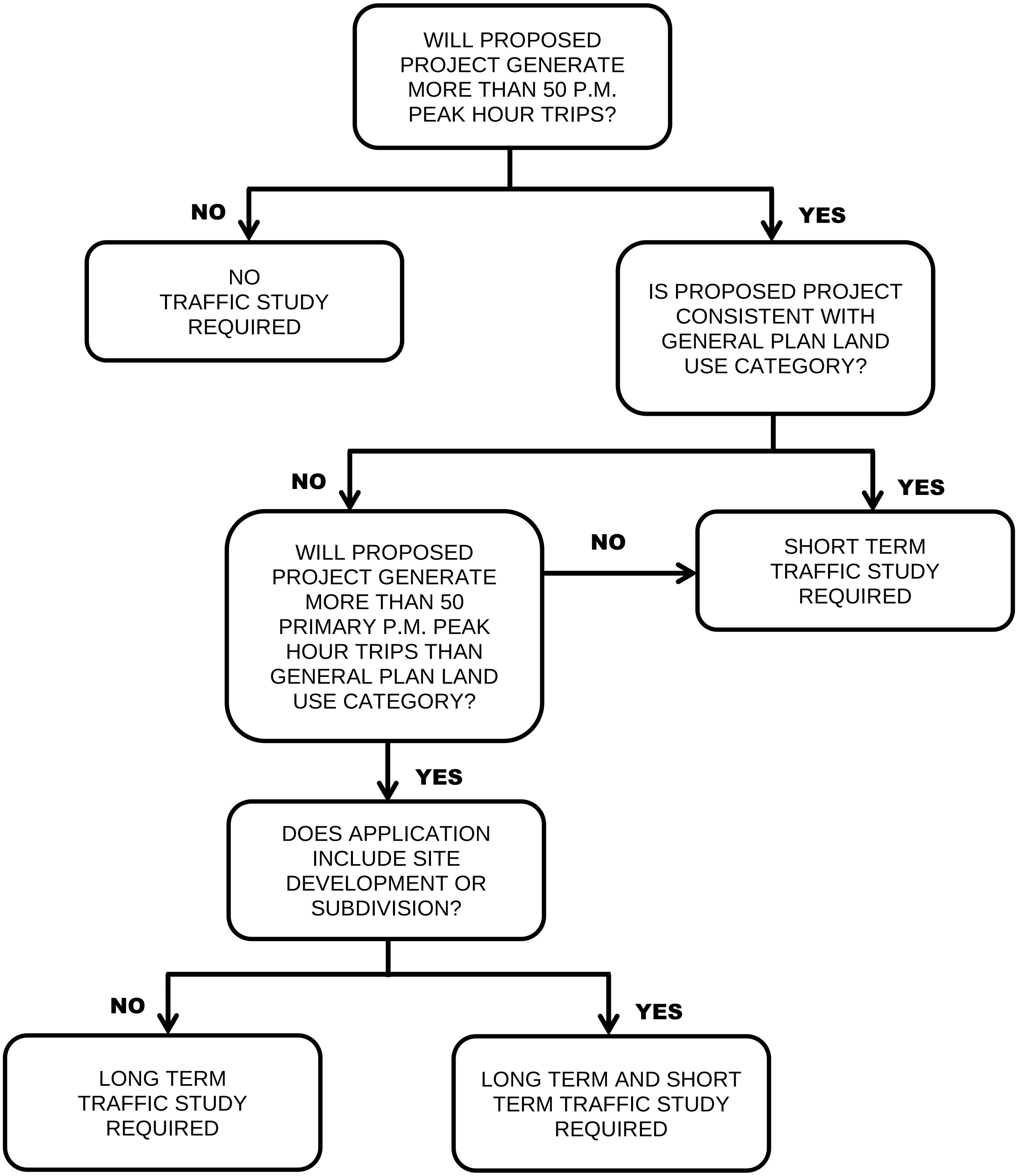


FIGURE 13-1

A. **Preparation and Submittal Requirements** - Traffic studies shall be the responsibility of the Developer/Subdivider and shall be prepared by a Registered Traffic Engineer or a Registered Civil Engineer with demonstrated competence and adequate experience in Transportation Engineering.

Initially, three copies of the traffic study shall be submitted to the Planning Department. For development projects seeking discretionary approval, three copies of the traffic study shall be included with the application submittal. Traffic studies that are not in compliance with the requirements set forth in this manual will be considered incomplete, and may result in the application being deemed incomplete.

The Planning Department will forward one copy of the traffic study to the Public Works Department. The Planning and Public Works Departments will then review the study data sources, methods and findings. Written comments from the Public Works Department will be provided to the Planning Department which will forward the comments to the Developer/Subdivider. The Developer/Subdivider and the Consulting Engineer will then have an opportunity to incorporate necessary revisions or responses as part of the final report.

Fifteen (15) copies of the final report shall be completed and submitted to the Planning Department and Planning Commission Meetings. Ten (10) copies are required for City Council Meetings.

B. **Previous Traffic Studies** - All previous traffic studies relating to a development that are more than two years old shall be updated unless the Planning and Public Works Departments determine that conditions have not changed significantly.

13.2 TRAFFIC STUDY FORMAT

In order to provide consistency and to facilitate staff review of the studies, the following format shall be followed in the preparation of such studies by Consulting Engineers:

A. **Introduction** - The introduction of the report shall contain the following:

1) Land use designation, site and study area boundaries - A brief description of the size of the land parcel, general terrain features, and the location within the City and the region shall be included in this section. In addition, roadways that afford access to the site and those that are included in the study area shall be identified.

   The exact limits of the study area should be based on engineering judgment and an understanding of existing traffic conditions surrounding the site. In all instances, however, the study area limits shall be subject to approval of the Planning and Public Works Department. A vicinity map that shows the site and the study area boundaries in relation to the surrounding transportation system shall be included.

2) Existing and proposed site uses - The existing and proposed uses of the site shall be identified in terms of the various zoning categories of the City. In addition, the specific use for which the request is being made shall be identified, if known, since a number of uses may be permitted under existing ordinances. Parcels in the vicinity

of the site shall also identify the zoning, land use and specific uses. This information shall include square footage of the various uses or the number and size of the units proposed.

It shall be the intent of the traffic study to evaluate the worst case impacts for the proposed development allowed by zoning. If several different uses are permitted by the zoning, the land use with the greatest overall traffic impact shall be assumed for the study.

3) Existing and Proposed Roadways and Intersections - Within the study area, the Developer/Subdivider shall describe and provide volumes for existing roadways and intersections including geometric and traffic signal control as well as improvements that have been proposed by government agencies and other development projects. The study shall identify roadway improvements within the study area planned to be constructed by the City as part of the City's Capital Improvement Program.

B. **Project Trip Generation** - A summary table listing each specific use, the size involved, the trip generation rates used (total daily traffic and A.M./P.M. peak hours), and the resultant total trips generated shall be provided for the project site. The peak hour analyzed shall be that of the roadway system, not the proposed project. This section shall also include a discussion on how the project's trip generation rate compares with typical trip generation rates for the site's existing General Plan land use category. If the proposed project represents only a portion of a larger overall site, such as a phased project, then the traffic study shall discuss the degree to which both the initial phase and the ultimate development impact the roadway network.

Trip generation shall be calculated based on data contained within the latest edition of the Institute of Transportation Engineer's (ITE) Trip Generation Manual or more appropriate local data as approved by the Public Works Department. Any internal trip reductions or modal split assumptions will require analytical support to demonstrate how the figures were derived. Peak hour reductions for Transportation Systems Management (TSM) will be allowed but only to the extent as provided per the City's TSM ordinance.

Pass-by trip factors may be used to reduce the estimated additional total daily traffic to streets serving a proposed development. They are not to be applied to reduce turning movement volumes at driveways serving the proposed development. The percentage of pass-by trips used shall be in accordance with data available in the ITE Trip Generation Manual. If no such data is available in the manual, then the rates shown in Table 13-1 may be used. Percentages other than ITE's or those shown below also may be used provided that supporting data is included in the study, and that the City finds the data acceptable.

TABLE 13-1

LAND USE	PASS BY TRIPS
Banks	14%
Regional Shopping Center	9%
Supermarkets	28%
Hardware Stores	8%
Auxiliary Commercial Uses	16%
Neighborhood Convenience Centers	40%
Drive-In Restaurant	40%
Service Stations	50%

C. **Trip Distribution** - The estimates of percentage distribution of trips generated by the proposed development onto the roadway network shall be shown on a map. The methodology of distribution shall be discussed in the study. The Consulting Engineer shall use the City's traffic model to estimate trip distribution.

D. **Traffic Assignment** - The volume of site-generated traffic on the area's street system shall be shown on a map. The technical analysis steps, basic methods, and assumptions used in this work shall be clearly stated. The assumed trip distribution and assignment shall represent the most logically traveled route for drivers accessing the proposed development. These routes can be determined by observation of travel patterns to existing land uses in the study area.

E. **Short-Term -vs- Long-Term Traffic Studies** - A short-term traffic study shall include items 1, 2, and 3 below.

Graphics shall be provided which show the following traffic volumes for private access points, intersections, and streets:

1) Existing P.M. peak hour directional roadway traffic volumes including turning movements at intersections.

2) The data in item 1 above plus projected site traffic volumes for the development scenario being analyzed. Include projected turning movements at driveways. It is acceptable to combine items 1 and 2 into one graphic.

3) Other peak hours which are determined by the City to be critical to site traffic and the street system in the study area shall be included and shall show the same information as is provided for above. Examples of other peak hours are A.M. peak, noon peak, and project peak.

A long-term traffic study is typically prompted by a request for a rezone of property. A long-term traffic study shall address the long term impact to the City's Capital Improvement Program (C.I.P.) caused by the rezone. This requires changing the land use in the City's latest version of the City wide traffic model and rerunning the model to identify any impact to the C.I.P. The term "impact" in this case refers to any additional improvements needed to maintain the City's level of service policy, or any change as to when a previously identified improvement is needed.

It shall be the Consulting Engineer responsibility to provide up-to-date existing roadway volumes and intersection turning movements. The Consulting Engineer may obtain recent (1 year or less) traffic count data on file with the Public Works Department, if available. If no such data exists, the Consulting Engineer shall collect new traffic count data in the field. "Future", as used above, refers to the horizon year of the City's computer traffic model and Capital Improvement Program.

The City may request any traffic study to include future traffic forecasts to project traffic volumes based on the current buildout scenario.

F. **Traffic Index** – Long-term traffic studies shall contain an estimate of the Traffic Index (TI) for the study streets. The estimated TI shall be for a 20-year period and follow procedures in Caltrans Highway Design Manual. Both short-term and long-term traffic studies shall include an evaluation of construction traffic routes and recommend adjustment of TI's to account for construction traffic. Traffic Indexes shall be approved by the City prior to publication of the final traffic study.

G. **Level of Service (LOS)** - This section shall include tables showing the level of service and volume/capacity ratio for each roadway intersection for each scenario. These parameters shall be calculated using the Transportation Research Board (TRB) Circular 212 Planning Method. If the intersection is unsignalized, then the methodology in Chapter 10 of the TRB 1985 Highway Capacity Manual shall be used. The report shall include a discussion of assumptions made in the above calculations, such as saturation flow rates, peak hour factors, and lane configurations for each intersection.

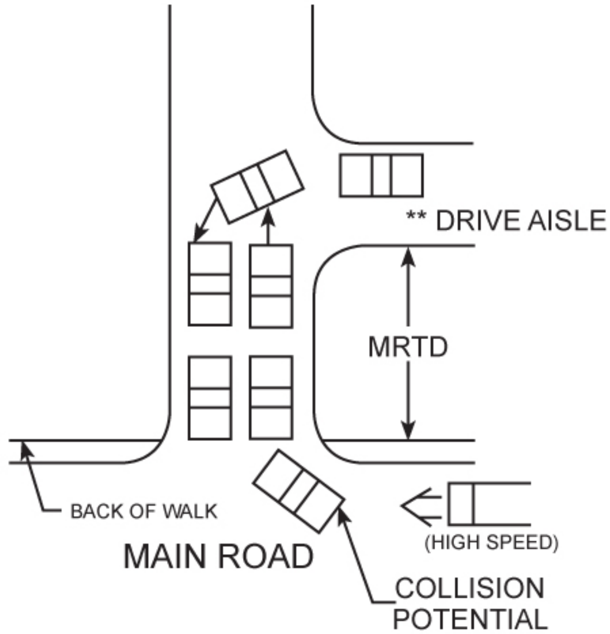
Intersection level of service "C" shall be the peak hour design objective. A LOS worse than "C" shall not be acceptable unless the intersection is operating worse than LOS "C" prior to project construction or the City's General Plan identifies a LOS worse than "C" as being acceptable. If either case applies then the report shall discuss whatever plans the City has for intersection improvements and shall include a LOS analysis for the "improved" scenario. The Consulting Engineer shall inquire with the Public Works Department as to planned roadway and intersection improvements.

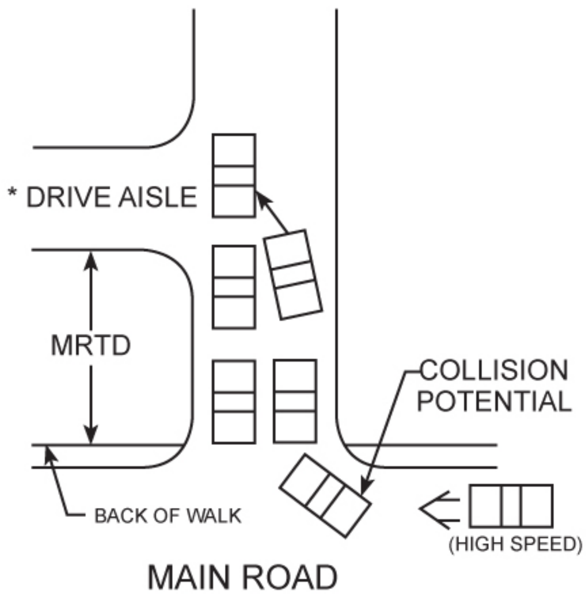
If the proposed project is shown to cause degradation of intersection LOS to worse than "C" (or whichever LOS is identified in the General Plan for the particular intersection) after considering any improvements already planned by the City, then the traffic study shall recommend feasible mitigation measures to bring the intersection level of service within acceptable standards (in accordance with the General Plan).

H. **Site Access** - A short-term traffic study shall discuss how the proposed site access compares with the City's access standards as described in this section and in Section 12 of this manual entitled "Site Access." Some of the topics that may be included in the traffic study are: Number of driveways serving a parcel or site, right-turn deceleration lane or right-turn curb flares for driveways, left-turn deceleration lane for driveways, storage requirements for turn lanes, minimum offset for opposing driveways, restricted turning movements for driveways, and sight distance. Each site access point shall be discussed separately. If the proposed site access does not meet the City's standards, then the traffic study shall identify what modifications to the proposed site access would be necessary to meet City standards and explain why these modifications are not proposed.

The traffic study shall evaluate the minimum required throat depth (MRTD) needed on-site for each access point for the proposed development. The MRTD, as illustrated in Figure 13-2 entitled "MINIMUM REQUIRED THROAT DEPTH," is measured from the back of sidewalk to the first drive aisle. The purpose of the MRTD is to allow enough stacking distance for egressing vehicles so that the first drive aisle is not blocked. This minimizes the possibility of incoming vehicles queuing out into the traveled way of the main street thereby creating a safety concern as shown in Figure 13-2. The MRTD shall be measured in car length increments of 25 feet. In no case will the City allow a MRTD of less than 25 feet for any project. Throat depths greater than the calculated MRTD are encouraged. On-site parking shall not be permitted within the MRTD area. The MRTD requirement does not apply to single family residential or duplex land uses.

MINIMUM REQUIRED THROAT DEPTH (MRTD)





* NOTE: IF THIS DRIVE AISLE IS "ONE-WAY ONLY" TOWARDS THE DRIVEWAY THROAT, THEN A MRTD OF 25' IS ACCEPTABLE.

** NOTE: IF THIS DRIVE AISLE IS "ONE-WAY ONLY" AWAY FROM THE DRIVEWAY THROAT, THEN A MRTD OF 25' IS ACCEPTABLE.

FIGURE 13-2

Figure 13-2 illustrates that the MRTD is a function of the length of the queue of vehicles waiting to exit the driveway. The length of this queue is a function of two variables: the number of vehicles desiring to egress during a given time period versus the number of vehicles that can enter the traffic stream of the main road during that same time period. The first variable, the number of vehicles desiring to egress, is called the EGRESSING DEMAND VOLUME. The second variable, the number of vehicles that can enter the traffic stream of the main road, is called the MOVEMENT CAPACITY. The egressing demand volume will have already been calculated as an earlier part of the traffic study under projected driveway turning movement volumes. The movement capacity can be calculated using methods discussed in the 1985 Highway Capacity Manual (HCM), and concepts discussed by the Institute of Transportation Engineers (I.T.E.).

If the proposed project represents only a portion of a larger overall site, or if it is expected that vehicles generated by other than the project will use the access under study, then the total expected turning movement volumes at the subject access location shall be used in determining the MRTD.

As shown in Figure 13-2, there are cases when an MRTD of 25 feet is acceptable. This is when the first drive isle is "one way only" to the right in the figure. Another scenario where a MRTD of 25 feet is acceptable is when a raised center median is constructed in the driveway throat from the back of sidewalk to the calculated MRTD distance. In this case, the nearest drive aisle can be two-way, but turning movements into and out of the drive aisle are restricted by the raised median, thereby mitigating the concern as shown in Figure 13-2.

If the calculated MRTD is physically or unreasonably too long for the proposed development, then the traffic study shall suggest ways to reduce the MRTD by either reducing the egressing demand volume, or by increasing the movement capacity. Examples of reducing the egressing demand volume at an access location would be to suggest additional egress locations, cause a different distribution of vehicles egressing the site by modifying the on-site design, or somehow reduce the site's trip generation. Examples of increasing the movement capacity at an access location would be to suggest additional egress lanes or, in the case of an unsignalized access location, suggest fewer allowed turning movements onto the roadway. In any case, the traffic study shall fully evaluate the impacts of any such modifications.

There are two types of access locations: unsignalized and signalized. Both are discussed below in reference to calculating the MRTD.

I. **MRTD for Unsignalized Access Locations** - At unsignalized access locations, the movement capacity is calculated using the most current methodology as described in the HCM. It is based on the availability of critical gaps on the main street to allow vehicles to safely egress from the driveway (i.e., the minor street as it is called in the HCM), which is a function of conflicting traffic streams.

In the event that throughs and/or lefts are permitted at the proposed access location, the traffic study shall evaluate this according to the HCM. If there is more than one lane available for egress, then the lane with the longer queue shall determine the MRTD.

The traffic study shall include all assumptions and computations used to calculate the MRTD.

J. **MRTD for Signalized Access Locations** - At signalized access locations, the movement capacity for egressing vehicles is controlled by signal timing. On page 467 of the above referenced I.T.E. book, there is a formula for calculating what the maximum length of the egressing queue will be. It is formula number 15.144 which says that the maximum queue is equal to the average arrival rate of traffic (i.e., the egressing demand volume) multiplied by the effective red time in seconds.

Obviously, signal timing parameters such as cycle length and split will directly affect the length of the egressing queue. This is where Chapter 9 of the HCM comes into play. The Consulting Engineer can use the Operational Analysis methodology to determine reasonable signal timing parameters. The goal of the calculations will be to maintain LOS "C" for all movements on the main road. For main road traffic volumes, the consultant shall use projected future traffic volumes as calculated by the latest citywide traffic model. For existing traffic signals, the consultant is recommended to discuss likely signal timing parameters with City Engineer. There may be some restrictions to signal timing parameters for existing signals due to progression, etc. Once an effective red time is calculated for the egressing traffic, the maximum length of the egressing queue can be calculated. The MRTD shall be this length rounded up to the nearest division of 25 feet.

Typically, signalized access locations will have more than one approach lane for egressing vehicles. As in the case with unsignalized access locations, the lane with the longer queue will determine the MRTD. In addition, the traffic study shall include all assumptions and computations used to calculate the MRTD.

In addition to MRTD requirements, the traffic study shall evaluate vehicle storage requirements for "drive-thru" type services. The goal here is to provide enough vehicle stacking distance to ensure vehicles will not queue out into the public right-of-way. Listed in Table 13-4 are various types of drive-thru facilities and their respective stacking requirements. The distance is measured from the back of sidewalk at the street driveway to the service point. One space equals 25 feet.

TABLE 13-4

TYPE OF FACILITY	VEHICLE STORAGE
Drive-thru bank window[1]	10 spaces
Drive-thru restaurant[2]	10 spaces
Drive-thru pharmacy[2]	3 spaces
Automatic car wash	10 spaces
Self-service car wash	3 spaces
Drive-in theater	15% of parking capacity
Hospital[3]	1% of parking capacity
Service station	4 spaces
Drive-thru liquor store[2]	3 spaces
Drive-thru dry cleaners[2]	3 spaces
Self-storage mini warehouse[4]	2 spaces

[1] Reduce to 3 spaces for savings and loan institutions and credit unions.
[2] Measured to pick-up window.
[3] At the main entrance to the hospital.
[4] Measured to gate.

K. **Traffic Signals/Stop Signs** - The need for new traffic signals and stop signs shall be based on warrants contained in the latest edition of the State Traffic Manual.

If a new traffic signal is being proposed which is not already a part of the City's Capital Improvement Program, and the signal installation would result in less than 1,320 feet between signals, then the study shall include a signal progression analysis. The section of roadway to be analyzed for signal progression shall be determined by the Public Works Department and will include all existing and possible future signalized intersections.

The progression pattern calculations shall use a cycle consistent with current signal timing policies of the City. A desirable bandwidth of 50% of the signal cycle shall be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, typically a 60% mainline, 40% cross street cycle split should be assumed. Cycle split assumptions shall relate to volume assumptions in the capacity analysis of individual intersections, and, where computerized progression analysis techniques are used, they shall be of the type which utilize turning movement volume data and pedestrian clearance times in the development of time/space diagrams.

The green time allocated to the cross street will be considered no less than the time which is required for a pedestrian to clear the main street using the Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices standards.

Those intersections which would reduce the optimum bandwidth if a traffic signal were installed may be required to remain unsignalized and have turning movements limited by access design or median islands.

All site access driveways not controlled by traffic signals shall have a stop sign installed on the driveway.

L. **Traffic Accidents** - Traffic accident data for affected street corridors may be required in the study as required by the City. The study period will normally be three years. The locations shall be specified by the Public Works Department. Accident data is on file in the Public Works Department. It shall be the Consulting Engineer responsibility to make copies of this data.

   Estimates of increased or decreased accident potential shall be evaluated for the development, particularly if the proposed development might impact existing traffic safety problems in the study area. Safety improvements shall be recommended where necessary.

M. **Executive Summary** - The Executive Summary of the report shall be a clear, concise description of the study findings. It shall include a general description of all data, project scope and purpose, findings, conclusions, and mitigation measures and recommendations. Technical publications and calculations, documentation, data reporting and detail design shall not be included in the executive summary. The executive summary should be short, complete in itself and not dependent on supplementary data included by reference. The applicant shall satisfy any mitigation measures and/or design elements identified in the traffic study as being needed or recommended for the project.

Section 14:
TRAFFIC SIGNALS

14.1 TRAFFIC SIGNAL NEEDS ASSESSMENT

The need for new traffic signals shall be based on warrants contained in the latest edition of the State Traffic Manual.

14.2 DESIGN STANDARDS

Traffic signals shall be designed in accordance with this manual and the latest editions of the following:

- State Standard Specifications and State Standard Plans, including all standard symbols contained therein.
- California Manual on Uniform Traffic Control Devices (latest edition) (CAMUTCD).

A. **Signal Standard Types -** Traffic signal standards, posts, and mast arms shall be of the types listed in Table 14-1:

TABLE 14-1

STANDARD/POST	MAST ARM	LUMINAIRE ARM
Ped. Push Button	none	none
7 foot 1-B	none	none
10 foot 1-B	none	none
Type 15	none	6-15 foot
16-2-70	20 foot	none
17-3-70	20 foot	6-15 foot
18-4-70	25-30 foot	none
19-4-70	25-30 foot	6-15 foot
23-4-70	35 foot	none
24-4-70	35 foot	6-15 foot
26-4-70	40-45 foot	6-15 foot
27-4-70	40-45 foot	none
28-5-70	50-55 foot	none
29-5-70	50-55 foot	6-15 foot

The typical luminaire arm length used is 15 feet.

B. **Vehicle and Pedestrian Signal Types -** Vehicle signals and pedestrian signals shall be of the following types:

MAT (3 section only)
MAS
SV-1-T
SV-2-TA
SV-3-TA

TV-1-T
TV-2-T
TV-3-T
SP-1-CS
SP-2-CS
TP-1
TP-2-T

The MAT mounting shall only be used for 3 section vehicle signals for protected left-turn movements. All other mast arm mounted vehicle signals shall be MAS mounted.

All left-turn lanes shall be provided with a protected left-turn phase.

Protected left-turn signals shall be all arrow.

Programmed visibility vehicle signals shall not be used without prior approval of the City Engineer.

C. **Vehicle Signal Alignment -** The following signal head alignments are typical. Variations may be required on a case by case basis.

1) For single left-turn lanes, the left-turn signal shall line up with the center of the left-turn lane as close as possible.
2) For dual left-turn lanes, the left-turn signal shall line up with the line between the two left-turn lanes as close as possible.
3) When a protected left-turn signal is used, the signal for the through movement shall line up with the center of the lane group as close as possible, regardless of the number of through lanes. When 50 or 55' mast arms are used, only one MAS signal shall be used for the through movement instead of two signals as shown in the State Standard Plans.
4) For one through lane with permissive left-turn (no left-turn lane), the MAS signal shall line up with the center of the left half (upon approach) of the through lane, as close as possible.
5) For two through lanes with permissive left-turn (no left-turn lane), the MAS signal shall line up with the center of the #1 through lane as close as possible.
6) When a 4 section MAS signal is used, it shall line up with the center of the left half (upon approach) of the #1 through lane, as close as possible.

D. Number of Vehicle Signal Indications - Typical indications are as follows:

1) For protected left-turn movements: one 3-section all arrow MAT and one 3-section all arrow far left side pole-mounted signal.
2) For through movements (with protected left turns): one 3-section MAS, one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.

3) For through movements (with permissive left turns): one 3-section MAS, one 3-section far left side pole-mounted signal, one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.

4) For split-phased situations: one 4-section MAS (w/GA), one 4-section far left side pole-mounted signal (w/GA), one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.

5) For right-turn arrow overlap situations: same as above except the far right side and near right side pole-mounted signals shall be 5-section with green and yellow arrows. Right-turn arrow overlaps shall not be provided without prior approval of the City Engineer.

E. **Vehicle Detector Layout and Inputs -** Typical vehicle detector layout and inputs shall be as follows:

1) For permissive left-turn situations, the left most through lane shall have four loops spaced ten (10) feet apart. The loop farthest from the stop bar shall have counting ability. The other three loops can share one input.

2) For protected left-turn situations, each left-turn lane shall have three loops spaced ten (10) feet apart and one intermediate loop with counting ability placed the same distance from the stop bar as the intermediate loops for the through lanes.

3) Each through lane shall have two call loops spaced ten (10) feet apart, one intermediate loop with counting ability placed 40% of the distance from the stop bar to the advanced loop, and one advanced loop placed per State Traffic Manual Table 9-1.

4) Each right-turn only lane shall have two loops spaced ten (10) feet apart. The loop farthest from the stop bar shall have counting ability. Detection in the right turn only lane shall have a 20 second delay.

5) For the geometric minor leg of a "tee" intersection where approaching vehicles must turn left or right, each left-turn lane shall have four loops spaced ten (10) feet apart. The loop farthest from the stop bar shall have counting ability. The other three loops can share one input. No intermediate or advanced loops will be required.

The loop nearest the stop bar shall be Type Q and shall be placed 1 foot from the stop bar. Where a loop is designated to have counting ability as discussed above, the loop shall not share an input with any other loop.

Detector handholes shall be provided. Handholes shall be placed so they line up with roadway stripes to minimize the frequency of vehicle tires driving over the handhole covers.

F. **Protected vs. Permissive Left-Turn Phasing -** Protected left-turn phasing should be provided under the following conditions:

1) If any of the guidelines for protected left-turn phases are met (or are expected to be met as a result of a development project) as outlined in the CA MUTCD.

2) Where left-turn lanes are provided.

3) Where the travel distance through the intersection for left-turn vehicles is more than 100 feet, and the 85th percentile speed of opposing traffic is 45 mph or more.

4) Where there are three or more opposing through lanes.

5) Where the left-turn queue recurrently occupies the #1 through lane, and where dual left-turn lanes cannot be provided, and where the left-turn lane cannot be extended.

Protected/Permissive phasing is not used in the City of Folsom.

G. **Traffic Signal Interconnect -** Traffic signal interconnect shall be provided for new signal installations, and for modification of existing signals which currently do not have interconnect. The interconnect cable shall not share conduit with service conductors, but may share conduit with signal conductors and lead-in cable.

The interconnect shall connect the subject signal with at least one existing traffic signal. If the subject signal is between two existing signals, the interconnect shall connect all three signals.

In cases where interconnect conduit is or will be provided, but for some reason interconnect cable is not being provided, the interconnect conduit shall be provided with a green #14 AWG pull wire.

H. **Traffic Signs for Signals -** Pertinent traffic signs shall be specified with the signal design. Typical signs include mast arm mounted street name signs, mast arm mounted regulatory signs, pedestrian signs, roadside warning signs (and pavement markings), and roadside signs on the geometric minor leg approach of a "tee" intersection.

All mast arm mounted or signal standard mounted street name signs shall have a white border per Caltrans Standard Specifications.

In the case of R73 mast arm mounted signs, a common question is whether or not to allow u-turns. This determination is a function of whether or not there is sufficient room for turning radius. The guideline the City uses to allow u-turns is there needs to be at least 36 feet between the left side of the vehicle in the left-turn lane and the curb to the far left of said vehicle.

14.3 PREPARATION OF PLANS

Traffic signal plan sheets shall conform to the provisions of Sections 5 of this Design manual, including submittal requirements, AutoCAD files, etc. Traffic signal plans shall have a title sheet followed by a signal and lighting sheet for each intersection. Signing, striping, and interconnect information may be included on the signal and lighting sheet, or may be included on separate sheets, depending on ease of readability.

A. **Cover Sheet -** The cover sheet shall include the following:

1) Title of project, which shall include the location.

2) A vicinity map with north arrow. The location map is not required to be to scale.

3) Pertinent signature blocks, and revision block.

4) A legend for symbols not found in the Standard Plans (e.g., utility lines, etc.). Below the legend, place the following note: NOTE: SEE STATE STANDARD PLANS ES-1A AND ES-1B FOR EXPLANATION OF OTHER SYMBOLS.

5) A service equipment schedule and wiring diagram with legend.

The following General Notes:

1) All work shall conform to the City of Folsom Public Facilities Improvement Standards and State Standard Specifications.

2) No lane closures are permitted between 3:30 pm and 9:00 am unless approved by the City Engineer. Traffic control shall be per the latest edition of the CAMUTCD (part b).

3) The Contractor shall be responsible for verification of all existing underground utilities, whether or not they are shown on these plans. The contractor shall contact U.S.A. and have utilities marked at least 48 hours before beginning work. Where markings are near proposed foundations, the contractor shall locate underground utilities by potholing prior to excavating.

4) Locations of signal standards, controller, and service pedestal as shown on these plans are approximate. Actual location shall be determined by the Consulting Engineer in the field, with approval of the City Engineer.

5) The contractor shall provide and install all equipment and materials necessary for the signal to operate as shown in the phase diagram.

B. **Signal and Lighting Sheet -** The signal and lighting sheet shall be drawn at a scale of 1 inch equals 20 feet, and shall include the following:

1) A north arrow.

2) Existing and proposed field conditions which include, but are not limited to, the following: underground and overhead utilities, driveways, fire hydrants, poles, signs, fences, street lights, edge of pavement, curb and gutter, sidewalk, right-of-way line, P.U.E.'s, roadway striping, medians, centerline, pull boxes, wheelchair ramps, trees (particularly those needing trimming), adjacent topography, etc. Existing field conditions, appurtenances, etc, shall be dashed and screened. Proposed shall be solid and bold.

3) Pole and equipment schedule.

4) Conductor and conduit schedule. The schedule shall include rows showing "percent fill" values, and conduit quantity/size.

5) Complete traffic signal design, including but not limited to, the following: conduit runs, detector loops (with input designations), detector handholes, vehicle and pedestrian signals (with phase designation), luminaires, pedestrian pushbuttons (with phase designation), controller, service pedestal, service point, emergency vehicle detectors, signing, striping, and interconnect.

6) Phasing diagram. Designate type of flashing operation below the phasing diagram.

7) Phasing for emergency vehicle preemption. Typically, protected left-turn phases are combined with the concurrent through movement during EV preemption.

Section 15:
STREET LIGHTING AND ELECTRICAL

15.1 GENERAL – STREET LIGHTING

This Section describes typical design practices for new or modified street lighting systems within the City of Folsom.

15.2 STREETLIGHT DESIGN STANDARDS

Street lighting shall be designed in conformance with the information contained herein, the current edition of the City of Folsom Standard Construction Specifications, and the "American National Standard Practice for Roadway Lighting" of the American Standards Institute, the average horizontal maintained foot-candles for the various street classifications shall be as shown on Plate 15-C. Data and calculations supporting the above requirements shall be submitted for review, or the predetermined design standard included herein shall apply.

15.3 STREETLIGHTS REQUIRED

Streetlights shall be required for all lots and parcels being developed or constructed upon unless exempted. In addition, streetlights may be required for lots and parcels containing existing structures, which are being improved or altered, depending on the nature and extent of the work. Typical streetlight placement locations are shown on Plates 15-A and 15-B.

No new trees shall be planted within 20’ of a street light.

15.4 STREETLIGHTS NOT REQUIRED

Streetlights are not required for a Single Residence.

15.5 DEVELOPER'S RESPONSIBILITY

Existing streetlights that must be relocated or repositioned as a result of the construction of new streets or driveways into a development shall be the responsibility of the developer.

15.6 UTILITY COMPANY AUTHORIZATION

A written notice from the serving utility company, stating that line clearances and services have been checked and are adequate, shall be submitted to the Engineer for all developments.

15.7 STREETLIGHT DESIGN DETAILS

A. Intersections

Intersections shall have at least one streetlight.

B. Cul-De-Sacs

All cul-de-sacs shall have a streetlight within the bulb. The location of the streetlight within the bulb shall conform to Plate 15-B.

C. Spacing

Maximum street lighting spacing, measured along the street centerline, shall conform to Plate 15-C.

D. Streetlight Poles

All streetlight poles shall be of galvanized steel. All pole construction and materials shall conform to the standards outline in the Standard Specifications.

The Engineer may approve special or unusual designs if the character of the surrounding neighborhood warrants unusual design. Where special or unusual design streetlight poles are to be used, the developer shall supply to the City additional poles to be used for future pole replacement. The minimum number of replacement poles to be supplied to the City shall be 10 percent of the poles being installed with any fractional percent being rounded up to the next whole number.

E. Luminaires

The type of streetlight and the appropriate wattage shall be specified on the plans. The luminaries shall be high-pressure sodium type with internal ballasts. All luminaries shall conform to the Standard Specifications.

The light pattern for each Luminaire shall be specified on the plans.

F. Service

All street lighting systems shall have underground service provided. Service points shall be provided within a utility easement immediately adjacent to or within the right-of-way and shall be open and easily accessible to the street frontage.

G. Pullboxes

All pullboxes, including the size, shall be shown and identified on the plans. Pullboxes shall be installed at the locations where more than two conduit runs intersect, where conduit runs are more than 200 feet long, where shown on the plans, at critical angle points, and at such locations ordered by the Engineer. Normally, a No. 5 pullbox will be used unless otherwise noted on the plans (see on Standard Detail SL-07).

H. Conductors

All conductors, including quantity and size, shall be identified on the plans. Unless otherwise specified, conductors shall be single conductor with THW insulation, solid or stranded copper, sized in accordance with these Design Standards and the National Electric Code.

The minimum conductor shall be in accordance with Section 3 of the Standard Specifications.

I. Photo Cell

A single twist-lock receptacle suitable for SMUD photocell shall be provided on the luminaire nearest to the service point for each service.

J. Conduit

All conduit runs, including the size, shall be shown and identified on the plans. The conduit size shall be determined according to the National Electrical Code, with the minimum size being 1½-inch diameter conduit. Larger size conduits may be required at the discretion of the City.

K. Electrical Equipment and Work

Control and switching equipment and fusing of all circuits shall meet the requirements of the National Electrical Code, the Basic Electrical Regulations, Title 24, Part 3, of the California Administrative Code, the rules of the National Board of Fire Underwriters, and the City of Folsom.

15.8 MASTER PLANNING

Master planning is the determination of streetlight locations between control points. Control points are proposed streetlight locations at street intersections in accordance with Section 15.7 and existing streetlights. The purpose for master planning is to end up with an overall uniform street light system meeting minimum requirements. On 80-foot and wider streets, master planning shall apply to both sides of the street. The procedure for master planning is outlined as follows:

A. Determine the nearest intersections each way from the streetlight locations required. Determine the location of the streetlights at the intersections in conformance with these design standards.

B. Determine the existence of any City owned and maintained streetlights situated between the adjacent intersections above.

C. Determine the distance between the adjacent designed intersection streetlights above and/or adjacent existing streetlights, whichever are nearest to the street light locations being determined.

D. Divide the distance into the most possible equal spaces between lights that can be obtained in conformance with the spacing requirements herein.

E. Compare the light locations to intersecting property line, driveways, pedestrian lanes and utility obstructions as follows:

1) If the location falls close to a property line and the street light location can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.

2) Generally, streetlights should be situated at intersecting property lines for residential lots with minimal frontage (75 feet or less). The light spacing may have to be unbalanced, with additional lights being added to attain this and still comply with the maximum spacing allowed.

3) Streetlight locations shall be adjusted to miss driveways and existing utility obstructions by five feet.

15.9 CONDUIT

Installation of conduit shall conform to the requirements of the City Standard Construction Specifications. The types of conduit to be used, unless the Engineer approves an alternate material, are:

A. Rigid Steel Conduit - hot dipped galvanized

B. Rigid Non-Metallic Conduit

15.10 CONTROLLER UNIT

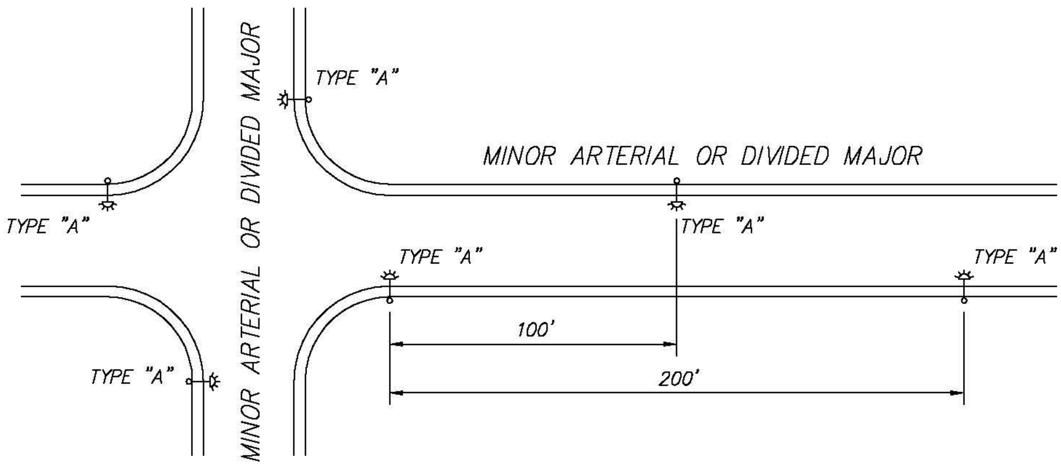
The controller unit shall be Model 90 for intersections within the City. Intersections on State Routes shall have a Model 170 controller unit in conformance with Caltrans specifications. In general, the cabinet used with the Type 90 controller at new installations shall be the Type M cabinet. The cabinet used with the Type 170 controller shall be the Type 332 cabinet in conformance with Caltrans specifications.

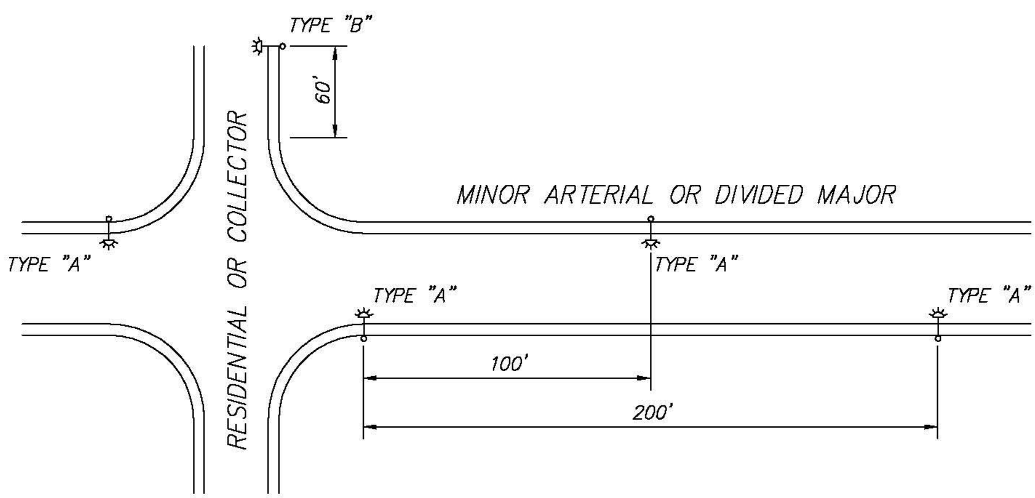
15.11 PLATES

A. Plate 15-A Street Light Placement on Minor Arterials & Divided Majors

B. Plate 15-B Typical Street Light Locations Collector & Residential

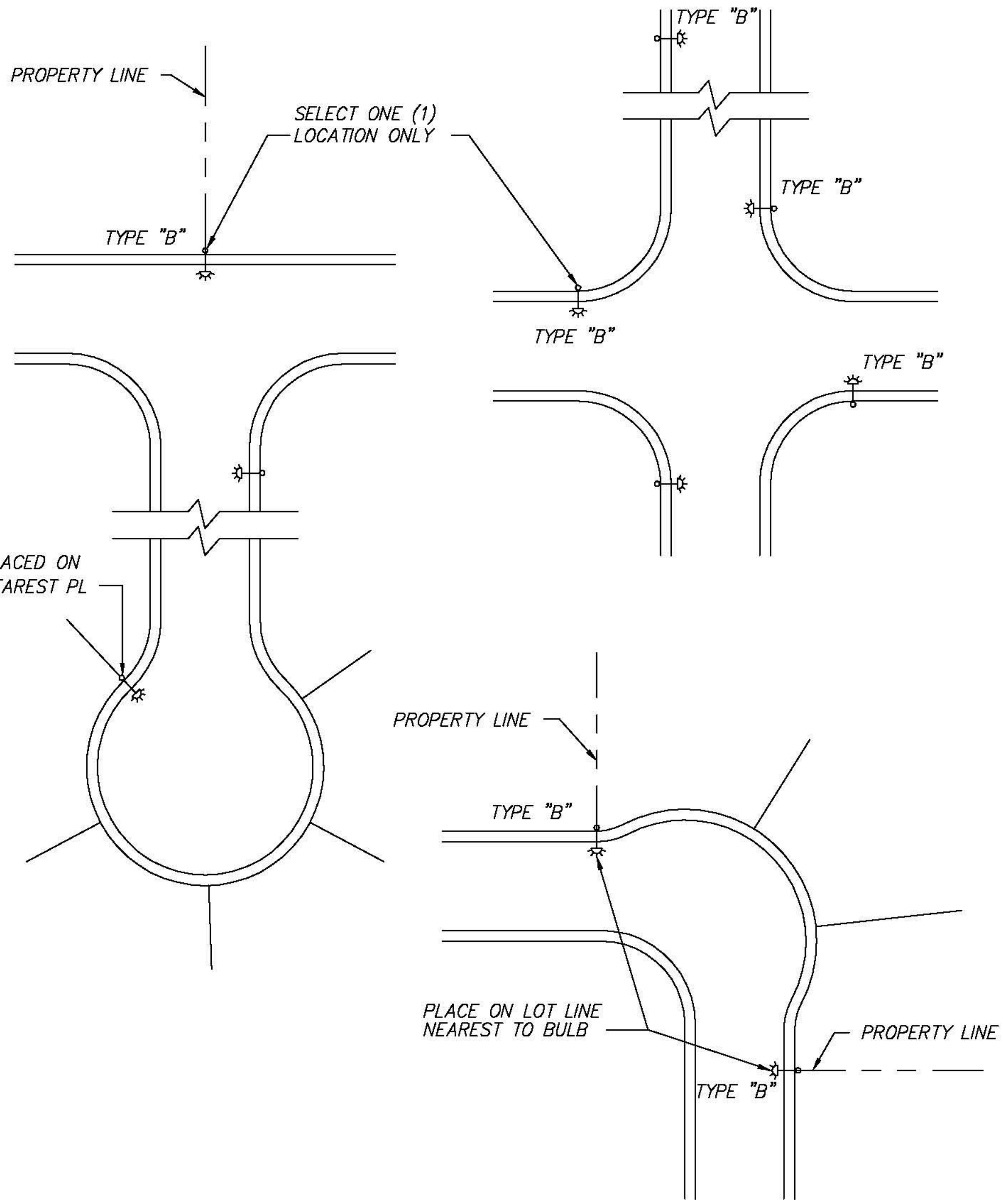
C. Plate 15-C Street Lighting Design Criteria





NOTE:
FOR STREET LIGHT SPACING REQUIREMENTS, SEE PLATE 15-C.

STREET LIGHT PLACEMENT ON MINOR ARTERIALS DIVIDED MAJORS
PLATE 15-A



NOTE:
FOR STREET LIGHT SPACING REQUIREMENTS, SEE PLATE 15–C

TYPICAL STREET LIGHT LOCATIONS COLLECTOR RESIDENTIAL
PLATE 15–B

STREET CLASSIFICATION	ST. TYPE & R/W WIDTH	TYPE STREET LIGHT	NORMAL MOUNTING HEIGHT	AVERAGE MAINTAINED FOOTCANDLE	MAINTENANCE FACTOR
MAJOR	120'	A	30'	.59	.65
	110'	A	30'	.59	.65
MINOR	90'	A	30'	.40	.65
COLLECTOR	60'	A	30'	.29	.65
	50'	A	20'	.15	.70
INDUSTRIAL COMMERCIAL	60'	A	30'	.26	.65
RESIDENTIAL	50'	B	20'	.13	.70
	44'	B	20'	.12	.70

1. LUMENS USED TO CALCULATE THE AVERAGE MAINTAINED FOOTCANDLE SHALL BE 80% OF INITIAL LUMEN VALUE RATED BY THE LAMP MANUFACTURER.

STREET CLASSIFICATION	ST. TYPE & R/W WIDTH	TYPE STREET LIGHT	NORMAL MOUNTING HEIGHT	HIGH PRESSURE SODIUM LAMP WATTAGE	FRONT ON LOT	BACK ON LOT	LIGHT DISTRIBUTION PATTERN MIDBLOCK LOCATION
					SPACING (ONE SIDE ONLY)		
MAJOR	120'	A	30'	250	220	220	III
	110'	A	30'	250	220	250	III
ARTERIAL	90'	A	30'	150	220	250	III
					SPACING (BOTH SIDES)		
COLLECTOR	60'	A	30'	150	180		
	50'	A	30'	150	200		II
INDUSTRIAL COMMERCIAL	60'	A	30'	150	220		II
RESIDENTIAL	50'	B	20'	100	200		II
	44'	B	20'	100	240		II

1. LAMP WATTAGE SHOWN IS FOR HIGH PRESSURE SODIUM LAMP ONLY. DESIGN CRITERIA MUST BE SUBMITTED FOR ALL OTHER LAMPS.

2. SPACING MAY BE ADJUSTED ±10% TO ALLOW FOR DRIVEWAYS.

3. BACK–ON LOT SPACING MAY BE ADJUSTED TO 330 FT. IF BOTH SIDES OF THE STREET ARE LIGHTED.

STREET LIGHTING DESIGN CRITERIA

PLATE 15–C

Section 16:
DOMESTIC WATER

16.1 SCOPE

The standards contained herein provide the minimum requirements for the engineering design and preparation of improvement plans for water distribution systems related to private development and public improvement projects within the City of Folsom. These Design Standards cover the size, layout, and placement of water distribution mains as well as appurtenant gate valves, fire hydrants, blow-offs, and water services.

16.2 AUTHORITY AND RESPONSIBILITY

The Environmental and Water Resources Department Director is given the authority and responsibility to produce and distribute a safe supply of drinking water to the public. The primary responsibility for adherence to the design standards contained herein is delegated to the Environmental and Water Resources Department. The City of Folsom reserves the right to revise and update the Design Standards from time to time to protect the health and safety of the water consuming public.

All improvements to the City's water distribution system shall be designed to meet the applicable and current requirements of the following standards:

1. City of Folsom Municipal Code
2. Water System Cross-Connection Control, Chapter 13.22, of the Folsom Municipal Code.
3. City of Folsom Standard Construction Specifications.
4. Laws and standards of the State of California, Department of Public Health relating to domestic water supply. Particularly the applicable provisions of California Waterworks Standards contained in Title 22, California Administrative Code.

In case of a conflict between the various standards, the design criteria of the City as presented herein shall govern.

16.3 DEFINITIONS

The terms used in these Design Standards shall have the following meanings:

A. Water Distribution System

   A collection of interconnected elements that store, convey, and distribute drinking water to the public for a variety of consumptive uses. The elements making up a water distribution system include a network of distribution mains, valves, blow-offs, fire hydrants, and water services as well as transmission mains and storage reservoirs.

B. Hydraulic Analysis and Modeling

Hydraulic Analysis and Modeling is required on any new water system. Hydraulic modeling illustrates the effects of changing demand and climactic conditions within a water distribution system. Hydraulic modeling should include the analysis of demand, pressures, water age, etc.

C. Water Plan

A separately prepared engineered plan, drawn to scale, showing the layout and details of water distribution system improvements to be constructed for any given private development or public improvement project. Preparation of separate water plans is required whenever the water distribution system improvements are "major" in scope. The definition of what constitutes a "major" improvement as well as a "minor" improvement is given herein.

D. "Major" Water Improvement

Scope of improvement or extension to the City's water distribution system such that the work is required to be shown on a separately prepared water plan. Such "major" improvements include:

1) Water main extensions 100-feet or more in length.
2) The replacement of an existing water main determined to be too shallow or too deteriorated for continued use.
3) Replacement and/or abandonment of an existing undersized water main with a larger main.
4) All City maintained water mains located in public street and public easements.
5) New residential subdivisions.

E. "Minor" Water Improvement

Scope of improvements to the City's water distribution system is such that the proposed work may be shown on a street frontage improvement plan, site development plan, or plumbing plan for a building permit project. Such "minor" improvements include:

1) Water main extensions less than 100-feet in length.
2) Installation of water service(s) (domestic, fire, or landscape irrigation).
3) Installation of fire hydrants (new hydrants as well as relocation and/or adjustment to grade of existing hydrants).
4) Short length raising or lowering of existing water mains to eliminate grade conflicts with proposed sanitary sewer or storm drainpipes.

F. Water Mains

Public water mains placed in public and private streets and alleys and public easements for the purpose of conveying and distributing potable (drinking) water to the public for such uses as domestic consumption, landscape irrigation, and fire suppression. Water mains consist of distribution mains and transmission mains.

G. Water Distribution Mains

Water distribution mains from 4-inches through 16-inches in diameter may be PVC C-900, Cement Mortar Lined and Coated (CMLC) steel pipe, or Ductile Iron Pipe (DIP) and restrained with concrete thrust block as identified in Construction Detail WR-04, machined grooved spigots with continuous circumferential splines, or wedge style mechanical joint (EBAA, Megalug 2000PV; Tyler Union, Series 2000 Tufgrip; Star Pipe Products, Stargrip 4000 Series; Or approved equal) as described in Section 4 – Domestic Water Supply System Construction. Ductile iron pipe is required to be cathodically protected as described in Section 4 – Domestic Water Supply System Construction.

H. Water Transmission Mains

All water transmission mains that are used to convey large volumes of water from where the water is produced, to selected points throughout the distribution system as well as to (and from) storage reservoirs to meet fluctuating daily and seasonal demands shall be CMLC steel pipe or ductile iron pipe regardless of diameter. Water transmission mains regardless of diameter shall not be tapped for the installation of water services unless otherwise approved by the Environmental and Water Resources Director. Each transmission main shall be designed with a Cathodic Protection system, double encased with 8 mil polyethylene, and shall be standard push-on non-restrained joints, restrained push-on joints, or mechanical joint type and mechanically restrained with mega lugs as needed.

I. Circulating Water Main

A looped length of water distribution main with two or more "tie-in" connections to other water mains in the City's distribution system.

J. Dead End Water Main

A length of water distribution main longer than 50 feet with only one "tie-in" connection to other water mains in the distribution system.

K. Public and Private Water Mains

Public water mains are water mains that are owned and maintained by the City. Private water mains are owned and maintained by the property owner(s) or, in some cases, by a homeowner's association.

Water mains shall be located within public streets, alleys, and/or easements to be considered <u>public</u> water mains. On-site water mains serving one or more parcels shall be privately owned. For parcels with private on-site water mains, the fire service main shall be separate from the domestic water mains. Public water mains domestic and fire service shall be protected by approved Reduced Pressure Principle Assembly (RPPA) and Reduced Pressure Detector Assembly (RPDA) respectively where the main transitions from public to private.

L. Water Service

Water services are short runs of pipe connected to a water distribution main for the purpose of supplying water to individual lots or parcels of land. All water services shall have a meter and approved Reduce Pressure Principal Backflow Preventer device. Water services provide water for domestic, fire, or landscape irrigation purposes to residential, commercial, and industrial consumers. Water services range in size from one inch through 12-inches in diameter. All water services are required to be metered, in accordance with the City Standard Details.

M. Fire Service

An underground water service pipe installed for connection to an on-site fire suppression system required for certain types of building occupancies. Such fire suppression systems may include wet or dry standpipes, automatic fire sprinkler lines, as well as private fire hydrants located on-site. Fire services are not metered but require the installation of a RPDA backflow from the most current list of approved devices. No domestic or irrigation connections shall come off any fire service line.

N. Landscape Irrigation Service

A water service installed for the sole purpose of supplying water to a landscape irrigation system such as found in a public park or center median of a street, as well as the landscaping in the front and around the sides and rear of multi-family residential, commercial, and industrial buildings, and off-street parking lots.

Landscape irrigation services are required to be metered and shall be separate from the domestic water service. All separate landscape irrigation services require the installation of a RPPA backflow prevention assembly. Please refer to the “Back Flow Prevention Assemblies” portion of this section.

O. "Point of Service"

As applied to water services, the "point of service" or "service connection" is defined as the location where the City terminates maintenance responsibility. The "point of service" is at the downstream side of the meter (see standard detail WR-1).

P. Water Service Line and Customer Service Line

All water services may be divided into two segments consisting of a water service line and a customer service line. The water service line consists of the portion of the water service pipe placed within a public street or alley and extends from the connection at the water main to the "point of service". The customer service line consists of the portion of the water service pipe extending beyond the "point of service" onto private property. For small water services (2-inches in diameter or less) the water service line originates at the corporation stop, where the water service pipes connects to the main, and extends to and includes any shut off valve (curb stop) placed at or near the "point of service".

For water services 4 inches in diameter and larger, the water service line extends from a gate valve placed at the connection to the water main to a second gate valve placed at or near the "point of service".

Q. Fire Hydrants

Standard fire hydrants are described in the Standard Construction Specifications. Fire hydrant leads greater than 50-feet shall be 8-inch diameter, minimum.

R. Approved Backflow Prevention Device

"Approved backflow prevention device" shall mean devices, which have passed laboratory and field evaluation tests performed by a recognized testing organization, which has demonstrated their competency to perform such tests to the California Department of Health Services.

S. Water Main "Tie-In" Connection

A water main "tie-in" connection is the juncture or point of connection of one water main with another water main. Water main "tap" and water main "cut-in" are two types of tie-in connections used to connect one water main to another.

T. Water Main "Tap" Connection

A method of making a direct connection of a new water main to an existing water main while the existing water main is kept in service and under pressure. The isolation, shutdown, and de-watering of the existing water main is not required for water main "tap" connections.

Water main "taps" are made with the use of special fittings and equipment. The installation procedure involves the use of a tapping machine to bore a hole through the wall of the pipe of the existing water main after having first bolted on a two part sleeve with gasket followed by the installation of a gate valve.

U. Water Main "Cut-In" Connection

A means of making a direct connection of a new water main to an existing water main that involves the cutting and removal of a short length of pipe from the existing main. A tee or cross fitting is inserted in the resulting gap and connected to the cut ends of the existing water main with flexible couplings.

The "cut-in" type of tie-in connection requires the existing water main to be taken out of service, in other words isolated, shutdown and de-watered.

V. Backflow Prevention Assembly

An assembled system of gate valves and check valves used to prevent the undesirable reversal of the flow of water from the individual consumer back into the potable water system, particularly, the City's distribution system. Reference should be made to the City of Folsom Municipal Code Chapter 13.22, Water System Cross-Connection Control, latest edition, for the particular type of backflow assembly to be used where such assemblies are required.

W. Air-Gap Separation

"Air-gap separation" shall mean a physical break between a supply pipe and a receiving vessel. The air gap shall be at least double the diameter of the supply pipe measured vertically above the top rim of the vessel, in no case less than one inch.

X. AWWA Standards

"AWWA standard" shall mean an official standard developed and approved by the American Water Works Association (AWWA), latest edition.

Y. Backflow

"Backflow" shall mean a flow condition, caused by a differential in pressure that causes the flow of water or other liquids, gases, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than an approved water supply source. Back siphonage is one cause of backflow. Backpressure is the other cause.

Z. Contamination

"Contamination" shall mean a degradation of the quality of the potable water by any foreign substance which creates a hazard to the public health or which may impair the usefulness or quality of the water.

AA. Cross-Connection

"Cross-connection" shall mean any unprotected actual or potential connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or a substance that is not or cannot be approved as safe, wholesome, or potable. By-pass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could occur, shall be considered to be cross-connections.

BB. Double Check Valve Assembly

"Double check valve assembly" shall mean an assembly of at least two independently acting check valves including tightly closing shut-off valves on each side of the check valve assembly and test cocks available for testing the proper functioning of each check valve. These devices shall be from the most current approved list.

CC. Public Water System

"Public water system" shall mean a system for the provision of piped water to the public for human consumption.

DD. Reduced Pressure Principal Backflow Prevention Device

"Reduced pressure principal backflow prevention device" shall mean a device incorporating two or more check valves and an automatically operating differential relief valve located between the two checks, a tightly closing shut-off valve on each side of the check valve assembly, and equipped with necessary test cocks for testing. These devices shall be from the most current approved list.

EE. Private Owned and Maintained Water

"Private Owned and Maintained Water" shall mean any water system located outside of the City right-of-way that is located on private property, private streets, etc. Private water service line ownership and responsibility begins after the water meter.

FF. Fixed Network System

"Fixed Network System" shall mean all infrastructures such as collectors, repeaters, transmitters, etc. required for each water meter to communicate remotely from point of use to the City's water meter database.

16.4 GENERAL REQUIREMENTS AND STANDARDS FOR DETAIL DESIGN

A. Size and Layout of Water Distribution Mains

As previously defined, water distribution mains between 4-and 16-inches in diameter shall be PVC C-900, CMLC steel, or DIP and restrained. Wherever possible, water distribution mains shall be designed in the form of a grid to allow the water pressure throughout the system to be equalized under varying rates and locations of maximum demand. All new water distribution systems shall be analyzed and designed using an appropriate hydraulic model. The hydraulic model shall be considered during system design:

1) Hydraulic Analysis – A Hardy-Cross network hydraulic analysis shall be provided to the Environmental and Water Resources Department.

a. The hydraulic analysis submitted shall include a copy of the following items:

i. The data input files, as well as the analysis results in electronic format.

ii. Information on the proposed development (e.g. type of development, number of units, fire flow requirements, etc.)

iii. Data sheets outlining all assumptions

iv. Map identifying pipe and node numbers and their locations

v. Fire hydrant locations

vi. The name and version of software used for the analysis

vii. Elevations of junctions and source nodes.

viii. Staging or phasing of the development

b. The Hazen-Williams formula shall be used in the analysis of the system. The roughness factor shall be as follows:

i. C=130 for all new PVC C-900 and ductile iron pipes

ii. C=130 for all existing pipes greater than or equal to 14-inches in diameter

iii. C=120 for all existing pipes less than or equal to 12-inches in diameter

c. When identifying the fire flow available in a network analysis, use the hydrant located at the development's weak point (highest point in the development and/or last hydrant on a dead-end main).

Water distribution systems shall be designed to satisfy the following criteria listed below:

1) At maximum day peak hour demand, the operating or "residual" pressure at all water service connections shall be at least 40 pounds per square inch.
2) At average maximum day demand plus fire flow, the operating or "residual" pressure in the area of the fire shall not be less than 20 pounds per square inch.
3) Maximum pipe velocity: 5 feet per second
4) Required Fire Flow:
   a. Single Family Residential: 1,500 gpm for 2 hours
   b. Multi-Family Residential: 2,500 gpm for 2 hours
   c. Commercial/Industrial: 3,000 gpm for 3 hours
   d. Schools: 4,000 gpm for 4 hours
5) Peaking Factors:

   The average day demand to maximum day demand peaking factor shall be 2.0. The maximum day demand to peak hour demand peaking factor shall be 1.7 (3.4 average day to peak hour).

B. Residential

The minimum size water main for single-family residential subdivisions is 6-inches. However, 4-inch diameter water mains may be installed in courts or cul-de-sacs where the length of the water main is 250 feet or less and fire hydrants are not required.

Water distribution systems in areas zoned for single-family residences shall, as a minimum, be analyzed and designed by using appropriate hydraulic modeling software. Velocities within the water distribution system shall not be greater than 5 feet per second.

C. Commercial and Industrial

For areas zoned multi-family, office building, limited and general commercial, light industry, etc., the minimum size water distribution main shall be 8 inches in diameter. Such zoned areas shall have minimum 12-inch water mains at grid intervals of one-half mile.

Areas zoned heavy commercial, heavy industrial, manufacturing industrial parks, etc., require a minimum of 12-inch diameter water mains throughout their distribution systems.

D. Circulating Water Mains

The maximum length of a circulating or looped water main with two or more "tie-in" connections to existing water mains varies according to the size of the main. The limits in maximum length shall be governed by using an appropriate hydraulic model.

E. Dead End Water Mains

Dead end water mains or distribution systems with single tie-in connections are to be avoided. Exceptions are short length streets with cul-de-sacs or temporary dead ends at the ends of streets that will be extended in the future.

The minimum size and limits of length of dead end water mains is as follows:

1) Four-inch diameter main is limited to a maximum length of 250 feet (without fire hydrant).
2) Six-inch diameter main is limited to a maximum length of 600 feet.
3) Eight-inch diameter main is limited to a maximum length of 1,200 feet.
4) Twelve-inch diameter main is limited to a maximum length of 2,400 feet.

The City will determine where it may be necessary to deviate from these maximum lengths of dead end main. Each dead-end main shall have a fire hydrant or blow-off-valve installed at the end of the line.

F. Water Transmission Mains

As previously defined, transmission mains are used to convey large volumes of water from where the water is produced, to selected points throughout the distribution system as well as to (and from) storage reservoirs to meet fluctuating daily and seasonal demands. The installation of water service taps of any size on transmission mains is not permitted without the prior approval of the City. The use of special equipment and techniques is required to install taps on water transmission mains. In addition, water transmission mains may be shutdown from time to time for periods of several days, thus cutting off service to any direct taps. Transmission mains shall be Ductile Iron Pipe (DIP) or steel. A corrosion protection study shall be included with improvement plan submittals. All fittings such as valves, tees, crosses, etc. shall be mechanical joint type and mechanically restrained with mega lugs.

G. Placement of Water Mains

Water mains shall be placed no closer than three feet from the lip of the curb and gutter. The three-foot dimension is measured from the outside edge of the water main to the lip of the gutter. New water mains in existing streets shall also be placed no closer than three feet from the lip of the gutter (existing or future) unless the location of existing utilities dictate otherwise.

Water mains shall be placed to meet the requirements for separation from sanitary sewers as given under "Horizontal and Vertical Separation of Water Mains" contained in the "Horizontal and Vertical Separation of Water Mains" Section. Water mains should also be placed no closer than 5-feet, measured from the outside edge, to other underground utilities such as telephone, electrical, or gas.

For water mains located within public easements, the mains shall be centered within the easement. Dedicated easements shall be clear of all permanent structures, building eaves, roof lines, retaining walls, fences and the future trunks of large tree species. All waterline easements shall be located between two adjoining lots. The easement width shall be the greater of the following:

a. Minimum width of easement shall be 15 feet

b. All easements shall have a minimum width equal to the required trench width according to the standard detail for trench backfill plus two additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to finished grade.

H. Horizontal and Vertical Separation of Water Mains

Water mains and sanitary sewer lines shall be placed to conform to the standards of the Public Water Supply Branch of the State of California Department of Public Health. Excerpts from the standards entitled, California Waterworks Standards contained in Section 64630, Title 22, California Administrative Code, specify:

1) Water mains shall have no contaminated soil conditions resulting from leaky sanitary sewer pipes.
2) Water mains shall be installed at least:
   a) Ten feet horizontally from and one foot higher than sanitary sewers located parallel to the (water) main.
   b) One foot higher than sanitary sewers crossing the water main.
   c) Two feet of vertical clearance shall be provided at all transverse crossings of water mains with sanitary sewer force mains.
   d) A minimum of 6 inches of vertical clearance shall be provided between water mains and storm drain lines as well as other non-sanitary utility lines.
   e) Water mains shall cross over rather than under sanitary sewer lines unless the depth of cover over the water mains is limited.

3) Separation distances specified in (2) shall be measured from the outside dimension of the facilities.

4) Where the requirements of (2) and (3) cannot be met due to topography, inadequate right-of-way or easement (widths), or conflicts with other provisions of these regulations, lesser separation is permissible if:

   a) The water main and the sewer main are located as far apart as feasible within the conditions listed above.

   b) The water main and the sewer main are not installed within the same trench.

   c) The water main is appropriately constructed to prevent the contamination of water in the main by sewer leakage.

      a. Water main shall be ductile iron to a distance of 10 feet on each side of the crossing and be concrete encased.

      b. Sewer or storm drain pipe shall be backfilled with slurry to the spring line the entire width of the trench, see detail WR-22.

To establish the distance between the respective centerlines of water mains (distribution and transmission) and sanitary sewer lines (gravity and force mains) while maintaining a four foot wide column of earth between the trench walls, the following criteria may be used determine the width of the trenches:

Type of Utility	Width of Trench
City sewer lines and water mains	O D + 24-inches
City water transmission mains	O D + 24-inches
County sanitary sewer lines	O D + 24-inches

Refer to the Plate 16-B entitled "Separation of Water, Sewer, and Drain Lines" included at the end of this Section.

Horizontal separation must also be maintained between water pipelines and other utilities such as conduits. Provide a minimum of five (5) foot separation between edge of water pipeline and edge of conduit.

I. Depth of Cover over Water Mains

Water distribution mains are to be placed within certain limits of minimum and maximum depth of cover. The limit for minimum depth of cover will ensure the water main pipe is not over-stressed by the passage of large wheel loads, particularly heavy construction equipment. The limit on maximum depth of cover will help to ensure the cost of excavating to install future water services will not be excessive.

The minimum depth of cover over water mains in areas of new street construction is 36 inches. The maximum depth of cover for water mains in new streets or existing streets with full improvements (curbs, gutters, and sidewalks) is 48 inches. The minimum depth of earth cover over new water mains installed in existing streets that lack full improvements is 36 inches. In all cases the depth of cover is measured from the top of the pipe to finish grade or pavement surface.

For water mains constructed in new streets with deep pavement sections, the determination of the depth to which the water main is to be placed is governed by the greater of the depth of cover when measured from the finished pavement surface versus the depth of earth cover measured from subgrade.

If the level of existing streets and alleys to be reconstructed (re-graded and resurfaced) is to be cut down significantly, existing water mains may need to be lowered or replaced with new water mains installed at greater depth in order to maintain adequate earth cover.

The following tabulated minimum depths of earth cover will serve as a guide in determining to what depth water distribution mains are to be placed in new streets as well as the need to lower or replace existing 4, 6, and 8-inch diameter water distribution mains in existing streets that are to be reconstructed. The depths of earth cover are measured from subgrade to the top of the water main. An allowance is made of 6 inches for scarifying and compaction of subgrade and is included in the tabulated depths. The depths of cover are exclusive of any gate valves placed along the water mains.

Type of Pipe Material	Minimum Earth Cover
Cast or Ductile Iron	36-inches
Polyvinyl Chloride (C-900)	36-inches

The maximum depth of cover over water distribution mains shall be 48 to 54-inches. The maximum cover limits may be exceeded for short distances however, by the need to place water mains below other underground utilities to avoid grade conflicts.

J. Raising or Lowering Water Mains to Resolve Grade Conflicts

Grade conflicts between existing water mains and new or replacement storm drain and sanitary sewer lines are often encountered in the field during construction.

Grade conflicts are problems to be resolved during design and not during construction. Advance "potholing" of existing water mains at locations of potential conflicts during early stages of design will provide the Design Engineer with the information needed to determine if a conflict is likely to occur.

Water mains shall be designed in such a manner that each water main achieves continuous positive or negative slope. Station and elevations within the profile sheets are required at each point of inflection along the waterline profile. Vertical curve data of the waterline is also required on all plan and profile sheets. Fittings used on waterline to go above or below utility conflicts shall be avoided if possible. Water system shall be designed to avoid utility conflicts by pulling the manufacturers recommended maximum joint deflection. In the event that angle fittings on waterlines are required to avoid utility conflicts, all angle fittings shall use a segment of ductile iron pipe and be restrained mechanically between the two angle fittings.

Water mains shall not be designed to pass beneath bridges or creeks. The water mains shall be designed to hang off the bridge with proper seismic joints and encased.

Existing water mains shall not be altered if a conflict arises in the field during construction. The proposed utilities must be re-designed to avoid any conflict with an existing water main.

K. Placement of Gate Valve/Butterfly Valves

Gate valves/butterfly valves are used to isolate and shutdown a section of existing water main, for the purpose of making repairs on the main. Gate valves are required on all mains 10 inches in diameter and less. Butterfly valves are required on all mains greater that 10 inches in diameter. Gate valve/butterfly valves are also placed at tie-in connections of new water mains to existing water mains. In addition, gate valves are placed on fire hydrant branch leads at the connection of the branch lead to a water main. Location of valves is as follows:

1. The number of gate valves/butterfly valves at each tee or cross fitting is the same as the number of inlet/outlet openings of the fitting. Thus tees will require three gate valve/butterfly valves and crosses will require four valves.

2. Only one gate valve is required at a tee fitting placed for the connection of a branch lead for a fire hydrant.

3. No single shutdown will result in shutting down a transmission main.

4. Valves located on water distribution mains shall be spaced no more than 500 feet apart.

5. Valves located on water transmission mains shall be spaced no more than 1,000 feet apart.

6. Gate valves/butterfly valves shall be the same size as the water main. The gate valve/butterfly valves shall be bolted to tee or cross fittings.

7. Gate valves/butterfly valves shall be placed such that a maximum of 40 dwelling units would be affected by a water main shutdown.

8. Where a distribution main crosses a bridge, drainage channel, irrigation canal, railroad, etc., a gate valves/butterfly shall be placed on each side of the crossing for all sizes of water distribution main and transmission mains. All crossings shall be fully restrained and sleeved.

9. Valve clusters should not be located in the middle of major intersections or where the closure of an entire travel lane is required when the valves need to be accessed.

10. For major intersections, locate the end of the tracer wire from the valve cluster to the back of walk inside of a meter box.

L. Placement of Fire Hydrants

Standard fire hydrants shall be placed at a maximum spacing of 500 feet along the streets in single-family residential subdivisions and at a maximum spacing of 300 feet along streets in commercial and industrial areas.

Standard fire hydrants shall be installed on 6-inch diameter or larger distribution mains. No fire hydrant shall be installed on 4-inch diameter distribution mains. Fire Hydrant laterals whose length exceeds 50 feet, shall be a minimum of 8-inches in diameter.

Fire hydrants shall be placed at the beginning or end of round corners (curb returns) at street intersections. Fire hydrants placed between street intersections shall be located on property lines between adjacent lots. The spacing of fire hydrants shall take precedence over the placement of hydrants at street intersections. See plate 16-C entitled "Fire Hydrant Placement and Spacing" included at the end of this Section. Public fire hydrants shall be painted yellow. Private fire hydrants shall be painted white.

At cul-de-sacs in both residential and commercial areas, fire hydrants shall be placed at the beginning of the reverse curve transition to the bulb of the cul-de-sac. Fire hydrants installed in cul-de-sacs shall be installed to operate as an end of the line blow-off valve.

Care shall be taken to avoid placing fire hydrants too close to street lights or traffic signal standards. Coordination of water plans with electrical plans for traffic signal or street lighting systems shall be made to determine the placement of fire hydrants at street intersections to avoid such conflicts.

Fire hydrants shall be installed no more than 150 feet from the furthest corner of any building or other structure requiring fire protection. In commercial areas a fire hydrant should be installed within 40 feet of a Fire Department standpipe hose connection (part of a building sprinkler system). See plate 16-D entitled "Examples of Fire Hydrant Placement for Commercial Buildings" included at the end of this Section.

All fire hydrants placed along streets shall be positioned to provide at least three feet of clearance to any fence, bush, power pole, traffic signal standard, etc., to ensure freedom of operation and access for maintenance. Fire hydrants shall be placed a minimum of five feet from any water service and should avoid sharing the same trench. Fire hydrants shall be placed a minimum of 10 feet away from any existing and/or proposed street trees. In addition, hydrants shall be placed at a location not in conflict with retaining walls or pedestrian handicap ramps.

Fire hydrants shall be placed on the long side of the street in relation to the water main to ensure water personnel and equipment have safe access to the hydrant valve in the event a fire hydrant is hit.

Fire hydrants placed in off-street parking areas around and behind buildings shall be protected from contact with vehicles and shall be located at least 50 feet from the nearest building corner to ensure firefighting personnel and equipment have safe access to the hydrants. Fire hydrants shall not be closer than 25 feet from any structure. See Section 5 of the City Standard Construction Specifications for additional Fire Department requirements.

M. Placement of Blow-Offs

A blow-off shall be installed at the dead end of all distribution mains regardless of the length of the dead end main. An exception to this is made if a fire hydrant has been placed at the end of the length of dead-end distribution main. Blow-offs shall also be placed at low points along the vertical alignment of water distribution mains. Fire Hydrants shall be installed at low points along the vertical alignment of water transmission mains and will serve as a blow-off.

All blow-offs for water mains 12-inch diameter or less shall be 4-inch in size. In addition, a 4-inch blow-off is required at the end of any "future" water service (domestic or fire) 4-inches in diameter or larger. Blow-off for transmission mains shall be sized appropriately, however shall not be less than 4-inches.

Excluding cul-de-sac installations, the gate valve/butterfly valve and outlet pipe elements that make up a blow-off assembly for water distribution mains shall be placed outside or beyond the street pavement whenever possible.

N. Placement of Combination Air Relief Valves

In order to relieve air trapped in high points of the water main, combination air/vacuum relief valves are required on pipeline high points and changes in grade.

O. Installation of Water Services

The curb shall be stamped with a “W” at all water service locations.

Water meters shall be installed on all water services.

All water services are connected directly to water distribution mains and are installed at right angles to the distribution main unless otherwise approved by the City.

The tapping of fire hydrant branch leads for the installation of water services is not permitted.

Two valve boxes may be required for all water services 3-inches in diameter and larger. One valve box is installed over the gate valve/butterfly valve at the connection of the service to the water main. Another valve box is installed in the event a second gate valve/butterfly valve is installed near the "point of service".

Plate 16-F entitled "Key to Installation of Water Services" illustrating the different locations and types of valve boxes used for water services is included at the end of this Section. Also included is plate 16-G entitled "Location of "Point of Service" illustrating the locations of "points of service" relative to right-of-way lines of streets, alleys, and easements.

1. Residential Water Service

   Water services for subdivisions for single-family residences and duplexes are one inch in diameter polyethylene (CTS) services encased in a 2-inch PVC sleeve and shall be placed three feet either side of property lines of the lots unless otherwise directed by the City. Small lots with driveways adjacent to property lines may require the water services to be placed at the centerline of lot, meters should never be placed in a driveway. Water services for corner residential lots are to be placed at the lot frontage with the greater set back distance. The location of the meter box should be no further than three feet into the property. If possible residential water services shall be placed a minimum of ten (10) feet from the installation of any proposed street tree. Saddles for all residential services shall be a minimum of 12-inches from the end of the main and 18 to 24-inches to any other service saddle or pipe joint. Meter boxes are not to be installed in any hardscape areas.

   Banked meter boxes should have the addresses on tags attached to the corresponding water meter.

2. Multi-Family, Commercial, Industrial and School Water Service

   For multi-family development projects such as apartment complexes and for commercial developments such as office buildings, retail stores, shopping centers, etc., the size and location of domestic water services is normally provided on the improvement plans by the design engineer.

   For multi-family, commercial, industrial or schools a single water service connection from the distribution main shall be required to provide water service for domestic, fire and landscape irrigation purposes. At the property line the single water service line shall transition to a manifold. The manifold shall include an individual appropriately sized service line for domestic, fire and landscape irrigation.

   Each parcel whose land use is designated as multi-family, commercial, industrial or school shall have an individual meter and approved Reduced Pressure Principal Backflow Preventer device for domestic, fire and irrigation service.

   For large users: Hospitals, care facilities, large apartments (greater than 100 people), large businesses; two (2) water services are required for the property. If located on a corner, one service will be off each street.

3. Future Water Services

   "Future" water services 2-inches in diameter and smaller shall have a corp stop placed at the end of the services. Four-inch and larger "future" water services require a 2-inch diameter blow-off to be provided as part of the water service installation.

4. Fire Service

   The need for fire services for private development projects as well as their size shall be determined at the time of building permit plan review. Fire services shall have a RPDA type backflow assembly. In addition, fire services shall also have a ¾-inch by-pass meter to register low-flows in accordance with the City Standard Details.

   Large-scale apartment or condominium complexes as well as commercial and industrial developments requiring fire hydrants to be installed on-site shall be provided with fire services that are separate from the services supplying water for domestic use. Fire service lines serving the on-site fire hydrants may also be connected to fire sprinkler systems, fire hose connections, or other fire suppression systems. The separate domestic water service lines shall be designed so as not to be interconnected to any of the fire suppression systems.

5. Landscape Irrigation Service

   Separate water services for City or privately maintained landscape irrigation systems such as planters in commercial or industrial developments, park strips between sidewalks and curbs and gutters, center medians of wide right-of-way streets, City parks, etc. shall be metered. The installation of a RPPA backflow shall be required on all landscape irrigation services. The backflow prevention assemblies for separate irrigation services shall be the reduced pressure principle type. This device shall be from the most current approved list.

   A meter box shall be provided as part of the installation of the landscape irrigation service to serve as a marker for the end of the "future" underground irrigation service, In accordance with Standard Details.

   In cases where a raw water meter for irrigation services is installed after the backflow, install a ball valve after the meter, inside a valve box, to isolate the meter to allow repairs.

6. Temporary Construction Service

   A temporary water use permit is required for all construction water on all project sites.

7. Services 3-Inches and Larger

   All services 3-inches and larger shall be designed to have a meter bypass testing assembly.

P. Installation of "Tie-In" Connections

A water main "tie-in" connection is the point of connection of a newly placed water main with an existing water main. The two types of tie-in connections used are referred to as water main "tap" and water main "cut-in". All tie-in connections, whether "tap" or "cut-in", are made only after the newly constructed water distribution system improvements have been disinfected and satisfactorily pressure tested. The new main shall be isolated from the existing main by an approved backflow prevention device until the new main has passed all tests and disinfections. All parts and tools used for a proposed tie-in shall be disinfected with a 5% chlorine solution.

Water main "hot tap" connections to existing mains are made while the existing water main is kept in service and under pressure. The isolation and shutdown of the existing main is not required. Water main "cut-in" connection requires a section of the existing main to be taken out of service, or in other words, isolated, shutdown, and de-watered. Plate 16-E “Types of Water Main ‘Tie-In’ Connections” illustrates the two types of tie-in connections (water main "hot tap" and water main "cut-in").

The criteria for determining whether the type of tie-in connection will be a water main "hot tap" connection or a water main "cut-in" connection depends in part on the practicality of isolating and shutting down a section of existing water main. That is, the extent of public inconvenience due to the number and length of time residences or business establishments will be without water as a result of the shutdown. The determination of the type of tie-in connection to be used will be made by the City during the course of reviewing water plans for subdivisions, street frontage, and capital improvement projects.

With certain exceptions, contractors are allowed to perform the work of making tie-in connections, both "hot tap" and "cut-in", to existing water mains provided the work is under the direct observation of the City Construction Inspector. Tie-in connections that are of the "hot tap" style shall be made using a stainless steel full circumferential seal type-tapping sleeve with stainless steel bolts. The design engineer shall call out the manufacturer's name with the wording "or approved equal" on the plans. For “cut-in” connections three valves will be added on a tee and four valves on a cross.

All water plans shall indicate, with appropriate notes, the type of water main tie-in connection ("hot tap" or "cut-in") to be used. The determination of the type of tie-in connection to be installed will be made by the City upon review of the water and/or improvement plans. Size on size “hot taps” are not allowed.

Q. Backflow Prevention Assemblies

A reduced pressure principle (RP) backflow device will be required on all domestic water services for commercial, multi-family, industrial, etc. and landscape services. Backflow prevention devices are generally not required for residential services unless the following conditions occur:

1) Presence of an unapproved auxiliary source of water supply, such as a private well or grey water irrigation system, on a customer's premises.

2) On-site presence of a relatively large elevated water storage tank or pressure booster pump.

3) Private water systems with service connection(s) to the City's existing distribution system, such as found in commercial, apartment, or condominium complexes.

Reduced pressure principle backflow prevention assemblies discharge water to the atmosphere when activated by changes in normal operating pressures. Provision shall be made for the control and disposal of this water or the backflow prevention assembly placed in a location such that any water discharged from the backflow preventer will not harm nearby facilities or equipment.

All reduced pressure principle assemblies shall be mounted above ground as detailed on Standard Detail WR-10 in the Standard Construction Specifications unless otherwise approved by the City.

A list of certified backflow assembly testers is available from the City.

R. Type of Protection Required

The type of protection that shall be provided to prevent backflow into the approved water supply shall be commensurate with the degree of hazard that exists on the water user's premises. The type of protective device that may be required (listing in an increasing level of protection) reduced pressure principal backflow prevention device (RP), and an air-gap separation (AG). The water user may choose a higher level of protection than required by the City. The City shall determine the minimum types of backflow protection required to protect the approved water supply. An approved list of certified backflow prevention device testing companies may be obtained from the City.

S. Water Sampling Station Requirements

A permanent sampling station shall be installed in each new subdivision, per Standard Drawings WR-16. It shall be located on the side of the main closest to the right-of-way line, and in a common area or on a common property line. An example of an approved sampling station assembly is the American Machine & Conveyor Model EZ-01F.

T. Restraint

1. Restraint of all fittings, valves, crosses, etc. regardless of size shall be mechanical joint type fittings and restrained mechanically.
2. Thrust blocks for water mains 12-inches and smaller where C-900 pipe is installed shall be the primary method for restraining pipe.
3. The primary method for restraining ductile iron and steel mains 14-inches and larger shall be restrained push-on or mechanical restraint and mechanically restrained mega lugs as needed.
4. Restrain calculations shall be submitted with the plan review.

U. Fixed Network System

Includes the design and installation of all infrastructures necessary such as collectors, repeaters, transmitters, etc. for each water meter to communicate remotely from the meter to the City's water meter database.

V. Pressure Reducing Valve Station

All Pressure Reducing Valve Stations (PRVs) shall be above ground within an insulated enclosure designed two valves, one valve for domestic use and another valve for fire use. The domestic use PRV shall have an orifice plate with pressure reducing, pressure sustaining and flow control capabilities. The magnetic flow meter must be located 10 straight pipe diameters upstream of the PRV station. All PRV stations shall have permanent power and be connected to the City's SCADA system. SCADA functions shall include monitoring of flow, adjusting downstream pressure and adjusting flow.

16.5 WATER IMPROVEMENT PLAN REQUIREMENTS

Plans for the construction of water infrastructure, whether in conjunction with other improvements shall conform to these standards, the Standard Specifications and must meet the following Requirements.

A. Water Study – A water study or water master plan as determined by the Environmental and Water Resources Department may be required prior to review of the water design.

B. General Requirements – Plans for the water improvement project shall include a layout sheet, plan and profile of each public water line, and necessary detail drawings.

C. Layout Sheet – Improvement plans shall include an overall map which shows the project boundaries, water mains, valves, services, and other important items of the work.

D. Plan and Profile Sheets – Water lines to be maintained by the City of Folsom shall be shown on both plan and profile. The following standards, with respect to drafting and the information to be included on the plan and profile sheets apply:

1. Water lines to be constructed shall be indicated on profile by parallel lines spaced to show the pipe diameter to scale. The length, size, and type of pipe material shall be printed parallel to the horizontal grid lines and approximately halfway between the ground surface and pipeline. The profile shall note all proposed appurtenances. Existing facilities shown on the profile shall be dashed or distinguishable from proposed improvement. Stationing shall appear at the lower edge of the profile grid directly under the appurtenance.

2. Water mains shall be designed in such a manner that each water main achieves continuous positive or negative slope.

3. Station and elevations within the profile sheets are required at each point of inflection along the waterline profile.

4. Vertical curve data of the waterline is also required on all plan and profile sheets.

5. Fittings used on waterline to go above or below utility conflicts shall be avoided if possible. Water system shall be designed to avoid utility conflicts by pulling the manufacturers recommended maximum joint deflection. In the event that angle fittings on waterlines are required to avoid utility conflicts, all angle fittings shall use a segment of ductile iron pipe and be restrained mechanically between the two angle fittings.

6. Proposed water services shall be indicated on the plans per the Standard Specifications.

7. Permanent easements shall be shown to scale and dimensioned on the plans.

8. Proposed water lines shall be adequately dimensioned from street centerline. If the waterline is to be located in an easement, sufficient dimensions and bearings from physical features to locate the line in the field shall be shown on the plans.

9. Existing gas, sewer, storm drains, and all other utility lines above or below ground shall be shown on the plans.

10. No trees or permanent structures shall be placed within water easements.

16.6 PLATES

A. Plate 16-A Separation of Water, Sewer, and Drain Lines

B. Plate 16-B Separation of Water, Sewer, and Drain Lines

C. Plate 16-C Fire Hydrant Placement and Spacing

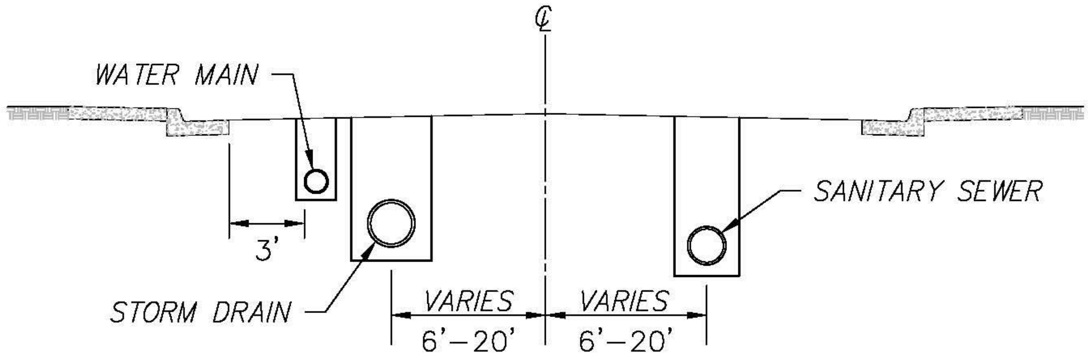
D. Plate 16-D Examples of Fire Hydrant Placement for Commercial Buildings

E. Plate 16-E Types of Water Main “Tie-In” Connections

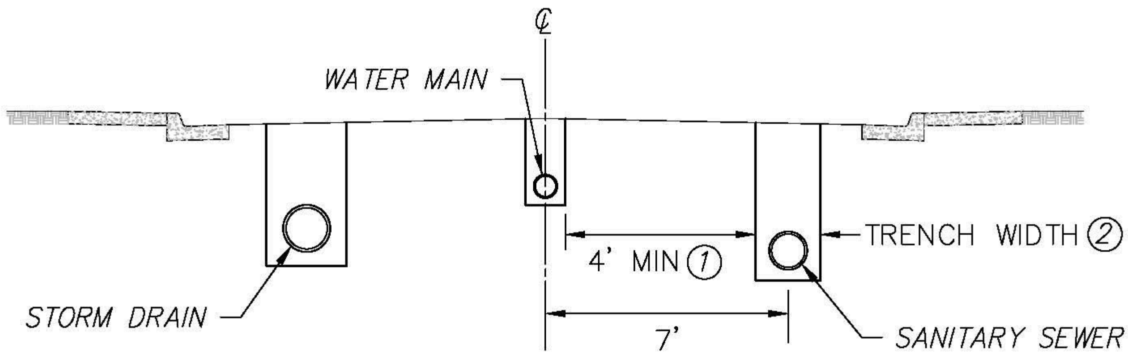
F. Plate 16-F Key to Installation of Water Services

G. Plate 16-G Location of “Point of Service”

H. Plate 16-H Service Transfer Detail



TYPICAL WATER, STORM DRAIN &
SANITARY SEWER LAYOUT



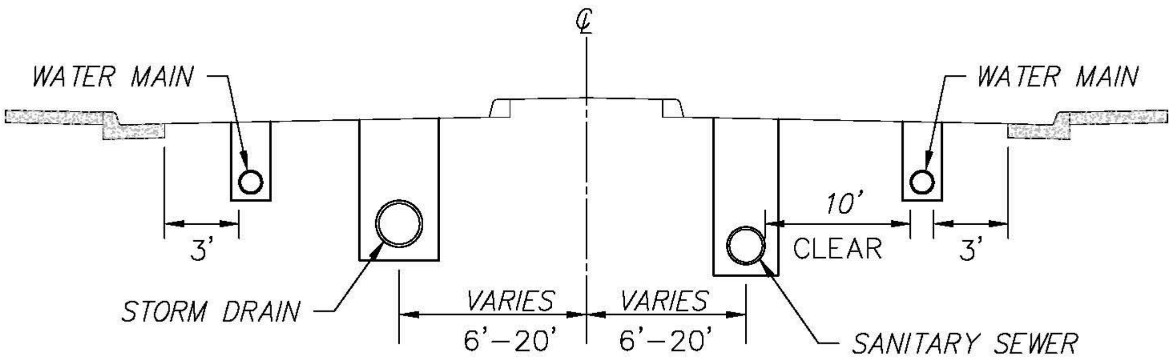
STREET WIDTH NOT WIDE ENOUGH TO PROVIDE 10 FEET OF
CLEAR SEPARATION BETWEEN WATER MAIN & SANITARY SEWER
IN EXISTING STREETS

NOTES:

① FOUR FEET (MIN.) WIDE COLUMN OF UNDISTURBED EARTH BETWEEN TRENCH WALLS.

② TRENCH WIDTH = O.D. OF PIPE + 16"

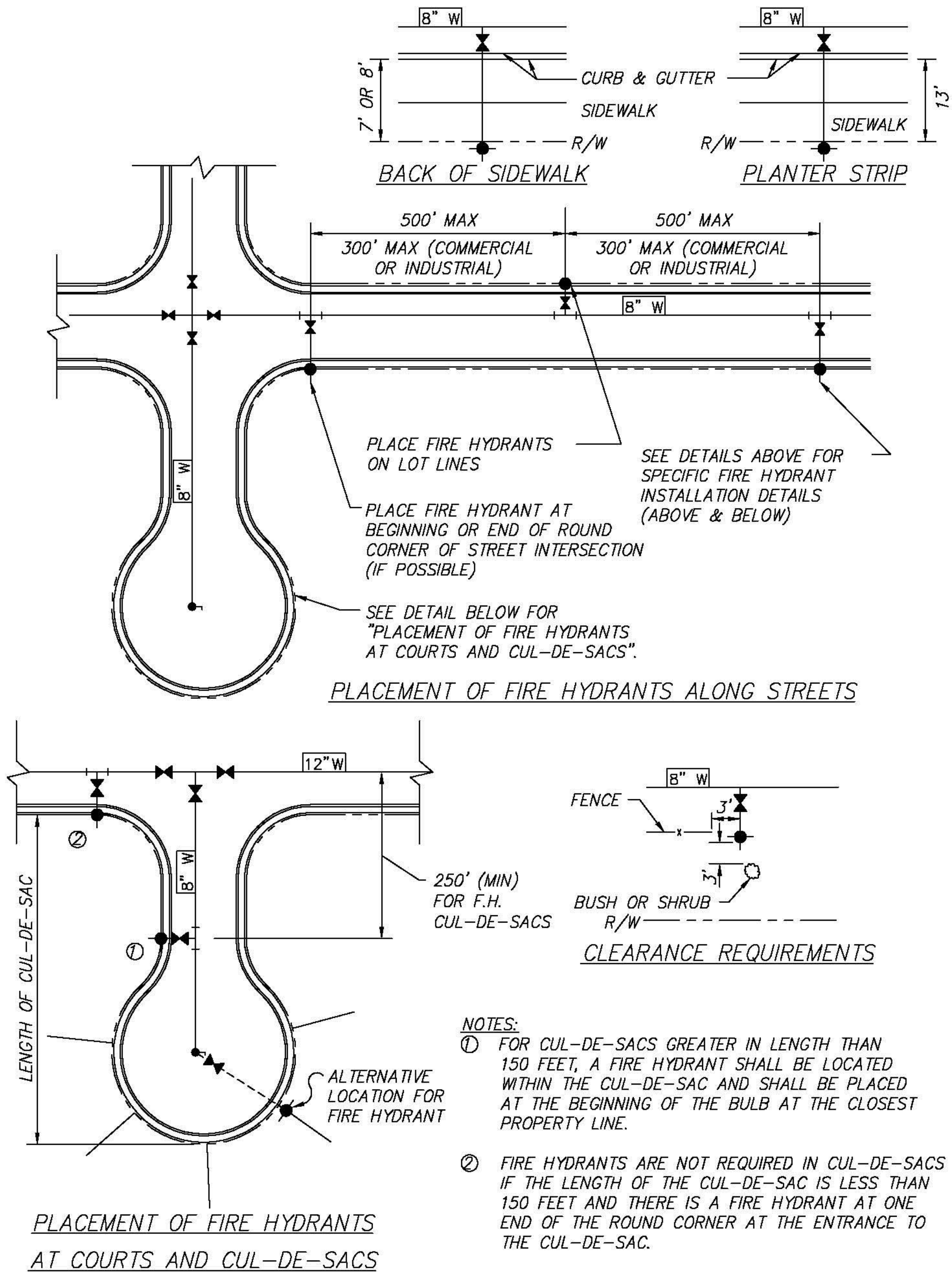
SEPARATION OF WATER SEWER AND STORM DRAIN LINES
PLATE 16–A



(DIVIDED STREETS WITH DUAL WATER MAINS)

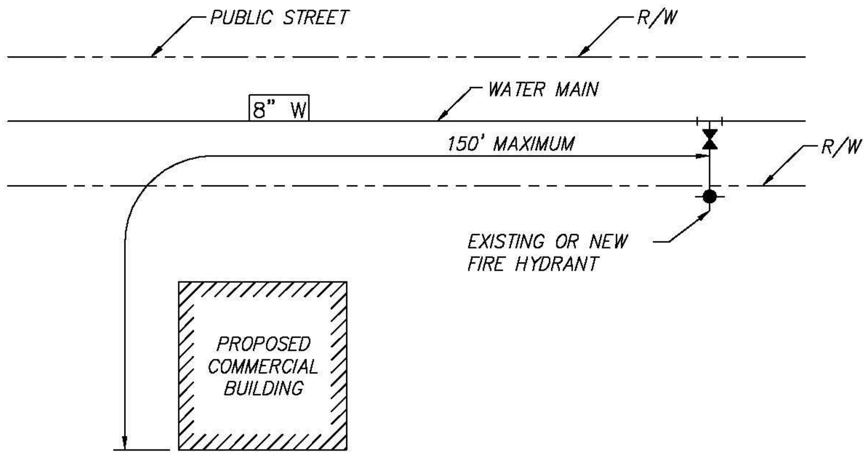
STREET R/W WIDTH ADEQUATE TO
PROVIDE 10 FEET OF CLEAR SEPARATION
BETWEEN WATER MAIN & SANITARY SEWER

SEPARATION OF WATER SEWER AND STORM DRAIN LINES
PLATE 16–B

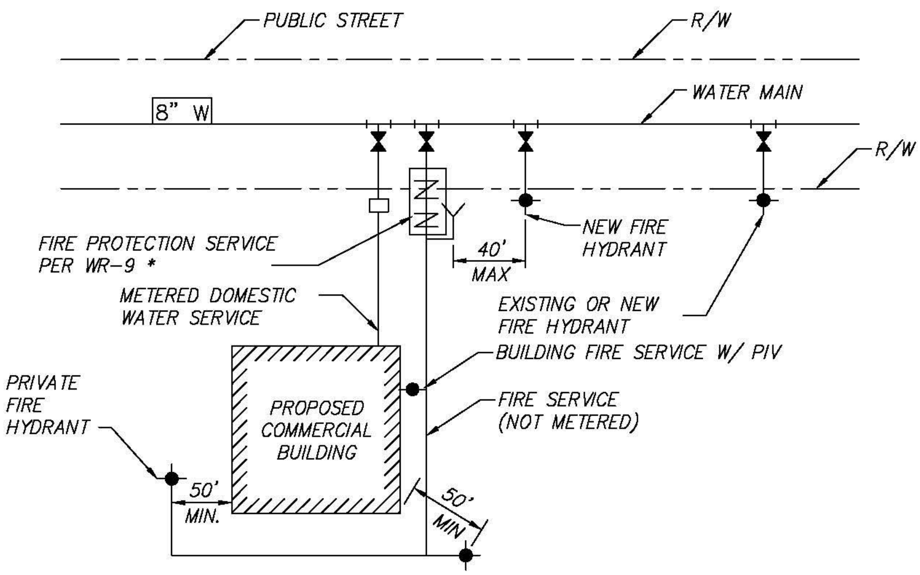


FIRE HYDRANT PLACEMENT AND SPACING

PLATE 16-C



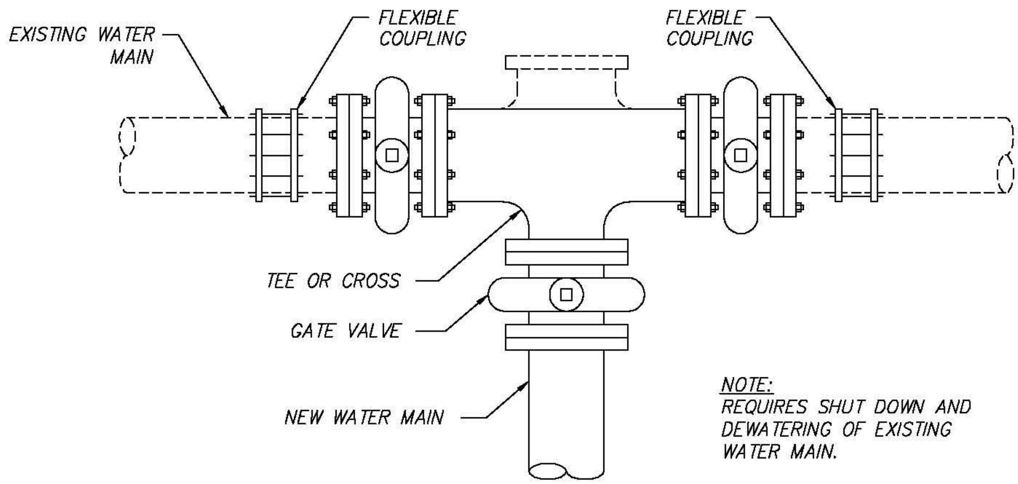
TYPICAL FIRE
HYDRANT PLACEMENT



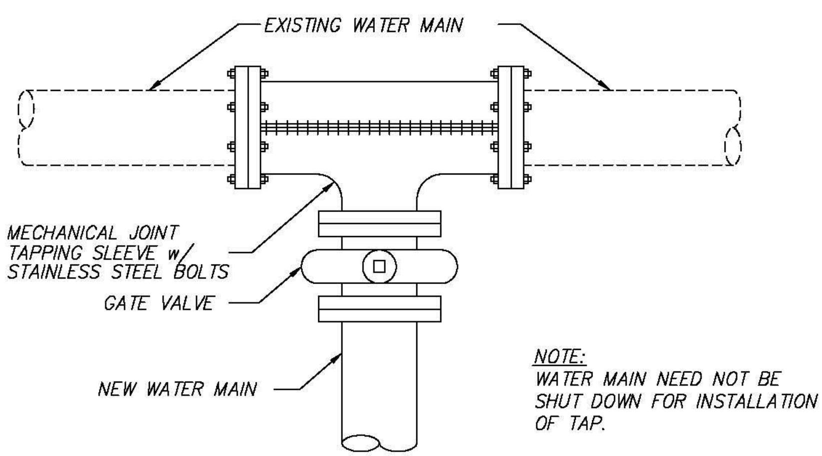
SEPARATE DOMESTIC
AND FIRE SERVICE

* NOTE: FIRE DEPARTMENT CONNECTION (FDC) NOT REQUIRED IF BUILDING FIRE SERVICE HAS FDC.

EXAMPLES OF FIRE HYDRANT PLACEMENT FOR COMMERCIAL BUILDINGS
PLATE 16-D



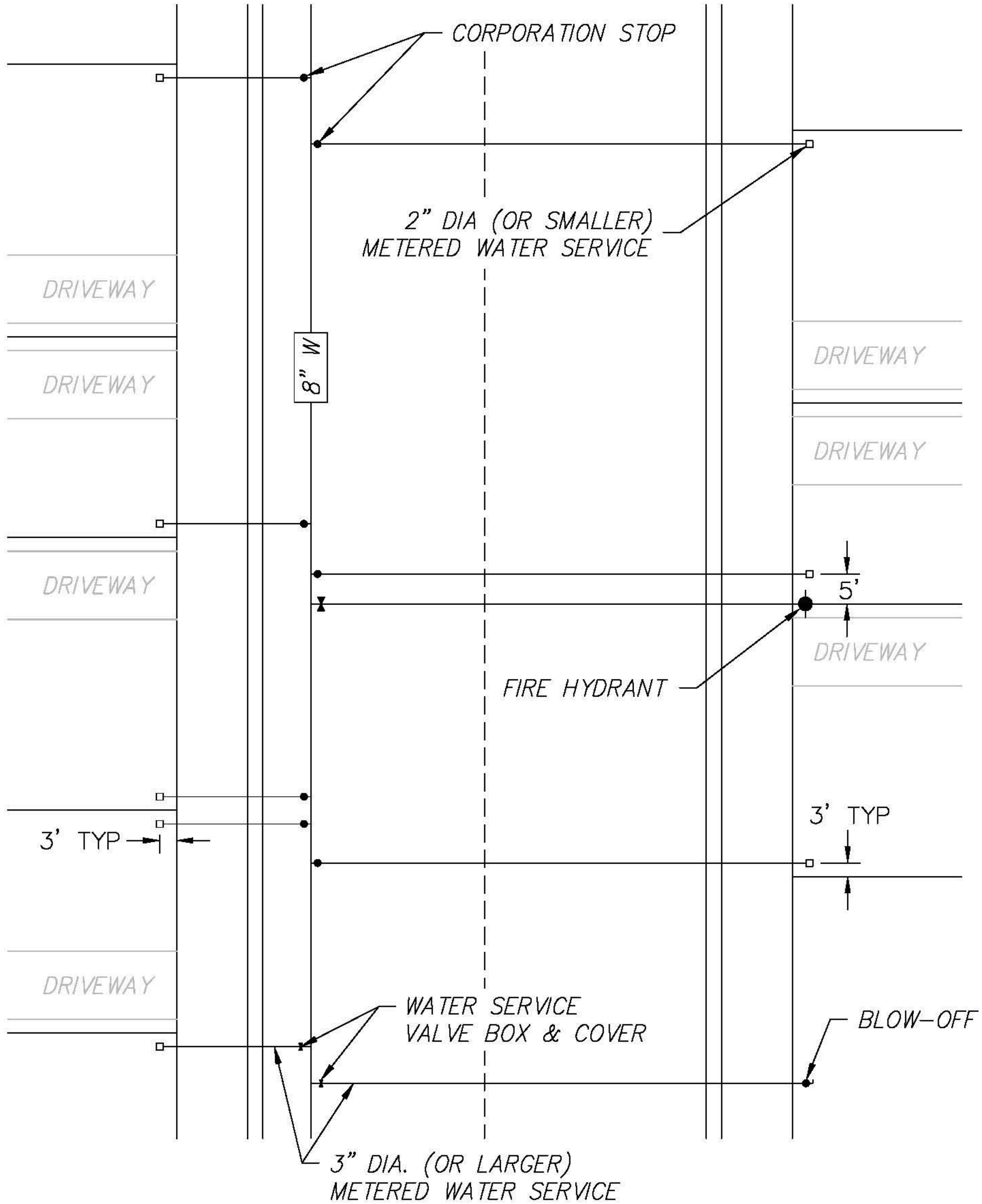
WATER MAIN "CUT-IN" CONNECTION



WATER MAIN "TAP" CONNECTION

TYPES OF WATER MAIN TIE IN CONNECTIONS

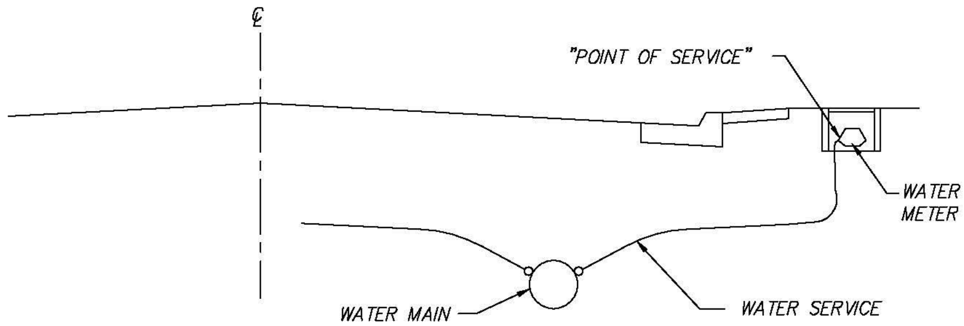
PLATE 16-E



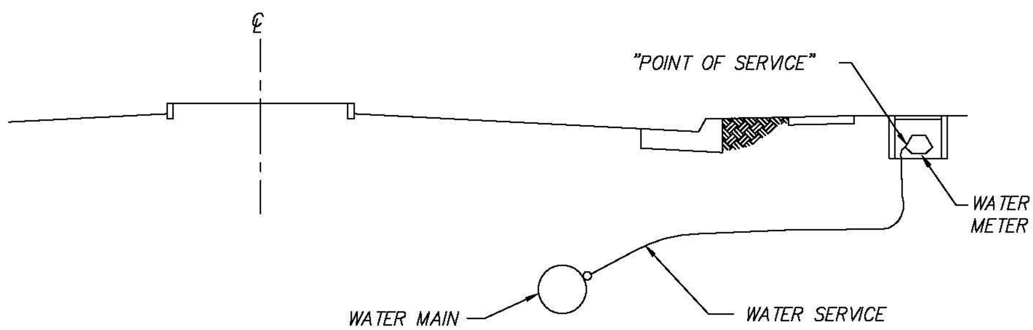
NOTE: 3" METERED SERVICE HAS 4" TAP AND LEAD TO METER (SEE STANDARD DETAIL WR-02).

KEY TO INSTALLATION OF WATER SERVICES

PLATE 16-F

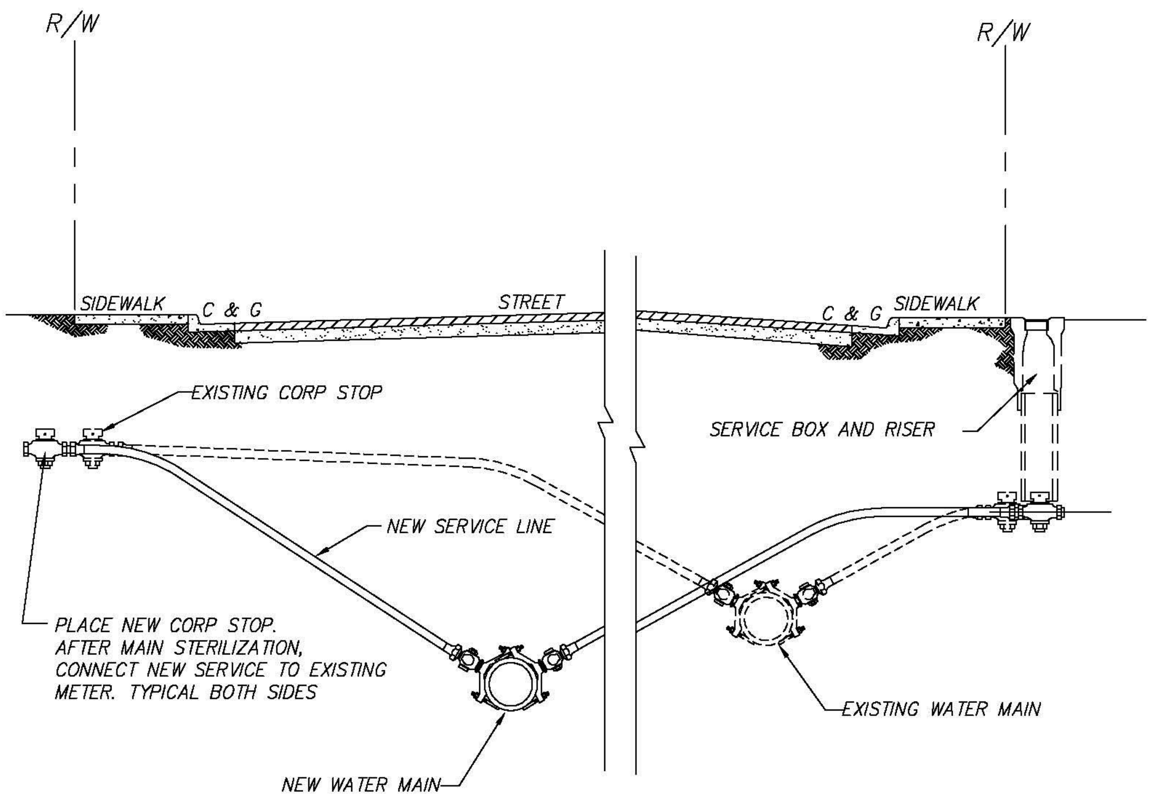


STREET WITH SIDEWALK
MONOLITHIC WITH CURB & GUTTER



STREET WITH SIDEWALK SEPARATED FROM
CURB & GUTTER BY PLANTER STRIP

LOCATION OF POINT OF SERVICE
PLATE 16–G



NOTE:

1. TRANSFER IS TO TAKE PLACE AFTER NEW MAIN IS IN SERVICE.

SERVICE TRANSFER DETAIL

PLATE 16-H

Section 17:
FIRE

17.1 GENERAL

A. Construction requirements shall comply with the Folsom Fire Code and the California Fire Code.

B. Electronic copies

(AutoCAD files in .DWG or .DXF) of the Site Plan including driveways, fire hydrants, FDC's and building address numbers are required prior to any permits being issued. All data shall be submitted to the City on a compact disc.

C. Standard Private Fire Protection Requirements:

1) All fire mains shall be pressure tested to 200 psi for 2 hours with open trenches and center-loaded pipe with all fittings and thrust blocks exposed for the Fire Inspector.

1) All fire hydrants and fire sprinkler risers shall be flushed for the Fire Inspector.

2) All underground fire mains that can be pressurized by fire department apparatus (downstream of FDC's) shall be CPVC C900 class 200 or other UL/FM approved equivalent pipe. All underground fire mains that cannot be pressurized by fire department apparatus may be CPVC C900 class 150 or other approved UL/FM approved equivalent pipe.

3) Depth of bury to the top of all fire mains: Minimum 36 inches in driveways and minimum 30 inches in landscaped areas.

4) All thrust block bearing areas shall be sized in accordance with the City of Folsom's Standard Detail WR-5.

5) The fire sprinkler services shall terminate 6 to 24 inches above the finished floor elevation at the fire sprinkler riser locations in the Fire Control Rooms. Provide minimum clearances of 12 inches from the fire sprinkler risers to any adjacent walls.

6) Provide sleeves for the fire sprinkler mains at concrete slab penetrations with a minimum clearance of 2 inches around the pipes.

7) All control valves on the fire main system (including the valves on the backflow preventers) shall have tamper switches that are monitored by an approved central station. Provide the entire necessary underground conduit.

8) Fire hydrant street valves shall be at least 6 feet from the hydrants.

9) Provide a minimum 2-ft. by 2-ft. flat concrete surface around each fire hydrant located in a landscaped area.

10) Fire hydrants, FDC's, and PIV's shall be placed at least 2 feet behind back of curbs.

11) Paint fire hydrants safety yellow.

12) Color code paint the top 2 inches and the 4-½ inch hose connection cap of each fire hydrant light blue, unless a different color is specified by the inspector testing the water supply.

13) For each fire hydrant, a blue two-way reflective marker shall be placed on the street pavement 12 inches off of street or driveway centerline on the hydrant side.

14) Permanent signage (minimum 5”x7” 18-guage metal with contrasting numbers) shall be provided for the PIV’s and FDC’s to indicate what buildings are controlled.

15) Marking of Fire Apparatus Access Roads: All required fire lanes must be identified with painted and stenciled curbs and fire lane signs in accordance with the California Vehicle Code. All curbs shall be painted red with the words “No Parking Fire Lane” stenciled in white every 50 feet on the face of the curbs using 4-inch letters. Fire lane signs shall state “No Parking – Fire Lane – C.V.C. 22500”. The signs shall be located at each entrance.

16) All-weather emergency access roads and fire hydrants (tested and flushed) shall be provided before combustible material or vertical construction is allowed on site. All-weather access is defined as 6” of compacted AB from May 1 to September 30 and 2”AC over 6” AB from October 1 to April 30.

17) The underground contractor shall submit to the Fire Inspector a record-of-completion form in accordance with NFPA 24, after the entire fire underground system has been inspected and tested to meet the minimum site requirements.

17.2 ACCESS REQUIREMENTS

A. Dead ends:

The maximum length of any dead-end fire access road is 500 feet.

B. Turns:

On fire apparatus access roads shall be designed to accommodate Fire Department apparatus. Use inside turning radii of 25 feet and outside turning radii of 50 feet.

C. Grades:

The gradient for a fire apparatus access road shall not exceed 12%. Where said fire apparatus access road directly fronts the exterior of a building two or more stories in height, the gradient for a fire apparatus access road shall not exceed 9%

D. Parking:

At least one on-street parking spot is required for each dwelling unit within residential projects. On-street parking spots shall be equally dispersed throughout the entire project. A plan/exhibit showing the locations and number of the on-street parking spots shall be submitted.

E. Fire Apparatus Access Roads Minimum Widths:

Fire apparatus and emergency vehicle access roads shall have an unobstructed continuous width of not less than 27 feet for all major / primary driveway aisles and an unobstructed vertical clearance of not less than 13 feet 6 inches.

Fire apparatus and emergency vehicle access roads in subdivisions comprised solely of Group R-3 occupancies shall have an unobstructed continuous width of not less than 24 feet and unobstructed vertical clearance of not less than 13 feet 6 inches.

F. Marking of Fire Apparatus Access Roads:

All required fire lanes must be identified with painted and stenciled curbs and fire lane signs to restrict parking in accordance with the California Vehicle Code.

1) Curbs:

All curbs shall be painted red with the words "No Parking Fire Lane" stenciled in white every 50 feet on the face of the curbs using 4-inch letters. If curbs are not available, provide 6-inch wide red stripes along the edge of the fire lane with the same stenciling.

2) Signs:

Fire lane signs shall state "No Parking – Fire Lane – C.V.C. 22500", and shall be located at each entrance on the right-hand side.

G. Emergency Vehicle Access (EVA)

Used as secondary access/egress for fire apparatus:

1) Surface

Paved roadway surface system.

2) Cross Sections

Show scaled cross sections on the plans.

3) Access Width

Fire department and other emergency access shall be ensured through the use of an unencumbered continuous paved width of 20 feet on straight portions of the EVA.

4) Turns

Turns on the EVA shall be designed to accommodate Fire Department apparatus with inside turning radii of 25 feet and outside turning radii of 50 feet; therefore, the minimum width of the EVA in turning movements shall be 25 feet.

5) Structural Design

The structural design of the EVA shall accommodate a gross vehicle weight of 80,000 pounds for fire apparatus.

6) Grade

The **maximum grade** of an EVA shall not exceed 12% and gradual transitions between differing grades are required.

7) Vertical Clearance

The EVA shall have an unobstructed vertical clearance of not less than 13'-6".

8) Curbs

Access points to the EVA shall have rolled curbs. Access points to the EVA shall be identified with painted and stenciled rolled curbs to restrict parking in accordance with the California Vehicle Code. All curbs shall be painted red with the words "No Parking Fire Lane" stenciled in white every 50 feet on the face of the curbs using 4-inch letters. If curbs are not available, provide 6-inch wide red stripes along the edge of the access points with the same stenciling.

9) Gates

Provide Manual gates or barriers approved by the Fire Department at all access points.

10) Signs

Provide 18-gauge metal signs in the center of and on both sides of each gate and/or barrier that shall read, "FIRE LANE – DO NOT OBSTRUCT". Letters shall be red on a white background and be a minimum of 3" high with a ½" stroke. Provide a Mutual-Aid Knox padlock or key box on both sides of each gate and/or barrier.

H. Security Gates

Security gates on fire apparatus access roads shall be in accordance with the *Sacramento County Emergency Access Gates and Barriers Standard*:

1) Gated entries shall be electronic and UL 325 compliant.
2) Access opening for single direction traffic shall be unobstructed 16 feet wide and 13'-6" high and shall swing in the direction of vehicle traffic.
3) Access opening(s) for bi-directional traffic shall be either one (1) unobstructed 27-foot wide gate opening, or two (2) 14-foot wide gate openings and 13'-6clear height and shall swing into the property being entered.
4) The gates shall be located a minimum of 40 feet off of public streets.
5) Provide Mutual-Aid electronic Knox key-switches and click-to-enter radio-operated controllers for emergency vehicles to operate gates. .
6) Knox key-switches shall be located 48 inches above finish grade at the gate entrance.
7) The Knox key-switch shall be designed to keep the gate in the open position for at least one minute.

8) Provide a battery power supply that allows the gates to fail in the open position, when a power outage occurs.

9) Pedestrian gates shall be installed within 10 feet of the vehicle gate. The pedestrian gates shall be handicap accessible and have listed exit hardware that is operable from the inside at all times without the use of a key or any special knowledge or effort.

10) A Mutual-Aid Knox key box shall be installed at least 48 inches above finish grade on the outside of the gate with a key to open the pedestrian gate.

17.3 DESIGN REQUIREMENTS

A. Private Fire Hydrants:

1) Fire hydrant numbers and spacing shall be in accordance with the Folsom Fire Code.

2) A fire hydrant shall be located within 50 feet and on the same side of the street as the fire department connection (FDC) for the building fire sprinkler system.

3) Provide a minimum 2-ft. by 2-ft. flat concrete surface around each private fire hydrant located in a landscaped area.

4) Fire hydrant valves shall be located in driveways outside of landscaped areas or parking spots.

5) Fire hydrant valves shall be located a minimum of 6 feet away from the fire hydrants.

6) Any fire hydrant lateral line greater than 50 feet in length shall be a minimum of 8 inches in diameter.

7) No trees within 10 feet of a fire hydrant.

B. Fire Department Connections

FDC shall be located a minimum of 40 feet from the buildings.

C. Sectional valves

Sectional valves on private fire services shall be post indicator valves (PIV's). Street gate valves are not allowed on private fire services. The PIV's shall have tamper switches that are monitored by an approved central station. Provide the entire necessary underground conduit.

D. Piping

All private fire service mains that can be pressurized by fire department apparatus (downstream of fire department connections) shall be CPVC C900 class 200 or other UL/FM approved equivalent pipe. All underground fire mains that cannot be pressurized by fire department apparatus may be CPVC C900 class 150 or other approved UL/FM approved equivalent pipe.

E. Depth of bury

To the top of all private fire service mains: Minimum 36 inches in driveways and minimum 30 inches in landscaped areas.

F. Fire Sprinkler Service Mains

The design of all private fire service mains shall terminate 6 to 24 inches above finished floor at fire sprinkler system riser locations. These fire sprinkler system riser locations shall provide minimum clearances of **12 inches** from any adjacent walls.

G. Electronic Monitoring

All control valves on private fire service mains (including the valves on the backflow preventers) shall have tamper switches that are monitored by an approved central station. Provide the entire necessary underground conduit.

17.4 DESIGN REPORT REQUIREMENTS

A water model analysis that proves the minimum fire flow requirements can be provided by on-site fire protection systems shall be required before any permits are issued. A safety factor equal to at least 10% of the available static pressure is required on hydraulic calculations. The Design Engineer shall wet stamp, sign and date the water model analysis.

Section 18:
SANITARY SEWER

18.1 DESIGN REPORT REQUIREMENTS

A sanitary sewer design report shall be prepared for each development project. The design report shall document existing and proposed conditions and shall establish the necessary improvements and system requirements needed to provide sanitary sewer service for the development. The Design Engineer shall wet stamp, sign and date the sanitary sewer design report.

18.2 AVERAGE FLOW DETERMINATION

A. New Development

8) Zoning

Flow determination shall be based upon the most recent zoning. The area shall be examined for trends toward population concentration and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as the basis for determining flow.

9) Single-Family and Duplex Units

Flow shall be based on four persons per residential unit, 100 gallons per person per day, and five lots per acre. However, if the number of lots per acre is known, the actual number shall be used.

10) Multiple Residential

Flows shall be based on the maximum density allowed or actual number of units, 100 gallons per person per day and three persons per unit. The City may assign flow quantities of 400 gallons per day if the dwelling units are similar in characteristics to single-family detached residential units. For multiple residential areas where no density figures are available, flows shall be determined from the curves on Plates 18-A and 18-B.

11) Commercial

Every attempt shall be made to base design flows on specific quantities for the type of development expected. In the absence of specific knowledge of the type of development expected, flows shall be determined from the curves on Plates 18-A and 18-B.

12) Schools

The larger flow, as determined from one of the two following methods, shall be used.

a) The entire school area shall be assumed R-1 zoning with 16 people per acre and 100 gallons per person per day.

b) Flow shall be based on ultimate design student population plus administration, teaching and operating personnel. Per capita average flow shall be as follows:

Elementary School	40 gallons per day
Junior and Senior High School	50 gallons per day

13) Industrial

Every attempt should be made to base flows on specific, known industrial development. In the absence of specific knowledge of development, flow shall be determined from the curves on Plates 18-A and 18-B.

B. Infill and ESD

For those areas where the sanitary sewer system is existing, the following categories, with Equivalent Single-Family dwelling units (ESD), should be used for computing average flow (1 ESD = 400 gallons/day).

Category	Equivalent ESD
Auto Dealerships	0.2 per 1000 sq. ft. of gross floor area
Bakeries	0.5 per 1000 sq. ft. of gross floor area
Banks/Financial Institutions	0.3 per 1000 sq. ft. of gross floor area
Barber/Beauty Shops	0.1 for each barber or beautician chair
Bars	0.7 per 1000 sq. ft. of gross floor area
Bowling Alleys (including eating facilities)	0.4 for each bowling lane
Car Washes	
Automatic	1.0 per 12,000 gallons water used each month
Self-service	0.7 for each washing stall
Condominiums and Duplex Units	0.75 per unit
Dry Cleaners	1.7 per 1000 sq. ft of gross floor area
Fire Stations	1.0 per station
Garages	0.1 for each service bay
Halls, Lodges and Auditoriums	0.3 per 1000 sq. ft. of gross floor area
Health Studios/Gymnasiums	0.3 per 1000 sq. ft. of gross floor area
Hospitals	1.0 per 12,000 gallons water used each month
Hotels and Motels Laundries	0.3 for each sleeping room
Self-service	0.5 for each laundry machine
Commercial/Industrial	1.0 per 12,000 gallons water used each month
Markets	
With Garbage Disposal	0.6 per 1000 sq. ft. of gross floor area
Without Garbage Disposal	0.2 per 1000 sq. ft. of gross floor area
Medical/Dental Offices (including eating facilities)	0.4 per 1000 sq. ft. of gross floor area
Mortuaries	0.8 per each slumber room
Office Buildings (including eating facilities)	0.2 per 1000 sq. ft. of gross floor area

Parks	1.0 per comfort station
Places of Worship (including residences)	0.2 per 1000 sq. ft. of gross floor area
Public Agencies (including eating facilities)	0.6 per 1000 sq. ft. of gross floor area
Rest and Convalescent Homes, Boarding Houses, Fraternities, Sororities, Convents, Dormitories, etc.	0.3 for each bed
Restaurants	
Dine-in	2.0 per 1000 sq. ft. of gross floor area
Take-out	1.7 per 1000 sq. ft. of gross floor area
Dine-in and Take-out	1.9 per 1000 sq. ft. of gross floor area
Retail Stores	0.2 per 1000 sq. ft. of gross floor area
Schools	
Primary	1.4 per 100 average daily attendance
Secondary	1.8 per 100 average daily attendance
College and Universities	1.0 per 12,000 gallons of water used each month
Service Stations	0.1 for each gas pump
Theaters	0.3 per 100 seats
Used Car Lots	0.2 per 10 fixture units
Warehouses	0.1 per 1000 sq. ft. of gross floor area
Non-Defined Commercial	1.0 per 12,000 gallons of water used each month

18.3 DESIGN FLOW

Average flow, as determined above, shall be multiplied by the peaking factor obtained from the curve on Plate 18-B. The average ground water infiltration shall be 50 gallons per day per inch diameter per mile and added to this value to obtain the design flow. Areas deemed by the Engineer to have high ground water may require a larger value of infiltration assigned which the Engineer will determine.

18.4 PIPE, SIZE, SLOPE, CAPACITY, AND MATERIAL

A. Pipe Size

Minimum size of laterals which serve single-family units shall be 4-inches in diameter and duplex development shall be 6-inches in diameter. Schools, commercial, industrial, and multiple residential shall be served by laterals 8-inches in diameter, minimum. Single commercial buildings which contribute negligible sewage flow, when among single-family or duplex development, may be served by a lateral 6-inches in diameter, minimum. The City shall be consulted in every such case and his decision shall be final. Minimum sewer pipe size located within the City's Right of Way or sewer easements shall be 8-inch in diameter or larger.

B. Pipe Slopes

A table of pipe size versus minimum slope is shown below when the pipe is flowing half full or full. In situations where velocities of two feet per second in an 8-inch pipe is not achievable due to low flow conditions, such as the first sewer run sections in cul-de-sacs, 6-inch diameter pipe may be used upon approval by the City. **Sewer pipe should not be artificially oversized to utilize a smaller slope.** Manning's formula shall be used to determine the relation of slope, design flow, velocity, diameter, and "n" value. The "n" of the specific pipe material shall be use. If unknown, use 0.013.

Diameter - Inches	Absolute Minimum (Velocity = 2 fps) Slope - feet per foot
6	0.005
8	0.0035
10	0.0025
12	0.0020
15	0.0015
18	0.0012

1) The maximum depth of flow at design conditions in any lateral shall be 0.7 diameter.
2) All sanitary sewer pipe shall be designed for a minimum scour velocity of two feet per second at peak flows.
3) Maximum design velocity shall not exceed ten (10) feet per second.

C. Hydraulic Grade Line

The hydraulic grade line shall be determined from the design flows, based upon 100% development of the tributary area. Hydraulic grade line calculations must be submitted for the design of all lines 12-inches in diameter or larger.

D. Depth

No sewer service shall be more than fifteen feet deep. In the design of a system, one of the controlling conditions shall be that the lateral system is to be at a sufficient depth to provide a minimum slope for the sewer service of ¼-inch per foot, at the same time maintaining a minimum cover of 12 inches at any buildable location within the properties to be served. Per the Folsom Municipal Code, Section 13.08.090, a backflow prevention device is required on all new construction and noted on the plans if any of the following provisions are met:

1. The finished grading pad elevation is twelve inches or less above the rim of the nearest upstream manhole.

2. When deemed necessary by the Environmental & Water Resources Director to protect public health or safety.

All existing property owners shall be required to install, operate and maintain a backflow prevention device if they meet any of the following provisions:

1. When deemed necessary during the application process when applying for a construction, remodel or sewer replacement permit.

2. When deemed necessary by the Environmental & Water Resources Director to protect public health or safety.

E. Material

Pipe material shall be approved by the City, and shall conform to the requirements of the Standard Construction Specifications. All Polyvinyl Chloride (PVC) sanitary sewer mains and laterals shall be SDR-26 PVC.

F. Pipe Capacity

Pipe capacity, in all cases, shall be adequate to carry the design flow from the entire tributary area, even though the area may not be within the project boundaries. The maximum depth of flow at design conditions shall be no more than 0.70 diameter.

18.5 LOCATION AND ALIGNMENT

A. General

All sanitary sewers shall be placed within rights-of-way dedicated for public streets unless the City specifically approves the use of public sewer easements. All sewer systems on private streets or courts shall be privately owned and maintained.

B. New Streets

New subdivision - Sanitary sewer lines shall be placed to provide 10 feet of clear separation from parallel existing or proposed water mains whenever possible as a means of protecting the water main from contamination. Sanitary sewer lines shall pass beneath water mains at all transverse crossings and shall be placed to provide a vertical clearance of at least one foot between the respective pipes.

At locations where 10 feet of clear separation between a sanitary sewer line and water main cannot be provided due to limited width of street right-of-way or by the presence of other utility lines, sewer lines and water mains shall be placed as far apart as possible. At the very minimum, the separation distance shall be sufficient to allow a 4-foot wide column of undisturbed earth to remain between the excavated trench walls of a sewer line and a parallel water main.

1) Lateral Connections

Lateral connections between parallel sewer lines shall be at right angles with manholes at each end.

2) Placement in Streets

Sanitary sewer lines shall be located south or east of the centerline of streets in areas of new development. The distances sewer lines are to be placed from street centerlines vary according to the width of the street right-of-way and are given by the following:

Width of Street Right-of-Way (feet)		Median Width (feet)		Distance From Centerline (feet)
44 - 50		--		6
60 - 90		--		12
100 - Larger		16		14

C. Existing Streets

When sanitary sewers are to be placed in existing streets, factors such as curbs, gutters, sidewalks, traffic conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered. The final location of the sanitary sewer shall be approved by the City in every instance.

D. Easements

The minimum width of easements for pipe installations shall be 15 feet in width. Easements shall be avoided. Deep sewer will require wider easements. The easement width shall be the greater of the following:

1) Minimum width of easement shall be 15 feet.
2) All easements shall have a minimum width equal to the required trench width according to the standard detail for trench backfill, plus two additional feet for every one foot of depth of the pipe as measured from the bottom of the pipe to finished grade. All sewer lines shall be centered within their easements. No trees or permanent structures shall be located within the easement.

E. Domestic Wells

No sanitary sewer shall be placed within the required clearance as set by the County Health Agency to any public or private well unless the well has been abandoned in full accord with County Health Agency requirements.

F. Alignment

1) Horizontal Alignment

Alignment shall be parallel to the street center line wherever possible. Minimum radius for sanitary sewers 8-inches through 24-inches in diameter shall be 200 feet. A larger radius shall be used whenever practicable. A manhole shall be placed at any abrupt change in alignment, or as determined by the City.

2) Vertical Alignment

Vertical alignment shall provide a constant slope between manholes. Changes in grade or slope will require a manhole. Vertical curves on sewer slopes are not acceptable.

G. Sewer Depth and Groundwater Conditions (Pipe Zone Material)

1) ¾-inch Class II A.B. compacted to 95% relative compaction for standard trench depth (3'-15') with no groundwater concern and native soil trench base.
2) ¾-inch Class II A.B. wrapped 100% with filter fabric with a 1-foot overlap and compacted to 95% relative compaction for standard trench depth (3'-15' with no groundwater concern and fractured or cobble trench base.
3) All deep sewers greater than 15' of vertical trench excavation will use mixed aggregate (MA) wrapped in filter fabric. The MA must be wrapped 100% with filter fabric with a 1-foot overlap.
4) Mixed Aggregate (MA) is allowed in the pipe zone when groundwater is present. The MA or AB must be wrapped 100% with filter fabric with a 1-foot overlap and with cutoff walls and sub-drain routing to prevent inflow/infiltration at sanitary sewer manholes. Transition from MA to ¾-inch Class II A.B. shall occur within the pipe zone once groundwater is no longer present and 95% compaction of the ¾-inch Class II A.B. can be achieved. In trenches where flowing water is present, the Design Engineer shall consult with a Geotechnical Engineer and incorporate the Geotechnical Engineer's recommendation for collecting and conveying flowing water safely away from the underground roadway and infrastructure.

H. Channel Crossing

Refer to Storm Drainage, see Section 19.

18.6 MANHOLES

A. Placement

Manholes shall be placed at the intersections of all sanitary sewer lines, at the end of any line terminating with a cul-de-sac which has three or more lots fronting on the cul-de-sac, at the end of all permanent lines 120 feet or more in length, and at the end of any temporary line more than 200 feet in length. All manholes from which sewer line extensions are anticipated shall have a pipe stub installed at the grade and in the direction of the anticipated extension. Summit manholes connecting two sewer laterals are not acceptable. Manholes located outside of paved areas should be placed such that they are accessible to maintenance personnel and shall be located in the center of a 10-foot diameter level pad in order that a tripod may be used for access in conformance with safety regulations.

B. Spacing

Maximum spacing of manholes shall be 400 feet for all straight runs of pipe. Manhole spacing on lines that curve continuously between manholes with a radius of 200 feet (minimum allowable) shall be 200 feet. Manhole spacing on curved lines with a length of curve and radius less severe shall be adjusted proportionately. A line with a radius greater than 400 feet shall be considered straight. Reverse curves will require a manhole at the point of tangency between the curves. A manhole shall be placed at any abrupt change in horizontal alignment. Manhole frame and covers shall be GMI Composite or approved equal. Manholes outside of the paved areas shall be placed 12-inches above grade in accordance with Standard Details. Manholes shall include, but are not limited to, all manholes on trunk main 15-inches in diameter or larger, the first manhole originating from a sewer trunk main 15-inches in diameter or larger force main transition manholes, manholes designed with inside drops, or as determined by the City.

C. Hydraulic grade Line

The average hydraulic grade line of any pipe, which flows into a manhole, shall be 0.10-foot (minimum) above the average hydraulic grade lines of the exit pipe. The invert elevation for pipe of the same diameter entering a manhole shall have a 0.10-foot drop between the entering and existing pipe. When the major conduit, based on flow, passes through a manhole with less than 20 degrees deflection, the 0.10-foot differential between hydraulic grade lines shall be derived from design flows based upon 100% development of the tributary areas. The invert elevation for pipe of the same diameter entering a manhole shall have a 0.10-foot drop between the entering and exiting pipe.

In the absence of calculations which establish the average hydraulic grade lines, the invert or spring line of any incoming pipe shall be located not lower than the spring line nor higher than the crown of the exit pipe. The crown of the exit pipe shall never be higher than the crowns of pipes entering the manhole. Exceptions may be approved by the Engineer. Inside connections are not governed by the above elevation requirements.

D. Manhole Types

Manhole types shall conform to the City of Folsom Standard Details.

E. Manhole Lining

Refer to City of Folsom Sewer Standard Details SS-01 and SS-02 for requirements regarding interior linings and exterior coatings.

18.7 SEWER SERVICES

A. Sizing

Sewer services shall conform to the Standard Construction Specifications. All sanitary sewer laterals six (6) inches and greater in diameter and laterals serving commercial, office, multifamily, etc., shall connect to the main with a manhole. In no case will a sewer lateral connect to a sewer main with the use of a “tee.”

B. Cutting Existing Services

When it is necessary to cut a sewer service for trench excavation, the sewer service replacement shall conform to the provisions set forth in the Standard Construction Specifications.

C. Depth of Service

Sewer service lateral is to be of sufficient depth to provide a minimum of four feet of cover at the property line. The City shall approve depths over 4 feet. Show depth of service at property line on improvement plans or place note on the plans indicating the allowable depth at property line. On all "Un-graded Lots" show invert elevation at property line on the plan view.

D. Service Materials

New sewer services shall generally be in accordance with City approved details and specifications for PVC SDR-26 sewer service. Other materials may be accepted on a case-by-case basis with prior approval by the City.

E. Sewer Service Backflow Preventers

Sewer service cleanouts with a backflow prevention device shall be required as described in Section 18.4.D. In addition, the backflow prevention device shall be in accordance with Standard Sewer Construction Detail SS-13.

F. Location

When sanitary sewer laterals are constructed as part of the new subdivision improvements, a sewer service shall be constructed to each lot. In new subdivisions or developed areas, unless specifically requested otherwise in writing by the property owner or Consulting Engineer, sewer services shall be placed on the low side of any typical subdivision lot or similar parcel with two percent or greater slope across the front or shall be placed in the center of lots of lesser slope. Consideration shall be given to trees, improvements, etc., to minimize interference when the service sewer is extended to service the house. Sewer service cleanouts shall not be placed in driveways and typically located in the center of the lot and/or placed in locations to minimize being in potential future driveway locations. Sewer service cleanouts shall be placed in accordance with Standard Sewer Construction Detail SS-08.

If the property is located such that service is available both to a line located in an easement and also in the right-of-way, the sewer service shall be located within right-of-way unless otherwise approved by the City. No sewer service shall be located such that future on-site construction will result in the line being in such proximity to a water well or water main or service that the applicable health standards will be violated.

G. Landscaping

No trees shall be placed within eight (8) feet of a sewer line. No trees shall be placed within the width of any sewer easement.

18.8 DROP CONNECTIONS

A. An inside drop connection is required if the incoming pipe is 3 feet or more above the flow line of the manhole. Inside drop sewer connection are detailed in the Standard Details. Manholes with inside drop connections shall be a minimum of 48inches in diameter. The diameter of the manhole shall be a minimum of 60-inches if the manhole depth exceeds 15-feet measured from rim elevation to deepest invert elevation or the size of the inside drop connection exceeds 10-inches in diameter or if multiple, two (2) or more, inside drop connections of any size are placed within the manhole or any incoming or outgoing sewer pipe diameter is 15-inches or larger. Outside drop sewer connections shall not be permitted without approval by the City.

B. A vortex flow insert drop connection is required if the incoming pipe is 8 feet or more above the base of the manhole structure and SSMH could have an odor and/or corrosion issue as determined by the City. The SSMH must have a minimum flow of 300,000 gallons per day in order to use a vortex flow insert. Diameter and invert elevations of the SSMH shall be confirmed with the vortex flow insert manufacturer to ensure proper fit and installation.

18.9 FLUSHER BRANCH

Flusher Branches may be installed at ends of permanent lines where the length is 120 feet or less to a manhole in accordance with the Standard Details.

18.10 BORING AND JACKING STANDARD DETAILS

Where use of a conductor casing is specified, the casing shall be welded steel pipe. The casing shall be of sufficient diameter to allow dry sand to be blown onto the void between the carrier and the conductor and too allow adjustment of the carrier pipe to grade. Sand shall meet ASTM D 448 Table I Size 89. Normally, as inside diameter 12-inches greater than the outside diameter of the couplings of the carrier pipe is sufficient, Welded steel conductor pipe shall have a minimum wall thickness of ½ -inch. Manufactured casing spacers shall be APS Model SS18 (or approved equal) polyethylene casing spacers spaced at appropriate intervals. Casing shall have APS molded end seals (or approved equal).

Backfill in bore pits shall be given special attention with respect to preventing structural failure of the pipe entering or exiting the conductor, and adequate bedding and initial backfill shall be specified.

18.11 PUMP STATION AND FORCE MAIN REQUIREMENTS

Sewer pump station and force mains shall require preparation of a pre-design report subject to review and approval by the City. The pre-design report shall include all information necessary to size all pump station facilities, including, but not limited to, the following information:

A. Number of equivalent dwelling units (EDUs) and associated average day flow.

B. Peaking factor applied and Peak wet weather flow.

C. System curve calculations, including supporting documentation, necessary to determine total head requirement for the lift station pump(s), operating both individually and in parallel. Calculations shall consider both minimum and maximum head conditions.

D. Wet well sizing calculation (according to Pumping *Station Design, Second Edition*, by Sanks, et al., or approved) and associated pump on/off and alarm levels.

E. Proposed pumps and associated pump curves. Pump information shall include motor type (explosion proof) and hp, voltage requirements, insulation class, motor lead conductor sizes and properties, motor protection provided, pump impeller size and type, pump materials, breakaway discharge elbow size, mounting bolt size and requirements, guide rail size and material, and associated pump appurtenances.

F. Maximum time between starts under minimum flow conditions and maximum number of pump starts under Peak flow conditions.

G. Emergency storage column calculation, including storage volume required based on Peak flow conditions, storage volume provided in wet well and additional volume of emergency storage provided, if necessary to meet City of Folsom requirements.

H. Detailed drawings of pump valve vaults and associated vaults if required.

I. Minimum and maximum velocities in force main.

J. Discussion of Operational Control Strategies to provide details of how lift station will be operated and maintained (i.e., proposed use of VFDs to regulate pumps, use of small pump size for average day flow with lag pump(s) to meet peak flow conditions, etc.)

K. Odor control system design and proposed control system calculation, including product changeout intervals and cost per changeout.

L. Pipe type, roughness, size

M. Surge/hammer analysis

N. SCADA Integration into the City’s existing SCADA system

O. Buoyancy calculations

No sewer system shall rely on a pumping station without prior approval by the City. The plan sheets shall show the general layout and control system required prior to acceptance of the pump station.

A. Location/Access

The minimum distance from the station to any existing or future home shall be 100 feet. Waiver of this requirement may be granted by the City, if special circumstances warrant deviation. Adequate paved access, including a minimum width of 10 feet and a turning radius of 25 feet, must be provided to accommodate delivery and maintenance vehicles.

B. Capacity

Depending on the size of the service area and the extent of the development at the time of station design, the station's initial pumping capacity may be less than ultimate. In such an installation, allowances for larger or additional pumping equipment shall be made for future requirements. If the initial design capacity is in excess of anticipated initial flow, the effects of the minimum flow condition shall be estimated to be sure that the retention of sewage in the wet well will not create a nuisance and that the pumping equipment will operate with reasonable frequency. Peaking factor to be 3.4 times average dry weather flow.

C. Wet Well

The shape of the wet well and the detention time shall be such that the deposition of solids is minimized and the sewage does not become septic. The design of the wet well shall also consider and prevent air entrainment in the pumps by limiting the invert height into the wet well, and shall limit the approach velocities to the pumps to 1-foot per second or less. The wet well shall be lined with PVC T-lock or approved equal. The wet well shall be sized to provide two hours of detention time for buildout peak wet weather flow in case of power failure. Additional emergency storage volume may be required in critical locations as determined by the City, and is subject to review on all projects. An access hatch shall be provided in the top of the wet well for use in removing the submersible pumps. The hatch shall be sized and rated for the particular application. All hatches shall incorporate safety grating. All lift station hatches shall be manufactured by Bilco, or approved equal. For smaller lift stations the wet well shall be self-cleaning. Larger lift stations shall include self-cleaning equipment such as ANUE Water Technologies Enviroprep Lift Station FOG Control unit or equal.

D. Type

For a permanent station, a concrete structure with submersible pumps shall be used. Temporary stations, if of limited size, may utilize manhole-installed submersible pumps or factory-built, subject to approval by the City. Pump stations whose incoming flow is equal to or greater than 1.0 MGD 10-Year, 6-Hour PWWF shall be of wet well/dry well type. In all stations, applicable safety codes shall be complied with, including but not limited to those pertaining to electrical installation, ventilation, and the location of railings and equipment guards.

E. Pumps

The pumping equipment shall consist of Flygt type N Impeller centrifugal sewage pump or equal for canned style stations and Flygt type N Impeller centrifugal sewage pumps or approved equal for stations that are wet well/dry well type stations. Pump suction and discharge size shall be a minimum of 4-inch diameter. Maximum suction velocity shall be 1.32 gal/sec. Pumps shall be capable of passing 3-inch solids. Pump drive units shall normally be electric. A sufficient number of pumping units shall be installed such that station capacity can be maintained with any one unit out of service. Telemetry shall be included in the station control system as directed by the City and the City's Wastewater Division. Pumps and wet well shall be sized to limit the number of pump starts to no more than eight in any hour period. Warranty information for all pumps and components shall be provided to the City upon acceptance of construction completion.

F. Controls

Controls shall be solid state programmable controller such as Tesco L3000 or approved equal, 4-inch PVC stilling well, pump alteration selection switch, uninterrupted power supply (UPS) or battery capable of operating the controller for two weeks with the external power source removed. Bubbler type controls will not be accepted. The controls shall be contained in a Nema 4 enclosure, sized to enclose all necessary electrical equipment and switchgear necessary at the lift station site. A sub-panel and access door shall be provided to access the control and alarming portion of the control panel on a regular basis without opening the main enclosure door. The control panel shall contain all required heating, ventilation, and climate control necessary to maintain proper operating conditions in the panel in accordance with NEC, IEEE, and equipment manufacturer requirements. The control system and electrical controls shall be mounted on a concrete pad poured at the site.

G. Alarming/Telemetry

An on-site alarm system with exterior light and horn with battery backup shall be provided. The alarm system shall include a 16-channel automatic telephone dialer, such as Raco Chatterbox, or approved and alarm display. Alarms shall be sent for low sewer, high sewer, pump failure, and power failure through a dedicated phone line required to be provided to the lift station control panel. Sewer level will also be sent via the telemetry system to the main City SCADA computer along with the same autodialer alarms listed previously. The lift station PLC shall communicate with the SCADA computer via radio communications per City standard requirements. The SCADA computer database shall be updated to include the new improvement necessary to monitor the lift station improvements and will be provided by a firm approved by the City who is familiar with the City SCADA system. The necessary radio path survey shall be performed by the Developer and the results provided to the City to ensure reliable radio communication is feasible with the lift station site. If radio communication is determined not to be feasible by the City, alternatives which are compatible with the existing City SCADA system shall be provided to the City for consideration and selection. The pump station design shall also include site security including security fencing, cameras, intrusion alarms, etc. Intrusion alarms shall be designed but not limited to the following location: fences, vaults, lids, doors, etc.

H. Site Improvements

Site Improvements - Each pump station shall have paved access, parking, and work area around the wet well, valve vaults, and control building to allow access and maneuvering for maintenance vehicles including a 10-yard sewer cleaning truck. The pump station shall be lighted. The pump station site, including wet well rim shall be a minimum of three feet above any adjacent 100-year flood elevation. The pump station shall be enclosed with a six foot CMU split-face block wall, and an wrought iron electric vehicle access gate capable of being locked. Access to all underground vaults and manholes shall include safety grating and shall comply with the requirements of the California Occupational Safety and Health Administration (Cal-OSHA) and be labeled correctly for confined space. Depending on the size of the pump, a second gate for a utility maintenance truck may be required.

I. Electrical

All electrical installations shall comply with the National Electric Code and City of Folsom Building and Electrical Codes. Electrical controls shall be enclosed in prefabricated cabinets and shall include running time meters (reset type) switches for hand/automatic/off operation. An Arcflash study for each pump station is required. The study shall include identification of all electrical panels that need to be properly labeled, training of City staff members, etc.   All electrical panels shall have proper electrical labels that state, “arcflash,” shock”, etc. Pump stations shall have a permanent engine generator set installed with an automatic transfer switch to power the station in case of power outage at the site. The generator shall be sized to run the station for a minimum of eight hours at peak flow capacity without the need for refueling. The generator shall meet all State and local requirements and proof of compliance shall be provided to the City for use in Registering units with Sacramento County Air Quality Control Board or others as may be required. The generator shall have a battery trickle charger with extension cord, cable, and male plug for connection to the control panel for maintaining battery charge. The generator shall also have a critical grade silencer to reduce noise and a sound-dampening enclosure which will allow the generator to operate under full load while meeting applicable noise ordinance requirements.

J. Station Piping

Suction, discharge, and header piping within the station shall be sized to adequately handle flows. Piping less than 4-inches in diameter should not be used for conveying sewage. If necessary, 3-inch Schedule 80 PVC may be approved by the City for use in lift stations with low flows. Valves shall be located to allow proper equipment maintenance and operation and in such locations that they are readily accessible for maintenance. Valves 4-inch and larger in sewage applications shall be eccentric plug valves, manufactured by DeZurik, or approved. Valves 3-inch and smaller shall be Schedule 80 PVC true-union ball valves, or approved. Sewage air/vacuum valves, with properly sized orifices, shall be Apco Series 401 or approved, with vent hood, isolation valves and attachments installed by the manufacturer. A tee sized to match the force main shall be provide in a vault to allow for bypass pumping or pig launching as necessary. A full-size plug valve with blind flange shall be provided on top of the tee, which faces the top of the vault. A blind flange shall be threaded with a stainless steel nipple and camlock quick connector and cap installed for use as a cleanout per City requirements. Piping at each pump station shall also be designed and constructed to accommodate all piping and appurtenances necessary for a pig launching station as well as for bypass pumping.

K. Odor Control

An odor control device will be required at the force main discharge manhole to control odors from the force main. This unit shall be insertable into the manhole to allow for maintenance or access.

The lift station site may also require odor control equipment to be provided, depending on evaluation of expected odors and nearness to surround homes, or other factors as determined appropriate by the City, to prevent malodorous odors associated with the lift station from escaping into the surround area. A forced ventilation system, if required, will be necessary to collect and treat odors from the wet well, valve vault, and other odor producing areas with a centralized system. The odor control unit shall be sized to control all site odors, including hydrogen sulfides, biological odors, etc. The unit shall be capable of treating down to a minimum concentration of 5 ppm of hydrogen sulfide, or as determined from site testing data. The centralized odor control unit shall be self-contained or skid mounted, and provided as a complete operational unit, except for power supply and air/drain supply piping. The unit shall be manufactured by US Filter, Flygt, or approved, and shall meet all local, State, or Federal requirements, whichever is more stringent as determined by the City. A noise study and measures to reduce noise as a result of the odor control system (i.e. a building) is required. A decibel rating that falls outside of the parameters listed in the City of Folsom Municipal Code 8.42 are required to be mitigated.

L. Force Mains

Force mains shall be designed such that velocities normally fall within a range from 3 to 5 feet per second. If initial capacity of the station is considerably less than ultimate, consideration shall be given to the undesirable effect of extensive detention time within the force main. The feasibility of installing dual force mains to accommodate initial and ultimate flows shall be investigated in such situations. A pig-launching station shall be required for all sewer lift stations in order to clean the force main.

Force main pipe shall either be ductile iron pipe (DIP) or C900 polyvinyl chloride pipe (PVC). When DIP for sewer force mains are required, installation of a cathodic protection (CP) system will also be required. The CP system shall be designed and submitted for approval to the City. The design shall include bond jumpers, test stations, anode bags, etc.

Force mains shall have #10 insulated copper tracing wire running along the top of pipe from the pump station to the force main discharge manhole.

M. Miscellaneous Items

The following miscellaneous items shall also be required, unless directed otherwise by the City, at each lift station site and shown on the improvement plans:

1) 1-inch water service with meter, meter box with approved USC backflow for use for landscape irrigation and/or maintenance of the lift station facilities.
2) Paved asphalt driveway
3) Electronic access gate, main gate, and fence/wall details
4) Site grading and drainage plan
5) Site electrical service location and size, including transformer pad location and size, if located on the site.
6) Proposed easements across the lift station site.
7) Drain line from valve vaults to wet well with flap valve on the end of pipe.
8) By-pass pump setup
9) Pig Launching Station
10) Odor Control Station
11) Installation and Calibration of the Mag Meter for sewer flows
12) Street Lights at Pump Station
13) Sewer Cleaning/Flushing Truck Dump Station
14) Backup Generator (Less than 49 Watts to prevent environmental permitting)
15) Bathroom (Larger Lift Stations)
16) Eye Wash Station
17) Lock-Out, Tag-Out Station

N. Variable Frequency Drives (VFDs)

Variable Frequency Drives (VFDs) shall be incorporated into all pump stations with a 10-Year, 6-Hour PWWF capacity of 1.0 MGD or more. VFDs shall be Allan Bradley or approved equal. VFDs shall be designed with the following considerations:

- Avoid running VFD controlled pumps at low frequencies to prevent the pumps from clogging.
- Avoid running VFDs at low frequencies that will result in the velocities in the pipes lower than 3 feet per second to minimize the risk of sedimentation

- ➢ Use the appropriate shielded cables and filters to avoid the VFDs interfering with sensor control systems and other equipment.

18.12 PREPARATION OF PLANS

A. Preliminary Design

A preliminary design for each sanitary sewer project proposed to be constructed in the City of Folsom shall be submitted to and be approved by the City prior to submission of project improvement plans.

The sewer study shall be submitted in the form of a map and table.

The map shall show the following:

1) Area of project
2) Tributary areas outside project
3) Adjacent areas
4) Contours over complete map
5) Line layout and pipe size
6) Predicted average and peak flows at major junction points including flow coming from outside the project area
7) Direction of flow
8) Zoning used to predict flows
9) Special areas such as hospitals, schools, large office buildings, etc.
10) Boundaries of areas within the project which are tributary to points of major flow.
11) Scale

The table shall include the following in tabular form:

1) Areas tributary to points of major flow
2) Zoning within each area
3) Predicted flow from each area, including ground water infiltration
4) Peaking factors
5) Cumulative flow
6) Pipe size and slope
7) Pipe material, type, and designation

B. Parcel Benefiting Outside Project Area

A parcel or area which benefits and participates in a project, but is not included within the project boundaries shall have a note to this effect placed on the overall project map and on the plan and profile sheet if the parcel appears thereon.

C. Plan Layout

A layout sheet shall be required and shall contain the following information:

1) Overall map of the project which shows all boundaries, sewer lines, manholes, flushing branches, and other important items of the work.
2) Contours shall be shown with an interval of 1 foot for relatively flat land and 5 feet for hilly land.
3) Adjacent sewer facilities, including lateral sewers, identification, etc., shall be shown.
4) Scale shall be 1" = 100', 200' or 300'.
5) The existing pavement type and condition shall be indicated on the layout sheet. Pavement replacement may be shown on the pertinent plan sheets as an alternate method.
6) Existing and proposed pipe size, slope and invert grade at manholes shall be indicated.
7) Flow quantity shall be shown at all significant locations.
8) Direction of flow shall be shown on each reach of line.
9) Un-sewered areas within the project boundaries, which cannot be served at a future date by extension of the project's gravity system, shall be indicated.

D. Plan and Profile Sheets

Sewer lines to be owned and maintained by the City of Folsom shall be shown on both the plan and profile. All plan and profile sheets shall contain the following information:

1. Sewer lines to be constructed shall be indicated on profile by parallel lines spaced to show the pipe diameter to scale. Manholes shall be indicted by parallel lines spaced according to scale. Slope, pipe type and pipe size shall be printed above the pipe line or between the parallel lines. Pipe inverts, "IN and OUT," at manholes and other structures shall be indicated on the profile. The invert elevations shall be printed parallel to the horizontal grid lines and shall be underscored by a line which then runs at a 45-degree angle to the corresponding pipe invert. Rim elevations for all manholes shall be labeled. The profile shall note all proposed manholes, special connections and other appurtenances. Existing facilities shown on the profile shall be dashed or distinguishable from the proposed improvements. Stationing shall appear at the lower edge of the profile grid directly under the manhole.

2. Proposed sewer services shall be indicated on the plans by stationing. The invert elevation of the service at its upstream end shall be shown on the plans.

3. Permanent easements shall be shown to scale and dimensioned and called out on the plans.

4. Proposed sewer lines shall be adequately dimensioned from the street centerline. If the sewer is to be located in an easement, sufficient dimensions and bearings from physical features to locate the line in the field shall be shown on the plans.

5. Existing gas, water, storm drains, etc. above or below ground shall be shown on the plans.

6. No trees or permanent structures shall be placed within sewer easements.

7. Details not covered by the Construction Standard Detail sheets shall be shown on the plans.

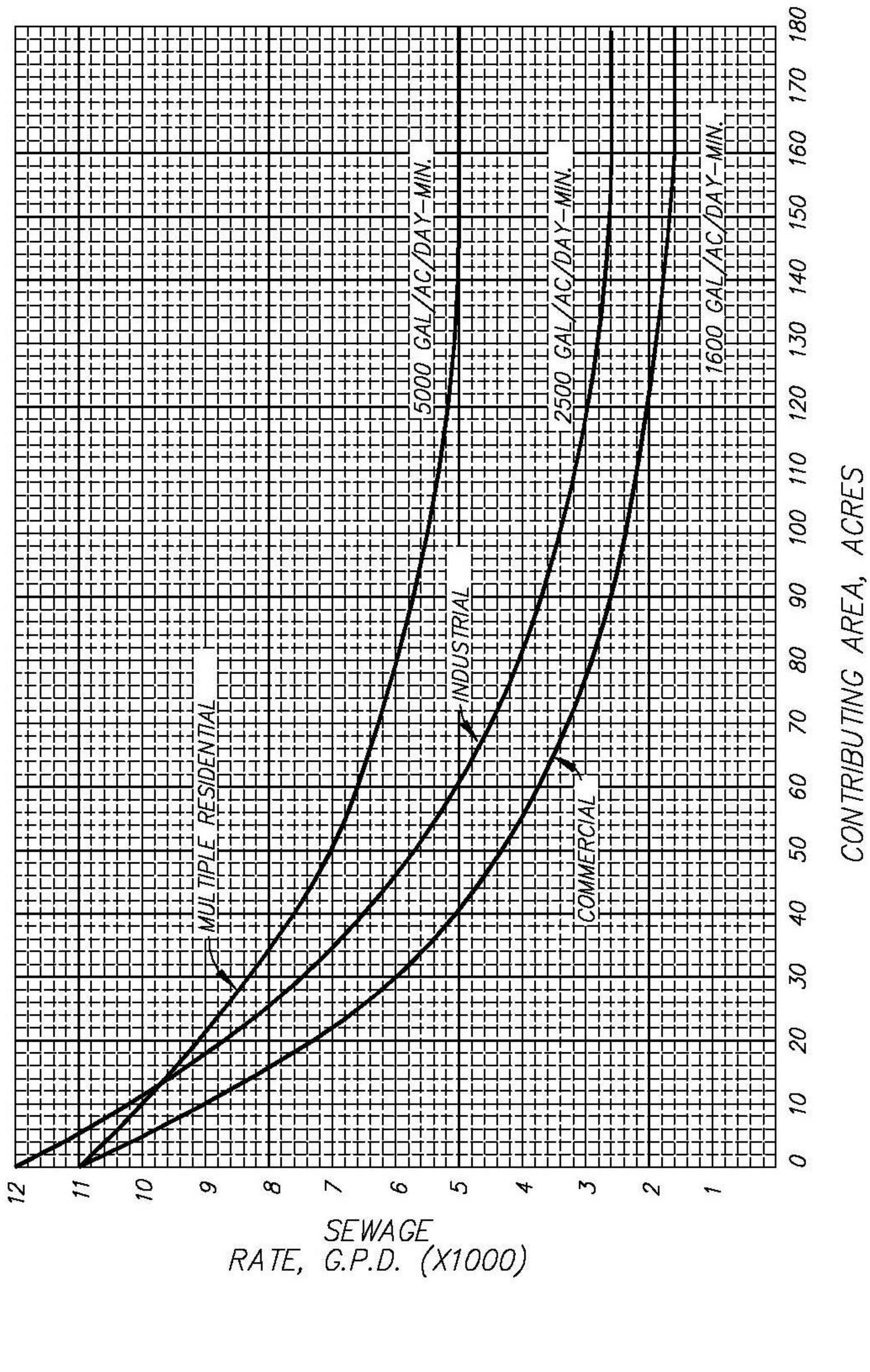
E. Connection to Existing Facilities Where Bypassing or Stoppage of Existing Flow will be Required.

Prior to connection to an existing sewer main, a coordination meeting with the City to discuss a work plan shall be organized by the Contractor a minimum of seven working days prior to the proposed connection. In some cases, the complexity and sensitivity of the proposed connection may require the work to be performed by the City. In such cases, the City costs will be negotiated between the Owner and City on a time and materials basis.

18.13 PLATES

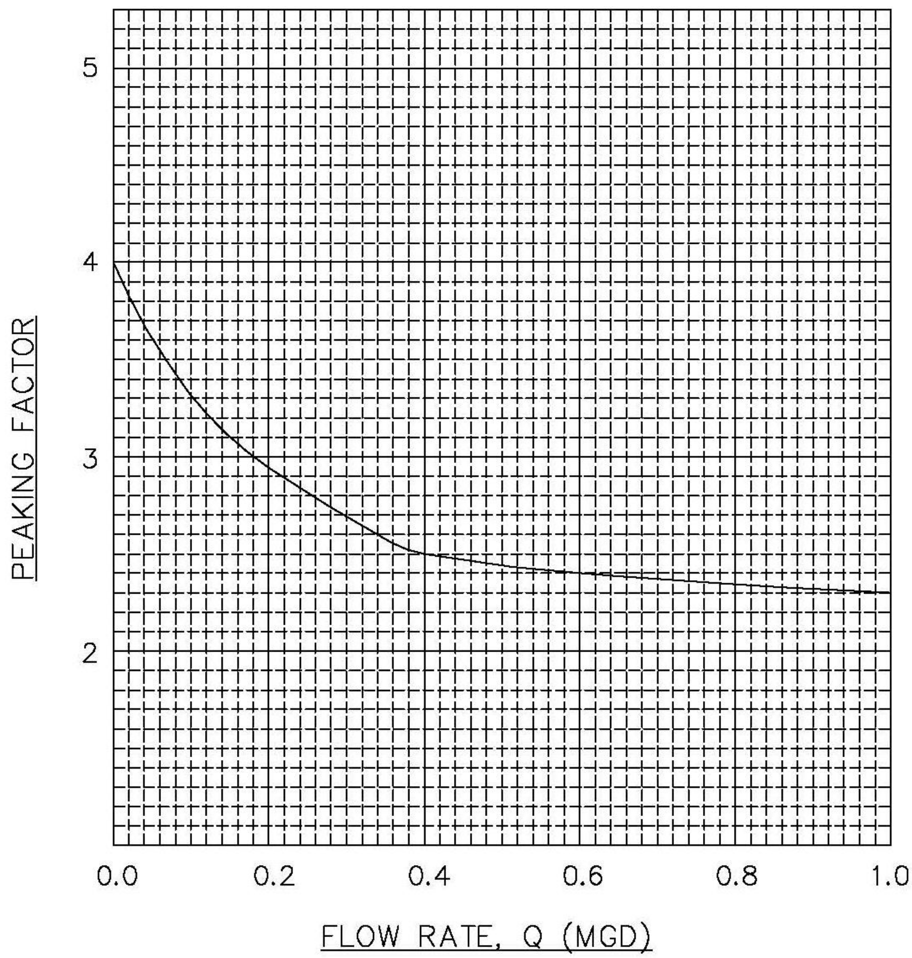
A. Plate 18-A Average Sewer Flow (By Area) Curves

B. Plate 18-B Sanitary Sewer Peaking Factors



AVERAGE SEWER FLOW BY AREA CURVES

PLATE 18-A



SANITARY SEWER PEAKING FACTORS

PLATE 18–B

Section 19:
STORM DRAINAGE

19.1 GENERAL REQUIREMENTS & DRAINAGE POLICIES

A. General Requirements

1) Stormwater facilities in the City of Folsom shall be designed in accordance with criteria and standards in this Section and in conformance with Chapter 8.70 of the FOLSOM MUNICIPAL CODE [(1)]. Additional information on the reference can be found in the Reference section of this document.

2) Folsom's streams and drainage courses naturally collect storm runoff and convey runoff to Lake Natoma, directly to the American River or to existing creeks in Sacramento County. The City of Folsom promotes managing stormwater at its source as well as applying a regional approach to stormwater management which is both internally consistent and consistent with goals and plans of neighboring communities.

19.2 Definitions

The following terms, abbreviations or definitions shall apply,

and the intent and meaning shall be interpreted as stated herein, wherever they are encountered in these Standards or in any documents or instruments referenced by these Standards.

Apron	A floor or lining of concrete or other suitable material at the toe of a dam, discharge side of a spillway, a chute, or other discharge structure to protect the waterway from erosion from falling water or turbulent flow
Base Flood	The flood having a one percent chance of being exceeded in any given year (100-year). The "base flood" is commonly used as the "standard flood" in federal flood insurance studies
Base Flood Elevation	The water surface elevation of the base flood
Caltrans	California Department of Transportation
Capacity	The effective carrying ability of a drainage structure or facility. May also refer to storage capacity
Catch Basin A	Basin combined with a storm drain inlet to trap solids
Catchment Area	The contributing area to a single drainage basin, expressed in acres, square miles, or other unit of area. Also called Drainage Area or Watershed
City Engineer	Responsible Engineer of the City of Folsom or assignee thereof representing the interests of the City
CLOMA/LOMA	Conditional Letter of Map Amendment/Letter of Map Amendment from FEMA generally based on an elevation certificate for a structure

CLOMR/LOMR	Conditional Letter of Map Revision/Letter of Map Revision from FEMA generally based on modeling of altered grades and drainage improvements
Concentrated Flow	Flow which is altered from its natural surface runoff and has accumulated into a single narrow ditch, channel, or pipe
Conduit	Any pipe, arch, or box through which water is conveyed
Confluence	A junction of streams or channels
Conveyance	A measure of the water carrying capacity of a stream or channel
Culvert	A closed conduit for the passage of surface drainage water under or over a roadway, railroad, canal, or other impediment
Debris Basin	A basin formed behind a low dam, or an excavation in a stream channel, to trap debris or bed load carried by a stream.
Design Storm	Storms comprising particular parameters of interest to be analyzed for the design of storm drain facilities. These may include the 2-year, 10-year and 100-year frequency storms.
Detention	Temporary ponding of stormwater to attenuate or reduce peak runoff rates
Development	Development, as referenced in these standards, shall refer to all new development, redevelopment, improvements to existing development, etc.
Director	City of Folsom Director of Public Works/Utilities
Discharge	A volume of water flowing past a given point per unit time
Diversion	The change in character, location, direction, or quantity of flow of a natural drainage course
Drainage Easement	A dedication, condemnation or reservation of an area of land for drainage purposes
Encroachment	The advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain which may impede or alter the flow capacity of a floodplain
Engineer	Registered Engineer conducting the drainage study or design of a drainage system
Federal Flood Zone	An area at risk of flooding as determined by the FEMA Flood Insurance Rate Maps
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map

Flood Proofing	A combination of structural changes and adjustments to properties subject to flooding primarily for the reduction of flood damages
Flood Storage	Storage of water during floods to reduce downstream peak flows
Freeboard	The vertical distance between the maximum water surface level (for a given flow or design storm) in a conduit, reservoir, channel, basin, canal, etc., and the top of the confining structure
Headwater	The upper reaches of a stream near its source or the region where ground waters emerge to form a surface stream or the water upstream from a structure
Hydraulic Gradient	A hydraulic profile representing the sum of the depth of flow and the pressure. In open channel flow, it is the water surface
Hydrograph	A graph showing stage, flow, velocity, or other property of water with respect to time
Impervious	A term applied to a material through which water cannot pass, or through which water passes with great difficulty
Inlet	A surface opening into a storm drain system for the entrance of surface storm runoff
Intensity	As applied to rainfall, is a rate usually expressed in inches per hour
Invert	The bottom of a drainage facility along which the lowest flows would pass
In-fill	Development of vacant properties within existing developed areas
Left Bank	The left-hand bank of a stream or channel when the observer is facing downstream
LID	Low Impact Development
NPDES	National Pollutant Discharge Elimination System
Outfall	Termination of a storm drain which receives the runoff from a collecting system
Overland Release	The passage of surface floodwater through a development in a manner to protect structures
Peak Rate of Runoff	The maximum rate of runoff during a given runoff event
Pervious	Applied to a material through which water passes relatively freely
Retention	Containment of runoff by ponding to be discharged by infiltration and evaporation or by release after the storm has ended

Riprap	Broken or natural stone or boulders placed compactly or irregularly on channel banks, levees, ditches, dikes, etc., for protection of earth surfaces against the erosive action of water
Right Bank	The right-hand bank of a stream or dam when the observer is facing downstream
Rock Slope Protection (RSP)	See “Riprap” above
Runoff	That part of the precipitation which reaches a stream, channel, drain, etc., directly or indirectly
Scour	The erosive action of running water in streams or channels in excavating and carrying away material from the bed and banks
SCS	Soil Conservation Service
Sheet Flow	Any flow spread out and not confined, i.e., flow across a flat open field
Soffit	The under-surface of the bridge structure
Standards	These storm drain design standards
Stormwater Quality	A multi-jurisdictional program made of Sacramento County and the Partnership incorporated cities of Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, and Rancho Cordova.
Stormwater Quality	The Sacramento Stormwater Quality Partnership Storm Water Quality
Design Manual	Design Manual
Subdrain	An underground conduit designed to permit infiltration for the purpose of collecting ground water
Sump	Low point in a natural or improved surface topography where surface flows will pond if a drain is not provided
Tributary Basin	An area tributary to a specific point under study

19.3 CITY DRAINAGE POLICIES

The following policies help set guidelines and criteria for the formulation of these Drainage Standards. They are not intended to be all encompassing or absolute. Projects will be reviewed based on these Standards as well as on the basis of “good engineering practices” where these Standards do not apply.

A. All submitted plans shall be signed by a registered California Civil Engineer prior to approval and all work shall be in accordance with these Design Standards and good engineering practice. The unsigned stamp shall be displayed on all sheets during the plan review process.

B. All public drainage facilities shall be located within the City's public right-of-way and/or public easement to provide access for installing, repairing, maintaining, improving, operating, constructing, and reconstruction of the public drainage facilities.

C. All drainage systems shall be designed to accommodate the ultimate development of the entire upstream watershed based on the current land use plan.

D. The design of a new storm drain system shall include consideration of the downstream drainage systems. The Engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

E. If downstream drainage facilities are determined to be inadequate, a detailed analysis shall be made to include impacts and mitigation to all downstream facilities to the confluence of the nearest master planned, regional, or previously designed system or until the impacts are determined to be negligible. The detailed analysis shall show that the downstream system can accommodate the increased flow from the maximum development possible for the entire upstream catchment based on the current land use plan.

F. Where downstream drainage facilities are determined to be inadequate for any reason including but not limited to size, condition, or alignment, it shall be improved as part of development drainage improvements and shall be shown on the improvement plans. On-site detention or retention may be an acceptable alternative to replacement of undersized downstream drainage facilities on a case-by-case basis as determined by the City Engineer.

G. Detention storage facilities will maintain peak runoff to pre-project conditions and retention storage will retain the additional volume of runoff above the pre-project condition for a specified period of time as described later in these standards.

H. Stormwater quality treatment facilities which are often incorporated into detention basin designs shall be provided for all development projects in accordance with these Standards, the current NPDES permit requirements, and the Stormwater Quality Partnership Stormwater Quality Design Manual(2).

I. Concentration of flows on adjacent properties is not allowed without appropriate mitigation, including but not limited to: Energy dissipation, Erosion control, and/or Acquisition of offsite easements and construction of offsite drainage facilities.

J. Private storm drain systems and stormwater quality facilities shall be clearly noted on the plans. Maintenance responsibilities shall be described in a recorded private maintenance agreement. Private maintenance agreements shall be subject to review and approval by the City Engineer.

K. Improvements within the Historic District shall be in accordance with these Design Standards and in accordance with the Historic District Design and Development Guidelines where applicable.

L. All drainage improvements shall drain freely to a gravity system such as an outfall pipe, stream, channel or other facility that can drain by gravity condition or to an approved pumped system.

M. Within the City of Folsom, gravity systems shall be preferred whenever practical. Use of a pumped drainage outfall shall be approved by the City Engineer and designed in accordance with these standards.

N. Improvement plans for phased developments utilizing interim facilities shall include plan and profile information for the ultimate planned facilities

O. No drainage shed diversion shall be allowed unless it is part of an approved regional drainage master plan.

P. All public and private streets and roadways shall have all lanes passable during a 10-year storm event. All public and private streets and roadways shall maintain at least 1 lane width (12' width) of travel during a 100-year event. Flow or ponding from a 100-year event shall not encroach outside the street section. Major roads shall maintain at least 2 lanes of travel (one in each direction) and not encroach outside the street section during a 100-year event.

Q. The City of Folsom requires that all private streets be designed and constructed in accordance with the City Design and Construction Standards.

R. For a sump condition an approved overland flow release per open channel flow requirements Section 19.4.4 shall be provided that conveys up to the 100-year runoff in the event that the drainage system becomes completely blocked.

19.4 OTHER STANDARDS AND MASTER PLANS

A. In addition to these Storm Drain Design Standards, other specific requirements for the improvement and construction of drainage facilities are set forth in latest versions of the Sacramento County Department of Water Resources Drainage Manual (3), Sacramento Stormwater Quality Partnership Stormwater Quality Design Manual, City of Folsom Standard Construction Specifications, and the County of Sacramento Standard Construction Specifications. In cases where these City Standards conflict with any of the other standards listed, the most stringent standard, as determined by the City, shall have precedence.

B. Drainage Master Plans have been completed for several areas in and around the City of Folsom. It is the responsibility of the Developer/ Subdivider to consult with the City to obtain the plan information and confirm that the master plan is current and that the project components are consistent with the master plan goals and model results.

19.5 REGULATORY FLOODPLAIN REQUIREMENTS

A. Residential lots developed in or adjacent to the City's Regulatory Floodplain shall have pad elevations a minimum of two feet above the City's 100-year flood elevation in accordance with Chapter 14.32 of the Folsom Municipal Code "FLOOD DRAMAGE PREVENTION." A LOMA or LOMR is required for any residential lot in or adjacent to the flood hazard area as shown on a FIRM. Non-residential projects shall have finished floor elevations a minimum of two feet above the City's 100 year flood elevation. Elevation Certificates are required for such non-residential structures. In areas where the 100-

year flood depths are less than eight feet, the above freeboard requirements will be increased to a minimum of three feet.

B. In the case of no-grade or contour grade lots located adjacent to the City's Regulatory Floodplain, and where a portion of the lot may become inundated with the 100-year storm event, a standard Guarantee Letter shall be submitted to the City prior to plan approval and/or issuance of a building permit. The Guarantee Letter shall be submitted by a Registered Civil Engineer or Land Surveyor and confirm that the lowest ground elevation adjacent to the building foundation meets the minimum requirements for pad elevations as described above.

C. If a proposed project is submitted which shows fill or other significant improvements within the Regulatory Floodplain, a hydraulic study shall be required to determine the effect of the encroachment. Encroachments shall not result in any off-site increase in water surface elevation. The Design Engineer is responsible for assembling the necessary data and presenting the study to the City for review. The study should reflect ultimate build-out conditions of the watershed. When submitting plans that show improvements in the floodplain, the Design Engineer shall submit a "Compliance Statement," stating that the proposed improvements shown on the plans area are accurately reflected in the approved hydraulic study. A sample of the "Compliance Statement," the hydraulic study submittal requirements, and a sample Hydraulic Study Worksheets are provided at the end of Section 19.

D. Parking lots and storage areas shall be no more than 6 inches below the 100-year water surface elevation.

E. When a portion of developing property is inundated by the City's Regulatory Floodplain, the portion of property that extends into the floodplain shall be dedicated as a Flood Water Conservation Easement as determined by the City. In areas where the floodplain has been dedicated as part of a Specific Plan but the 100-year flood levels are shown to extend slightly outside this dedicated floodplain area, the development shall incorporate that area into the floodplain.

F. The City of Folsom is a participant in the National Flood Insurance Program (NFIP) and all development in the City shall comply with regulations of the FEMA and the City's Flood Damage Prevention Ordinance Chapter 14.32.

19.6 DRAINAGE STUDY REQUIREMENTS

A. All improvement plan submittals shall require an approved drainage study. The following items shall be included in all drainage studies:

1) Report cover with address, APN, name of project as contained in project

2) Application, engineering company name and engineer's stamp and date.

3) Table of contents and List of Appendices and Figures

4) Purpose and objectives for the project study

5) Description of existing conditions - watershed description, downstream receiving system description, existing hydraulic features, environmental constraints, and easements.

6) Description of Proposed Project - Description of change in surface conditions and land use; existing and required off-site drainage improvements, easements, or permits required, drainage facility impacts to any existing habitat features, discussion of stormwater quality treatment or runoff reduction requirements and any LID measure being implemented per the Stormwater Quality Design Manual, site grading plans, and description of proposed hydraulic features.

7) Hydrology and hydraulic methods utilized in the modeling – Description of criteria and methods used, pre and post project runoff and system flow results.

8) Hydraulic Analysis – Plan-and-Profile plot of the proposed on-site and off-site improvements including pipe system layout and sizes and overland release. Hydraulic grade line calculations for the design flows as described in Hydraulic Requirements Section 14.3.

9) Maps and Figures with the following:

10) A watershed map information including topography and sub-basins

11) Land use map (existing and proposed)

12) Site plan topographic information with 2' contour interval maximum.

13) Drainage feature plan layout

14) Plan and profile sheets for conveyance systems including the design flow hydraulic grade line.

15) Site grading and drainage plan

16) Post construction stormwater quality plan prepared in accordance with the SSQP SWQ Design Manual Submittal requirements.

17) Model Results - For complex conveyance or when requested by the City, detailed hydraulic model results shall be provided. Models such as XPSWMM/XPStorm or approved equal able to calculate HGL will be required.

B. In addition to items listed in Subsection above, the following are required for drainage studies with development within floodplain areas (federal or local floodplains):

1) Existing condition floodplain information that identifies structures at risk

2) Profile of existing and proposed 100-year floodplain water surface elevation

3) Two-year, 10-year, 100-year water surface elevations for open channels and any basins utilized.

4) Surveyed channel and overbank cross section topography at maximum 200' between sections, with shorter distance near all significant features such as bridges, abrupt changes in channel alignment, and abrupt changes in channel geometry.

5) Plot plan of existing and proposed floodplain extents

6) FEMA map with project location (including any revised floodplains) if appropriate

7) Electronic floodplain model using HEC-RAS or approved equal as appropriate, with files labeled in a clear manner and organized to allow efficient review.

8) A channel stationing map that includes cross sections that cover the full extent of 100-year inundation, bridge, and culvert locations with upstream and downstream invert elevations, along with model nodes and stations labeled as in the grading plan and model.
9) Compliance Statement and Hydraulic Study Worksheet as provided at the end of this Section.

C. In addition to items listed in subsections a. and b. above, the following are required for drainage studies with detention basins:

1) Cross-sections and details for basins including outfall structures, channels, inflow pipes, weirs and erosion control features
2) Depth-volume rating curves for flood control and stormwater quality volumes.
3) Two-year, 10-year, and 100-year water surface elevations and stormwater quality treatment water surface elevations
4) Plan and profile for connecting channels and/or pipes
5) A site plan of the basin with topography (existing and proposed)
6) Detail model results showing the effectiveness of the storage facility to meet peak flow and volume requirements.
7) Long-term maintenance requirements.

19.7 HYDROLOGY

A. General Approach

Hydrology for the City of Folsom is typical for Central Valley communities which are situated at the base of the Sierra Nevada foothills. Rainfall totals and intensities are measurably greater than for other valley communities farther to the west in Sacramento County. In addition, due to steeper topography with shallower less pervious soils than other communities within the region, peak runoff flows are much higher. In contrast, portions of the City are within areas near the American River and historic gold dredging operations where thick layers of highly pervious cobbles allow a high rate of infiltration. With these variations in hydrologic conditions, the planners and designers of drainage facilities shall keep in mind the potential for sharp peaks in runoff flow rates, while taking advantage of filtration for storage and treatment of stormwater runoff.

Watersheds within the City's sphere of influence are either built-out, have a current masterplan or are relatively small (less than 10 square miles). Therefore, hydrologic analyses can be maintained to a local level without the need for more complex modeling scenarios including "storm centering", and in most cases multi-day events.

For in-fill projects simplified methods for estimating design flows are contained in these standards and will generally be acceptable for sizing of pipes, selecting inlet types and spacing, and for overall planning of new improvements. However, in all cases the effects of new development on the existing drainage systems shall be considered. Downstream facilities as well as regional systems shall be identified and included in hydrologic studies to determine the capacity to receive stormwater flows and to address the water quality of the flows generated by any new development or improvements to the drainage system.

Detention storage will often be necessary for in-fill projects and nearly always for larger development projects to mitigate for increased runoff and to treat for water quality in order to maintain or enhance the current level of protection in the existing drainage systems. With this in mind, hydrograph methods will be necessary for completing hydrologic analyses. The following is a listing of appropriate methods for completing hydrologic analyses within the City of Folsom.

1) New development projects 20 acres or less:
   a) Pipe, overland and inlet sizing – Use Plate 19-B (See Section 19.7.C.1) or provide hydrologic/hydraulic model
   b) Check capacity of downstream system – Consult with City and City Masterplans and/or model downstream system using appropriate hydrologic/hydraulic modeling.
   c) Detention storage if necessary – Use hydrograph Method (see Section 19.7.C.2)
   d) Water Quality Analysis – Refer to the Water Quality Partnership Storm Water Quality Design Manual.
2) New development projects greater than 20 acres:
   a) Use a hydrograph method (see Section 19.7.C.2) on all projects
   b) Water Quality Analysis- Refer to the Water Quality Partnership Storm Water Quality Design Manual.

B. Rainfall

Rainfall data for the City of Folsom is available from several sources. The County of Sacramento incorporates rainfall into the SacCalc hydrologic computer model, with rainfall designated to be in Zone 3 which includes the eastern portion of Sacramento County. A second source is current rainfall gauges in the area. The closest gauge with significant years of record is the USGS, Prairie City Gauge, No A00 6690 34. Intensity duration data has been established for this in the Engineering Climatology for California, 2005 Extreme Precipitation Symposium., 2005 [4].

Based on the sources above and other resources, Plate 19-A has been established for the City of Folsom and may be used for calculating peak runoff for various storm events. The graphs on Plate 19-A are found to be good approximations and slightly conservative when compared to the Prairie City Gauge statistical data. When using the SacCalc program, the Zone 3 rainfall data built into the model will be adequate to produce consistent results with City and County masterplans and are also relatively close to the gauged statistical data.

C. Acceptable Methods

The following sections describe the use of acceptable hydrologic methods to be used within the City of Folsom.

1) Simplified Method (City Runoff Curves)

As mentioned previously, Plate 19-B provides a simplified method to determine peak runoff for sizing pipelines and inlets for developments with watersheds less than or equal to 20 acres. These curves provide peak flows (discharges) corresponding to approximately a 10-year frequency runoff for the various land use types. When used for sizing pipelines, the Engineer shall size the pipe to convey the peak flow from the curve with the pipe flowing full. For overland flow in streets, at least one lane width (12' width) of travel shall be maintained during the 10-year peak flow. Inlets shall be spaced to intercept the entire peak flow generated from these curves. Roadside ditches and on-site swales shall be sized to convey the peak flow generated from these curves with no overtopping.

It should be understood that this simplified methodology is intended for planning level design and will not meet all the conditions for approval such as 100-year criteria, downstream facilities review, potential storage and water quality requirements.

2) Hydrograph Methods

For determining storm run-off for new development or system upgrades in the City of Folsom, the use of a hydrograph method will nearly always be required. A hydrograph method will provide volume as well as flow variation over the entire duration of a designated storm event. This will provide necessary data for detention storage, water quality analysis, and overall impact to downstream facilities. Acceptable methods for use on projects within the City will include:

a) Sacramento Method – See the Sacramento County Department of Public Works Drainage Manual, latest edition
b) XPSWMM using the Sacramento Method – This method can also size above and underground facilities
c) HEC-HMS – This Army Corps computer program will calculate hydrographs and peak flow for various storm events. The program requires rainfall, soils, land use and routing data. These parameters are already incorporated into the Sacramento Method. The Engineer will be required to describe all parameters included in the HMS model which will be subject to review for consistency with those parameters contained in the Sacramento Method.

3) Design Storms

The following design storms shall be used for projects within the City of Folsom:

Pipe Size Capacities – 10-year peak flow with hydraulic grade line a minimum of 1 foot below final grade at all inlet grates and 100-year peak flow remaining within the street right-of-way. 100-year flow shall be contained in an overland channel and easement per these standards for open channel design.

Street and Overland Release from Sump Areas – 100-year peak flow contained within the street right-of-way. In sump areas an overland release shall be provided to convey the 100-year peak flow assuming no flow in any underground system.

Open Channels and Ditches – 100-year peak flow with a minimum of 1 foot of freeboard to adjacent grades. If levees contain the channel, then FEMA standards shall be met.

Culvert Crossings – 10-year peak flow with no head on the culvert and safely pass the 100-year flow while maintaining a minimum of 1 foot of freeboard to adjacent grades and without negatively impacting upstream property.

Bridges – 100-year water surface elevation with a minimum of 1 foot clearance from the bridge soffit on minor roadways, including pedestrian/bicycle bridges, and 2 feet of clearance on major roadways (defined as roadways with two or more lanes in each direction).

Flood Control Detention Facilities – 10-year and 100-year, 24 hour event with hydraulic grade lines of upstream facilities meeting the requirements above, and 100-year, 24-hour storm meeting required outflow restrictions and detention storage, while maintaining a minimum of 1 foot below adjacent finish grades.

Water Quality Detention Facilities – Detention facilities shall also meet the requirements of the Water Quality Partnership Storm Water Quality Design Manual (SWQDM). The SWQDM requires water quality basins as well as analysis of a range of design storms for a variety of watershed and drainage course conditions.

Flood Control Retention Facilities – 100-year, 5-day storm. Facility shall store the entire volume with means to drain facility in 48 hours.

4) Folsom Stream Hydrology

The City of Folsom's Humbug-Willow Creek hydrology defines the runoff for developed conditions from major sub-basins in that watershed. The information is available for use by the Engineer and is contained in the Humbug –Willow Creek Parkway Phase 2 Engineering Report [5].

19.8 HYDRAULIC REQUIREMENTS

A. Surface Runoff Hydraulic Criteria

1) Overland Flow

Overland flow calculations for swales and small ditches shall conform to open channel flow criteria using appropriate Manning's "n-values" for earth, grass lined, rock line or concrete line channels (see Section 19.3.3b).

The Engineer shall also consult the requirements of the Stormwater Quality Design Manual for the design of surface runoff improvements. Low Impact Design (LID) procedures such as grass lined swales and porous pavement design shall be incorporated into project designs for surface runoff.

2) Flow in Streets and Sump Conditions

Street Flow on Continuous Grade:
Estimating the capacity of street flow is important for determining the depth and extent of flow in the street during design storm events and for locating and sizing drain inlets. Per City policy, when conveying the 10-year event peak flow, all traffic lanes shall be kept open from flooding. The 100-year event shall not encroach outside the public right-of-way and/or public easement.

The Federal Highway Administration HEC-12, Drainage of Highway Pavement [6] provides detailed guidelines for estimating street flow and estimating various inlet capacities. The Engineer is encouraged to consult this resource for layout of the inlet system. In lieu of the HEC-12 guidelines, a simplified and conservative method for determining street flow capacity is provided below.

Q(½ street section)=.56/n x (Sx)^1.67 x (S)^.5 x T^ 2.67
This equation is for a triangular section (with a constant cross-slope), not accounting for any higher capacity in the gutter section.

Q = Flow in cfs for ½ street section
n =Manning's "n value" use 0.015
Sx= street cross slope
S= Slope of the roadway grade
T= width (spread) of the street flow. T shall be 8 feet maximum for the 10-year peak storm flow.

The 100-year T maximum will depend on the number of lanes and overall street width. Inlets shall be spaced adequately to intercept enough flow to maintain the maximum T width or less.

Sump Condition:
For sump conditions in the street, an overland flow outlet shall be provided at an

elevation and with adequate capacity to prevent the 100-year flow from flooding beyond the street right-of-way or public drainage easement. This overland release shall have the capacity to flow the entire 100-year event flow assuming any underground system is completely plugged.

Streets, parking lots, playgrounds, pedestrian areas, pedestrian walkways, utility easements and other open space areas may be considered compatible uses within the overland release path, subject to approval of the City Engineer.

3) Inlet Hydraulic Design Criteria

The following provides hydraulic criteria for the design of drain inlets.

a) The depth of flow in the gutter at the inlet shall not exceed 0.35 feet. The flow rate used to check the depth shall include any runoff that may by-pass upstream grates.
b) The maximum allowable area draining to one on-site inlet shall be two acres.
c) Where street grades are greater than 3%, the manholes and inlets will be located such that the laterals from the inlets shall enter the manhole at not more than 90 degrees measured from the upstream mainline entering the manhole. This is to avoid laterals designed to flow in a direction adverse to the direction of the flow in the main. Exceptions to this requirement may be considered at turns in the mainline at the manhole, such as at the tee intersections. These situations will be reviewed on a case by case basis. The above requirement may be waived if the Engineer can show by calculations that the adverse entering downstream inlets would enter the manhole at an invert elevation at least 6 inches above the calculated water surface elevation (HGL) of the peak 100-year flow in the main.
d) Inlet Design capacities shall be indicated in the hydraulic design of the drainage system. Capacities may be determined per the Sacramento County Drainage Design Manual or the Federal Highway Circular HEC-22.

B. Hydraulic Criteria of Closed Conduit

1) Pipe Sizing Criteria and Hydraulic Gradient Calculations

Sizing and hydraulic grade line calculations for new drainage pipe shall be completed using an approved computer model. Spreadsheet or tabular calculations may be acceptable on smaller projects if all formulas are shown and calculations are complete and clearly assembled.

Hydraulic Grade Line Requirements –

a) Using flows from Plate 19-B (Simplified Method) of these standards calls for sizing pipe assuming the pipe is flowing full, without pressure flow allowed. This will result in conservative sizing.
b) Using an acceptable computer model and calculating the 10-year peak runoff a less conservative design can be achieved allowing pressure flow in the pipe during the 10-year event. Under this methodology, using the calculated 10

year flows, the hydraulic grade line shall stay at a minimum 1 foot below the surface grade of all manholes and 0.5 feet below all inlet grades. A profile of the pipe system shall be submitted with the hydraulic grade line calculations.

c) Hydraulic calculations for the laterals from the inlets will also be provided.

d) The hydraulic grade line for the 100-year event shall stay within the street right-of-way.

e) The starting water surface elevation for the 10-year and 100-year events shall be determined for the receiving system and indicated on the profile.

2) Acceptable Pipe Velocities and Minor Losses

Along with Hydraulic gradeline calculations the Engineer shall indicate the velocities in the pipe system. The minimum pipe velocity for a pipe flowing full (non-pressure condition) shall be 2.5 feet per second. The maximum velocity for a pipe flowing full, pressure or gravity flow shall be 10 feet per second. If steep grades cannot be avoided, short sections (100 feet or less) may be allowed to flow at up to 12 feet per second with the approval of the City Engineer. However, in most cases, drop manholes with milder sloped pipes can be used to achieve the 10 feet per second criteria.

For calculating hydraulic grade lines in closed conduit the following Manning's "n values" shall be used:

Pre-Cast Concrete Pipe	0.013
Cast-Place Concrete Pipe	0.014
PVC Pipe and HDPE Pipe	0.012
Corrugated Metal Pipe	0.023

Minor losses in manholes and other junctions shall also be accounted for. Typical equations for manhole losses are as follows:

HL = 1.25 x (Vin^2)/64.6 for flow through manholes and bends in the pipe up to 45 degrees
HL= 1.50 x (Vin^2)/64.4 for manhole with bends greater than 45 degrees
HL= manhole headloss (feet)
Vin = velocity in the inlet pipe (feet per second)

For planning purposes when the manhole locations and pipeline alignments are not finalized, calculations without manhole losses can be provided, however, the Manning's "n values" used shall be increased by 15%.

3) Culvert Hydraulic Designs

Culverts crossing roadways in the City of Folsom shall be designed to pass the 10-year peak flow with no upstream head on the culvert and the 100-year peak flow without entering the roadway section. In cases where the downstream receiving water creates a 10-year water surface that submerges the proposed culvert, pressure flow will be allowed with the following conditions:

a) Maintain a minimum 2 feet of freeboard at the upstream headwall and adjacent channel and roadway edge.
b) 100-year peak flood elevation maintained below the top of channel or roadway edge.
c) The maximum velocity through the culvert shall not exceed 10 feet per second.

In addition, the new roadway culvert cannot increase the 100-year floodplain elevations over existing conditions in the channel upstream or increase velocities(beyond energy dissipation measures) in the downstream channel.

All calculations for sizing culverts will assume a minimum of 30% blockage or greater depending upon the debris potential conditions in the upstream watershed and as directed by the City Engineer.

4) Acceptable Computer Models

Computer models are available that compute hydraulic grade lines in closed conduit, with some programs that will also compute open channel and street flow and storage, and storage in detention facilities. XPSWMM is an acceptable program for modeling closed conduit systems that is familiar to Engineers at the City of Folsom and in Sacramento County. Other similar programs will be acceptable upon approval of the City Engineer.

HEC-RAS is the preferred culvert hydraulic design program. Other programs such as HY8 will also be considered acceptable under certain conditions. The Engineer shall request approval of other programs before proceeding with the culvert modeling.

C. Hydraulics Criteria of Open Channels

1) Channel Sizing and Freeboard Criteria

Open channels shall be sized to convey the 100-year peak flows with a minimum of 1 foot of freeboard for channels at grade (non-levee) and shall meet the requirements of FEMA for any channel systems designed with levees. The hydraulic grade line of the 10- and 100-year storms shall be calculated and plotted on all channel profiles. Criteria for open channel hydraulic calculations are provided in the following sections.

2) Manning’s N-values and Open Channel Design Calculations

Manning’s “n-values” below are to be used as a guideline for open channel hydraulic calculations. The Engineer shall provide photos and design details as supporting data to justify “n-values” based on the channel conditions.

The Manning’s n values are to reflect the ultimate channel conditions and are especially sensitive for earthen, vegetated channels. Hydraulic analysis will be sensitive to Folsom's natural creeks and parkway policies. This should be reflected in the use of higher "n" values and assumed selective maintenance as appropriate. New drainage open channels shall also reflect this sensitivity as appropriate.

For consistency, the following "n" values shall be used in the analysis for improved channels:

Earth channel – straight maintained with no trees or willows	0.040
Earth channel meandering, maintained with some trees and willows	0.050
Open channel, lined bottom, sides maintained	0.030
Open channel, lined sides, bottoms left natural	0.035
Open channel, completely lined	0.020
Open channel, grass lined maintained (swales & ditches)	0.025-0.30

As stated above, for natural channels the Engineer shall provide evidence for current and expected long term channel roughness coefficients. An “n value” less than 0.030 will not be acceptable. Most local streams have “n values” that exceed 0.10.

Hydraulic calculations shall take into consideration all channel losses due to changes in geometry and slope, changes in manning’s “n”, and hydraulic control and limitations of downstream facilities. Backwater effects and hydraulic grade line calculations shall be included in the analysis of open channels.

3) Acceptable Channel Velocities and Minor Losses

Improved open channels shall be designed to limit erosion potential and to avoid unstable flow conditions. High velocities flow and flow traveling near “critical depth” can create undesirable erosive forces and unpredictable water surface profiles.

Flows near critical depth can change abruptly from subcritical to critical and back again. Water surfaces in a channel designed near critical depth can change from faster moving flow to deeper subcritical flow with little disruption in the stream configuration or due to any type of obstruction. These types of channel conditions shall be avoided. Acceptable velocity ranges shall be 2.5 to 6 feet per second in unlined open channels and 3 to 12 feet per second in lined open channels. All computations shall be clearly documented and submitted to the City Engineer for approval.

Where topography requires a steeper (well above critical) channel gradient, flow velocities can become excessive and erosion can be a problem. The Engineer shall provide an analysis showing channel velocities for all reaches of the channel, quantify the erosive (scouring) potential and provide mitigating measures to prevent erosion. Also refer to the Stormwater Quality Design Manual for requirements to analyze channel erosion and sediment transporting potential under “Hydromodification” analysis and mitigation measures.

The following are typical measures to address high velocity flows in open channels:

- Concrete lining followed by an appropriate dissipation structure

- Properly sized and placed rock lining
- Drop structures followed by mild sloped channels
- Vegetative rock slope protection
- Reduction of flows near the source though detention in conjunction with any of the above.

Use of any of these measures shall be analyzed hydraulically for its effectiveness and shall be approved by the City Engineer before implementation.

4) Outfall Hydraulics and Downstream Control

When analyzing the hydraulic design of open channels, the outfall conditions are an important factor. The Engineer shall gather adequate data on the receiving waters to show a starting water surface for hydraulic calculations. This is also a requirement for any closed conduit design.

Hydraulic grade line calculations shall include the 10-year and 100-year starting water surface elevations for the channel or closed conduit system at the outfall. Back-up data shall be provided to substantiate the starting water surface elevations of the receiving system. The backwater effects of the downstream water surface shall be included in these hydraulic energy calculations.

5) Hydraulics of Bridges and Required Clearance and Freeboard

Hydraulic design requirements for bridge crossings will apply to: single span bridges, bridges with piers or bends, and box culverts with conveyance (opening) cross-sectional area greater than 80 square feet.

For streams with levees, FEMA requirements shall be adhered to for freeboard at bridge crossings. For all other bridge crossings the following criteria shall govern:

a) For minor roadways (single lane in each direction) and streams with a 100-year peak flow less than 2,000cfs shall provide 1-foot freeboard from the 100-year water surface elevation to the bridge soffit. For major roadways or streams with 100-year flow greater than 2000cfs, the City Engineer may require up to 2 feet of freeboard depending on anticipated debris loads. The Engineer shall research debris potential for these bridge crossings.
b) Bridges with interior piers, bents or culvert walls shall be loaded with debris for the hydraulic analysis. A minimum of 1 foot width shall be added to all interior piers, bents or walls unless the Design Engineer can show proof of adequate upstream debris control or lack of debris source during the entire life of the bridge.

6) Acceptable Computer Models

Computer models for open channel hydraulic calculations are generally preferred over hand or spreadsheet calculations. HEC-RAS is the most common and preferred modeling tool for open channel and bridge calculations. Two dimensional models such as UNET, Flow 2D or River 2D will in most cases not be warranted for projects within the City of Folsom.

D. Hydraulic Criteria of Stormwater Storage and Pumping Facilities

1) Design Capacity for Flood Control Detention/Retention Facilities

Detention and Retention Basins shall be constructed to: 1) mitigate for increased runoff from new developments or other improvements and 2) as part of a Stormwater quality solution. The design storms for design of these features shall be as listed in 19.2.3c of these standards.

The hydraulic analysis for the design of detention and retention facilities will at a minimum provide the following.

a) Pre-project and post project hydrologic analysis, showing the effectiveness of the storage to mitigate for post- project runoff. In most cases post -project peak flows leaving the project boundary shall be at or below pre-project flows.
b) Storage volume, freeboard and basin evacuation calculations meeting the requirements listed in Section 19.2.3c.
c) Hydraulic grade line calculations for the facility including the upstream and downstream drainage systems connected to the detention/ retention basin.
d) Hydraulic calculations for the outlet control feature consistent with the basin volume and hydrologic routing calculations described above.

2) Hydraulic Requirements of the Stormwater Quality Design Manual

The Sacramento Stormwater Quality Partnership Stormwater Quality Design Manual will be adhered to when analyzing and designing stormwater storage facilities for the purpose of meeting the City's NPDES permit requirements. Stormwater Quality elements within the storage facility shall be included in the hydraulic analysis. In addition, effects of the proposed system on the natural conditions of downstream channels shall be addressed. The potential effects of erosion, sediment transport and storm water pollutants shall be included in the analysis and measured to address any of these issues and shall be incorporated into the storage facility design.

3) Stormwater Pumping Facilities

Use of pumping facilities shall be avoided whenever possible. However, hydraulic conditions or excessively deep pipe may result in the need to pump stormwater. The need shall be evaluated on a case by case basis for approval by the City Engineer. Typical conditions creating the need for pumping include interior drainage behind a levee and deep storage facility without the opportunity for a gravity outlet.

4) Design Capacity for Pumping Facilities

Stormwater pumping facilities shall be designed to deliver the 100-year peak flow with any one pump off line. The pumps shall come on-line at an elevation to meet the requirement of the system hydraulic gradient as described in these standards.

Pump station sumps shall be designed and sized to meet the above hydraulic criteria and the criteria of the Hydraulic Institute Standards (latest edition).

19.9 DRAINAGE CONSTRUCTION REQUIREMENTS

A. Design Plans and Specifications Submittal Requirements

1) Design Submittals and Reviews

Design submittals and the review process for drainage facilities shall be in accordance with these Design Standards and the City of Folsom Construction Standard Specifications

2) Use of Standard Plans and Specifications

The City of Folsom Standard Plans and Specifications shall be used for all drainage designs except where agreed upon by the City Engineer. In the event that a required drainage feature, material or construction installation procedure is not found with the City Standards, Sacramento County Standards shall be consulted. If neither of these sources adequately encompasses design standards for any drainage feature included in an improvement project, then the State of California (Caltrans) Standard Plans and Specification shall apply.

B. Design of Inlets and Manholes

1) Inlet Types, Locations and Spacing

All drain inlets shall have a “No Dumping” Public notice per Standard Detail SD-1.

Type B inlets shall be used on all public streets, except where noted as follows:

a) Hillside area where the street grade is greater than or equal to 4%, use Type GOL's only.
   (1) Type GOL inlets. A GOL-7 should be used for grades 4% to 7% and a GOL-10 shall be used for grades 7% to 10% at the 400-foot maximum spacing. For grades greater than 10%, the GOL-10 shall be placed at spacing not greater than 200 feet.
b) Type F inlets shall be used in unimproved medians.
c) Type A, C, D & E inlets shall be used for on-site drainage in parking area, private streets and in special circumstances within the public right-of-way with prior approval from the City Engineer.

Drain Inlets shall be connected directly to a manhole with exceptions noted as follows:

d) Parking lot and private drive drain inlets may be connected in series.
e) Inlets connected in series for public roadway drainage shall be for special circumstances and will require prior approval from the City Engineer.

Inlets shall be placed so that the length of flow in the gutter does not exceed 500 feet in either direction.

Drain Inlets shall be placed adjacent to handicapped ramps in high pedestrian traffic areas as directed by the City Engineer in such a manner that no more than 100 feet of curb and gutter drains through the ramp area. Drain inlets shall be placed three (3) feet from driveway sections, pedestrian ramps, round corners or pedestrian crosswalks, or the round corner side of pedestrian crosswalks. In new subdivisions, drain inlets should be placed at lot lines and 3 feet from the ends of curb returns at round corners.

Drainage Inlets from State of California, Department of Transportation Standard Plan, D72 and D74 may be used under special conditions and only when approved by the City Engineer.

All inlets for on-site use that are not shown in the Standard Drawings shall be clearly dimensioned on the plans. All grates shall be designed to provide adequate safety for automobile traffic, bicycles, and pedestrians.

Gutter drains as shown on the State Standard Drawings may be used for on-site drainage only in areas not subject to vehicular traffic.

Type B inlets may be used as junction boxes. Number and size of pipes entering and exiting Type B inlets shall be per the standard drawings. When used as junction boxes where pipe is changing directions, the inside dimension requirements for junction boxes shall be met. Only the first three inlets of a drainage system may be used as junction boxes. Inlets shall not be used as junction boxes in sag points.

2) Manhole Types, Locations and Spacing
   a) Manhole Types
      (1) Manhole types shall conform to the Standard Details in the City of Folsom Standard Construction Specifications. Type and size of manhole depends on type of drainage pipe used and pipe size and depth. The minimum spacing between pipelines holes shall not be less than 12-inches as measured along the inside face of the manhole. In cases where manholes will not adequately support inlet and outlet pipes, reinforced concrete junction structures may be required (normally on large diameter pipe). Junction structures shall be designed specifically for each site per the County of Sacramento Standard Drawings and Specifications.
      (2) Junction Boxes

The requirements for junction boxes are as follows:

(1) Junction boxes shall be constructed of reinforced concrete or fabricated from reinforced concrete pipe sections where size limitations permit. Structural calculations shall be provided for all junction boxes.
(2) Minimum wall thickness for reinforced concrete junction boxes shall be 6-inches.

(3) The inside dimensions of junction boxes shall be such as to provide a minimum of 3-inches of clearance on the outside diameter of the largest pipe in each face. In no case will junction boxes be allowed which are smaller than 48-inches inside diameter. All junction boxes shall be rectangular in shape unless otherwise approved by the City Engineer.

b) Covers

(1) All manholes and junction boxes, other than drain inlets, shall have standard manhole covers per the Standard Drawings. No pipe will be allowed to enter a manhole into the transition portion of the manhole cone. Manholes will not be allowed in the gutter flow line except where approved by the City Engineer. Slotted manhole covers may be used to pick up minor drainage in non-traffic areas with prior approval of the City Engineer.

c) Manhole Locations and Spacing

(1) Manholes shall be located at junction points, angle points greater than 15 degrees, and changes in conduit size. On curved pipes with radii of 200 feet to 400 feet manholes shall be placed at the B.C. and E.C. and at 300 feet maximum intervals along the curve. On curves with radii exceeding 400 feet, manholes shall be placed at the B.C. and E.C. and at 400 feet maximum intervals along the curve for pipes 24 inches and less in diameter and 500 feet maximum intervals along the curve for pipes greater than 24 inches in diameter. Manhole spacing on curves with radii less than 200 feet will be determined on an individual basis.

3) Storm Drain Pipe Laterals

Maximum velocity and hydraulic grade line requirements within these Design Standards will dictate the size of storm drain laterals from drain inlets. The smallest size for a storm drain lateral within the public right of way shall be 12-inches in diameter. The slope of the lateral is not to exceed 10%.

C. DESIGN OF DRAINAGE PIPE

1) Allowable Pipe Types

Within the City of Folsom, the following pipe types are acceptable for construction of drainage pipelines.

a) Pipelines

(1) Reinforced Concrete Pipe (RCP) – Reinforced concrete pipe shall conform to ASTM C76 and the provisions of the City of Folsom Standard Construction Specifications. RCP pipe class will be selected based on such factors as soils conditions, cover, street loading and pipe size. The Engineer shall refer to the City of Folsom and the County of Sacramento Standards when selecting the appropriate pipe class.

(2) Polyvinyl Chloride Pipe (PVC) – PVC pipe may be used for pipelines less than or equal to 24-inch in diameter and shall be a minimum of SDR26.

Pipe larger than 24-inches in diameter shall be constructed of reinforced concrete.

2) Culverts

   a) Reinforced Concrete Pipe (RCP) – Reinforced concrete culverts shall meet the requirements of these standards for pipe in streets and the State Standard Plans and Specifications for headwall construction.

   b) Reinforced Concrete Box (RCB) – RCB construction shall meet the requirements of the State Standard Plans and Specifications for the construction of highway RCB culvert and headwall construction.

D. Pipeline Alignment Requirements and Conflicts with other Utilities

1) Pipelines for storm drainage shall have a constant slope between manholes, junction boxes, and/or catch basins. Minimum radius of horizontal curvature shall be 200 feet. In no case shall the radius of curvature be less than the manufacturer's recommendations for the particular pipe size under consideration. Meandering and unnecessary angular changes in alignment shall be avoided. Angular changes in alignment shall be no less than 90 degrees with the downstream section of the storm drain main.

   a) When storm drainage lines are to be placed in existing streets, factors such as curbs, gutters, sidewalks, traffic conditions, pavement conditions, future street improvement plans and existing utilities shall be considered.

   b) Joint deflection shall not exceed 80% of the manufacturer's recommendation. When a change in pipe diameter occurs, the top of pipe elevations of the inflow and outfall pipes shall match.

2) Conflicts with Water and Storm Drain Lines

   a) Conflicts with water lines shall be avoided by relocation of the water lines subject to prior approval of the City Engineer. Remediation and/or disturbances of the existing storm drain mains and appurtenances that conflict with water mains and appurtenances shall not be permitted.

   b) The vertical clearance between the water pipe and storm drain pipe may be reduced to a minimum of 6-inches if a block of extruded polystyrene (Styrofoam) is installed between the two. Inlet depth of Type A through Type E inlets may be increased to 5 feet if reinforced. Reinforcement will need to be engineered with details shown on the plans. The City Engineer shall approve all requests for deeper inlets. Type F and Type GOL inlets should have adequate depth as designed. The City Engineer will also consider requests for reduces cover at conflict points on a case-by-case basis where a hardship can be demonstrated as approved by the City Engineer.

E. Cover Requirements

In the City of Folsom, the minimum cover on any pipe shall be 18 inches from sub-grade, or the manufacture's recommendation, whichever is more stringent, with the exception of PVC pipe which shall be a minimum of 24-inches from sub-grade. Special circumstances shall otherwise be approved by the City Engineer. Pipe with less cover may be allowed in special circumstances with a controlled density backfill or a concrete cap per these Design

Standards, the City of Folsom Standard Construction Specifications and the County of Sacramento Standards.

Maximum cover shall meet the requirements contained in the Sacramento County Standard Drainage Manual, Sacramento County Standard Drawings and Specifications as well as the pipe manufacturers' recommendations, whichever is more stringent as determined by the City Engineer.

F. DESIGN OF OPEN CHANNELS

1) General Conditions

The design of levees associated with open channels shall comply with the Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineer, and State Reclamation Board requirements. The Engineer shall determine the design requirements for all levee projects on a case by case basis. All levee projects shall include levee structure reports, surveys, certified soils reports, as-built drawings, and any other information determined by the Engineer as being required for FEMA compliance.

Open channels shall be paralleled by a maintenance access road, including turnaround areas, and security measures, such as fencing, as required by the City Engineer. The access gate shall be recessed a minimum of 20 feet from the street.

Levee slopes shall be free from non-essential structures, encroachments or vegetative growth which could interfere with maintenance, inspection or hamper flood fighting activities.

For all channels, either realigned or natural, the following items shall be shown on improvement plans in addition to the information heretofore required:

1) The profile of existing channels shall be shown for a minimum of 1,000 feet at each end of the development on the construction plan to establish a minimum profile grade.
2) Typical cross sections.
3) Special headwalls, endwalls, reinforced concrete transitions to culvert crossings, riprap, concrete aprons, energy dissipaters and other hydraulic devices shall be installed where required. All such devices shall be shown on the plans and approved prior to construction.

G. Typical Lined and Unlined Channel Sections

Channel configurations and types shall be submitted for approval by the City Engineer. Additional design requirements for unlined and lined channels are as follows:

1) **Unlined Open Channels** – In unlined channels, and channels with lined bottoms only, all underbrush and debris shall be removed from the channel cross section with the exception of certain trees which may be utilized to retain the ecology of

the area. All such trees shall be shown on the plans and those to be left in place so designated. All abrupt changes in the alignment or profile of the natural channel which seriously restrict flow shall be improved and re-graded.

2) **Lined Open Channels**– All channels to be lined shall be lined with concrete or air-blown mortar to an elevation of 0.5 feet above the 10-year water surface elevation for buildout conditions. The channel bottom shall be constructed using Portland cement concrete. The side slope shall not exceed 1:1 on the lined portion and 1-½:1 on the unlined portion above the top of the concrete lining. The minimum bottom width shall be 6 feet. Where a channel is to have a lined bottom only, channel lining shall extend up the side slopes of the channel a vertical distance of at least one foot from the flowline of the channel. Other lined channel design requirements are as follows:

   a) The welded wire fabric shall be placed on one-inch wire tie Dobies spaced 2.5 feet on centerlines each way.

   b) Channel lining expansion joints shall be concrete tie ASTM D1751 Asphalt impregnated fiber expansion joint spaced 50 feet on centers.

   c) Channel contraction joints shall be ½ inch to 5/8 inch wide grooves with a groove radius of ¼ inch to 3/8 inch and a groove depth of 1 inch to 1-1/8 inches. The depth shall be established using depth control wires set on 10-foot centerlines each way.

   d) For smaller channels (less than 20cfs) the lining requirements shall be the same as described above with the exception that the minimum bottom width shall be 2 feet.

      (1) In hillside areas, lined channels shall be required to intercept storm runoff from undeveloped or open space areas prior to storm runoff sheet flowing into adjoining downstream developed parcels or proposed to be developed parcels. The lined channel shall be constructed entirely within the undeveloped or open space parcel. The lined channel shall be placed in an easement which is either public or private depending on the ownership and/or operation and maintenance of the channel in the future. Easement requirements in accordance with these standards shall apply regardless of whether the lined channel is publicly or privately owned and maintained.

      (2) For circumstances where single-family residential lots drain to the rear of the lot instead of draining to the fronting street, lined channels shall be constructed in accordance with the requirements of these standards. The lined channels shall be constructed on the privately owned residential lot to intercept storm runoff from the lot prior to the storm runoff flowing to the adjoining downstream parcel.

      (3) The lined channels shall be placed in private drainage easements of sufficient width to contain the entire channel from top of bank to top of bank, but no less than 10-feet in width. The private drainage easement shall include language that prohibits existing and future property owners from changing, modifying, altering, etc. the lined channel and that the lined channel remains in place in perpetuity to ensure storm runoff from the lot as well as all upstream and downstream lots are

maintained at all times. The private drainage easement language shall be subject to the review and approval by the City Engineer.

(4) As an option to open channel design, rear-yard, private drainage may be conveyed in underground drainage conduits with special approval of the City Engineer. However, in most cases, the City Engineer will not allow rear yard underground conduit due to the possibility of the storm drain pipe being clogged with debris, resulting in flooding upstream and downstream of the conduit. If underground drainage conduits are approved by the City Engineer, each individual residential lot with an underground drainage conduit will be required to have at least one drainage inlet in accordance with these standards.

3) Interceptor Ditches for Open Channels – Interceptor ditches or approved alternates shall be placed at the top of the cut or bank where deemed necessary by the City Engineer to prevent erosion of the channel bank. Runoff shall not be allowed to sheet flow over the top of banks.

4) Drainage Easements for Open Channels (>20CFS) – Drainage easements for open channels shall have sufficient width to contain the open channel, plus 14-foot-wide right-of-way width on one side and a 4-foot-wide right-of-way on the opposite side. The toe of a bank shall not be within 5 feet of an easement boundary. Easement boundary lines shall, at changes in alignment, have a radius sufficient enough to provide turning room for vehicles operating on the service road.

H. Channel Crossings

When sewer or storm drain lines cross open channels, the following minimum standard requirements shall apply:

1) Encroachment and crossing designs shall comply with the manual of "Standards for Encroachments" developed by the Central Valley Flood Protection Board (CVFPB).

2) Channel crossing shall also incorporate recommendations from the Alder Creek Watershed Management Plan to minimize impacts to the channel or creek.

3) Minimal crossing requirements:

a) In all cases, the proposed future creek bed elevation shall be used for design purposes. Crossing details of pipe, piers, anchorage, transition couplings, etc., shall be shown on a detail sheet of the plans in large scale.

b) For line sizes 10 inches and smaller, cast iron pipe or C-900 PVC, SDR18 shall be used under the full creek width plus 10 feet each side unless the pipe is 4 feet or more below the creek elevation. For line sizes 12 inches and larger, pipe used shall be as directed by the City Engineer. Special care shall be taken to provide a firm base for the pipe bedding. The plans shall specify that all soft or organic material within the creek beds shall be replaced with select imported backfill. In addition, a layer of 4"x8" cobbles shall be placed and compacted on the top surface of the trench area for the full width of the creek. Unless otherwise directed, a clay plug shall be required about the pipe at the downstream side of the crossing. The plug shall be a minimum of 4 feet in length, shall extend the full width of the trench, and shall extend 12 inches above and below the pipe.

c) If the pipe must cross above the creek bed, ductile iron pipe, cast iron, or welded steel pipe shall be used. Steel pipe may be cement lined and coated, or fusion epoxy lined and coated or glass lined; the City Engineer shall approve the type of coating and lining specified, and the gauge, class, or thickness of the pipe. The City Engineer may specify which is to be used.

Reinforced concrete piers of adequate depth shall be located as necessary for adequate support of the pipe. The pipe shall be held in cylindrical cradles, formed in the pier tops, by galvanized steel straps, with galvanized anchor bolts of adequate size. Cushion material shall be placed between the pipe, clamps, and support. The invert elevation at the point of maximum deflection of the suspended pipe shall be higher than the invert of the pipe at its downstream support.

d) Calculations shall be submitted to the City Engineer, which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.

I. OUTFALL DESIGNS

Pipeline outfalls to improved open channels, natural streams, ponds or reservoirs shall be designed to provide: 1) proper support of the pipe, 2) stability of the embankment, 3) control of erosive forces, 4) adequate access for maintenance and 5) provide overall safety of the public.

1) Outfall Pipe Support and Bank Stability

The Engineer shall submit a design using headwalls, flared end sections or other outfall structures per these Design Standards, the Standards of the County of Sacramento or the California State Standards that will adequately support the pipe and the adjacent embankment to the receiving system. City of Folsom Standard Details are provided for most outfall conditions, however, approval at the County, State and Federal level may be required depending on the receiving system and related permit requirements.

Safety railing and/or fencing on headwalls shall be provided on all headwalls over 5 feet high. The design shall conform to the California State Standards or the County of Sacramento Standards on a case by case basis depending on site conditions, height of structure and location within the City.

2) Erosion Control at Outfalls

All outfall erosion control features shall be designed for the highest potential flow velocity from the pipe (using design storm criteria), while the receiving stream or channel is at its lowest stage. Use of concrete apron outfall designs found in these Design Standards will generally protect the embankment and support the out fall pipe, however, these solutions alone seldom provide enough protection against erosive forces farther downstream. The Engineer shall provide hydraulic design calculations, including scour potential and provide measures if necessary to prevent channel scour downstream from the outfall.

Rock slope protection (RSP) provided per the State of California Specifications is a cost effective means to provide for outfall erosion mitigation. The Engineer shall provide calculations for rock sizing and for determining the extent of the required RSP.

The Standard Details provide a concrete energy dissipater design as an option for pipe outfalls to channels or streams. This design is effective to reduce erosive energy from high velocity outfall flows. The City Engineer may require this type of energy dissipater based on the existing outfall conditions. The concrete dissipater although effective, may not be warranted if a less costly and less visually obtrusive solution can be used. Using one of the outfall designs in these Design Standards in conjunction with channel rock lining (rock slope protection) will most often provide adequate protection at outfalls.

3) Trash Racks, Access Control and Debris Barriers

Trash Racks shall be used for entrances from open channels to piped systems per the Standard Details. In addition, racks for access prevention are often necessary at pipe outfalls. Standard Details for Outfall Racks are provided in these Design Standards and will be required for pipes 18-inch and larger unless otherwise approved by the City Engineer. Other designs such as top hinged racks may be acceptable or preferred on a case by case basis with the approval of the City Engineer.

Debris Barriers are used for watersheds that can generate destructive debris flow and will seldom be considered necessary within the City of Folsom. Only for natural channel systems flowing into a developed area will these types of facilities be considered and the need will be determined on a case by case basis.

J. DESIGN OF CULVERTS AND BRIDGES

1) Minor Cross Culverts - 36” and Smaller

Minor cross culverts shall be designed with reinforced concrete pipe as required by the City Engineer. Under most cases a flared end section will be adequate as an inlet and outlet for culverts of these sizes. However, depending on site conditions, slope and limits of right-of-way a vertical concrete headwall may be required as determined by the City Engineer.

Driveway culverts shall be approved by the City for size, grade, alignment and type. Driveway culverts will not be allowed unless the City has agreed to defer the construction of the curb and gutter unless it is for temporary construction access.

2) Culverts 48” and Larger

For pipe culverts 48-inch in diameter and larger, a concrete headwall shall be used. Reinforced concrete pipe shall be used. Reinforced concrete box culverts will be required where the flow exceeds the capacity of a 36-inch pipe or where vertical clearance requires a wider conveyance area. In no cases shall a box culvert have less than a 24-inch vertical opening.

In some cases due to environmental concerns, a culvert crossing will be required to have an earthen bottom. In these cases buried inverts, concrete box system with no bottom (essentially a bridge section) will be acceptable upon approval by the City Engineer.

3) Headwalls and Wingwalls

Detailed designs for Concrete Headwalls and wingwalls shall be provided by the Engineer and shall include safety railing or fencing as required in these Design Standards and for any headwall greater than 5 feet in height. The design shall conform to the California State Standards or the County of Sacramento Standards on a case by case basis depending on site conditions, height of structure and location within the City.

K. DESIGN OF FLOOD CONTROL DETENTION/RETENTION FACILITIES

1) Earthen Basins and Swales

Earthen ponds and swales shall be preferred for storage of storm runoff whenever practical. The use of these types of facilities will provide for stormwater quality enhancement, possible recreational benefits, riparian benefits and to take advantage of percolation in the ultimate discharge of stormwater. In general earthen ponds will be more cost-effective than lined storage basins or underground storage if space is available.

For earthen basins, the maximum side slope shall be 1-vertical to 4-horizontal to allow for easy access and maintenance while minimizing erosion of the slopes. A minimum 12-foot wide perimeter road and access ramp to the bottom of the basin shall be provided. Right-of-way and fencing shall be required and meet the conditions of these Design Standards.

Gravity outfall from the basin shall be provided unless not practical. Other outfall alternatives shall be approved by the City Engineer. Incorporation of water quality features shall adhere to the requirements of the Stormwater Quality Design Manual.

Dimensions and shape of a stormwater storage basin will be dependent on site conditions and constraints, outfall location and approval of the City relative to hydraulic criteria, maintenance, aesthetics, and public safety.

2) Lined and Underground Storage

Lined storage basins and underground storage options shall be considered only where space limitations cannot be avoided and shall require City Engineer approval on a case by case basis. Underground storage shall only be allowed as part of an on-site design.

The Engineer shall provide adequate hydrologic and hydraulic calculations to prove the effectiveness of the underground system to store and dispose of the stormwater over the life of the project, taking into consideration long term maintenance and potential plugging of the discharge system.

3) Basin Inlet and Outlet Design

Storage basin inlets will incorporate outfall erosion control features as well as other water quality facilities per these Design Standards and the Stormwater Quality Design Manual.

Outlet features from a storage basin shall be designed to control outflow at or below existing flow rates under a wide range of storm event conditions (see hydraulic criteria), unless through an accepted master planned system, the outflow is allowed to vary from this criteria. The outlet shall be designed to be accessible during entire storm events for operation and shall be designed to prevent plugging. Several methods and alternatives to control the outflow from storage ponds are available. The preferred design shall be coordinated with and approved by the City Engineer.

4) Water Quality Basins

New detention basins in the City of Folsom may be required to incorporate a water quality component. For water quality basin design criteria refer to the Stormwater Quality Design Manual.

L. EROSION AND SEDIMENT CONTROL

1) General Conditions:

a) All erosion and sediment control measures shall be reviewed and approved by the City Engineer. These control measures shall, at a minimum, meet the City's State & Area-Wide National Pollutant Discharge Elimination System (NPDES) permits issued by the State Water Resources Control Board & California Regional Water Quality Control Board, respectively.
b) Under the NPDES permit, all construction activities one acre and larger in size shall apply for coverage under the Construction General Permit (2009-009-DWQ). This requires development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be developed by a Qualified SWPPP Developer (QSD) and, as a minimum, shall include the following items:
c) The Notice of Intent (NOI) and Waste Discharge Identification Number (WDID) for the project;
d) Topographic map of the project area;
e) Risk Level Analysis
f) Soils/geotechnical report or project materials report;
g) Pre-construction (existing) control practices;
h) During construction storm water control measures;
i) Post-construction storm water control measures;
j) Other plans/permits;

k) Project drainage report;
l) Construction site estimates such as area calculations, runoff coefficients and pervious area calculations;
m) Schedule outlining implementation of the various phases of control measures.
n) Inspection Reports (if applicable)
o) Rain Event Action Plans (REAPs) (if applicable)
p) Construction projects with a disturbed area of less than 1 acre do not require a SWPPP, but are required to prepare Sacramento County Erosion and Sediment Control Plan Standards and details.

2) Revegetation Standards.
   a) Permanent revegetation or landscaping, if required, is to be commenced on the construction site as soon as practical and in no case exceeding 12 months after achieving final grades and utility emplacements. Whenever practical, land is to be developed in increments of workable size, which can be completed during a single construction season; erosion control measures are to be coordinated with the sequence of grading or improvements.
   b) Grading equipment is to be confined to area immediately adjacent to areas of disturbance as indicated by the plans approved by the City's Engineer.
   c) All surfaces disturbed by vegetation removal, grading, haul roads, or other activity of construction which alters the natural vegetative cover are to be prepared for expedient revegetation or otherwise maintained to control erosion unless covered with impervious or other improved surfaces pursuant to approved plans within 30 days of following the completion of grading, or removal of vegetation if no grading was involved.
   d) Topsoil removed from the surface in preparation for grading and construction is to be stored whenever possible on or near the site and protected from erosion while grading operations are underway; provided, that such storage may not be located where it would cause suffocation of root systems of trees intended to be preserved. After completion of such grading, topsoil is to be restored to exposed cut and fill embankments or building pads so as to provide a suitable base for seeding and planting.
   e) Acceptable methods of revegetation include straw mulching, hydro mulching or planting of mixture specified by City's Engineer. The City may allow other methods or revegetation where equivalent protection is provided.
   f) All revegetation and landscaping are to be conducted within suitable growing periods. Native plant materials are specifically encouraged in order to reduce irrigation demands.
   g) For all grading or improvements to be conducted during the rainy season, a sedimentation control plan is to be submitted including, where necessary, temporary sedimentation basins. Sedimentation control facilities are to be installed in conjunction with initial grading operations and maintained throughout the construction period to remove sediments from runoff waters during development.
   h) Permanent sediment containment basins or other types of sediment retention facilities are required wherever necessary to prevent discharge of sediment

into stream channels. Accumulated sediment is to be inspected and removed for disposal according to a regular maintenance schedule.

i) The planting or seeding of vegetative protection shall be effective. If the vegetation does not grow and offer proper protection, it shall be replanted or reseeded.

j) The maintenance of vegetative protection on graded slopes shall be the responsibility of the permittee and shall be guaranteed until the vegetation is well established or is officially assumed by another party in accordance with City requirements.

3) All post construction water quality improvements require execution of a maintenance agreement that must be approved by the City.

M. RIGHT-OF-WAY, ACCESS AND FENCING REQUIREMENTS

1) Right-of-Way

Most of the underground drainage facilities and roadside ditches shall be constructed in public street right of way. Developments that include open channel improvements, closed conduit, storage basins or other facilities outside the street right-of-way shall provide permanent right-of-way (Drainage Easements) to the City for operations and maintenance of those facilities. The following are guidelines for minimum Drainage Easement requirements for various improvements:

a) Easements for closed conduits shall meet the following width criteria:

(1) All easements for closed conduits shall have a minimum width in feet equal to the required trench width according to the standard detail for unshored trenches and excavation backfill plus two (2') additional feet of width for every foot of depth as measured from the bottom of the pipe to finish grade. All conduits shall be centered within their easements.

(2) Minimum width for any easement for closed conduit shall be 15 feet.

(3) Easements adjacent to property lines shall be located entirely on one parcel.

2) Drainage easements for open channels shall have significant width to accommodate the following criteria:

a) Contain the channel and channel slopes.

b) Provide for fencing, where required.

c) A 15-foot-wide service road and maintenance access ramps. A service road may not be required where the channel bottom is lined and a suitable access ramp is provided. Dedication of easements shall be completed and recorded with the Sacramento County Recorder and shall be submitted to the City Engineer with copies of deeds and title reports for the affected properties before improvement plans will be approved.

(1) Open channels (natural or man-made) with a drainage area that exceeds 300 acres shall have the 100-year water surface elevation limits dedicated as a Flood Water Conservation Easement.

(2) Storage and water quality basins shall include right-of-way for a 15-foot-wide perimeter access road and fencing.

N. DRAINAGE PUMPS

Drainage pumps shall be avoided whenever possible and used only with specific approval of the City Engineer. If the use of drainage pumps is permitted, the drainage system shall be designed so as to provide for gravity outfall during the summer months and other periods of low water stages. If a low stage gravity outfall is impossible or impractical, an alternative pump of a smaller capacity for low stage may be used provided the City Engineer grants specific approval.

1) Design requirements

Pumping installations shall be designed to accommodate a design storm as specified by the City Engineer. When a station contains a gravity discharge, pumping capacity shall be equal to the design inflow. When the station does not have a gravity discharge, a redundant pump shall be provided and pumping units shall be designed to furnish 100% capacity with any one pump. Standby power shall be included in the design of the pump station. Any deviation from these criteria shall receive specific approval of the City Engineer.

Pumping stations shall be designed so that gravity flow does not pass through the pump pit. No motor overload condition shall exist at any sump or flow condition. This does not preclude high sump design if low sump condition does not create an overload.

Each pumping station shall receive separate approval for the electrical system, piping system, housing installation and other miscellaneous design features. The electrical system for drainage pumps shall conform to the electrical code and the State Department of Transportation Standards. A detailed Operation and Maintenance Plan (O&M Plan) shall be submitted to the City Engineer for approval prior to the approval of the pumping station.

2) Maintenance Requirements

Adequate access shall be provided for cleaning the pump sump. Trash racks shall be provided upstream from the pumping plant. Provisions shall be made for easy cleaning of the trash racks. Hatch covers, where used, shall be raised pattern aluminum floor plate, or other approved lightweight cover. Dissimilar metals shall be insulated from each other when necessary. Ladder rungs, where used, shall be of non-slip variety. All drainage pumping plant sites shall be fenced with a 6-foot chain-link fence with barbed wire extension arms if required by the City Engineer.

O. ON-SITE DRAINAGE DESIGN

1) General Requirements

Except for single-family or duplex residential lots, site drainage shall be collected on-site and conveyed via an underground storm drainage system to an approved existing underground storm drainage system without flowing across sidewalks and driveway aprons, into existing street gutter, or existing roadside ditches.

Unless regional storm water mitigation devices are available and can be utilized by the project as determined by the City Engineer, specific mitigation for stormwater quality devices shall be required for the project and shall be located on-site and shall be maintained by the landowner.

2) On-Site Drainage Facilities

For non-single family residential development, generally, no more than 6,000 square feet including roofs, sidewalks, parking areas and other impervious surfaces, etc. will be allowed to sheet drain over a public sidewalk and into the public or private street. If the area is larger than 6,000 square feet, an on-site subsurface drainage system is required and shall be connected to the underground street drainage system by means of a storm drain service tap.

Storm run-off from paved surfaces on-site and outside the City rights-of-way shall be routed to the City underground storm drain system via on-site catch basins and an underground system. No surface run-off shall be routed to an adjoining private property unless approved by the City and authorized by a reciprocal drainage and maintenance easement or agreement. The pavement at the driveway entrance(s) to the project may be constructed so as to allow storm drainage to cross the driveway apron provided that the high point of the pavement is situated a maximum distance of 30 feet measured from the back of driveway apron or sidewalk. In order to contain storm drainage run-off in the street, the pavement at the parking lot entrance may be crowned a maximum height of six (6) inches.

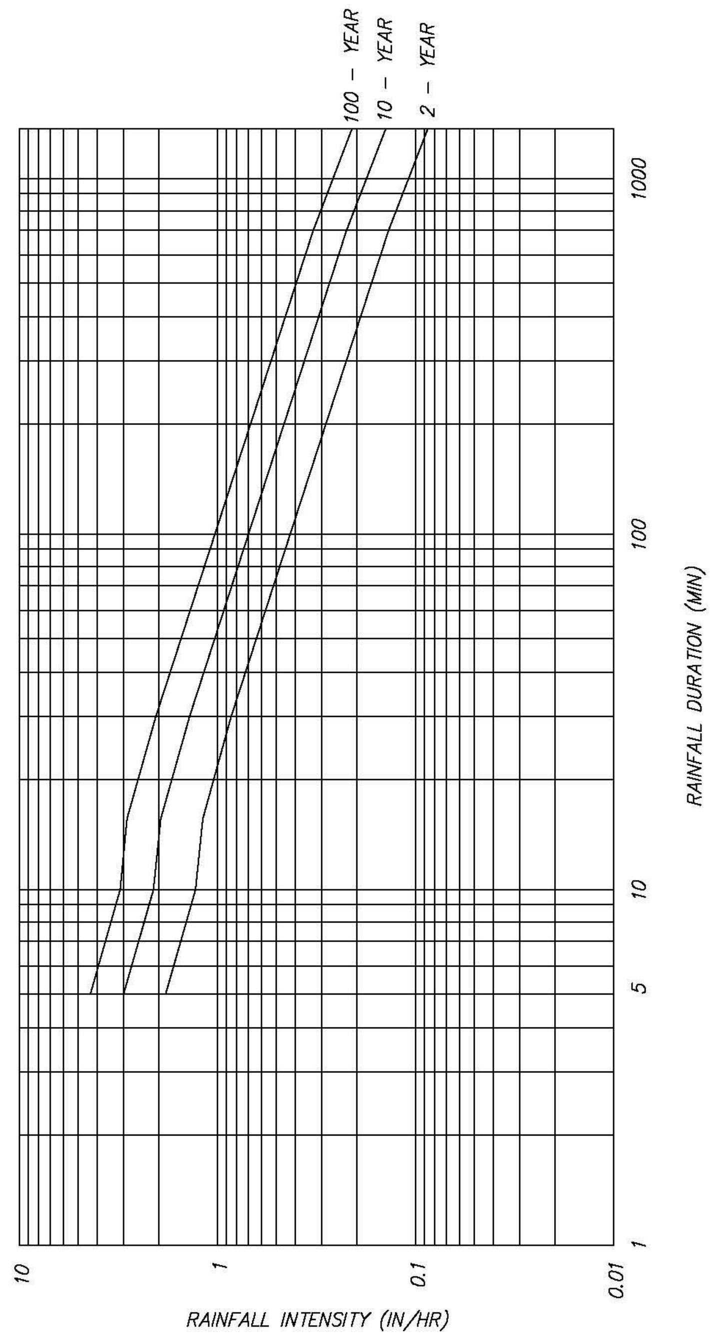
Roof drains shall not be discharged through the public street curb but shall be dissipated in the landscape area close to the building or connected directly to the on-site underground storm drain system. Landscaped areas may sheet drain over the public sidewalk, curb and gutter.

19.10 Plates

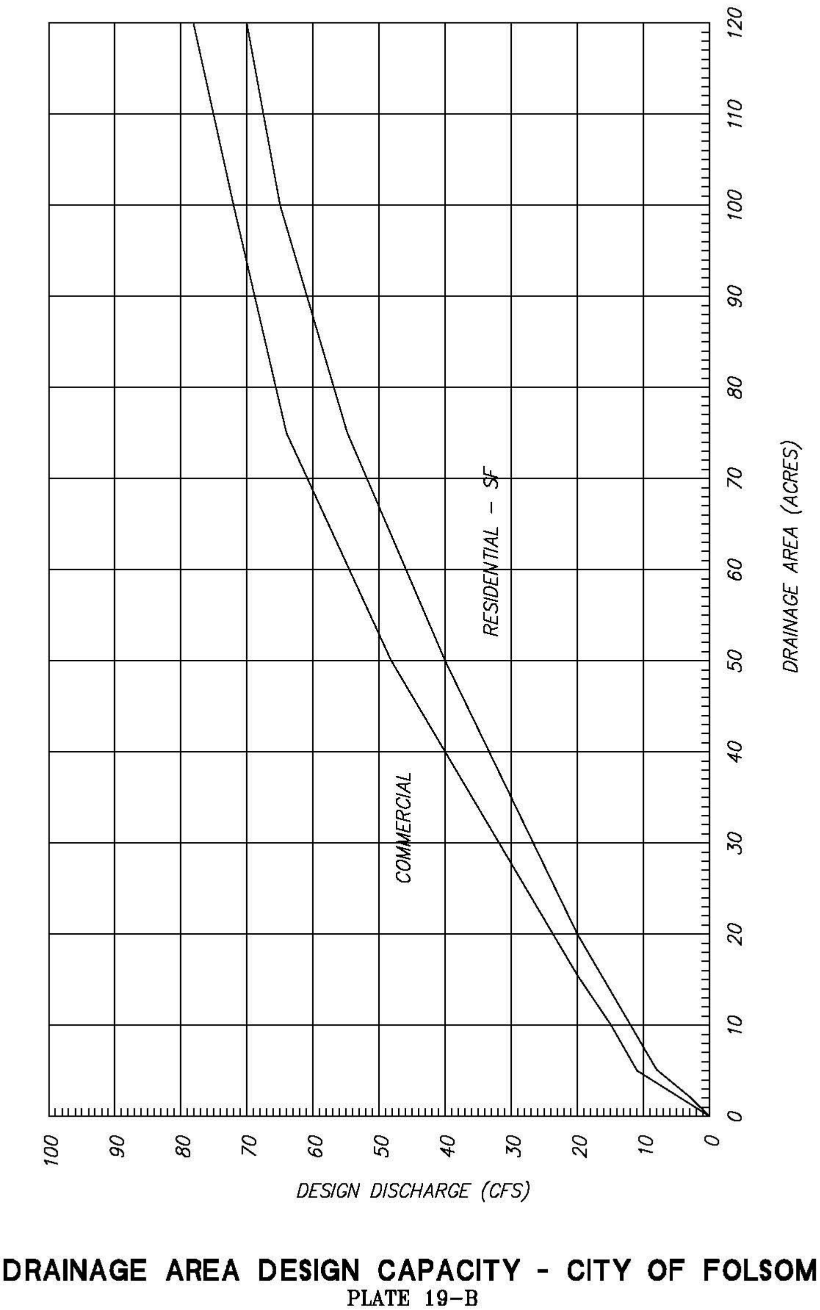
A. Plate 19-A Rainfall Intensities

B. Plate 19-B Drainage Area Design Capacity

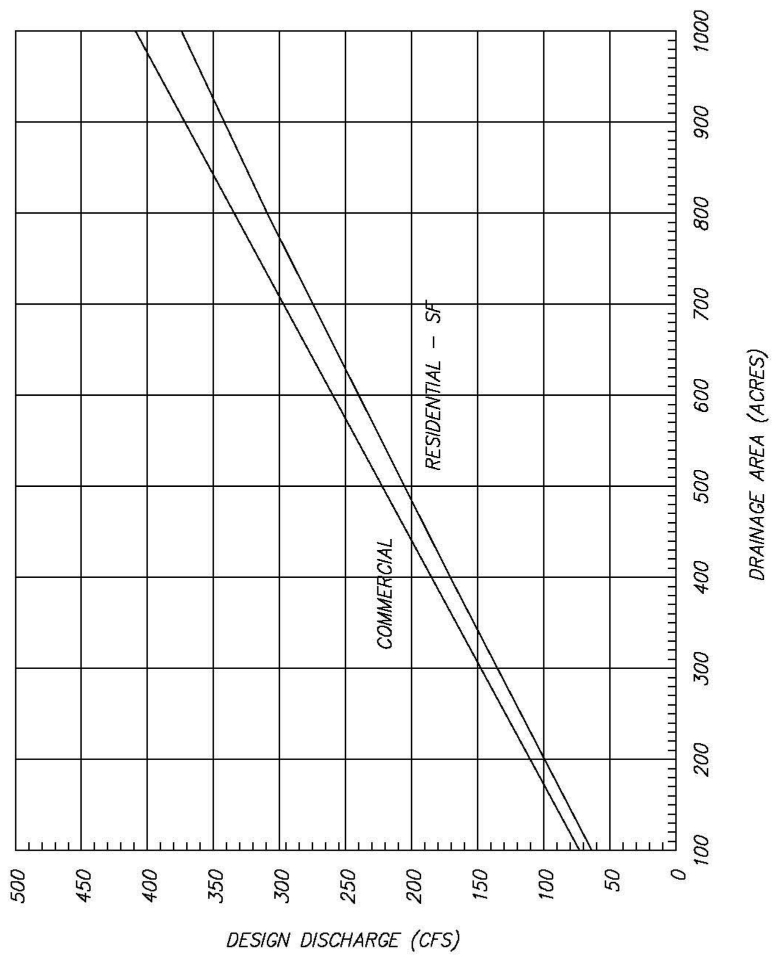
C. Plate 19-C On-Site Drainage Design Capacity



RAINFALL INTENSITIES - CITY OF FOLSOM
PLATE 19-A



DRAINAGE AREA DESIGN CAPACITY - CITY OF FOLSOM
PLATE 19-B



ONSITE DRAINAGE DESIGN CAPACITY - CITY OF FOLSOM

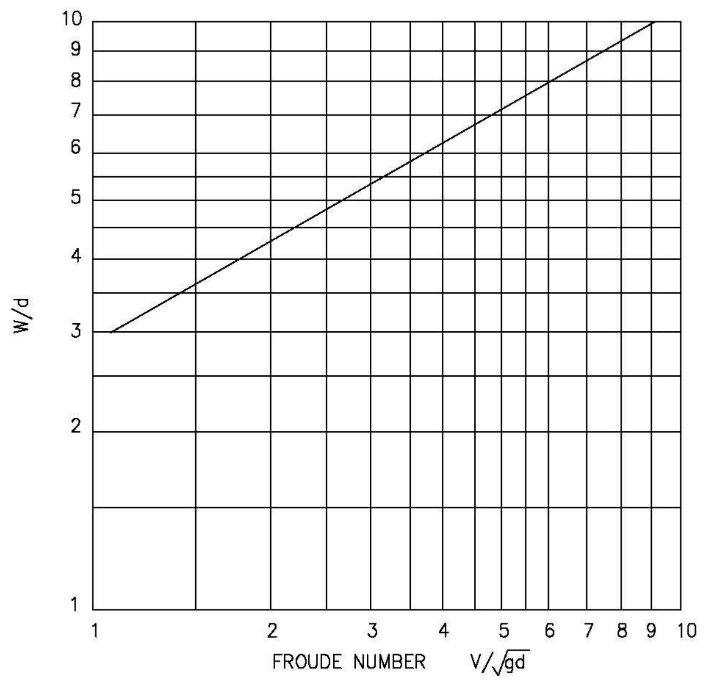
PLATE 19-C

B W D P

For a given design Q and head, h, the width of the baffled outlet is determined as follows:

(1) Compute the theoretical velocity in feet per second, $V = \sqrt{2gh}$.
(2) Then compute the cross-sectional area of the incoming flow in square feet, $A = Q/V$.
(3) Next compute the depth of flow, d in feet, d= A (This assumes the shape of the jet is square).
(4) Compute the Froude number, F = V/ gd.
(5) For this Froude number read W/d ration from the curve on the figure below.
(6) Then W in feet = d(W/d). This is the minimum width which should be used.
(7) Select the Type Energy Dissipator that best fits from the Standard Drawing SD-34 to SD-37.

NOTE: For W greater than SD-37 a special design will be required per Section C of Chapter 6 of Small Canal Structures published by United State Bureau of Reclamation.



W, ft, is the inside width of the basin.
V, fps, is the theoretical velocity of the incoming flow and is $\sqrt{2gh}$.
h, ft, is the head to be dissipated
A, ft^2, is the area of flow entering the basin and is Q/V.
d, ft, Represents the depth of flow entering the basin in is $\sqrt{A}$

DESIGN OF ENERGY DISSIPATOR

PLATE 19-D

REFERENCES:

1. Folsom Municipal Code, latest edition
2. Water Quality Partnership Storm Water Quality Design Manual, latest edition
3. Sacramento County Department of Water Resources Drainage Manual, latest edition
4. Engineering Climatology for California, 2005 Extreme Precipitation Symposium , April 22, 2005, California State University, Sacramento, Presented by Jim Goodridge.
5. Humbug –Willow Creek parkway Phase 2 Engineering Report , latest edition
6. HEC-12, Drainage of Highway Pavement , Federal Highway Administration, March 1984

CITY OF FOLSOM

SUBMITTAL REQUIREMENTS FOR ALL HEC – 1 STUDIES

Submit the items listed under each category that applies to each HEC – 1 model run that is submitted.

1. Hec-1 print out with summary tables.
   The following information shall be on the cover of the print out:

   - Name of engineering firm who performed the study
   - Name of the project
   - Version of HEC-1 program
   - Date & time that the model was run
   - A statement if the model is pre-project or post-project

2. The computer model disk.
   - Disk must be clearly labeled
   - If more than one model file is on the disk, a listing and description of all files shall be included with the disk in an envelope
   - HEC-1, HEC-2 or HEC-RAS files shall be submitted on separate disks

3. City of Folsom's "Model Summary Worksheet" Pages 1-3 completed for each HEC-1 run submitted and attached to the printout.

4. Drainage Shed map showing the following:
   - Outline of all subsheds used in the HEC-1 study
   - The label of each subshed as modeled in the HEC-1 study
   - The area of each subshed as used in the HEC-1 study
   - The location where each subshed merges with the next clearly marked

5. If the study compares pre-project to post-project HEC-1 models, the City's summary sheets shall include a listing of all the types and the locations of changes made in the model

CITY OF FOLSOM
HEC-1 MODEL SUMMARY WORKSHEET
GENERAL INFORMATION

Name of Project:____
Name of engineering firm who performed the study:___________________________________
Contact person ____________________________________ Ph # _____________________
If this replaces a previously submitted study, what is the name of that study?
____
This study reflects: ______ Existing conditions ______ Post-development conditions
If this HEC-1 study is used to compare pre-project to post-project runoff, what is the name of the study that you are comparing it with? _________________________ Run date ___________
Has the pre-project study been approved by the city? _____YES and when ________________
______NO

BASIN INFORMATION
Total are of the basic studied (sq. ml.) _____________________Number of sub-sheds________
Elevation of shed: High point ________ Low point __________ Ave. _______ Used__________
The method used to determine the design storm used in the model:
______ P.C. Flood Dist. Manual _______ HEC-1 synthetic storm
______ P.C. Flood Dist. PDP program _______ Rain gauge data
Duration of design storm: 1 hr 2 hrs 3 hrs 6 hrs 12 hrs 1 day other _________________
Design storm frequency: 2 yr 5 yr 10 yr 25 yr 50 yr 100 yr other _________________
Base flow (cfs/sq mile): _____________________ Infiltration (in/hour) __________________
Response time of entire basin ___________________________

Detention Basins Give location and size of all detention basins that were modeled:
Provide topo or grading plans used to calculate storage volume for each detention basin.

Location in model	Amount of storage resulting from each design storm	Storm frequency	Max. Stage Height (ft.)	Freeboard to Spill Point (ft.)

CITY OF FOLSOM
HEC-1 MODEL SUMMARY WORKSHEET **PAGE 2 OF 3**

SUBSHED INFORMATION

The total number of subsheds in the model: ____________________________
Provide an assumed "N" factor used most often for the following surfaces:
Overland swales ___________ Concrete gutters ______________ Drainage Pipes ___________
Earth-lined channels _____________ Streams ______________ Other _________________

TITLE OF SUBSHET OR ROUTING LEG IN MODEL	PRIMARY LAND USES OF SUBSHED Residential, open space, commercial, etc.	AREA OF SUBSHED (SQ ML)	METHOD USED IN ROUTING EXAMPLE: Kinematic wave, Muskingum	WAS DETENTION MODELED (YES OR NO)

CITY OF FOLSOM
HEC-1 MODEL SUMMARY WORKSHEET **PAGE 3 OF 3**

PRE-PROJECT TO POST-PROJECT CHANGES

This sheet shall be completed if this HEC-1 study is used to compare pre-project to post-project runoff.

Name of pre-project HEC-1 study: ____

Run date _____________________

Basin's peak flow rate: Existing conditions __________________________

Post-development conditions _________________________

Has the pre-project study been approved by the City? ______ YES If yes, when? __________

______ NO

Locations in	Types of change made
Example Shed-2S	Change earth-lined channels to drainage pipes and increased shed areea

CITY OF FOLSOM

SUBMITTAL REQUIREMENTS FOR ALL HEC-2 OR HEC-RAS STUDIES

SUBMIT THE ITEMS LISTED UNDER EACH CATEGORY THAT APPLY TO EACH **HEC-2 OR HEC-RAS** MODEL RUN THAT IS SUBMITTED.

1. HEC-2 or HEC-RAS print out with summary tables.
   The following information shall be on cover of the print out:
   - Name of engineering firm who performed the study
   - Name of project
   - Version of HEC-2 or RAS program
   - Statement if the study is pre-project or post-project

2. Provide the computer model on a 3-1/4” disk or cd-rom.
   - Disk must be clearly labeled.
   - If more than one model file is on the disk, a listing and description of all files shall be included with the disk in an envelope.
   - HEC-1, HEC-2 or HEC-RAX files needs to be submitted on separate disks

3. City of Folsom’s “Model Summary Worksheet” pages 1-3 filled out for each HEC-2 or HEC-RAS run that is submitted.

4. Water course map showing the following:
   - Lay out of the route of all water courses used in the HEC-2/RAS study
   - All man-made structures with their type and size will be clearly marked and labeled (bridges, culverts, storm drain pipes, man-made channels, etc.)
   - Map of the locations and number of all cross-section used in study
   - The starting HGL and peak flow rate for all storm frequencies modeled
   - The location of where the flow rate changes and what the new flow rate is

5. If the study compares pre-project to post-project HEC-2/RAS models, you shall include a summary sheet listing the locations and types of changes made between the models.

CITY OF FOLSOM
HEC-2/HEC-RAS MODEL SUMMARY WORKSHEET
GENERAL INFORMATION

Name of Project:____
Name of engineering firm who performed the study:____________________________________
Contact person ____________________________________ Ph # ______________________
If this replaces a previously submitted study, what is the name of that study?
____
This study reflects: ______ Existing conditions ______ Post-development conditions

If this HEC-2/RAS study is used to compare pre-project to post-project runoff, what is the name of the study that you are comparing it with? __________________________ Run date ____________

Has the pre-project study been approved by the city? _____YES and when _________________
______NO

Total length of water course (miles) ______________ Total number of cross-section _________

Name of Hydrology study used to get peak Discharge? ________________________________

Design storm frequency: 2 yr 5 yr 10 yr 25 yr 50 yr 100 yr other __________________

The starting HGL _____ _____ _____ _____ _____ _____ _____ _____

Starting flow rate _____ _____ _____ _____ _____ _____ _____ _____

How was the starting HGL determined:
____
____
____
____

Give location of cross-sections where the flow rate changes and what the new flow rate (s) are.

START	10 YEAR	50 YEAR	100 YEAR

CHANNEL REACH INFORMATION

Give the total number of reaches in the Model: ____________________________
Provide an assumed "N" factor used most often for the following surfaces:
Overland swales ___________ Concrete gutters ______________ Drainage Pipes ___________
Earth-lined channels _____________ Streams ______________ Main channel_______________
Over Bank _____________________ Other _______________________

Are the assumptions used in hydrology study's routing section to determine peak discharge, in line with those used in this hydraulic study for the same segment of channel (channel length, "N" factor, etc.)
______ YES ______ NO If no explain why: ______________________________________

BRIDGE OR CULVERT MODEL INFORMATION

Provide the following Information for all Bridge and Culvert crossings:

DOWN STREAM X-SEC. AT BRIDGE OR CULVERT	METHOD USED TO MODEL (special culvert, bridge, etc.)	IS STRUCTURE OVERTOPED Example (2.1' in 50 yr, 3.4' in 100 yr)	WAS DETENTION MODELED (YES OR NO)

PRE-PROJECT TO POST-PROJECT CHANGES

Name of pre-project study: ____
Run date ____________________

Name of post-date study: ____
Run date ____________________

Do you plan to place any improvements in, or change the Floodway ____ YES ____NO If yes, explain: ____

Provide the following information for all changes between studies:

Locations	**Types of changes (added, deleted, changed)**
Xsec – 252	Added xsec, to reflect encroachment, Changed right overbank “N” to 0.04

Floodplain Encroachment Compliance Statements

Improvements are being proposed within the 100-year floodplain of the City of Folsom

These improvements are shown on the plans for:

The proposed plans for : ____

Designed by: ____

Dated: ___________________________

A hydraulic study has been completed to show the hydraulic impacts of all the improvements proposed within the floodplain shown on these plans. The title of this study is:

Title of hydraulic study: ____

Prepared by: ____

Dated: _____________________________

I certify that I have looked at both the plans and the study and found that the improvements that are within the 100-year floodplain shown on the plans listed above are in conformance with the hydraulic study listed above and are accurately represented in the study.

____

Signed

R.C.E Lic. Number ____________________________ Expires _______________________

STANDARD HYDRAULIC CALCULATIONS SHEET

TO	FROM	AREA	CUMU. AREA	T_r	q	F_i	Q_p	STORM DRAIN PIPE						HYD GRADE LINE		
								DIA	SL	L	Qmax	VEL	Tc	SL	UMH	LMH

Section 20:
LANDSCAPE

20.1 GENERAL

The following Design Standards must be considered during the design of projects and incorporated into the plans and specifications where applicable. Projects must also be in accordance with the City Standard Construction Specifications. Whenever special requirements conflict on any subject matter, the City shall determine which special requirement will govern.

20.2 LANDSCAPE GRADING AND DRAINAGE

A. Parkway Drainage and Common Area Drainage

Parkway drainage and common area drainage will not be allowed to drain onto private property. Design must incorporate provisions to minimize drainage over sidewalks and prevent ponding in parkways. No concentrated flow shall be allowed over curbs, sidewalks, and property lines.

B. Subsurface Drains

Subsurface drains shall connect into storm drain system. A secondary drainage path must be provided where grate inlet-type basins are used for drainage. Grate inlet type basin shall not be used where leaves or other debris may clog the grates. Steel drain lines shall not be used.

C. Turf Areas

Turf areas shall have a minimum slope of 1% and a maximum slope of 25% (athletic fields are exempt).

20.3 EROSION CONTROL

Cut slopes 2:1 and steeper, 5 feet or more in height and fill slopes 2:1 and steeper, 3 feet or more in height, shall require that special design provisions be made to control erosion and runoff.

20.4 PARKING LOT SHADE

A. Tree Shading:

Trees shall be planted, monitored, and maintained throughout the surface parking lot to ensure that, within 15 years after establishment of the parking lot, at least 50 percent of the parking area will be shaded. This should be calculated by using the City's diameter of the tree crown at 15 years. Each planting area shall be of adequate size for the landscaping approved and shall have adequate irrigation for that landscaping.

Note: Planter dimensions <u>exclude</u> curbing. Planter shall contain earth and living ground cover. Bark mulch is not allowed in planter areas adjacent to public right-of-way, wood chip mulch is acceptable (hardwood chip mulch is preferred).

B. Parking Lot Shade (50% with 15 years)

All surfacing on which a vehicle can drive is subject to shade calculation.

- Parking stalls
- All drives within property line (regardless of length)
- All maneuvering (regardless of depth)

<u>Exceptions</u>

- Truck loading in front of overhead doors
- Truck maneuvering and parking areas unconnected to and exclusive of any vehicle parking
- Surfaced areas not to be used for vehicle parking, driving or maneuvering, provided they are made inaccessible to vehicles by a barrier such as bollards or fencing
- Automobile dealerships, display/sales/service/vehicle storage (required parking for automobile dealerships is still subject to shading)

If a site has two or more <u>unconnected</u> parking areas, shade is calculated separately for each area. If they are connected by a joining drive, they are calculated as one lot.

1) Shade is determined by using the appropriate percentage of the crown as indicated on the approved shade tree list (see Plate 20-A).
2) Trees must be planted at a distance one half of the required planter size behind curb. Refer to the Folsom Master Tree List and Folsom Tree Care and Maintenance Standards for information on minimum required planter size per species. Where a walk falls adjacent to a curb, any 35-foot diameter tree within 10 feet of the curb face receives 50% shade credit. It is necessary for the tree to be planted at a distance one half of the required planter size behind walk for this to apply.
3) Two feet of vehicle overhang into planter area is allowed, provided the planter is a minimum 6 feet wide. Vehicle overhang is not allowed into required setback areas.
4) Identify any existing tree species on-site for consideration in shade credit calculations. New trees planted for mitigation shall not count for shade or "street tree" requirements.
5) Overlapping shade does not count twice.
6) Parking lot lighting shall not conflict with required shade tree locations or growth. No new trees to be planted within 20' of a light standard.
7) Provide shade calculations to the Community Development Department-Engineering Division for review and approval. The planting plan may be used as the shade plan, provided the trees are drawn to scale at the size indicated on the approved shade list. To calculate shade, indicate: surface area, shade area, shade provided, and mark each tree with the credit accorded it (F or 100 percent, TQ or 75 percent, H or 50 percent, Q or 25 percent, OT or 33.3 percent, TT or 66.6 percent). Each tree with different shade credit shall be listed separately. This method allows easy follow-up and coordination when a discrepancy is found in the plan check process. See Plate 15-A for examples of tree placement.

8) The shade trees shall be inspected by the Project Arborist to confirm compliance with the proposed shade target with a report to the City Arborist.

Shade Inspections and monitoring report shall be submitted to the City by December 1st with all corrections made within 90 days.

1) 1-year after acceptance
2) 5-year after acceptance to be 25% coverage
3) 10-year after acceptance to be 50% coverage
4) 15-year after acceptance to be 100% coverage.

C. General Requirements

All projects submitted for building permits must include site grading, landscape planting and irrigation with irrigation calculations. All plans that include parking must also include a shade plan. The planting plan may be used as the shade plan provided the trees are drawn to scale at the size indicated on the approved shade list and shade calculations are included. Plans will not be accepted into the building permit plan check process unless these items are present.

All landscape, irrigation and shade plans shall be approved by the Planning Department. This approval occurs as part of the development application review process.

D. Trees for Parking Lot Shading

Selection of the trees listed is based on adaptability to parking lot conditions. The following tree conditions and characteristics are informational to help select a good shade tree:

1) Minimum planter width (clear inside soil width)
2) Approximate tree height
3) Growth rate
4) Root growth and depth
5) Suggested soil type
6) Soil Moisture Needs (per "Water Use Classification of Landscape Species (WUCOLS)")

   VL = Very Low
   L = Low
   M = Moderate
   H = High

7) Remarks - deciduous or evergreen, miscellaneous information

   The species listed are not foolproof for all situations. Consultation with a nurseryman or landscape architect is desirable before any selections are made. Professional guidance is recommended to assure that optimal design is achieved to meet the needs of each development. Proper planting procedures, optimal spacing distance, soil, water requirements and maintenance programs should be ascertained at the start of the landscape project. It is important to note that proper planting procedure may include digging past the hardpan layer to assure deep rooting and proper growth.

Refer to the "Folsom Master Tree List" and "Folsom Tree Care and Maintenance Standards" for canopy diameters and appropriate planter sizes of Parking lot Shading Trees.

20.5 VEHICULAR SIGHT REQUIREMENT

If the project includes intersections or driveways onto public streets, the plan shall show the intersection, driveway and approaches, noting the minimum vehicular sight distance triangle as required by the City Engineer.

20.6 MEDIANS AND PARKWAYS

A. Turf is prohibited in medians. Turf shall be 10 feet wide, minimum in parkways. Shrub or ground cover areas shall be 4 feet wide, minimum and will require erosion control on slopes 2:1 or greater.

B. An 8-inch wide concrete or owner approved materials mow strip shall be required adjacent to median curbs, along walls and fences and between turf and ground cover areas.

C. Medians shall have a cross slope of 2% unless the median is specifically designed for a special landscape treatment.

D. No Type 1

E. curb and gutter adjacent to medians or park ways.

F. All landscape and irrigation sleeves shall be Schedule 80 PVC.

20.7 WATER EFFICIENT LANDSCAPE – STATE MODEL ORDINANCE

California Code of Regulations, Title 23, Division 2, Chapter 2.7, Model Water Efficiency Landscape Ordinance (MWELO), requires the City of Folsom to enforce water- efficient landscaping and irrigation methods. This is includes areas to be owned or maintained by the City, such as parks, landscape corridors, and median islands; as well as private development projects requiring a permit, and developer-installed landscaping in single-family and multi-family projects, as required by the ordinance.

For all applicable landscaping projects, the design professional shall submit to the Community Development Department, for review, a complete Landscape Documentation Package. For commercial building submittals, the Landscape Documentation Package will be included as part of the Building Permit submittal, with the landscaping plans included in the overall building plan set.

For corridors, median islands, etc., a separate landscape plan submittal shall be made which includes all elements of the Landscape Documentation Package.

Where required by the MWELO, the applicant shall submit two copies of the Soils Analysis and two copies of the landscape improvement plans, which show the following:

Landscape Documentation Package:

A. Water Conservation Concept Statement
B. Calculation of the Maximum Applied Water Allowance (MAWA)
C. Calculation of the Estimated Total Water Use (ETWU) for each station/hydrozone
D. Calculation of the aggregate ETWU of all the hydrozones.
E. Documentation for Mean Annual Precipitation (P) if used in the calculation of estimated Total Water Use
F. Landscape Design Plan
G. Irrigation Design Plan
H. Irrigation Schedules
I. A recommended Maintenance Schedule for the plant material and irrigation appurtenances
J. Landscape Irrigation Audit Report

For plans where grading will be performed that is not shown on the civil engineer's grading plan, where applicable, the plans also need to include the Grading Design Plan.

Each of these terms is outlined in the Mandated State Model Water Efficient Landscape Ordinance.

20.8 IRRIGATION

Once a project is completed, the City Inspector will require a complete audit, Irrigation Survey and Irrigation Water Use Audit, by a certified landscape auditor prior to acceptance of the landscape improvements or certificate of occupancy.

A. All irrigation systems shall be designed to minimize vandalism (with special consideration in parks). All controllers and backflow preventers are to be within standard approved enclosures.

B. Water velocity in system shall not exceed 5 feet per second.

C. All irrigation systems shall have the design capability of delivering 1-½ inches of water in a 5-day period. Watering time shall be between the hours of 10:00 p.m. and 6:00 a.m.

D. City maintained irrigation systems shall be designed to ultimately connect to a central computer controller.

E. Irrigation systems shall be designed to apply water at a rate, which does not exceed the infiltration rate of the soil, and systems shall be programmable to prevent ponding and minimize runoff.

F. Irrigation systems shall be designed to meet the peak moisture demand of all plant materials used within the design area. Individual station run time shall meet peak evapotranspiration (E.T.) rate. Separate remote-control valves shall be used for shrub and ground cover areas versus turf, with sun and shaded areas also segregated.

G. Irrigation systems shall be designed so that separate remote-control valves are used to irrigate plant material with differing water needs. Where plants of adjacent water needs (low water use and medium water use, for example) are irrigated on the same remote control valve, ETWU for that hydrozone shall be based on the plant material with the higher water needs. Separate remote-control valves shall also be used for trees versus shrubs, groundcovers, and turf.

H. Irrigation systems shall be designed so that the Evapotranspiration Adjustment Factor (ETAF) complies with the most current version of the MWELO.

I. On all slopes or mounded areas requiring irrigation, lateral lines shall be installed parallel with contours. Provide separate remote-control valves for sprinkler lines operating systems at the top, toe, and intermediate areas of slopes.

J. Irrigation systems shall be designed and operated to eliminate fogging and minimize overspray and discharge onto non-landscaped areas.

K. The following specific constraints (in addition to all related sections of Title 27) shall be adhered to during the design and any subsequent modification of irrigation systems using reclaimed water:

    8) Cross connections between potable water systems and other water systems are not permitted.

    9) Hose bibs are not permitted on irrigation systems using reclaimed water.

    10) Drinking fountains must be protected from the direct spray of reclaimed water by either proper placement of the drinking fountain or use of a covered fountain approved for this use.

L. Irrigation systems shall be designed to provide uniform coverage throughout each system for turf areas.

M. Sprinkler heads used in turfed play areas shall be equipped with protective covers.

N. Pop-Up style sprinkler heads shall use rotary style nozzles.

O. Sprinkler Heads:

1) All sprinkler heads shall be spaced to not exceed 50 percent of the spray diameter (head to head coverage).

2) In large turf areas and any area exposed to consistent winds, sprinkler heads shall be spaced to not exceed 45% of the spray diameter.

3) Sprinkler head spacing in medians and parkways shall not exceed the width of the landscape area.

4) Large turf sprinklers with different patterns or different precipitation rates shall be operated by separate remote-control valves.

5) Popup sprinkler heads in turf areas shall have a precipitation rate less than or equal to 1” per hour.

P. System design pressure shall not be greater than lowest available pressure during the previous 2-year period per City of Folsom records.

Q. Master valves, pressure regulating valve, and basket strainer equipment shall be required on all irrigation systems unless (domestic water and reclaimed water) otherwise approved by the City. The strainer shall be located immediately downstream of the water meter.

R. Ball valves shall be provided with each remote-control valve to allow shutting down various sections of the system independent of the entire system, and on the supply side of the system.

S. Backflow Prevention:

1) All backflow prevention devices shall comply with requirements of Title 17 of the California Administrative Code, Sacramento County Health Department, and City of Folsom. Reduced pressure type backflow preventers are required for irrigation systems using domestic water.

2) System design shall prevent any back siphonage after system valves are closed.

3) Backflow prevention devices are not permitted on irrigation systems using reclaimed water.

T. Remote Control Valves:

1) The following criteria shall be used for locating remote control valves:

- Locate valves in ground cover or shrub areas when possible.
- Locate valves outside of designated athletic play areas.
- Locate valves adjacent to paving to facilitate access.
- For slopes, locate valves either at the top or toe of slope.

2)Install remote control valves independently in plastic valve boxes with bolt down lids.Quick Coupling Valves:

1) Provide quick couplers a minimum of 100 feet on center in recreational areas and 200 feet on center in general landscaped areas. Provide one quick coupler within 12 inches of paved end sections of landscape medians, and at the end of main line runs 200 feet and longer. Quick coupler valves shall be installed in valve boxes.
2) Quick couplers shall be located outside of designated athletic play areas and within an area of 12 to 18 inches from hardscape where possible.

U. Stub-out requirements for future systems extending beyond the limits of the current project, for mainline piping and components shall be determined by the City

V. Drip irrigation or subterranean irrigation may be used.

W. Anti-drain valves (inline and/or under sprinkler heads) shall be installed on all slopes greater than 5%. Inline anti-drain valves shall be installed in approved valve boxes.

X. In mulched planting areas, the use of low volume irrigation is required to maximize water infiltration into the root zone. For shrub or groundcover, overhead spray requires prior approval of the City.

20.9 PLANTING

A. All plant material shall be in accordance with the appropriate ordinances, resolutions, and specifications established by the City.

B. All plant material shall be in conformance with City-approved Streetscape/ Street Tree Master plans where applicable. The City retains the right to prohibit any plant material generally known to require excessive maintenance, because of factors such as, but not limited to, disease, pest control, troublesome root development, ultimate size, high water needs, overplanting, difficult growth habits, and invasive regeneration habits.

C. To help protect our Urban Forest from pests, disease, storm damage, and drought, a diverse tree palette is required for landscaping projects. With the exception of projects utilizing a City approved tree mitigation plan, all landscaping projects shall maintain the following tree percentages:

If more than 20 trees, but less than 60 trees shall be planted for a project, the total number of trees:

Not to exceed 35% Genus
Not to exceed 30% Species
Not to exceed 25% Cultivar

If more than 60 trees shall be planted for a project, the total number of trees:

Not to exceed 25% Genus
Not to exceed 20% Species
Not to exceed 15% Cultivar

D. The use of drought tolerant plant materials that are particularly compatible with our local environment is strongly encouraged to promote water conservation and reduce maintenance costs. Landscape irrigation shall be designed in accordance with the State Model Water Efficient Landscape Ordinance as required by AB 1881. Plans shall show Water Conservation Concept statement and all calculations and schedules required by the Ordinance. The Soils Analysis, when required, may be shown on the plans or submitted separately.

E. In addition to minimum setback requirements for certain species as required by the "Folsom Master Tree List" and "Folsom Tree Care and Maintenance Standards," the following minimum distances shall be required:

   3) Three feet from City maintenance limit line.
   4) Four feet from utility installations including, but not limited to sewers, gas, water lines, meter vaults, catch basins, etc.
   5) Ten feet from driveways.
   6) Ten feet from fire hydrants.
   7) Twenty feet from light standards.
   8) Tree limbs must have a clearance of 14.5 feet over streets, 8 feet over bicycle trails, and 7 feet over pedestrian-traveled ways.
   9) Minimum sizes of trees shall be #15, or as approved by the Director.
   10) Ten feet from front of stop signs.
   11) The distance from infrastructure as specified in the "Folsom Master Tree List". Where the minimum required distance from infrastructure cannot be met, installation of City approved root barriers required. The City retains the right to prohibit usage of inappropriate tree species for landscape areas too small to accommodate the mature tree size.

20.10 LIGHTING

A. All accent lighting shall be located on public property and will be maintained by a Lighting and Landscape District. The poles and fixture shall be reviewed and accepted by the Lighting and Landscape District Supervisor.

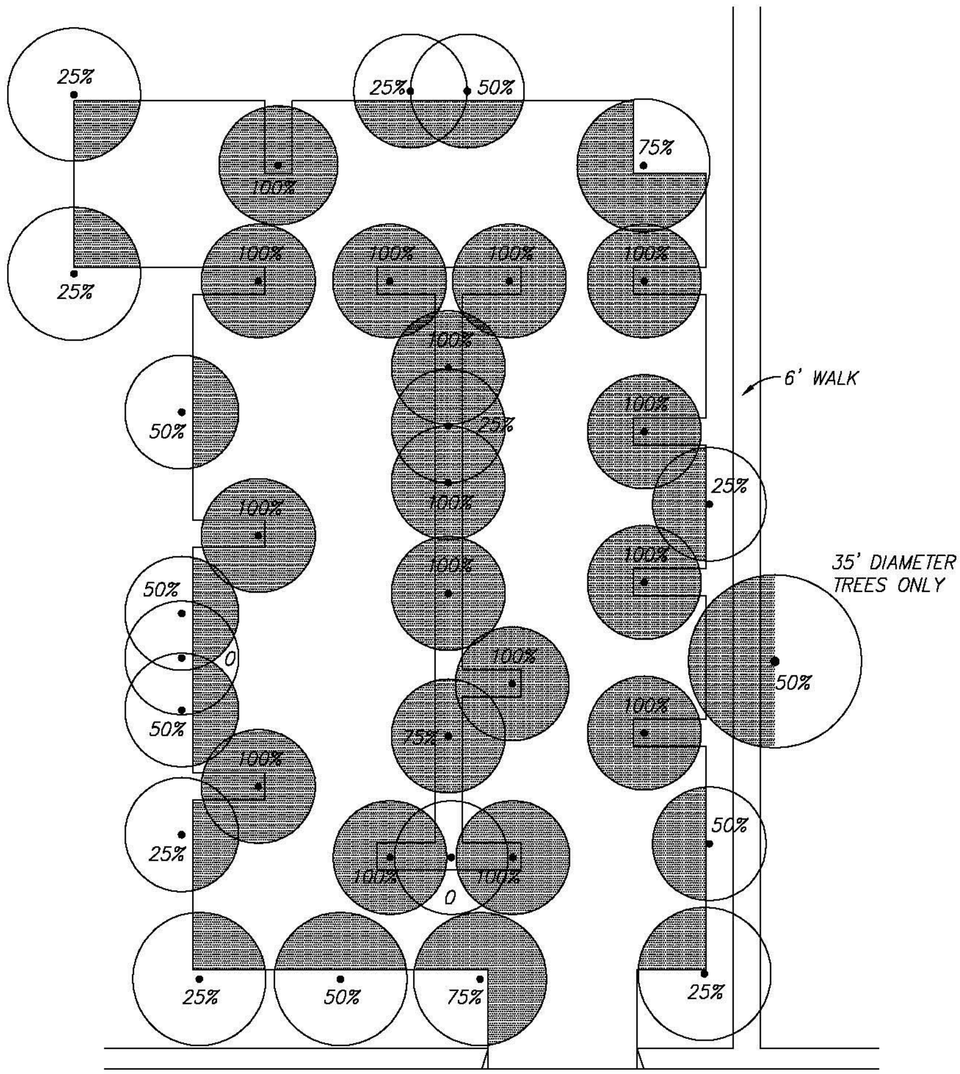
B. All street, park, trail, and paseo lighting shall be vandal resistant, and have approved LEED lighting LED lights with Lexan lenses.

C. All lighting shall be designed to conform to Section 15 and the requirements of SMUD. Existing tree(s) shall be maintained at appropriate distances (normally about 4') from the light standard and fixture by the property owner of the tree(s), so it will not damage the lighting system. The owner of the tree(s) shall be responsible for any damage to the public street lighting system cause by their tree(s).

D. Existing tree(s) shall be maintained at appropriate distances (normally about 4') from the light standard and fixture by the property owner of the tree(s), so it will not damage the lighting system. The owner of the tree(s) shall be responsible for any damage to the public street lighting system caused by their tree(s).

20.11 PLATES

A. Plate 20-A Tree Shading Diagram



NOTES:

1. THIS DIAGRAM IS INTENDED TO REFLECT A MANNER IN WHICH SHADE IS CREDITED UNDER VARIOUS CONDITIONS. IT IS NOT AN ILLUSTRATION OF 50% COVERAGE.
2. TREES MAY RECEIVE 25%, 33%, 50%, 66%, 75%, OR 100% SHADE CREDIT AS SHOWN.
3. SHADE OVERLAP IS NOT COUNTED TWICE.
4. SHADE TREES MAY NOT COUNT AS MITIGATION OR AS "STREET TREES".

TREE SHADING DIAGRAM
PLATE 20–A