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 improvements.

Such public improvements include the installation of storm drain lines, sanitary sewer lines, water mains, 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 design 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. The division 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 Specifications.

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 design 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 for 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 first hand 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).

6.3.1 Above Ground (Overhead) Utilities

Common overhead public utility lines include electrical power (Sacramento Municipal Utilities District, Pacific Gas and Electric Company, Central Valley Power, etc), communication such as telephone (American Telephone and Telegraph, Pacific Bell, General Telephone and Electronics, etc), cable TV (Sacramento Cable Company and Northwest Cable TV), and fire alarm (City of Sacramento).

6.3.2 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 placed underground in the form of duct banks or buried insulated cable (Pacific Bell, General Telephone, Sacramento Cable, etc). Natural gas pipelines (Pacific Gas and Electric) are generally underground. At stream crossings, however, natural gas lines may be mounted on a bridges.

6.3.3 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.

6.3.4 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 such as Procter and Gamble, Airco Products, etc, may have their own pipelines for transmitting natural gas or other gases to their plants for their own 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.

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.

6.4.1 Electrical Power (Overhead and Underground)

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.

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

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.

Pole Mounted Transformers - Power poles may have one or more electrical transformers mounted near the tops of the poles.

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 below beneath the switch operating handle.

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 is not guyed as the horizontal pull exerted by the power line cancel out.

The 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.

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 only be shutdown at specific times of low demand such as during weekends or holidays.

6.4.2 Underground Electrical Powers

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 the downtown area, underground electrical power lines are most often placed within stacked multiple duct banks encased in concrete. 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".

6.4.3 Telephone (Overhead and Underground)

Overhead Telephone - 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. Certain pole lines may be carrying telephone lines only, in which case they are owned by Pacific Bell or possibly American Telephone and Telegraph.

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 utility lines such as water and sewer services as well as leads from drainage inlets.

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 or 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 a somewhat impenetrable barrier to the desired placement of storm drain lines and sanitary sewer lines. Although the telephone company (Pacific Bell) 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 in 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.

6.4.4 Natural Gas (Underground)

Generally natural gas mains and gas services 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 the 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 1-1/2 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.

6.5 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 appropriate, 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 the location 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 lines.
GREEN	Sanitary sewer lines and sewer services as well as storm drain lines.

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 2 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.

6.6 UTILITY INFORMATION AND NOTIFICATION

In the preparation of construction plans for public improvement projects, it is important to obtain accurate and factual information concerning the location of existing aerial and underground utilities early in the design process. As the design of a public improvement project progresses through various stages of preliminary to final design, 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.

Provide partially completed plans (35% to 75%) with existing utilities plotted. Plans should show proposed improvements. Identify locations of potential utility conflicts.

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 construction is expected to begin.

Blank copies of these utility notification letters are included in the Appendix 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.

6.7 CLEARANCES TO EXISTING UTILITIES

6.7.1 Excavating Near Power or Telephone Poles

In streets improved with curbs, gutters, and sidewalks, power poles and telephone poles are placed at the back of curb in the sidewalk or planter area. In paved streets that lack curbs, gutters, and sidewalks, the poles are generally placed a few feet inside the street right-of-way line but behind any drainage swales or roadside ditches. In easements, such as along the rear lot lines of residential subdivisions or along drainage channels, power poles are usually placed inside the easement right-of-way line far enough for the crossarms to remain within the easement.

Many public improvement projects, particularly street widening projects, may involve the installation of municipal utilities (storm drain lines, sanitary sewer lines, and water mains) in close proximity to existing power or telephone poles. Existing power and/or telephone poles may need to be set back if the street widening project includes the acquisition of additional right of-way. However, until the additional right-of-way is acquired and the poles relocated to their ultimate position, the current location of the poles may greatly influence, if not completely dictate, the placement of the proposed drain lines, sewer lines, or water mains.

In determining the placement of drain lines, sewer lines, or water mains relative to fences, channel banks, power poles, telephone poles, street lights, traffic signal standards, etc, consideration should be given to the working space needs of excavating equipment used to install the drain lines, sewer lines, or water mains.

Large capacity trench excavating equipment may have a side overhang of approximately 7 feet measured from the centerline of the trench. The space needs of the excavating equipment may be also be governed by the minimum horizontal and vertical clearances to overhead wires. In general, the deeper or wider a pipe trench is, the larger will be the size of the machine used to excavate the trench and the farther the pipeline will need to be from a line of poles or other fixed objects.

Descriptive literature giving the dimensions and working space needs of specific models of excavators from various manufacturers (Caterpillar Co, Deere and Co, etc) is available upon request from dealers of such equipment.

Existing power or telephone poles may need to be braced if the stability of the poles is threatened by the excavation of a trench nearby. The work of bracing of the poles is performed by the utility company owning the poles (SMUD or Pacific Bell). For some types of projects (usually privately funded ones) the utility company may charge for the cost of bracing the poles.

Situations occur where the horizontal and/or vertical clearances between the bucket and boom of an excavator and the energized overhead wires of a power pole line may be less than safety standards allow. If an existing electrical power line cannot be temporarily shutdown (de-energized) for a long enough period of time to complete the excavation of a trench and installation of pipe, a temporary power pole line or "shoofly" may need to be installed parallel to but some distance from the existing pole line.

Following completion of installation of a "shoofly" the existing power line between the limits of the "shoofly" is de-energized thus allowing the safe use of excavating equipment. Any customers normally served from the de-energized overhead line are temporarily connected to the energized "shoofly".

6.7.2 Horizontal and Vertical Clearances to Underground Utilities

If at all possible, water mains are to be placed to provide 10 feet of horizontal clearance from parallel sanitary sewer lines. A minimum of one foot of vertical clearance shall be provided between water mains and gravity sewer lines at all transverse crossings. Water mains shall be installed a minimum of 2 feet above sanitary sewer force mains at all transverse crossings. In addition, water mains shall cross over rather than under sanitary sewer lines unless the depth of cover over the water main dictates otherwise.

A minimum of 6 inches of vertical clearance shall be provided between water mains and storm drain lines and other non-sanitary utility lines.

All new, relocated, or replacement water distribution mains as well as small to medium size sewer or drain lines (12 to 18 inches in diameter) shall be placed at least 5 feet, centerline to centerline, from such underground utility lines as gas mains and electrical or telephone cables and ducts, provided the existing underground facilities are not too large (wide).

In areas where the clearances between existing and proposed facilities is extremely limited, such as along alleys in the downtown area, new or replacement drain lines, sewer lines, or water mains may be placed such that no portion of the substructure of an existing underground utility is closer than two feet to the trench wall of the new or replacement facility.

Long skew crossings of proposed storm drain lines, sanitary sewer lines, or water mains over and especially under of underground existing utility lines should be avoided if at all possible. Such crossings are very costly to construct due to the amount of difficult excavation and tunneling required (usually by hand) and the need to provide special support for the portion of the existing utility that is exposed.

6.8 "POTHOLING" EXISTING UTILITIES

"Potholing" an existing utility involves the excavation and exposure of the utility's substructure at the location of a potential conflict to determine the utility's depth and size. Using the "pothole" measurements, the location and depth of the existing utility should be indicated on the profile of the improvement plans. In some cases the depth and location of an existing utility is best shown on a cross section.

If there is a strong possibility a conflict will occur between a proposed municipal utility line and an existing underground utility, and the owner of the existing utility line is unable to provide its exact elevation at the location of the interference, the Design Engineer for the proposed public improvement project should arrange to have the existing utility "potholed". It is recommended a survey party be on hand at the time a "pothole" excavation is made to accurately record the necessary measurements of location and depth (elevation). A representative of the owner of the underground utility should also be at the site of the "pothole" excavation.

6.9 SHOWING EXISTING UTILITIES ON PUBLIC IMPROVEMENT PLANS

All major existing above and below ground utilities should be shown on the public improvement plans in an accurate manner. The location of any existing utility parallel to and within 5 feet of any proposed municipal utility line or which crosses a proposed municipal utility line at an angle of 30 degrees or less should be determined with an accuracy of plus or minus one foot. The distances between existing underground utility lines and proposed storm drain lines, sanitary sewer lines, or water mains within 5 feet of one another should be dimensioned on the plans.

The horizontal or vertical alignment of a proposed public improvement facility requiring the permanent relocation of an existing utility line should be thoroughly analyzed before the alignment is finalized to determine if feasible options other than relocation are available.

Completed plans for proposed public improvement projects should clearly differentiate, insofar as possible, existing utilities that are:

1. Existing utilities to remain in place.
2. Already abandoned in place
3. To be abandoned in place
4. To be relocated by others
5. To be removed by others
6. To be removed by the contractor

The contractor's responsibility for the protection, removal, relocation, or avoidance of interference with existing utilities should be indicated on the plans for public improvements.

APPENDIX TO SECTION 6

UTILITY INFORMATION FORM
(To be filled in by Engineer)

Date:_____

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

From: _____ Address: _____
(Name of Engineering Firm) Phone: _____

Developer:_____ Address: _____
Phone: _____

Project:_____
(Name of Subdiv; Street Address, etc.)

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, SMUD, Citizens Utilities, etc.)

_____ _____
Signature of Utility Representative Date

NOTE: This form is to be returned to Name of Engineer, within 15 days.

(date)

(Name & Address)

Utility Letter "A"

Dear (Name):

For your information, please find enclosed two sets of preliminary showing improvements to be constructed as part of the _____ project, together with a partially completed Utility Information Form.

The anticipated advertising date for the subject project is _____.

On one of the copies of the enclosed plans, please verify the location, size and depth, if underground, of any of your company's facilities that may be affected by the proposed work. Within 15 days of receiving this letter, please return the marked up copy to this office. Also, please complete the attached Utility Information Form and indicate the estimated time schedule for completing any utility relocation work necessary as a result of this project.

If you desire further information concerning the proposed work, please call me at _____.

Sincerely,

NAME
Title

AUTHOR:typist initials
Document #
PN or JN

Enclosures

cc: N. Dee Lewis, Supervising Engineer

(date)

(Name & Address)

Utility Letter "B"

Dear (Name):

Preliminary prints showing the public improvements to be made in the _____ project are enclosed for your information. The anticipated advertising date for the subject project is _____.

Unless further information is received from your office within 15 days, we will assume that your facilities will be relocated prior to the start of construction (approximately six weeks after the proposed advertising date).

If you desire further information concerning the proposed work, please call me at _____.

Sincerely,

NAME
Title

AUTHOR:typists initials
Document Code #
JN or PN

Enclosure

cc: N. Dee Lewis, Supervising Engineer
John Middlebrook, Construction Manager

(date)

(Name & Address)

Utility Letter "C"

Dear (Name):

You are hereby advised that the City of Sacramento is planning the improvements of the _____ _____ project in the near future by pubic contract.

Prints showing the improvements to be made are enclosed for your information. The anticipated bid date for the project is _____. It is expected that your facilities will be relocated prior to the start of construction (approximately three weeks after bid date).

If you desire further information concerning the proposed work, please call me at _____.

Sincerely,

NAME
Title

AUTHOR:typists initials
Document Code #
JN or PN

Enclosure

cc: N. Dee Lewis, Supervising Engineer