

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.01 DESIGN CRITERIA

(1) General

(a) The design criteria set forth in this section shall be adhered to in the design of all sewer systems except where a local sewer district or a controlling agency has a higher standard, in which case their requirements shall take precedence.

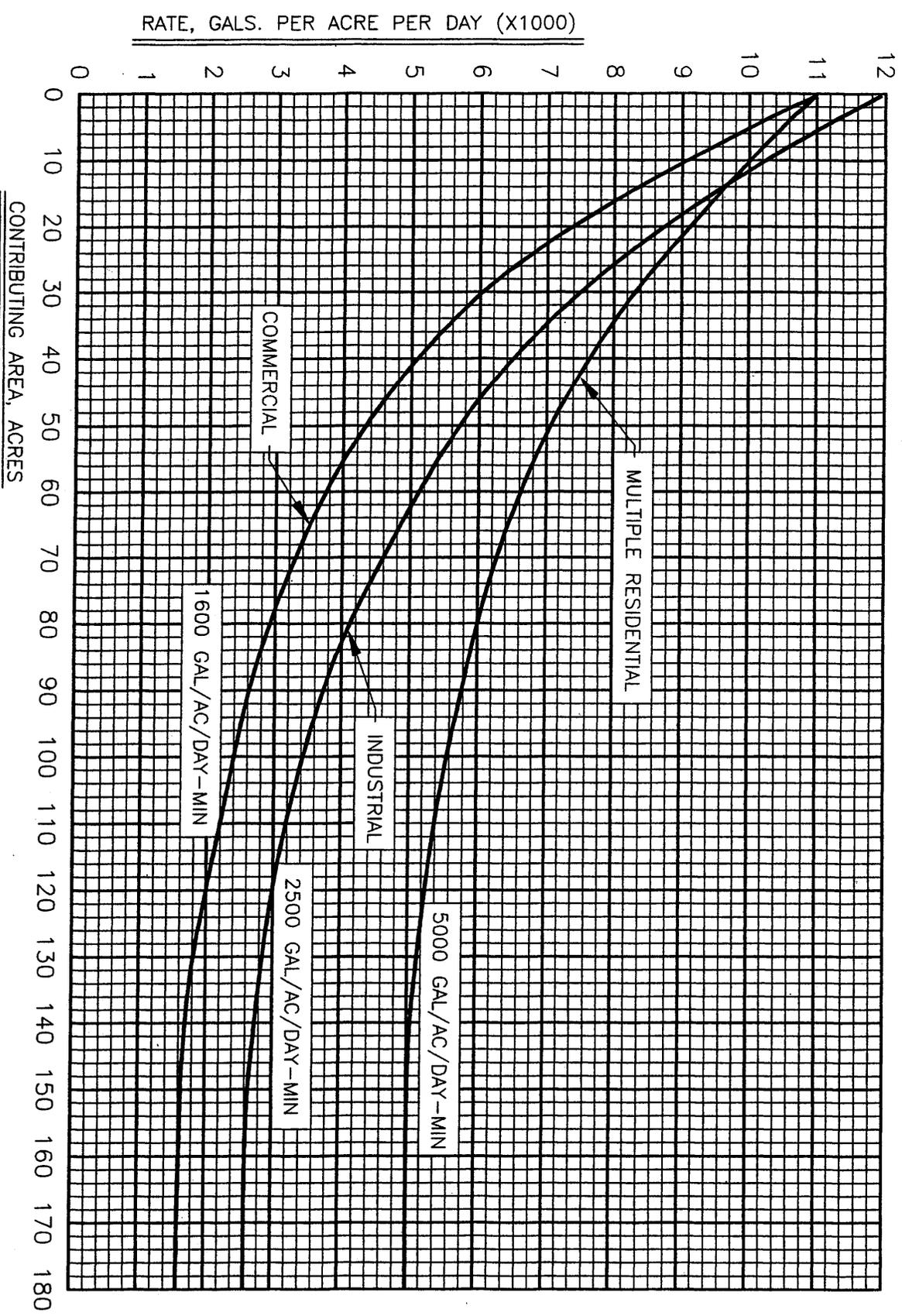
(b) The sewer system shall be adequate to serve the area under consideration, and shall meet the requirements contained in this section regarding provisions for future extensions into the surrounding areas.

(2) Average Flow Determination. Flow determination shall be based upon the general plan buildout. The minimum population density used shall be equivalent to that of single family zoning at buildout of the general plan. This estimate shall be used as the basis for determining flow.

(a) Single Family and Duplex Units - Flow shall be based on four persons per residential unit, 100 gallons per person per day, and four lots per acre. However, if the number of units is known, and is greater than four per acre, the actual number shall be used.

(b) Single Family, Planned Unit Development - Flow per unit shall be the same as above and the actual number of units per acre shall be considered. However, in the absence of known data, the density shall be assumed to be 12 units per acre.

(c) Commercial and Multiple Residential - Flows shall be determined from the curves on Standard Drawing No. 1. However, if the type of planned improvements are known and estimated discharges are available, they shall be used in-lieu of Standard Drawing No. 1. Multiple residential is differentiated from planned unit developments in that the latter contain individually owned residences with the adjacent land owned in common and with maintenance performed by a homeowner's association. Multiple residential is designed to be owned by one party with the individual residences rented or leased. The average flow from single bedroom multiple residential units shall be 200 gallons per day per unit; from two-bedroom units, 300 gallons per day; and from three or more bedroom units, 400 gallons per day. Mobile home flow shall be 300 gallons per day per unit. Arrangements for the connection of facilities with a high discharge rate or with a type of discharge that could be detrimental to the public system shall be subject to the approval of the Engineer.



ESTIMATED AVERAGE FLOW
 COMMERCIAL, INDUSTRIAL, AND MULTIPLE RESIDENTIAL ZONED AREAS

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.01(2) (Continued)

(d) **Schools** - The larger flow, as determined from one of the two following methods, shall be used:

1. The entire school area shall be assumed to contribute an average flow equivalent to that of an equal area of single family, detached residential units; i.e., 1600 gallons per acre per day.

2. Average daily flow per school shall be based on the type of school as follows, with the indicated capita limits including ultimate student population plus administration, teaching and operating personnel:

<u>Type of School</u>	<u>Avg. Daily Flow</u>	<u>Capital Limit</u>
Elementary (K-5, K-6 or K-8)	0.025 MG	1,00
Upper Elementary (6-8), 7-8 or 7-9)	0.060 MG	1,500
High School (9-12 or 10-12)	0.080 MG	2,000

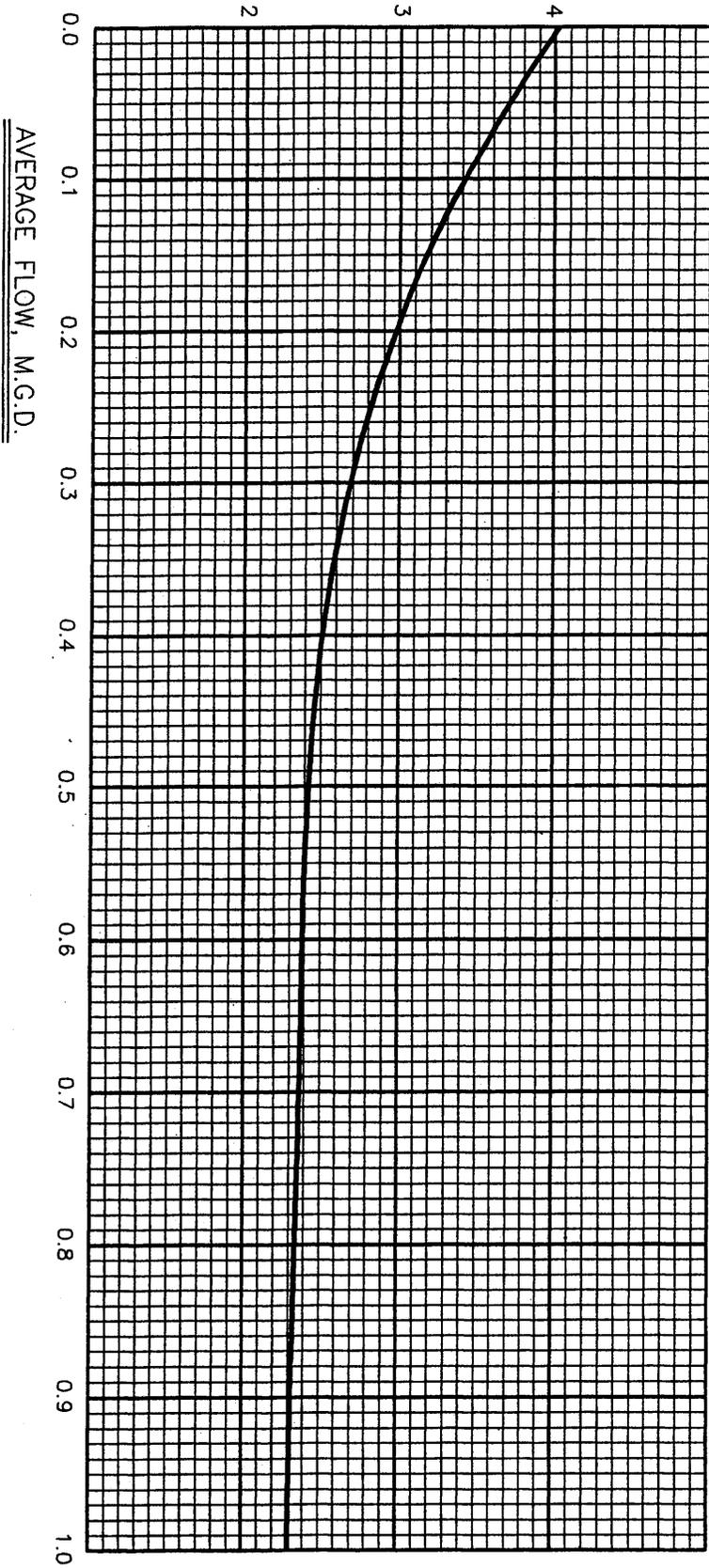
For enrollments and personnel in excess of that indicated, there shall be added 25 gallons per day per additional capita in elementary schools and 40 gallons per day per additional capita in upper elementary and high schools.

e. **Industrial** - Every attempt should be made to base flows on specific, known industrial development. In the absence of specific knowledge of type of development, the flow shall be determined from the curves on Standard Drawing No. 1. Special attention shall be given to any facilities with a magnitude or type of discharge that could be detrimental to the public system.

f. **Infiltration** - A normal amount of infiltration was considered in establishing the above discharge rates. However, in areas with high ground water, it may be necessary to increase these rates to reflect a greater amount of infiltration.

g. **Design Flow** - Average flow, as determined above, shall be multiplied by the peaking factor obtained from the curve on Standard Drawing No. 2 to obtain design flow.

PEAKING FACTOR



AVERAGE FLOW, M.G.D.

PEAKING FACTORS

STANDARD DRAWING No. 2

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.01 (Continued)

(3) Oversizing and Extra Depth

(a) All sewers which can logically serve upstream tributary areas shall be oversized and/or installed at extra depth to serve such tributary areas. See also Section 6.03(4) and Chapter 19.109.

(4) Velocity of Flow

(a) Sewers shall be designed to flow with a velocity of not less than 2 feet per second nor more than 10 feet per second when flowing full, whenever practicable. Manning's formula shall be used in determining flow conditions, with "n" = 0.013 for all pipe materials.

(5) Minimum Sewer Slopes

(a) Standard minimum acceptable slopes for sanitary sewers shall be as specified below:

Minimum Slope in Ft./Ft. (N=0.013)

<u>Diameter</u>	<u>2 Ft./Sec. Flow</u>
4" (house service only)	.0200
6"	.0050
8"	.0035
10"	.0025
12"	.0020
15"	.0015
18"	.0012

Building Sewers 1/4" per foot

(b) When the use of slopes less than the listed minimums are proposed to avoid pumping, such installations shall be subject to approval by the Engineer. Furthermore, the use of larger than needed pipe sizes in order to obtain flatter slopes is not allowed due to lack of self cleaning velocities.

(6) Minimum Sewer Lateral Size

A trunk sewer is defined as a public sewer having an inside diameter of 10 inches or more. A sewer lateral is defined as a public sewer of 6 inches or 8 inches inside diameter.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.01(6) (Continued)

The minimum size of any lateral sewer to serve a single family or duplex zoned area shall be 6 inches in diameter. Multiple family residential, schools, commercial, and industrial areas shall be served by lines not less than 8 inches in diameter. Single commercial establishments which contribute negligible sewage flow, among single family or duplex development may be served by a 6 inch sewer, subject to specific approval of the engineer. It is understood that the listed sizes are minimum sizes and they shall be increased whenever anticipated flows dictate.

SEC. 6.03 LOCATION AND ALIGNMENT

(1) General

(a) All sanitary sewers shall be located within rights-of-way dedicated for public streets where possible, unless use of an easement is specifically approved by the Engineer.

(b) When any sanitary sewer or building sewer is located between 50 feet and 100 feet of a well, it shall be constructed of ductile iron pipe or C-900 PVC water pipe, with approved water-tight joints.

(c) Sanitary sewers and/or building sewers shall not be located less than 50 feet of a water well without the prior written approval of the County Health Department and the Engineer for each specific location. If approval is obtained, the sewer shall be constructed of ductile iron pipe or C-900 water pipe, with approved water tight joints, and shall be completely encased in concrete.

(2) Location

In all new subdivisions when the sewers are to be in the road right-of-way they should be located on the south or east side of the street. When sewers are to be constructed in existing streets, they shall be placed in the same location when practicable. However, traffic conditions, existing utilities and other physical features shall be considered. Under no circumstances shall the horizontal distance between parallel sewer and water lines be less than 10 feet without specific approval of the State Health Department and the Engineer. When water lines and sewer pipes cross, there must be at least 1.0 ft. vertical clearance between them. If the clearance is less than 1.0 ft. the appropriate water agency must give approval (see Plate 94).

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.03 (Continued)

(3) Alignment

(a) Sewers shall be laid on a straight alignment and grade between manholes whenever practicable. When curved sewers are allowed, they shall be subject to the following requirements:

1. A 400 feet radius shall be maintained whenever possible. The minimum radius shall be 200 feet. When a radius is specified less than 400 feet, a note shall be placed on the plans informing the contractor that pipe lengths of 10 LF or less will be required in order to have sufficient joints to make up the curve.

2. No more than one horizontal and vertical curve shall be used between manholes, however, a length of tangent sewer may be used at either or both ends of the curve. A horizontal curve and a vertical curve may be used simultaneously on a section of pipe; however, the B.C. and E.C. must coincide with the B.V.C. and E.V.C. respectively.

3. Maximum deflection at any joint shall be as recommended by the pipe manufacturer, but in no case shall it be greater than three degrees.

4. All horizontal and vertical curves shall be staked on 25 foot intervals.

5. For vertical curves, the following formula for length of vertical curve shall apply: $L \geq 400A$, where;

L = vertical curve length (ft).

A = algebraic grade difference of vertical curve in the decimal form of percent.

However, the minimum length of vertical curves shall be 50 ft. All vertical curves shall be parabolas.

(4) Future Extensions

(a) Whenever an area outside a tract can be logically served by future extension of a tract sewer, the tract sewer shall extend as near as practicable to the tract boundary. See also Section 6.01(3).

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.05 DEPTH OF SEWERS

(1) Gravity Service

(a) Sewers shall be installed at a depth which will provide gravity service from all properties to be served if at all possible. The private engineer shall verify the adequacy of the sewer depth to serve the intended parcel. The limits of gravity sewer service shall be clearly shown for all lots on the project improvement plans and the design must be approved by the Engineer.

(2) Non-Gravity Service

(a) Parcels requiring pumping service must be clearly indicated on project improvement plans.

(3) Minimum Depth

(a) Sanitary sewers shall have a minimum of 36 inches of cover unless lesser cover is approved by the Engineer. When it is allowed to have a sewer less than 36" but greater than 18" cover, ductile iron pipe shall be used. For cover of 18 inches or less, ductile iron pipe shall be used and it shall be capped with Class A concrete. A service line shall have a minimum of 30 inches of cover at the property line. When a public sewer is designed parallel to a domestic water line, the sewer shall be designed at a depth so that sewer services shall run under the water line by at least 1 foot. If the sewer service cannot be designed under the water main, with approval of the local water purveyor, the water line may be lowered to provide the appropriate vertical clearance.

SEC. 6.07 STRUCTURES

(1) End of Sanitary Sewers

(a) All sanitary sewers shall terminate in a manhole except as provided below:

1. If the sanitary sewer is 200 feet or less in length and if the sewer cannot logically be extended to serve other areas, a flushing branch may be used. Longer runs may be reviewed for approval by the Engineer.

2. If the sanitary sewer is 200 feet or less in length and if the sewer can logically be extended, a flushing branch may be used if the future extension of the sewer will be on the same alignment and grade.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.07(1) (Continued)

3. Sanitary sewers installed for future extensions may terminate by capping or plugging provided there are no existing building sewers connected to it and there is no possibility of a building sewer being connected to it prior to the sewer being extended.

(2) **Manholes**

(a) Manholes shall be located at all junctions of sewer laterals and at all angular changes in grade or alignment that do not meet approved curve requirements as set forth in Section 6.03(3).

(b) Manholes on sanitary sewers shall be located at normal maximum spacing of 400 feet.

(c) An external or internal drop connection shall be constructed whenever any sewer enters a new or existing manhole greater than 2 feet above the flow line of the manhole. Drop connections cannot be used where force mains enter a manhole. No more than two inside drop connections can be used inside a single manhole. Drop connections cannot be used on 10 inch or larger pipe. In all areas where drop connections cannot be used, the pipe shall enter at the bottom of the manhole as detailed in Section 6.07(2)(h) (Ref: Plate 91 and 91A)

(d) Manholes constructed in a fill section shall extend to original ground or the engineered fill material under the manhole must be compacted to 95% relative compaction.

(e) Ram-Nek gaskets shall be installed between manhole sections, rings, and covers.

(f) In areas where snow conditions are present, all manhole covers shall be set 1/2 inch below finish pavement grade. In aggregate base shoulders, the manhole covers shall be set 5 inches below finish grade or may be placed 1/2 inch below finish grade provided that an area 10 feet on each side of the manhole and for the full shoulder width is paved with 0.2 feet of asphalt concrete.

(g) Manholes located in off-road easements shall be minimum of 6" above the natural ground surface, and above anticipated high water levels. If they are in a 100-year floodplain they shall have sealed and bolt down lids. (Ref: Plate 86)

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.07(2) (Continued)

(h) Grade Through Manholes

1. In all manholes with 6" and/or 8" sewer pipes, the invert of the exit pipes shall be at least 0.10' below that of the entrance pipes.

2. In manholes with a 10" or larger pipe flowing through, the invert elevation of all side connecting pipes, (4" services and laterals, 6" and 8" laterals) shall match the crown elevation of the larger pipe.

(i) Manholes shall be constructed with details shown on Plates 85 through 91.

(j) Where possible, all manholes should be designed to be in roadways accessible by large sewer cleaning equipment. If manholes are required to be constructed off a roadway, an all-weather road shall be constructed to every other manhole. All-weather roads shall be 10' wide with a double chip seal (or 2" AC) over 6" of compacted aggregate base rock. A through connector road shall be provided or a turnaround constructed.

(k) When designing manholes in new or existing sewer systems, due consideration should be given to the generation of Hydrogen Sulfide (H_2S). Where H_2S is expected, the inside concrete and metal surfaces of all manholes shall be coated with an approved acid resistant coating. H_2S is typically encountered downstream of force main discharges, on trunk sewers where sewage is old, and at locations of turbulence.

(3) Flushing Branches

(a) Flushing Branches shall be constructed in accordance with details shown on Plate 93.

(4) Strength Requirements

(a) All structures and pipes placed under roads shall be of sufficient strength to support, with an adequate factor of safety, the backfill, H-20 truck loading with impact, and any other anticipated loads. When a proposed sewer design has pipe depths greater than 20 feet, the designer shall provide to the Engineer for approval, a pipe strength and trench width analysis that is used to determine the type of pipe specified.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.07 (Continued)

(5) Detail Sheets

(a) The private engineer shall incorporate the standard sewer detail sheet, provided by the Engineer, into all sewer plans. All items of a special nature, such as a creek crossing, shallow or unusual manholes, etc., shall be shown in large scale on the project improvement plans.

SEC. 6.09 SERVICE AND BUILDING SEWERS

(1) Service Sewers

(a) In all new sewer work, the service sewer from the sanitary sewer to the property line shall be installed wherever it is known or wherever it can be reasonably assumed that a building sewer connection is or will be required. Each service sewer shall be shown on the improvement plans and referenced to the plan stationing. All sewer service elevations at the property or easement line shall be shown on the project improvement plans.

(b) The private engineer shall verify the adequacy of the normal service sewer depth to serve the intended parcel and shall show the limit of gravity service on the project improvement plans for all parcels of land within the project not fully served by gravity.

(c) Service sewers shall be a minimum of 4 inches in diameter. Multiple family housing (other than a duplex), schools, commercial (other than a single commercial establishment which contributes negligible sewage flow), and industrial facilities shall be served by a 6 inch or larger service sewer. A plan and profile of any service sewer shall be submitted upon request of the Engineer.

(d) A 6 inch service sewer shall enter a 6 inch lateral sewer at an existing or new manhole, but may enter an 8 inch lateral sewer by means of a factory "Y". Eight inch diameter and larger services shall be connected to the lateral sewer by use of an existing or new manhole. Service sewers shall not be connected to a sanitary sewer 10 inches in diameter or larger unless such connection is specifically approved by the Engineer in writing. Sewer services can be connected to 10 inch through 18 inch trunk sewers by means of a factory "Y" provided the "Y" is installed when the trunk sewer is constructed.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.09(1) (Continued)

(e) Unless requested otherwise by the property owner, service sewers shall be placed in the center of a typical subdivision lot or similar parcel, except that it shall be placed on the low side of a lot or parcel with two percent (2%) or greater gradient across the parcel or at the lowest point if needed to provide gravity service. Due consideration shall be given to trees, existing and future improvements, etc., to minimize interference when the building sewer is extended to serve the property.

(f) The location of sewer service lines shall be permanently indicated by imbedding the letter "S" in the curb, directly above the line. It shall be the developer's responsibility to so mark any curb which is poured after the installation of the service line. All sewer services shall be extended past the back of the joint trench or to the property line or road easement line whichever is furthest from the road centerline. The end of all sewer services shall be marked with a length of 1/2 inch rebar extending from the surface down to the flow line of the pipe. The bottom of the rebar shall have a 12 inch hook and the top, above the surface, shall have a plastic cap or be bent in a loop to eliminate sharp ends.

(g) When sewer services are connected to existing manholes, the invert of the service shall match the elevation of the manhole shelf. The shelf shall then be bush-hammered to create a channel.

(2) Building Sewers

(a) Building sewers, from the property line to any building, shall be constructed in accordance with the current edition of the Uniform Plumbing Code.

(b) Building sewers shall be of the same material and size as the connecting service sewer, except as specifically approved by Engineer. In no case will a building sewer be larger in diameter than the service sewer.

(c) Building sewers from laundromats, restaurants, and commercial and industrial establishments having waste of non-human origin may be required to provide a sampling well and or grease traps.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.09(2) (Continued)

(d) Any building sewer serving service stations, maintenance shops, restaurants, auto wash racks, or other potential sources of oil, grease, or inert solids shall be equipped with an oil and waste separator and shall be approved by the engineer and the Health Department.

(e) In all industrial subdivisions, in lieu of the standard property line cleanout shown on Plate 92, a standard sewer manhole may be required (see Plate 86) at the property or easement line. The sewer service pipe shall extend through the manhole and be stub and plugged 3 feet outside the manhole.

SEC. 6.11 TYPE OF PIPE

(1) **Gravity Sewers**

(a) All gravity sewer lines up to and including 15 inches in diameter shall be Extra Strength Vitrified Clay, SDR 35 PVC, or Ductile Iron Class 50 pipe. However, all gravity sewer lines greater than 15 inches in diameter and up to and including 24 inches in diameter shall be extra strength Vitrified Clay or Ductile Iron Class 50 pipe. Sewer lines larger than 24 inches in diameter may be of the latter specified material or reinforced concrete pipe. Pipe of a material other than the above may be used only with the specific approval of the Engineer. When concrete pipe is proposed for use, due consideration to hydrogen sulfide generation shall be taken and the inside of the pipe shall be coated with a material approved by the Engineer.

(2) **Force Mains**

(a) Force mains shall be Polyvinyl Chloride (PVC) pressure pipe. Force mains 4" to 12" in diameter shall conform to AWWA C-900 standards. Force mains 14" to 36" diameter shall conform to AWWA C-905 standards. Design parameters shall be specified on the plans. Force mains shall terminate in manholes at an invert elevation 0.20 ft. higher than the manhole outlet flow line. No drop connections shall be allowed.

(3) **Fill Sections**

(a) Sewers constructed in fill sections shall be ductile iron pipe, Class 50, or as approved by the Engineer.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.13 SEWAGE PUMPING STATIONS

(1) General

(a) Where design dictates that a substantial area cannot be sewerred by gravity, a sewage pumping station may be installed. However, no pumping facilities may be incorporated in sewerage improvement plans without prior approval of the Engineer. The following data shall be furnished with a request for approval to install a pump station:

(b) A contour map covering all areas tributary to the proposed pump station, including those outside the project, and the predicted flow from each area.

(c) The design computations for the pumps, including the pump curves, the peaking factor used, the type to be installed, and a plot plan showing the dimensions of the site, its access, and its location with respect to homes and/or other structures.

(d) The size, design head, and type of the force main to be used, and its tentative alignment.

(2) Design Requirements

(a) Pump stations, where approved, shall be of the submersible pump type in a wet well (unless specific authorization is given by the Engineer) and incorporating the following features:

(b) The minimum distance from any building to a sewer pumping station shall be 50 feet.

(c) Pumps shall be submersible type on vertical rails with a quick disconnect mounting at the bottom of the wet-well.

(d) A minimum of two pumps shall be installed. Each pump shall be capable of handling ultimate peak flow from the entire tributary area.

(e) The pump station wet-well shall be made of fiberglass. The shutoff valves and check valves for the pumps shall be housed in an separate adjacent or attached vault. Both the wet well and the valve box shall be accessible on the ground surface through approved, hinged, access hatches that are designed for a H-20 traffic loading.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.13(2) (Continued)

(f) The controls for the pumps shall be housed in a NEMA 3 control panel, free standing, within 10 feet of the wet well. The control panel shall be mounted on a concrete pedestal above any flooding level. Controls for the pumps shall be Mercury Float type including low water, pump off, 1st pump on, 2nd pump on, alarm, and redundant. The high water alarm shall have a switch for "alarm check".

(g) An emergency overflow tank shall be provided for the pump station. The tank shall be a reinforced concrete pipe with pre-fabricated plug ends. The tank shall have an access manhole at either end and shall drain by gravity into the wet well. The gravity drain pipe shall enter the wet well a minimum of 0.5 feet above the high water alarm elevation. The volume of the emergency storage tank shall be equal to or greater than 24 hours of design flow for the pump station.

(h) The pump station site shall be enclosed in an eight foot high chainlink fence with three strands of barbed wire at the top. A ten foot gate will be provided. The surface inside of the fencing shall be paved with 3 inches of Asphalt Concrete over 8 inches of compacted base rock. The pump station site shall have a domestic water service and hose bib and back flow valve installed inside the fencing.

(i) Access to the pump station site shall be across a minimum 10 foot wide paved access road. The road shall have 3 inches of Asphalt Concrete over 8 inches of compacted base rock. If the pump station fence is further than 25 feet from a paved road wide enough for large trucks to turn around on, a truck turnaround at the pump station shall be provided as specified by the Engineer.

(j) The pump station shall be provided with a two-way radio monitor and control system, that is fully compliant with the FCC rules and regulations part 90.63 and the National Electrical Code, as specified by the Engineer. The two-way radio monitor and control system shall be interfaced to the pump station monitor and control equipment in accordance with the specifications. The two-way monitor and control system shall be housed inside the control panel for the pump station where possible. An antenna support structure of sufficient heights (radio frequency path dependent) shall be placed near the two-way radio monitor and control system. A 1 inch conduit shall be run from the antenna support structure to the two-way radio monitor and control system.

**PLACER COUNTY LAND DEVELOPMENT MANUAL
SECTION 6**

SEWERAGE

SEC. 6.15 TESTING

(a) All sewer systems, including but not limited to pipes, structures, manholes, and pump installations shall be tested in accordance with the County General Specifications, Special Provisions, or as directed by the Engineer.