
WASTEWATER

This chapter provides ordinance, policy, and standards establishing design criteria for constructing and modifying sanitary sewer systems to be owned and operated by the city, and for the private systems. It provides guidance on agreements, preparation of design reports and design of sewer collection systems and final plans preparation.

DS&PM 2014 UPDATE NOTES OCTOBER 28, 2014:

The revisions shown in red bold font (new language) and red bold font strike-through (deleted language) were made after publishing for the September 15, 2014 Open House meeting and public review.

- There was no public input on this document.
- The revisions shown are staff review revisions.

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GENERAL INFORMATION

1. Ordinance Requirements

Developers are required to install at their expense, all improvements necessary to provide wastewater service to their development. This includes any sanitary sewer lines, lift stations, force mains or other facilities, and the payment of all required fees.

Refer to the Scottsdale Revised Code, Section 49-73.

Developers must also adhere to the city's requirements for extension of the city's wastewater system to newly developed areas and subdivisions inside the city's service area. Refer to Section 49-212, www.ScottsdaleAZ.gov/codes.

A civil engineer registered in the State of Arizona is required to analyze the wastewater generation from a proposed development and determine its impact on the city's wastewater collection system.

This analysis is typically required from the development to a point on the downstream system where the engineer can certify compliance with a master plan previously accepted by the city. The city is responsible for analysis of sanitary sewer lines shown in the city's Integrated Wastewater Master Plan.

2. Design Policy

It is strongly advised that developers and property owners verify the need for any sewer extensions necessary to provide service to a site and comply with the extension/frontage requirements of the Code.

Available Resources:

1. Records Department; obtain existing utility maps and as-built drawings.
2. Scottsdale Revised Code; (generally Chapters 47 through 49) available at www.ScottsdaleAZ.gov/codes.
3. MAG Uniform Standard Specifications and Details for Public Works Construction available at <http://www.azmag.gov/Communications/publications.asp>
4. The Scottsdale supplements to the MAG standards and details available at <http://www.scottsdaleaz.gov/design/cosmagsupp>
5. City's website - Home Improvement Center at www.ScottsdaleAZ.gov/bldgresources.
6. A city civil plans examiner and/or a city water resources engineer can confirm the need for any required extension or condition for sewer service.
7. Water Resources Planning and Engineering – 480-312-5685.

EPA REGULATIONS

The US Environmental Protection Agency (EPA) requires the city to develop and implement a program to control discharges that might harm the Publicly Owned Treatment Works (POTW). The program establishes local discharge limits for non-residential users and provides a permitting process based on the users' discharges and types of businesses. Details of the program and requirements are found in the Scottsdale

Section 7-1

7-1.000

7-1.001

Revised Code: Article IV of Chapter 49; Water, Sewers and Sewage Disposal. Specific information may be obtained by calling the Water Resources Department at 480-312-5685.

ADEQ REQUIREMENTS

A. Design Policy

Maricopa County Environmental Services Department (MCESD) is required to review and approve all public sanitary sewer line extensions and construction of wastewater-related facilities within the city's service area, prior to the city approving the final plans.

Engineering Bulletin No. 11, "Minimum Requirements for Design, Submission of Plans and Specifications of Sewage Works" published by the Arizona Department of Environmental Quality (ADEQ) and Arizona Administrative Code, "Title18 - Environmental Quality," contain specific requirements for submittals, approvals and notifications when extension of a public sanitary sewer line is proposed. Some of the provisions are outlined below. The developer is responsible for reading and complying with all regulations and requirements.

1. Prior to city approval of final plans, the developer will submit a cover sheet for the improvement plans with a completed signature and date of approval from the MCESD. A City of Scottsdale Water Resources Engineer will provide a letter to comply with the requirements of Arizona Administrative Code Section R18-9-E301. 4.01.
2. Before commencing construction, the contractor or developer will provide documentation to the city public works inspector that a Certificate of Approval to Construct and/or Provisional Verification of General Permit Conformance has been approved by MCESD. Contact MCESD at 602-506-6666 with any questions.
3. Before building permits are issued, the developer will submit to the city public works inspector a Certificate of Approval of Construction and/or Verification of General Permit Conformance signed by MCESD.
4. Before Inspection Services issues a Letter of Acceptance, the developer will deliver to the city's Public Works Inspector an acceptable set of full-size 4-mil as-built mylars of the improvements.

PRIVATE WASTEWATER FRANCHISES

Portions of Scottsdale's municipal service area are served by private wastewater franchises. Figure 7.1-1 delineates these areas. Franchise lines constructed within city right-of-way will require an agreement between the wastewater company and the city.

Applicable review fees must be paid when the city reviews franchise sewer system plans. When submitting final plans, the developer must provide written documentation that the franchise company has reviewed and approved the sanitary sewer lines within its service area or jurisdiction. A note must be placed on the final plans stating responsibility for operation and maintenance.

The city cannot provide wastewater service within the service area of private wastewater franchise without an agreement.

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7-1.003

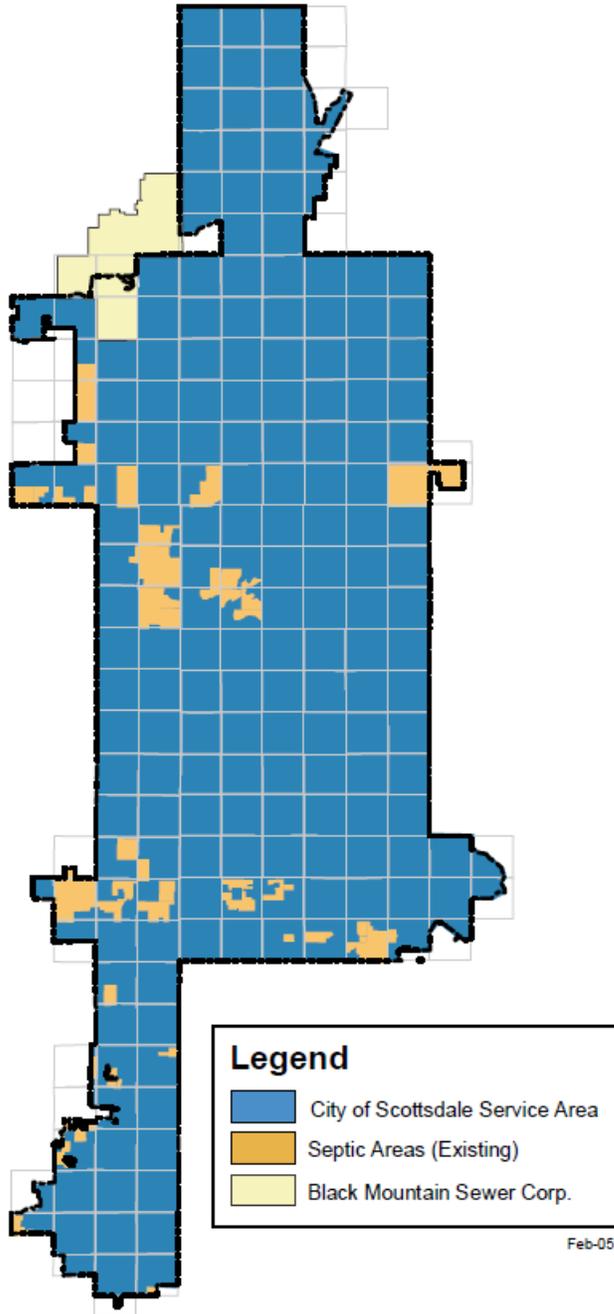


FIGURE 7.1-1 WASTEWATER SERVICE AREAS

AGREEMENTS

Developers and property owners who install improvements to the public wastewater system may be eligible to request a credit, oversize or payback agreement with the city allowing for partial reimbursement of costs to design and construct those improvements.

Ordinance Requirements

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Developers who construct wastewater system improvements may receive credit for such construction, see Scottsdale Revised Code per Section 49-74.2. The city has specific programs to provide for reimbursement agreements with developers or property owners and for the collection of line payback charges and for the oversizing of wastewater lines, refer to Scottsdale Revised Code, Section 49-212.

CREDIT AGREEMENTS

Credit agreements are established to compensate a developer for installing system infrastructure that has been identified in the city's Capital Improvement Plan and/or included in the most recent infrastructure improvement plan or long range master plan. Credit agreements are set up through the Water Resources Department and are to be identified in the developer's master plan.

7-1.101

OVERSIZE AGREEMENTS

Oversizing Agreements allow the city to compensate developers for the cost to install a sanitary sewer line larger than what is minimally required to serve the development. Oversizing is requested by the Water Resources Department when a larger line is necessary to meet the needs of additional properties upstream of a development. All oversizing projects involving city funds must have an oversizing agreement and must meet all the city requirements. The city can only participate in the cost of oversizing when there are sufficient funds in the CIP budget and the amount does not exceed the limitations set forth by the Arizona Revised Statutes, Title 34, Article 2, Paragraph 201.D. If sufficient funds do not exist, the oversized lines will be installed at the developer's cost. Oversizing agreements are set up through the Water Resources Department.

7-1.102

PAYBACK AGREEMENTS

Developers may request a Payback Agreement when constructing sanitary sewer lines across frontages of parcels not currently receiving wastewater service from the city. When a designated parcel requests wastewater service, a pro-rated cost of the sanitary sewer line is collected by the city and returned to the developer. Line extension payback agreements are set up through the Water Resources Department. For questions or details on procedures to initiate an agreement, contact the Water Resources Department. The Extension Participation Program:
<http://www.scottsdaleaz.gov/bldgresources/counterresources/waterratefees/ExtensionParticipation> may be available to single family property owners required to public extended public sewer lines to their lot for service.

7-1.103

WASTEWATER SERVICE AGREEMENT

The County's Sewer Service Agreement form should be completed by the developer's engineer and submitted or emailed for signature to the Water Resources Department and the Solid Waste Management Division. It is the owner's responsibility to obtain these signatures from the respective city divisions. The agreements will not be signed prior to

7-1.104

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the city approving the final plans. Following is specific information regarding the city's municipal wastewater system and the appropriate identification numbers:

- Water Campus – Wastewater Treatment # 37-024
- Gainey Ranch – Wastewater Treatment # 37-160
- System Name: City of Scottsdale Water Campus
- Address: 8787 E. Hualapai Dr., Scottsdale, AZ 85255

The following identification number relates directly to that portion of the city's wastewater system that is not treated at the Water Campus or Gainey Ranch. This area is generally south of Doubletree at Scottsdale Road, south of Via Linda at Pima Road and excludes the Hayden corridor to Frank Lloyd Wright Blvd:

- General sanitary sewer collection system # 37-011

IN-LIEU PAYMENTS

At the sole discretion of the Water Resources Department, an in-lieu payment may be accepted as a developer contribution satisfying the frontage extension requirements of the ordinance provided:

1. An existing public sewer line presently fronts a portion of the property and is available to provide service.
2. An anticipated land division of adjacent property would impact the size or desired alignment of the sewer line.
3. Future construction of the sewer line will not impact any offsite improvements otherwise required of the property.

All in-lieu estimates are subject to review and acceptance by the Water Resources Department and shall include itemized amounts for design, permitting, construction, inspection, and administration based on current costs from the City's Capital Project Management program. In-lieu payments are to be made at the City's One Stop Shop when applying for either an encroachment or a building permit.

DESIGN REPORTS

Projects requiring the extension of a sewer line will require a basis of design report.

Preliminary Basis of Design Reports will be identified on the application checklist when required for a case submittal (zoning, preliminary plat, development review, etc.).

Final Basis of Design Reports must be reviewed and accepted by the Water Resources Department prior to submittal of improvement plans to the city's One Stop Shop.

Larger planned communities, phased developments and rezoned properties may be stipulated for a Wastewater Master Plan to evaluate offsite sewer infrastructure and proposed onsite improvements. Contact the Water Resources Department to discuss offsite and onsite requirements and the necessary content for a specific Wastewater Master Plan.

7-1.105

7-1.200

PRELIMINARY BASIS OF DESIGN REPORTS

Preliminary basis of design reports will evaluate a site’s existing and proposed sewer demands to determine if adequate line capacity exists to sewer the development or if additional infrastructure will be required.

A. Report Format

1. A narrative describing the existing and proposed site development and utilities.
2. An estimate of existing and proposed sewer demand.
3. A preliminary site plan with onsite sewer line layout (11 x 17 or 24 x 36).
4. Any additional analysis determined necessary will be discussed in the pre-application meeting.

B. Submittals

Two copies of the Preliminary Basis of Design Report shall be included in the project’s case submittal for review and comment by the Water Resources Department. This report may be combined with the Water Submittal. A copy will be available for the developer upon acceptance by the Water Resources Department.

FINAL BASIS OF DESIGN REPORTS

Final Basis of Design Reports shall provide an analysis of a development’s impact on the local sewer system. These reports are reviewed and accepted by the Water Resources Department then utilized by Plan Review staff as support for their review of the construction drawings. The report’s objectives are to demonstrate design conformance to the city’s current Water Reuse Master Plan and/or established local conditions.

A. Design Policy

A civil engineer registered in the State of Arizona must analyze new development that will impact on the city’s sewer system. The effects of average day flow, peak hour flow and minimum day flow are to be evaluated ensuring the pipe design criteria described elsewhere in this chapter are met and that the proposed sewer system design and sizing are adequate for the development. The Final Basis of Design Report shall provide supporting map detail to serve as a master utility plan for the project.

B. General Format

1. The report shall be letter-sized (8 1/2 x 11).
2. Provide a table of contents.
3. Maps and other supporting materials shall be attached as an appendix to the report.
4. Reports must be sealed by a civil engineer licensed to practice in the State of Arizona.

C. Report Covers

1. Covers shall include the project name along with the name, address and phone number of the developer/owner and engineer.
2. Covers shall include the original submittal date and any subsequent revision dates.

D. Vicinity Map

1. Identify the project's location with respect to major cross streets and city quarter-section.

- E. Introduction
 1. Summarize the proposed development including the number of residential units, square footages of non-residential development, and related site improvements.
 2. Summarize any previous site development.
- F. Existing Conditions
 1. State the existing zoning and land use.
 2. Describe the existing, topography, vegetation and landform features.
 3. Include a description of existing utilities in the vicinity.
 4. Summarize and attach the results of any certified sewer flow monitoring.
- G. Proposed Conditions
 1. Describe the proposed connection(s) to the city's sewer system.
 2. Describe general depth of the sewer to accommodate the building pads.
 3. Describe any proposed drop structures and measures taken to minimize development of odors.
 4. State reasons for any shallow or steep sewer slopes approaching the allowable sewer grades stated elsewhere in this chapter.
 5. Describe the need and method of sizing for any grease or sand/oil interceptors.
 6. Address maintenance responsibilities of the proposed sewer system.
- H. Design Documentation/Computations
 1. Include a discussion of which design procedures, policies and methodologies will be incorporated into the engineering of the wastewater system.
 2. List the title and version of any software used in the design analysis.
 3. Base wastewater flows on the unit demands listed in Figure 7.1-2 or other sources acceptable to the Water Resources Department. Verify any variance from the stated design flows with the Water Resources Department.
 4. Give particular attention to wastewater peaking factors used for restaurants or specialty developments.
 5. Calculated pipe data – include ID, upstream and downstream nodes, invert elevations, pipe material, slope, length, diameter, Manning's n-value, peak flow, flow depth, flow depth/diameter ratio, actual flow velocity, full flow design capacity and average pipe cover.
 6. Provide calculations for the sizing of grease interceptors or sand/oil interceptors.
 7. Include a scour analysis when crossing washes with flow greater than 499 cfs.
- I. Summary
 1. Summarize the proposed sewer improvements stating that all the city's design standards and policies have been met or note why the developer is requesting any variance or exception.
 2. Include a brief project schedule indicating the proposed start and completion of the development's improvements.
 3. State any intent to request a credit, oversize or payback agreements along with a description of the applicable sewer infrastructure.
- J. Supporting Maps

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1. Include a scaled site plan showing all existing and proposed utility lines and all existing and proposed improvements including line sizes and service locations. Provide separate maps if site demolition involves significant removal of existing utilities and improvements.
 2. Screen existing topography and clearly label all existing and proposed contours, or provide spot elevations with sufficient information to evaluate pipe cover.
 3. Indicate locations of grease interceptors or sand/oil interceptors.
 4. Show, dimension and label all property lines, rights-of-way, tract and easement lines.
- K. Submittals
1. Counter submittal – reports stipulated to be accepted by Water Resources prior to submittal of improvement plans, shall be submitted to the One Stop Shop to the attention of the Water Resources Department or may be submitted electronically. Counter submittals require three copies of the report in addition to any previously redlined reports.
 2. Electronic submittal – reports may be electronically submitted following the digital plan submittal processes described on the city’s website at <http://www.scottsdaleaz.gov/bldgresources/planreview.asp>.

ADDITIONAL INFORMATION

Questions regarding report requirements and the city’s sewer distribution system may be obtained by contacting the Water Resources Department at 480-312-5685.

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WASTEWATER FACILITIES

Lift stations and force mains are typically designed and constructed by the city through its Capital Improvement Program. Developers needing to construct these facilities must contact the Water Resources Department and request a meeting.

7-1.300

A. Ordinance Requirements

When wastewater service is not available, a septic system or alternative system acceptable to the Water Resources Department may be allowed with the approval of both the City of Scottsdale and Maricopa County Environmental Services Department per Scottsdale Revised Code, Section 49-116.

B. Design Policy

Maricopa County Environmental Services Department and the city discourage the development of privately owned packaged treatment facilities designed to serve two or more lots.

Wastewater facilities will be located on a tract or a lot dedicated to the city (conveyed by a general warranty deed) and accompanied by a title policy in favor of the city.

SEPTIC SYSTEMS/ON-SITE TREATMENT FACILITIES

7-1.301

The property owner is responsible for the design, construction, operation and maintenance of an on-site wastewater treatment facility. The city will not accept any type of on-site system for operation and maintenance.

All on-site wastewater treatment facilities shall be designed and constructed compliant with the applicable requirements of the Maricopa County Environmental Services Department. Final plans submitted to the One Stop Shop will include the county's permit number for the on-site system.

LIFT STATIONS

7-1.302

Water Operations maintains a separate document outlining the design, specifications and materials required for a city owned and maintained wastewater lift station. Contact the Water Resources Department for additional information.

A. Site Selection

In selecting a site for a sewer lift station, consider accessibility, drainage patterns, visual impact, function and design constraints. The station's equipment must be protected from damage and remain operable during a 100-year flood.

B. Lift Station Design

Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control," contains minimum requirements for a wastewater lift station. The city's current lift station criteria, details and specifications are available online at:
<http://www.scottsdaleaz.gov/bldgresources/counterresources/waterratefees>

FORCE MAINS

7-1.303

Force mains shall be located within a right-of-way, private street tract or utility easement. The line shall be located under pavement where possible.

A. Velocity Requirements

The flow velocity in the force main shall be between 4 and 6 feet per second (fps).

B. Materials of Construction

All pipe material used in design of the force main must have established ASTM, ANSI, AWWA or NSF standards of manufacture or seals of approval and shall be designated as pressure sanitary sewer pipe. Force mains must be identified as such with marking tape 1 foot above the pipe.

C. Air Release Valves

Air release valves designed for sewage works must be provided on force mains at all high points to prevent air binding. Refer to COS Standard Detail No. 2405.

D. Cleanouts

Lines 6 inches and larger shall provide two-way cleanouts every 1,300 feet or 1-way cleanouts every 650 feet. Single cleanouts must be provided at all horizontal bends oriented in line with the downstream pipe.

Lines 4 inches and smaller shall provide two-way cleanouts every 600 feet or 1-way cleanouts every 300 feet. 90-degree changes in direction are to be accomplished using

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two 45-degree bends with a 2-way cleanout located between the two bends. Refer to COS Standard Detail No. 2403.

E. Force Main Restraint

Force mains shall be constructed using mechanically restrained joints at the following locations:

1. All locations where a vertical realignment or horizontal bends are required;
2. Drainage wash crossings;
3. Air release assemblies;
4. Clean-out assemblies.

F. Line Separations

1. Where a force main crosses a water main or transmission line, protection must be provided as per ADEQ Engineering Bulletin No. 10 and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control."
2. The minimum separation between the force mains and water lines should be 2 feet wall-to-wall vertically and 6 feet horizontally under all conditions. Where a force main crosses above or less than 6 feet below a water line, the force main shall be encased in at least 6 inches of concrete for 10 feet on either side of the water line or constructed using mechanically restrained joint ductile iron pipe.

G. Connection to Gravity System

1. Force mains should be swept down to the receiving manhole trough and aligned with the downstream pipe to minimize potential air stripping and turbulence.
2. Refer to COS Standard Detail No. 2402 for situations where line separation requirements necessitate a drop connection into the manhole. The engineer must evaluate the potential for odor to develop from a force main downstream of the receiving manhole. Backwater valves on downstream building service lines shall be specified where there is potential for gasses to strip from the waste stream. The valves should be located at or near the building cleanout and include provisions for access and maintenance by the property owner.

COLLECTION SYSTEM

This section describes the minimum requirements for extending the public wastewater collection system.

A. Ordinance Requirements

When a public sanitary sewer line is located within 660 feet of the boundary of the subject property, extend the line to provide service to the property per Scottsdale Revised Code, Section 49-224. A separate private on-site wastewater treatment system shall be constructed for each lot only when a public wastewater system is not available per Section 49-116.

Sanitary sewer lines are required along the entire length of property line frontage whenever future upstream extension of the wastewater system is possible. The property line frontage is that portion of the property that abuts a street, public utility easement or public rights-of-way. If a parcel to be developed has more than one property line frontage, the city may require a sanitary sewer line be installed along the entire length of all frontages per Scottsdale Revised Code, Section 49-219.

7-1.400

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1. Developers must install, at their expense, all on-site and off-site improvements necessary to serve their developments. This expense includes all required development fees per Scottsdale Revised Code, Section 49-73.
2. On-site sanitary sewer lines to non-platted commercial shopping center developments must be privately owned, operated and maintained. Multi-family developments may elect to install public or private sanitary sewers per Scottsdale Revised Code, Section 49-118.
3. When required by the city, users who discharge non-residential wastewater must install monitoring manholes per Scottsdale Revised Code, Section 49-96 Users discharging industrial wastes must install monitoring manholes and provide written notice to the Water Resources Department per Scottsdale Revised Code, Section 49-161.
4. Additions or reconstruction of more than 50% of the existing square footage of residential or commercial structures, or improvements that necessitate modification to an existing onsite wastewater treatment system, generally require compliance with all current ordinances and design guidelines relating to sewer line extensions per Scottsdale Revised Code, Section 49-117.

B. Design Policy

Sanitary sewer lines shall not be privately owned if a future connection to those lines can serve adjacent parcels.

When an existing sanitary sewer is not available to avoid future disruption, planned developments and subdivisions shall install a dry sewer line conforming to all the design requirements for a public sanitary sewer line. Use a permanent marking system to locate the capped ends of service line stubs. The design of interim on-site wastewater treatment systems shall be planned for future connection to the dry system when sanitary sewer service becomes available.

Wastewater systems must be designed to serve the ultimate population density expected in the tributary area. Design shall be in conformance with the current city's Water Reuse Master Plan. Where extension of the wastewater collection system is possible upstream of a subdivision, extend the sanitary sewer through the subdivision to a point of connection on the platted boundary that will provide wastewater service to adjacent properties.

C. Design Standards

The engineer should be familiar with the Maricopa Association of Government's Uniform Standard Specifications for Public Works Construction and the COS Supplement to MAG Uniform Standard Specifications for Public Works Construction, including all applicable Standard Details. These documents contain construction related specifications and details that impact the design of water systems including trenching, bedding, backfill and pavement replacement, etc.

Private wastewater systems must be designed in compliance with Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control".

MATERIALS

In selecting pipe material for sanitary sewer lines, give consideration to chemical characteristics of wastewater, velocity, potential for going septic, internal and external pipeline forces, infiltration, abrasion and potential for root infestation.

Sanitary sewer lines are to be vitrified clay pipe (VCP), polyvinyl chloride (PVC) SDR35 up to 15 inches in diameter or meeting ASTM F679 - T1 for diameters between 18 and 27 inches, or ductile iron pipe (DIP) with an approved lining. AWWA C-900 or C-905 pipe may be permitted in areas where mechanically restrained joint pipe is permissible for PVC installations and shall include the appropriate marking tape. Submit any requests for consideration of alternative materials in writing to the Water Resources Department. Pipe material shall not change between manholes.

Where standard strength pipe is not structurally sufficient due to external loading, or 4 feet of pipe cover cannot be maintained, submit a written request with supporting calculations to the Water Resources Department for permission to use extra-strength pipe, special bedding specifications, or alternative construction methods. The Water Resources Department must accept the request in writing prior to Plan Review's approval of the final plans.

Ensure that all types of pipe material used in design have established ASTM, ANSI, AWWA or NSF standards of manufacture or seals of approval, and are designated for use with wastewater.

SYSTEM LAYOUT

Generally, sanitary sewer lines constructed along a street grid should be aligned parallel to, and south or west of the street centerline. Lines should not cross the street centerline except in cases where curvilinear roadway alignments are encountered.

Public sanitary sewer lines within commercial, industrial or multi-family developments must be located within drive aisles a minimum of 6 feet from any structure. Public sanitary sewer lines will be located within tracts and/or sewer line easements. No private utilities are allowed longitudinally within a sewer line easement.

Curvilinear sanitary sewer lines are not allowed. Developments with numerous curved streets should be discussed with the Water Resources Department to decide whether the city will consider a design report with water and sewer layouts in accordance with the following criteria:

1. Water and sanitary sewer lines will be placed under the paved section of the roadway within the area, from back-of-curb to back-of-curb.
2. Sanitary sewer lines must maintain a minimum of 6-foot horizontal clearance to dry utilities per COS Standard Detail No. 2401.
5. Sanitary sewer manholes are to be located at the approximate center of the drive lane.
4. The water line and sanitary sewer line shall run parallel to each other with 6 feet of separation between the pipe and the manhole centerline.

5. Deflections in the sanitary sewer line through manholes shall be designed to nominal fitting angles within standard tolerances and will occur at the same locations where the water line is deflected. Refer to Section 6-1.302 for related water system criteria.

DESIGN FLOWS

7-1.403

A. Residential

Sanitary sewer lines 8 to 12 inches in diameter will be designed using 100 gallons per capita per day (gpcpd) and a peaking factor of 4.

Sanitary sewer lines larger than 12 inches in diameter will be designed using 105 gpcpd and a peaking factor developed from “Harmon’s Formula”:

$$Q_{max} = Q_{avg} \times [1 + (14 / (4 + P^{1/2}))]$$

P = Population / 1,000

Residential densities are to assume 2.5 persons per dwelling unit. Multifamily densities exceeding 22 dwelling units per acre can assume 1.7 to 2.2 persons per unit.

B. Commercial and Industrial

Wastewater flows for uses other than those listed below shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

AVERAGE DAY SEWER DEMANDS		
Land Use	Demand	Peaking Factor
Commercial/Retail	0.5 per sq. ft.	3
Office	0.4 per sq. ft.	3
Restaurant	1.2 per sq. ft.	6
High Density Condominium	140 per unit	4.5
Resort Hotel (includes site amenities)	380 per room	4.5
School: without cafeteria	30 per student	6
School: with cafeteria	50 per student	6
Cultural	0.1 per sq. ft.	3

FIGURE 7.1-2 AVERAGE DAY SEWER DEMAND IN GALLONS

HYDRAULIC DESIGN

No public sanitary sewer lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

Sanitary sewer lines shall be designed and constructed to give mean full flow velocities of not less than 2.5 fps, based upon “Manning’s Formula”, using an “n” value of 0.013. To prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, submit a hydraulic analysis along with construction recommendations to the Water Resources Department for consideration. In no case will velocities greater than 15 fps be allowed.

Actual velocities shall be analyzed for minimum, average and peak day design flow conditions for each reach of pipe.

The sanitary sewer system shall be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope shall be evaluated for hydraulic jump.

The depth to diameter (d/D) ratio for gravity sanitary sewer pipes 12 inches in diameter and less shall not exceed 0.65 in the ultimate peak flow condition. The d/D ratio for gravity drains greater than 12 inches diameter shall not exceed 0.70 for the ultimate peak flow condition. These ratios include an allowance for infiltration and inflow.

Measures to mitigate hydrogen sulfide shall be analyzed at manhole drops, abrupt changes in pipe slope or direction and at changes in pipe diameter.

MANHOLES AND CLEAN OUTS

Manholes in city streets shall be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes shall not be located in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all changes of grade, pipe size, pipe material or alignment and at distances not to exceed those shown below:

Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
8 – 15	500
18 – 30	600
36 – 60	800
Over 60	1,300

FIGURE 7.1-3 MANHOLE SPACING

A. Manhole Base

Manhole bases shall be cast in place. The flow channel through the manhole shall be steel trowel finished to conform in shape and slope to the sanitary sewer pipe. The manhole shelf should be brushed or broom finished, with a slope of 1 inch per foot. The manhole bottom should be filleted to prevent solids depositions and channeled to ensure satisfactory flow to the lower invert.

B. Manhole Sections and Cones

All manhole sections and cones should be the precast concrete as detailed in the MAG Standard Detail No. 420, deleting the manhole steps and/or cast in anchors for steps. If a manhole is more than 10 feet deep or the line is 15 inches in diameter or larger, the manhole shall be 5 feet in diameter. Manhole depth shall be defined as the distance from the design rim elevation to the lowest invert elevation.

C. Manhole Covers

Manhole covers are to be per MAG Standard Detail No. 424 and COS Standard Detail No. 2421.

D. Manhole Linings

Manholes will be lined or coated when constructed on sanitary sewer lines 15 inches in diameter or larger or in other design situations where corrosive conditions are anticipated. Manholes receiving wastewater from force mains and private ejector lines must be lined. Manholes requiring linings or coatings shall be noted on the final plans.

E. Intersecting Lines within Manholes

All changes in horizontal direction, slope, material or size of the sewer line shall occur at a manhole. The horizontal angle formed between the two lines cannot be less than 90 degrees.

Manholes shall have a minimum 0.10 foot drop across the trough unless otherwise approved by the Water Resources Department. Where pipe size changes through a manhole, the top invert of the upstream pipe(s) will be equal to or higher than the top invert of the downstream pipe. In large trunk lines, inverts at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.

F. Drop Manholes

The difference in invert elevations between inflow and outflow lines shall not exceed one pipe diameter, unless a drop connection is installed. Drop connections shall be in accordance with MAG Standard Detail No. 426, modified as follows:

- For drops up to and including 5 feet, use Type "A" drop connections.
- For drops greater than 5 feet, use Type "B" drop connections.

G. Manholes at Washes and Drainage Areas

Manholes must be protected from storm drainage and flooding conditions. Sanitary sewer lines will not be allowed in washes or drainage areas unless otherwise approved in writing by the Water Resources Department.

Manholes located within washes or drainage areas, when approved by the Water Resources Department, are to have bolted watertight covers to prevent inflow and the rim elevation should be a minimum of 18 inches above adjacent finish grade, refer to COS Standard Detail No. 2420. Design watertight manhole bases, barrels and grade rings and provide structural protection against scour from a 100-year storm flow. This protection may require encasing the entire manhole using a sono-tube form or by constructing a monolithic manhole. The manhole should be designed by the engineer

to meet the amount of protection as calculated by the flow conditions of the wash. The engineer is responsible to design a manhole to eliminate infiltration in wash areas.

H. Cleanouts

Cleanouts per MAG Standard Detail No. 441, may be used in place of manholes at the ends of laterals that cannot be extended and are less than 150 feet in length. Cleanouts are required to allow for maintenance and inspection of the lines.

When a sewer line can be extended by others along the same alignment and grade, a cleanout may be permissible beyond 150 feet in length up to a maximum distance of 300 feet.

Service connections are not allowed at the ends of cleanouts. Service connections should be provided off the sanitary sewer line a minimum of 2 feet downstream of the cleanout.

MONITORING VAULTS AND MANHOLES

7-1.406

A. Monitoring Vaults

The Water Quality Division has sole discretion when to require a developer to install a monitoring vault for testing wastewater flow and composition. Generally, properties in industrial land use areas with a projected wastewater discharge of 25,000 gallons per day will be required to install a monitoring vault per COS Standard Detail No. 2460.

B. Monitoring Manholes

The Water Quality Division has sole discretion when to require a developer to install a monitoring manhole. Generally, commercial developments that will use chemicals or solvents are required to install monitoring manholes.

Monitoring manholes shall be constructed per MAG Standard Detail No. 420 with a straight channel and no taps or bends for 10 feet upstream or downstream or as approved by the Water Resources Department. Monitoring manholes on sewer services with a peak flow greater than 40 gallons per minute must be approved by the Water Resources Department.

Monitoring vaults and manholes shall be located in a minimum 20-foot-wide easement that extends from the manhole to the existing public wastewater system and shall be designed for access at all times to city crews.

PIPE COVER AND SEPARATIONS

7-1.407

Sanitary sewer pipe should be installed at a depth sufficient to ensure gravity drainage of wastewater from each service line and should anticipate the lowest potential finish floor elevation for each building pad.

Pipe design shall allow for future extensions of service to adjacent parcels.

In no case shall sanitary sewer lines be installed with less than 4 feet of cover over the top of the pipe, unless otherwise approved by the Water Resources Department.

WASTEWATER

All sanitary sewer lines shall be designed to absorb superimposed live loads and backfill loads without damage to the pipe material or adverse effect to the pipe hydraulics. The engineer will specify minimum depths of cover to be provided during the construction of roadways or other grading over the pipe.

A. Separation of Water and Sanitary Sewer lines

Caution shall be taken in the design and construction of the sanitary sewer lines to protect all water supplies from wastewater contamination. Horizontal and vertical separation of water and sanitary sewer lines shall comply with Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control", MAG Standard Detail No. 404-2 and COS Standard Detail No. 2401.

The minimum horizontal distance from a water line to a sanitary sewer line will be 6 feet, wall-to-wall. The minimum vertical clearance of a water line crossing under or over a sanitary sewer line will be 2 feet.

Where conditions prevent adequate vertical separation or where a water line must cross under a sanitary sewer line:

1. Both the water and sewer line will be constructed for ductile iron pipe with restrained joints, or,
2. Where the existing water line is other than restrained ductile iron, the water lines shall be replaced with restrained ductile iron pipe per MAG Standard Detail No. 404-2.
3. Where the existing or proposed sewer line is other than restrained ductile iron, the sewer line shall be encased in concrete per MAG Standard Detail No. 404-3.

B. Separation from Structures

Sanitary sewer lines will have a minimum of 6 feet of horizontal clearance from any structural footing or substantial improvement. Design will consider any structural load imposed on the pipe.

C. Separation from Other Utilities

For information about separation from other utilities refer to COS Standard Detail No. 2401.

D. Separation from Storm Drains and Culverts

Sanitary sewer lines crossing less than 2 feet below a storm drain, culvert or under large structures, such as box culverts and bridges, will require the additional protection using restrained joint ductile iron pipe or C-900/905 PVC pipe with concrete encasement. Sanitary sewer lines crossing over storm drains and culverts should have a minimum of 1 foot vertical clearance and be adequately restrained.

DESERT WASH CROSSING

All desert wash crossings shall be constructed using restrained joint ductile iron pipe or PVC pipe encased in accordance with MAG Standard Detail No. 402. Bury requirements to place sanitary sewer lines under washes or channels will be based upon the 100-year peak

7-1.408

design discharge (Q100) in the channel or wash. The minimum depth of bury below the design flow line of the channel or wash shall be per Figure 7.1-4.

100-year flow rate	Minimum depth of bury
1 to 49 cfs	5 feet
50 to 99 cfs	6 feet
100 to 499 cfs	7 feet
Greater than 499 cfs	Scour depth based on scour analysis required

FIGURE 7.1-4 WASH CROSSINGS -- MINIMUM DEPTH OF BURY

Wash crossings with a 100-year flow above 500 cfs shall have the scour depth estimated using Arizona State Standard Attachment SSA 5-96, Guideline 2, Level I, as published by the Arizona Department of Water Resources. The engineer will estimate the depth of scour and design the top of pipe to be 3 feet below the estimated scour depth. The engineer will provide a detailed analysis of the scour depth with final plans for review and approval.

All pipelines that must be located within the scour zone or will not meet the minimum required depth of bury, as indicated above, shall be protected by installing a cut-off wall downstream of the pipeline to stabilize the scour depth to a minimum of 3 feet above the pipeline. The engineer shall design the cut-off wall and include details on the improvement plans. Plan Review will review pipe protection and scour stabilization requirements on a case-by-case basis.

GRAVITY SEWER SERVICE CONNECTIONS

The engineer shall make every effort to use existing sanitary sewer lines that have been stubbed out to a property by previous construction. Where the use of a stubbed out line is not feasible, the existing line shall be abandoned and permanently capped at the property or easement line. If the existing service line is connected to a manhole, the trough of the manhole will be rebuilt to conform to the active lines.

A. Minimum Diameters for Service Lines

- Residential: 4 inch
- Multi-family: 6 inch
- Commercial: 6 inch

B. Installation

All service line connections shall be installed perpendicular to the sanitary sewer line in accordance with MAG Standard Detail No. 440-3, extended right-of-way or edge of the utility easement and be marked. No bends in the service line will be allowed within the right-of-way or easement.

7-1.409

C. Location

1. Each lot or building must be provided with its own individual service line unless otherwise approved in writing by the Water Resources Department.
2. The service line location should be coordinated to avoid conflicts with other utilities, with driveway locations and should be located within the downstream 1/3 of the fronting sanitary sewer line length.
3. Because water lines are located behind the curb in many locations, conflicts with sanitary sewer service lines are possible. Sanitary sewer lines should be designed to allow for the sanitary sewer service lines to pass under water lines with 12 inches of vertical clearance.
4. When it is not possible to maintain sufficient vertical clearance, or the sanitary sewer service line will pass over the existing water main, the sanitary sewer service line must be encased in concrete of 6 inches minimum thickness to 6 feet from each side of the crossing or ductile iron pipe must be used for the same distance similar to MAG Standard Detail No. 404-2.

D. Service Line Connection to Large Diameter Sanitary Sewer

Sanitary sewer lines 15 inches in diameter or larger, may be tapped only with a manhole. Service lines into manholes may be angled, but the flow line of the service line shall not be more than 4 inches below the crown of the main sewer line.

E. Service Line Connections into Manholes on Small Diameter Sewer Lines

No more than 4 service lines may be made into any manhole on a sanitary sewer line 12 inches in diameter or smaller. Sanitary sewer service line inverts will be not be more than 1 service line pipe diameter above the crown of the downstream sanitary sewer line.

F. Service Line Connections at Cleanouts

Sanitary sewer service connections shall be located a minimum of 2 feet downstream of the cleanout structure.

G. Backwater Valves

A backwater valve shall be provided on service connections where there is potential for the migration of sewer gas into the service line and at locations where the finish floor is not 12 inches higher than the upstream manhole. Backwater valves shall be located on private property and shall be accessible for maintenance by the property owner.

EJECTOR SEWER SERVICE CONNECTIONS

Pressurized sanitary sewer ejector systems are to be owned, operated and maintained by the property owner. The property owner's civil engineer is responsible for the design and hydraulic analysis of the pressurized system.

A. Connection of Individual Ejector to Adjacent Gravity Sanitary Sewer Line

A sanitary sewer service line per MAG Standard Detail No. 440-3 shall be constructed within the right-of-way or easement. The ejector line will connect into the gravity

7-1.410

service line outside of the right-of-way or easement through the end of a service cleanout connection.

B. Connection of Individual Ejector(s) Downstream of a Property

The city does not support extending private pressurized ejector lines across the frontages of adjacent lots or properties. The developer or property owner shall request a meeting with the Water Resources Department to discuss available options. Water Resources may approve the extension of individual private ejector lines across the frontages of adjacent properties where:

1. A private sewer system receives wastewater from ejector lines (the first downstream public manhole shall be coated or lined to prevent corrosion).
2. Individual ejector lines from parcels run within a private sewer easement adjacent to any public right-of-way and utility easement. Spare conduits shall be provided and clearly labeled on a plan detail in the event one line becomes plugged or damaged.

Where individual ejector lines exceed 600 feet in length or have retention times exceeding 3 hours, the engineer shall evaluate the potential for odor problems. The city does not accept odor-absorbing materials in basket containment placed within manholes. Odor management will be incorporated through the use of biofiltration processes.

GREASE, OIL, AND SAND INTERCEPTORS

Grease, oil and sand interceptors shall be provided for laundries, restaurants, automobile service facilities, car washes, parking garages and other similar facilities. The engineer should contact the Water Quality Division to determine if an interceptor is required and which type of interceptor is best suited for the proper handling of wastes. Interceptors shall be installed and maintained by the owner and made accessible to the city.

Each business, restaurant or establishment shall discharge to a separate interceptor. Each interceptor shall be shown to scale, stationed on the plans. The civil engineer shall coordinate with the mechanical engineer to assure the following are considered in the design of grease interceptors:

1. Design is compliant to the current plumbing code as adopted by the city.
2. Tanks size is appropriate for the maximum projected flow from the establishment and anticipates a 30 to 90 day maintenance schedule.
3. Potential to develop odors.
4. Separation from pedestrian areas or corridors.
5. Avoid locating grease interceptor in parking garages, streets and under public parking spaces.
6. Ease of cleanup after maintenance and pumping.
7. Kitchen garbage grinders should be avoided, but if installed must be routed through the interceptor.
8. Dishwashers equipped with booster heaters and or using water in excess of 140 degrees F shall not pass through an interceptor with less than 1,000 gallon capacity.
9. Grease traps shall only be installed for ice cream shops, small coffee shops or sandwich shops.

7-1.411

For more detail contact the Water Quality Division at 480-312-8732.

TRACT AND EASEMENT REQUIREMENTS

7-1.412

All public sanitary sewer lines located outside the public right-of-way or a private street tract must be placed within a minimum 20-foot-wide easement located within a dedicated tract unless approved otherwise by the Water Resources Department.

Trunk line sewers, sewers with depth in excess of 15 feet, and sewers located in difficult terrain may require easements wider than 20 feet. These easement widths will be determined by the Water Resources Department to meet access and maintenance needs. The sanitary sewer line shall be located a minimum of 6 feet from the edge of the easement.

The easement will be accessible from a public right-of-way, will be free of obstructions, and will be accessible at all times to city service equipment such as vacuum trucks and backhoes. Areas in question will be approved in writing by the Water Resources Department. **Water Resources may approve gates or removable type fencing across the easements.** Plan Review will evaluate situations where encroachment into the easement with structural improvements such as screen walls and paving cannot be avoided on a case-by-case basis.

1. Sanitary sewer line easements, located outside of paved areas, shall have a 10-foot-wide hardened path with a cross-sectional slope not greater than 10 percent. The hardened path will consist of native soil compacted to 95 percent to a depth of 1 foot from the existing or design surface, whichever is lower. Any revegetation within the easement will consist of low growing shrubs or plant material acceptable to the Water Operations Division. Trees may be located along the edge of the easement but not within 7 feet of the sanitary sewer line as measured to the trunk of the tree. Attention shall be given to the aggressive nature of vegetation roots.
2. Sanitary sewer easements located on private property without a dedicated tract will require written permission from the Water Resources Department.
3. If access across a sewer easement is not practical, the Water Resources Department will review access to manholes for cleaning and maintenance purposes on a case-by-case basis. City equipment requires a turn-around. Hammerhead turnaround configurations are acceptable as are cul-de-sacs.
4. A copy of any written approval from the Water Resources Department shall be submitted with the final plans.

EASEMENT RELEASE/ABANDONMENT REQUIREMENTS

7-1.413

When a property owner or developer believes a sanitary sewer line easement or portion thereof, is no longer required by the city, an abandonment may be requested by completing and filing an application through the city's One Stop Shop, www.ScottsdaleAZ.gov/bldgresources/counterresources.

After completing and filing the application, the property owner or developer will send a letter or email requesting release of the easement to the Water Resources Department with the following exhibits attached:

1. A detailed map highlighting the easement to be released and locations of existing sewer lines shown in reference to the easement.
2. If existing sewer lines are to be abandoned, a detailed civil plan prepared by a professional engineer licensed in the State of Arizona must be supplied describing the method of abandonment and any necessary relocation of the sewer lines.

The Water Resources Department will issue a determination recommending approval or denial of the release request and any stipulations that may be required.

The determination will be attached to an Application for Release of Easement and will be submitted by the applicant to the One Stop Shop for subsequent processing by the city. Failure to comply with the above process will result in a denial of the request. Where replacement rights are requested by the city, the city will not relinquish existing rights until the replacement rights have been granted.

PRIVATE SEWER LINES

Wastewater collection systems within non-subdivided commercial properties shall be designed as private systems compliant to the city's current plumbing code and Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control". Privately owned and maintained sanitary sewer lines shall not be located in the street right-of-way or in a public utility easement.

7-1.414

ALTERNATIVE SEWER SYSTEMS

Developers or property owners may request the Water Resources Department to consider the design of alternative wastewater systems upon their engineer's determination that conventional gravity or forced sanitary sewer systems cannot provide adequate service to their development. Contact the Water Resources Department for information regarding alternative sewer designs.

7-1.415

If an alternative wastewater system is acceptable to the Water Resources Department, the design concept will then be coordinated with the Maricopa County Environmental Services Department.

INCIDENTAL CONNECTIONS

Illicit discharges in violation of Arizona Pollutant Discharge Elimination System (AZPDES) are the responsibility of the property owner. Upon approval from the Water Resources Department, certain managed illicit discharges may be directed to the sanitary sewer system provided:

7-1.416

1. The developer provides to the Water Resources Department a written description of the illicit discharge and a statement of other methods of containment considered and why they were not implemented.
2. Provisions are made to prevent the inflow of any storm water into the sanitary sewer.
3. The Water Resources Department reviews and approves details of connection to the sanitary sewer.
4. The rate of discharge does not exceed that identified in the sewer basis of design report or on the improvement plan.

Developers are encouraged to provide mop sinks and inside rooms for cleaning floor mats and containers. Outside wash-down areas must protect floor drains from storm water inflow utilizing overhead covers, curbing and grading. Wash-down areas shall be directed to a grease interceptor or sand/oil separator.

FINAL PLANS PREPARATION

Construction Plan Submittal Requirements for the preparation of final plans in the city are described in Section 1-3. This section supplements the requirements of Chapter 1.

A. Ordinance Requirements

Upon development of property for which city wastewater service is desired and available, the developer shall submit a plan for the wastewater system prepared by a professional engineer licensed in the State of Arizona per Scottsdale Revised Code, Section 49-122.

B. Design Policy

Any variance to these standards will require written permission from the Water Resources Department.

C. Design Standards

Project notes that apply to construction on the city's wastewater system are required on each set of final plans that include improvements to the city's wastewater system or a wastewater system that is to be dedicated to the city.

SPECIFIC SEWER PLAN REQUIREMENTS

The following paragraphs highlight requirements for the preparation of wastewater final plans that are to be submitted to the city for approval.

1. All sanitary sewer lines will be shown in both plan and profile and pipe material called out.
2. Each manhole will have a unique identifier and be labeled in both plan and profile.
3. Sanitary sewer line stationing will be along the centerline of the pipe.
4. Final plans will show all proposed service line connections with stations and dimensions or offsets from street centerline. Dimension typical separation dimensions from the water service lines.
5. Concrete encasement will be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
6. If a line is to be connected to an existing system, the following note should be placed on the final plans:

7-1.500

7-1.501

WASTEWATER

Contractor shall verify the location of the existing sanitary sewer line before proceeding with trenching.

7. Both slope and elevation must be shown on all proposed sanitary sewer lines stubbed out for future extension.
8. Where sanitary sewer lines cross water lines, storm drains or drainage culverts, the clearances will be shown in profile.
9. For permitting purposes, quantities for all items of work within the public rights-of-way and public utility easements will be included on the cover sheet of the final plans.
10. Sanitary sewer service line invert elevations will be called out for all final plans. All service line connections shall be shown on the final plans with the ends of any capped service lines located by station, offset or dimension.
11. The drawings will show all utility locations, sizes, easements, rights-of-way and other structural features affecting the sanitary sewer line.
12. Lift station plans will show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of the wet well and dry well, valves and piping, surge control devices, pump suction and discharge details and any other details necessary to provide construction of the design.
13. Plans and profiles of force mains will show size, invert and grade elevations, material, existing and proposed utility locations and any other necessary details.
14. Private and dry sanitary sewer lines will be noted as such on the final plans set. The responsibility for operation and maintenance of private sewer systems will be stated on the final plans.
15. Easements within tracts will be shown and labeled in plan view. Existing County recording numbers shall be shown on the final plans.
16. Final plans must comply with any design review or preliminary plat stipulations and any accepted wastewater basis of design report.

All plan documents for sanitary sewer lines and/or wastewater treatment works will be prepared by a registered civil professional engineer licensed in State of Arizona under the provisions of ARS 32:141-145.

Additional requirements for the preparation of final plans in the city are presented in Section 1-2.100.

REVIEWS AND APPROVALS

All final plans that include work on the city's wastewater system or on a system which is to be dedicated to the city, must be submitted to the One Stop Shop for review. Plan Review fees must be paid at the time of plan submittal.

No final plans will be submitted unless accompanied by a copy of the accepted basis of design report, when one is stipulated for the project. Maricopa County Environmental Services Department approval is required prior to approval of final plans by Plan Review. No permits for improvements to the public wastewater system will be issued until the owner or developer has provided all necessary easements or right-of-way. These instruments of dedication must be approved and submitted to the city for recording at the Maricopa County Recorder's Office.

7-1.502

AS-BUILT DRAWINGS

7-1.600

At a minimum, record drawings shall represent the as-constructed information noted in Section 7-1.501.

Plans information, changed or unchanged, shall be noted with a bold A.B. lettered next to the item. Lettering shall be legible and a minimum 1/8 inch height.

The pipe material installed shall be indicated in both plan and profile. Any pipes, conduits or structures abandoned, removed, or discovered during construction shall be shown and noted as such.