



2021 DEVELOPER ENGINEERING GUIDE

Prepared by:

**City of Bullhead City
Utilities Department**

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November 2022

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ABBREVIATIONS LIST

NAD – NORTH AMERICAN DATUM

MAG – MARICOPA ASSOCIATION OF GOVERNMENTS

AAC – ARIZONA ADMINISTRATIVE CODE

NSF – NATIONAL SANITATION FOUNDATION

STD. – STANDARD

DET. – DETAIL

DIP – DUCTILE IRON PIPE

ROW(S) – RIGHT OF WAY(S)

USC – UNIVERSITY OF SOUTHERN CALIFORNIA

USC-FCCCHR – UNIVERSITY OF SOUTHERN CALIFORNIA FOUNDATION FOR CROSS-
CONNECTION CONTROL AND HYDRAULIC RESEARCH

BPAS – BACKFLOW PREVENTION ASSEMBLIES

BPA – BACKFLOW PREVENTION ASSEMBLY

PVC – POLYVINYL CHLORIDE

AWWA – AMERICAN WATER WORKS ASSOCIATION

DR – DIMENSION RATIO

SEC. – SECTION

PSI – POUNDS PER SQUARE INCH

GPS – GLOBAL POSITIONING SYSTEM

SDR – STANDARD DIMENSION RATIO

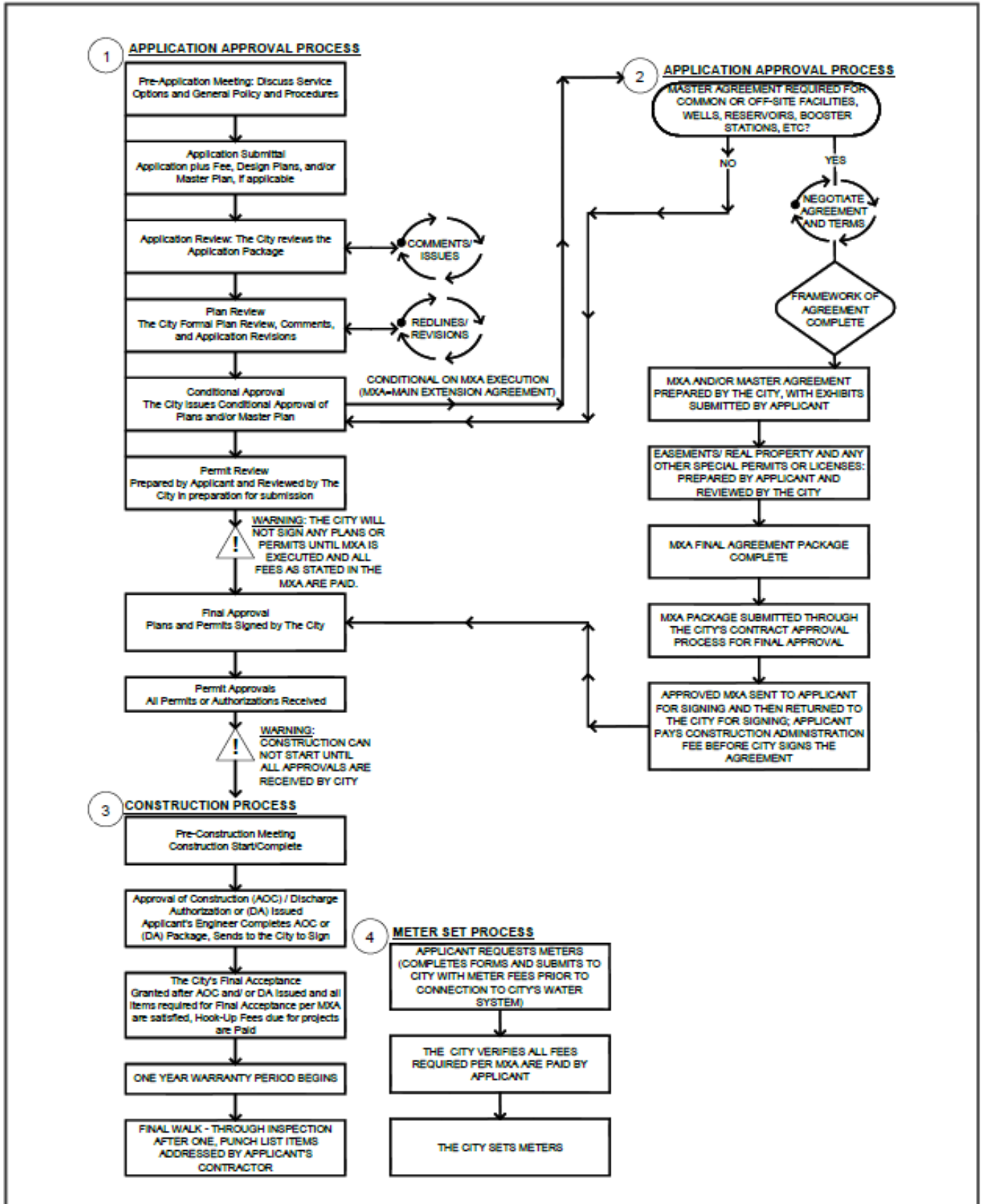
ASTM - AMERICAN SOCIETY OF THE INTERNATIONAL ASSOCIATION FOR TESTING AND
MATERIALS

CHAPTER 1

GENERAL INFORMATION

MAIN EXTENSION PROCESS OVERVIEW

SEE "SUMMARY OF KEY POINTS" FOR DETAIL



Date:
November 2022



2355 Trane Rd.
Bullhead City, AZ. 86442
(928) 763-9400

MAIN EXTENSION
PROCESS OVERVIEW

Detail No.
MEP

CITY OF BULLHEAD CITY

FEE SCHEDULE – DEVELOPER FUNDED PROJECTS

ALL FEES ARE SUBJECT TO CHANGE

	One Utility	Both
Review Fee for Master Plan Reports for developments with 100 or less residential services <ul style="list-style-type: none"> • This fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The types of Master Plan Reports include water, sewer and reclaimed water 	\$1,500 per report type	\$2,500
Review Fee for Master Plan Reports for developments with more than 100 Residential services <ul style="list-style-type: none"> • This fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The types of Master Plan Reports include water, sewer and reclaimed water 	\$2,500 per report type	\$4,500
Review Fee for Master Plan Reports for commercial developments <ul style="list-style-type: none"> • This fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The types of Master Plan Reports include water, sewer and reclaimed water 	\$2,500 per report type	\$4,500
Plan Review Fee <ul style="list-style-type: none"> • Does not apply to projects that are “fire protection services only” • This fee is submitted to Utility along with the first submittal of engineering plans and specifications to Utility for review • Includes two reviews 	\$5,000	\$8,000
Plan Review Fee – Fire Protection Services Only <ul style="list-style-type: none"> • This fee is submitted to Utility along with the “Application for Fire Lines” and with the first submittal of engineering plans and specifications to Utility for review 	\$2,000	-
Construction Administration Fee <ul style="list-style-type: none"> • Does not apply to projects that are “fire protection services only” • This fee is due once plans are approved, and before construction can begin • Includes testing inspection fees 	\$6,500	\$6,500
Water Main Testing <ul style="list-style-type: none"> • This fee is due once plans are approved, and before construction can begin 	9 x (volume of the main extensions) x Water Rate per the applicable Water Tariff	
Video Inspection of Sewer Mains <ul style="list-style-type: none"> • This fee is due once plans are approved, and before construction can begin 	\$1,000 which includes up to 1,000 ft of line \$1.00/ft after 1,000 ft Repeat inspections \$500 which includes up to 500 ft of line \$1.00/ft after 500 ft	
Application for Public Fire Hydrants <ul style="list-style-type: none"> • This fee is due after Utility’s review of the completed Application and before construction begins 	\$750 per hydrant	-
Hook-Up Fees	As Stated in Tariff	
Water Meter Fees	As Stated in Tariff	

SUMMARY OF MAINLINE EXTENSION PROCESS

This outline provides an overview of the key procedures involved in administration, design, and construction of water distribution or sewer collection facilities for developer-funded projects. These procedures have been designed to promote efficient completion of projects at the lowest possible cost. Adherence to these procedures will avoid costly delays.

1. When it is determined that a proposed development is within The City of Bullhead City ("City or The City") service area, the Applicant will complete an Application for Water and/or Sewer Main Extension ("Application") and will submit the Application along with improvement plans, related reports, and Improvement Plan Review Fees to The City. The Review Fees are non-refundable contribution intended to cover the initial cost of the City's project management expenses, including reviews of engineering plans, specifications and design reports, and preparation and reviews of the Main Extension Agreement (MXA) if needed.
2. The Review Fees are structured to cover up to two reviews of improvement plans, specifications, and reports. If the Applicants' Engineer fails to satisfactorily address the City's review comments with its second submittal, an additional Plan Review Fee will be required to cover the City's time to review the engineer's third submittal. City will not continue work until the additional Review Fees has been paid to the city.

Subsequent reviews of improvement plans are intended to focus on changes requested by the city because of the initial review, and additional changes made by the Applicant. As such, any changes made to the plans must be clearly identified so the plan reviewer can maximize the use of their time and focus solely on plan revisions. If other changes have been made to the plans (those not requested from City), they must be clearly called out as changes, or there is the possibility that these changes could be rejected during construction, and result in costly delays.

3. City will assign a project manager to coordinate with the Applicant's Engineer to assist them in developing engineering improvement plans and specifications in accordance with the City's requirements. These requirements are outlined in the Bullhead City Utilities Developer Engineering Guide, which is available on Bullhead City's website. The engineering improvement documents shall consider the following, as minimum requirements:
 - a. A letter or design report from the Applicant's Engineer estimating the ultimate population equivalents for the development, the average and maximum anticipated daily water demands (or wastewater flow rates) for domestic, irrigation, and fire protection, and the anticipated number and sizes of meters and service lines and proposed backflow prevention devices. Any pressure reducing valves (PRV) and air release valves (ARV) must also be detailed. Report shall consider future development as per the current approved General Plan.
 - b. Preliminary plats or final plats showing lot numbers with corresponding street addresses and public utility easements, right-of-way.
 - c. A minimum of 20-foot wide easement for all water and sewer facilities that are out of public right-of-way.
 - d. Larger width easements may be required in certain cases. City's easement forms are available upon request. Draft easement forms, deeds, ALTA surveys and title reports will be submitted for City's review prior to recordation of easements or execution of deeds.
 - e. All-weather access road is required to operate and maintain each sanitary sewer manhole.
 - f. After City's approval, the developer will be responsible for recording all public and private easements. A notarized copy of the recorded document shall be provided to the City.
 - g. All public easements for onsite and off-site improvements will be required prior to beginning of construction. All private easements recorded for onsite improvements are required prior to activation of service.
 - h. Submit one AutoCad file, one paper, and scanned copy of a complete set of final engineering improvement plans that are sealed and signed (approved by the fire protection agency, the governing regulatory agency, and The City).
 - i. Submit copies of Approval to Construct (ATC) and Construction Authorization (CA) as issued by the governing regulatory agency to the City.

- j. A material breakdown sheet in a format approved by the city showing the quantity and size of all water/sewer facilities to be conveyed to The City, including permitting and engineering costs. Engineer shall seal and sign this sheet for approval.
4. Construction Administration Fee:
The applicant shall submit construction administration fee as per City's Fee Schedule to the City prior to beginning of construction. The Construction Administration fee covers City's estimated construction administration expenses, including inspecting and testing the construction work, participating in construction progress meetings, reviewing as-built engineering drawings, reviewing Applicant's invoices, reviewing surveys, title reports, easement, and deed documents, coordinating meter set requests, and facilitating other numerous internal project management activities. Video inspection of sanitary sewer mains will be billed per city's fee schedule. An invoice for this fee will be sent to the Applicant at the time the plans are ready to be signed by The City.
5. All main extension agreements (if required) will be filed with and approved by the Bullhead City Attorney's office. No agreement will be approved by The City unless accompanied by a Certificate of Approval to Construct (ATC) or a construction authorization (CA) issued by the appropriate agency. Construction shall not begin until approval is received from the City's Utilities Department, which typically takes a minimum of 4 weeks.
6. After completion and testing of the new facilities, the following items are required to be submitted to and approved by Utilities Department prior to activation of water/sewer service:
 - a. All items listed in section 3
 - b. Copies of Certificates of Approval of Construction and / or Discharge Authorization as issued by the governing regulatory County or State agency.
 - c. Applicant's actual cost breakdown, including copies of all contracts and paid bills, invoices and other statements of expenses incurred by developer, covering all of the costs of permitting, design, and construction of the water/sewer facilities.
 - d. Unconditional lien waivers and releases.
 - e. One set of sealed and certified as-built engineering plans on full-size bond paper, and one set on flash drive or electronic file in Auto-CAD version requested by Bullhead City.
 - f. Easements and deeds.
 - g. Backflow Certification, as required per Chapter 5, Backflow Prevention.
 - h. Final walk-through inspection by The City and resolution of all punch list items.
 - i. Payment of all applicable tariff fees (meter fees, hook-up fees, etc.)
7. City will accept the constructed facilities once construction is completed and facilities are tested to City satisfaction. After the City issues its written final acceptance of the new facilities, project closeout begins. The city will not provide water or sewer service until after it provides the final acceptance letter.
8. Other specific project requirements may apply on a case-by-case basis.

WATER METER INSTALLATION CHECKLIST

Before The City will set a water meter in the meter box, the Applicant is responsible to ensure the following items have been addressed:

- a. Parcel Name, lot and address must be clearly posted in front of the premises.
- b. All lot grading must comply per the requirements from the Building Department.
- c. Meter box must be unbroken (with lid) and level.
- d. Meter box must be free of all dirt and debris.
- e. Meter box must be unobstructed and accessible in a non-traffic area.
- f. Angle valve must be undamaged, flush with box and in correct location (see Bullhead City Detail 342)
- g. Backflow device (if required – such as for irrigation meters) must be installed prior to meter activation.

The property owner shall provide and maintain a private check valve and cutoff valve within 24-inches of the meter on the private property (customers) side of the meter. This must be installed prior to activation.

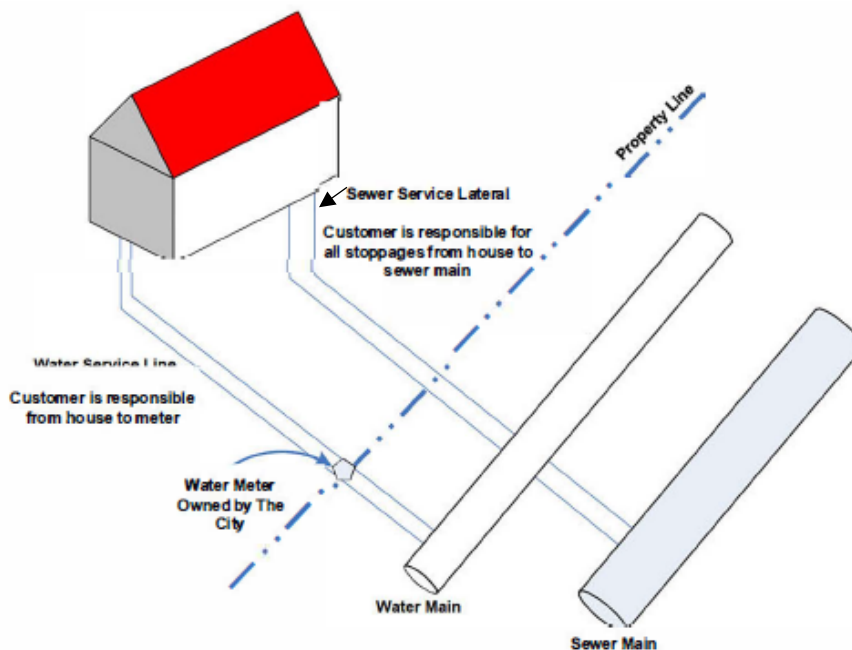
The property owner shall have an individual pressure reducing valve on the property owner's side of the meter.

The Applicant must complete a water meter application and attach a clearly visible photo of the water meter box, lid, and lot sign showing the lot number or address of the property requesting water service.

UTILITY OWNERSHIP OF FACILITIES

All water facilities located in the public right-of-way, dedicated easements to the city, and up to the water meter including the water meter, are owned by the city. All fire hydrants located in Right of Ways and related facilities are owned by the city. Fire sprinkler taps, isolation valves, and the portion of the fire sprinkler services in the public right-of-way or dedicated public utility easements are owned by the city.

Sewer mains are owned by the city. City is responsible to repair all leaks and stoppages within the sewer main. The private property owner is responsible for all leaks and stoppages within the sewer service lateral beginning from the first wye connection on the sewer main to all facilities on the private property. The city is responsible for all structural defects or failures in the sewer service lateral located in the public right-of-way. In all cases when a problem arises with a sewer service lateral within the boundaries of the private property, the property owner is solely responsible.



The water and sewer facilities that are owned by the City, as described above, shall become the sole property of the City after issuing a Final Acceptance Letter of such facilities. Full legal and equitable title in the facilities shall be vested in the City, free and clear of any liens, without the requirement of any further written document of transfer to the City or acceptance by the City other than the final acceptance letter.

SUBMITTAL LIST FOR IMPROVEMENT PLANS

ITEM	CODE	DESCRIPTION
1	a,1	24" x 36" Paper Plans and electronic PDFs of each sheet
2	c,1	Water/Sewer Material Specifications
3	a,1	Project Improvement Plans showing property boundaries, easements, water/sewer facilities, roads, public ROWs in 8 ½" x 11" format
4	a,1	Legal Descriptions in 8½" x 11" format for incorporation into the easement document (if needed). All legal descriptions shall have a corresponding exhibit. Signed and sealed by engineer
5	a,1	Engineer's Estimate of Probable Cost
6	a,1	Current survey of parcel with the future alignment of Easement mapped (if possible)
7	a,1	Boundary Closure Certification of Easements
8	a,1	Certificate of Approval to Construct (ATC) or Construction Authorization (CA), if required
9	d,1	Main Extension Agreement (MXA), if required
10	a,1	Master Plans/Design Report for proposed development
11	a,1	Water/Sewer Service Agreement
12	a,1	Address/Lot Map/ACAD File (compatible version)
13	c,2	Trench Compaction Test Results; submitted to the City Inspector or Engineer
14	c,2	Pipeline Test Results (Manhole vacuum, mandrel, air test, and video inspections results on Sanitary Sewer; Ball and flush, Disinfection, and Bac-T test results on Water Systems; submitted to City Inspector or Engineer
15	a,2	Final Recorded Property Plat and/or Final Recorded Easement with Land Surveyor seal and signature
16	a,1	Verify Public Access to the Easement, may have to submit Approved Site Plan, showing dedicated public or private access
17	a,1	Whenever possible, Easements should be recorded on the Final Plat with the City Dedication Language provided in our Developer Guide.
18	a,1	GIS Data submittal for Legal Description Exhibit (Mapping see Requirements below). The City requires digital submission of easement data, including (a) PDF format for the instrument itself, and (b) the geometry of the easement in GIS (SHAPE or GDB) or CADD (.DWG or .DGN) format. Graphics relating to the easement shall be on a separate layer so it can be isolated from adjacent graphics.
19	c,2	Backflow Prevention Assembly and Certification Data submitted to the Water Quality Specialist for Approval
20	a,1	Pre-treatment Approvals
21	a,2	Certified As-Built Improvement Plans on 24" x 36" bond paper, one set of 11" x 17" paper, and one set in ACAD and PDF file format
22	b,2	Approval of Construction (AOC) and Discharge Authorization (DA)
23	c,2	Lien waivers
24	a,1	Well Siting Study; Test Results of Water Quality and Production Quantity; Pump Start-up Test Results, if required
25	a,2	ADWR Non-Exempt Well Permit, if required
26	b,2	ADWR form Request to Change Well Information (change of ownership)
27	a,1	Boundary Closure Certification of Easement

Codes*:

- a - Typically provided by Engineer
- b - Typically provided by the Applicant
- c - Typically provided by Contractor
- d - Provided by Utility

- 1 - Required prior to Easement acceptance
- 2 - Required prior to Final Acceptance

*All items listed with code of 1 shall be submitted to the City and approved prior to City's approval of the easements. The easement grantor need not necessarily be the same party as the Applicant. The easement grantor needs to be the party that owns the affected real property. In any case, where the Applicant and the easement grantor are different, consult with Bullhead City Surveyor (see contact list).

GIS REQUIREMENTS

The digital easement geometry should conform to the basic topology rules including:

BASIC REQUIREMENTS	
Lines must not overlap with other or self	Lines must not have gaps in between
Lines must not intersect with existing parcels	Lines must be closed polygon (if applicable)
Digital submittals must follow an existing City spatial reference (coordinate system and horizontal datum)	Use NAD 1983, State Plane Arizona West, Feet

WATER/SEWER MAIN EXTENSIONS REQUIREMENTS

1. Applicant shall prepare and submit Water and/or Sewer Improvement Plans in accordance with the requirements outlined in Chapter Three.
2. City staff will be available to discuss plan development and design concepts. Applicant must contact the city Engineering Division prior to improvement plan development for special instructions that may apply to a particular expansion.
3. Easements, legal descriptions, and exhibits are required for all City owned facilities that are not within dedicated rights-of-way. Easements shall have a minimum width of 20-feet and shall be centered about the centerline of the City-owned facilities. City may require wider easements for larger diameter water or sewer mains or where deeper excavation is required or where soil conditions require wider trenching. For cases where the waterline and sewerline are proposed to be within the same easement, the easement shall have a minimum width of 30 feet (with a minimum of 6-feet between the edge of the two pipes and easement boundary). The easement legal descriptions and exhibits shall be submitted on 8½" X 11" sheets and signed and sealed by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona.
4. Water and sewer mains must have a minimum distance of 12-feet from buildings or retaining walls, as measured from the edge of the building foundation or wall to the outside of the main. In rare cases where a water or sewer main must encroach within 12 feet from a building or retaining wall, additional protection is required. Additional protection may include the use of a sleeve for the main, or modifications to the footing of the structure, to prevent damage in the event of a main break.
5. For all main extensions, Applicant is responsible to install the main along the entire length of the Applicant's property line frontage of that property being developed. The property line frontage is defined as that portion of a parcel of property that abuts a street, easement, or public right-of-way. If a parcel to be developed has more than one frontage, the main shall be extended along all frontages.
6. Prior to commencing construction, Applicant must supply the city with an "Approval to Construct" as issued by the Mohave County Environmental Services Department or approved delegate. For projects that are exempt from the plan review requirements per A.A.C. R18-5-505.B.3, the Applicant shall submit to Utility a letter from the applicable regulator confirming the exemption.
7. Applicant shall only install materials approved in writing by the City's Utility Department.
8. Applicant shall construct all infrastructure in accordance with the Standards and Specifications of the Arizona Department of Environmental Quality, the Maricopa Association of Governments, and the City's design requirements.
9. City will conduct periodic inspections of Applicant's construction. City does not provide full time on-site inspection. Responsibility for proper installation rests with Applicant. Such inspection as the City's personnel may perform in no way relieves Applicant of its responsibility for construction and installation of the infrastructure.
10. Applicant shall not make any changes from approved improvement plans and specifications without prior written approval of the City officials. Field Directives authorizing changes in the approved plans and specifications must be co-signed by the City Representative and Applicant's engineer of record prior to construction.
11. City will give final acceptance upon completion of all construction, including final adjustments of all valve boxes, manholes, meter boxes, etc. and submittal of any other required documentation.
12. Unless indicated otherwise by the provisions of the applicable main extension agreement, the date of final acceptance shall be the date of the Final Acceptance Letter from the City to Applicant unless otherwise stated in that letter. Applicant shall be responsible for the repair of the facilities installed for one-year from the date of final acceptance.
13. In order to establish actual cost of construction, Applicant shall provide copies of all invoices for material and labor for that portion of the work conveyed to the City. The invoices must be provided in a binder, itemized, and include engineering, construction supervision, actual installation costs, and any other costs directly associated with the project.
14. Applicant shall provide unconditional lien releases from all contractors, subcontractors and material suppliers for all water, sewer and reuse construction projects.
15. Applicant shall provide freshly sealed and certified "As-Built" plans of facilities installed. The "As-Built" plans shall include the locations of all vertical and horizontal pipe bends, valves, manholes, sewer taps, etc., by station/offset and northing and easting on State plane coordinates. Applicant shall provide one set of as-built drawings on full-size bond paper, one set on 11" x 17" paper, and one set on flash drive in CAD and PDF formats or in electronic form. The plans must be certified for correctness by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona. Reference the "As-Built" section, Chapter Three - Construction Plan Requirements, for detailed "As-Built" plan requirements.

16. No refunds will be made prior to receipt of invoices, lien waivers and approved "As-Built" plans.

City will not provide water service until after the items above are received and it provides the Final Acceptance Letter.

CHAPTER 2

MASTER PLAN AND DESIGN CRITERIA

MASTER PLANNING AND DISTRIBUTION MAIN REQUIREMENTS

City requires that distribution systems be designed at minimum in accordance with the City's design requirements, applicable state and county requirements, any authority having jurisdiction within the city's service area, commonly accepted engineering practices, and other applicable codes or recognized standards.

Distribution systems should be designed with sufficient "looping" and other redundancies as may be necessary to minimize outages to customers in the event of main breaks, routine maintenance, and repairs. Avoiding dead-end segments by providing looped distribution circuits also enhances potable water circulation and reduced age therefore minimizing the formation of disinfection byproducts. Distribution systems should be sized to accommodate sufficient fire flows as may be required. The design and sizing of the distribution systems should include a main break analysis to ensure the provision of adequate fire flows and service to our customers.

As a condition of service, and in addition to the distribution system design standards, City requires that the distribution systems include a **secondary 8-inch diameter distribution main** in addition to the normally required "backbone" or larger diameter distribution mains. This requirement is most easily achieved by increasing the size of portions of typically 6-inch diameter distribution piping to 8-inch diameter. The selected alignment of the secondary 8-inch distribution main would ideally traverse the center of the development or phase of development, originating and terminating at larger "backbone" mains. This requirement is not to be construed as a request for over-sizing, rather as a sound engineering design condition. No waterlines less than 6-inch in diameter will be accepted. Plan submittals will be reviewed for the inclusion and acceptability of the 8-inch secondary distribution main and its alignment. An approved water distribution analysis is required to accompany all waterline Construction Drawings. The analysis shall identify proper distribution system sizing based on the required flow parameters, as well as the criteria stated in this Developer & Engineering Guide.

Where a land developer has subdivided any piece of land for development by another party, the City may require an individual water master plan in line with these guidance notes, unless the principal land developer's approved master plan has adequately covered distribution of all individual parcels. All developers should coordinate with the city to identify whether additional master plans are required for their area of development. Where land is intended to be developed in phases, details, and timing of the phases of the development must be included in the master plan. The phasing information should include details and timing of any landscaped areas requiring irrigation from the potable water system (where the system tariff structure allows), especially where this will be effective prior to construction and/or sales of dwelling units.

Master plans will be reviewed by the City's Engineering department to ensure new developments are coordinated and consistent with the long-term master plans of the relevant service area. Applicants are required to submit two copies of the master plan and one appropriate electronic files of the hydraulic analysis. Initial master plan reviews may take up to 8 weeks for initial review depending on the complexity of the project. This does not include any time needed for revisions and subsequent reviews. Failure to provide two copies of the master plan as well as electronic files for the hydraulic model may result in a delay of the City's review that may then take more than 8 weeks. A hydraulic analysis using the current version of InfoWater (or equivalent with prior approval from the city), must be performed for the proposed water distribution system and submitted as part of the Master Plan. The Master Plan shall be prepared in accordance with the City's master plan outline. A color exhibit showing water line locations, sizes, parcel boundaries, junctions, contour elevations, pressure zone boundaries, etc. shall be submitted as part of the Master Plan. In addition to the hard copy documents required here, the submittal must also include a copy of the full hydraulic model and any tabular files used for the hydraulic analysis in electronic format on flash drive. The Master Plan shall be signed and sealed by a Registered Professional Civil Engineer in the State of Arizona and submitted to the City for review and approval.

All criteria not listed herein shall be in accordance with, but not limited to, the following governmental agency requirements and any such criteria presented in the Master Plan shall be referenced appropriately for City review:

Environmental Protection Agency (EPA), Arizona
Department of Environmental Quality, Arizona Department of Water Resources
City of Bullhead City and Mohave County.

All developments shall be compliant with AWWA standards. Fire flow requirements shall be determined by the jurisdictional Fire Marshal and the requirements shall be stated in a letter from the Fire Marshal, which must be included as an appendix with the Master Plan.

The “Demands” table provided in the Design Criteria in this Chapter shows typical demand values used by The City for internal planning purposes. It should be noted, however, that this table may not be applicable to certain developments. **In all instances, Applicant and their engineers should coordinate with the City's Engineering Division prior to development of master plans, to ensure appropriate demand projections are made.**

WATER and SEWER MASTER PLAN OUTLINE

The following outline shall be used for the preparation of water and sewer master plan reports. Use this as a minimum guideline as applicable to the project.

1. Cover Sheet:
 - a) Title (Development Name), Date, Revision Date(s)
 - b) Applicant and Engineer's contact information
 - c) Sealed by a Professional Engineer registered in the state of Arizona
2. Table of Contents:
 - a) Sealed by a Professional Engineer registered in the state of Arizona
3. Executive Summary:
 - a) Describe existing and proposed facilities serving the development
 - b) Emphasize on proposed facilities to serve the development
 - c) Include figures, tables, calculation summary
 - d) Provide recommendation and conclusion sections
4. Introduction
 - a) Plan Objective – state purpose of the report
 - b) Site Location w/ vicinity map.
 - c) Proposed Development
5. Design Criteria
 - a) Demands/flow calculations, Pressures, Storage, Booster Pumps, Wells, Distribution/Collection System (pipe sizing)
 - b) List criteria based on the City's Developer Guide
 - c) MAG, ADEQ, other governmental agency criteria as applicable
 - d) Generally accepted engineering standards (requires City approval)
 - e) Provide pressure class and velocity calculations
 - f) Include Pipe trench details, geotechnical report summary, and other project constraints in this section
6. Demands or Flow Calculations
 - a) Single family, multi family, commercial, school, open space, parks, landscaping etc.
 - b) Details of all zoning obtained within development, including any pending re-zoning applications.
 - c) Quarterly projections of demands from beginning of construction (construction water) to buildout, to include a breakdown of any phasing that may be involved with construction. This should include an exhibit to show locations, and a schedule showing the expected timing of demand growth for any phases as applicable. The intention would be to show how demand is projected to increase at all locations over time through buildout of the development.
 - d) Summary narrative of demands table. Discuss which demand scenario governs design (Peak Hour or Maximum Day plus Fire Flow)
 - e) Tabular calculations (spreadsheet) of all demands.
7. Existing Facilities/Conditions
 - a) Reference any previous master plans used and their dates as applicable.
8. Proposed Facilities
 - a) Required storage, proposed location, or expansion of existing if applicable.
 - b) Required booster pump capacity.
 - c) Required well capacity, number of wells if applicable.
 - d) Water Distribution/Sewer Collection system piping, onsite as well as any offsite infrastructure needed.
 - e) PRV's if applicable.
 - f) Required ARV, blow-off valves, in-line isolation valves, sewer manholes, access road
 - g) Phasing if applicable. Where facilities will be constructed in phases, the timing and responsible party for each facility must be defined. If the timing of more than one development in adjacent areas allows, developers are encouraged to meet and plan with Utility to maximize the possibility and benefit of regionalization of facilities.
9. Water or Sewer Model
 - a) Describe model used.
 - b) Assumptions
 - i. Pump curves obtained from Utility information/staff or otherwise accepted test
 - ii. Criteria used in the model.
 - c) Results/Discussion – proposed facilities are adequate to serve development based on hydraulics
10. Summary/Conclusions

- a) Discuss how the objective of report has been met, i.e. proposed facilities will serve the proposed development in accordance with established criteria.
 - b) List major facilities required and phasing as applicable.
11. Appendices
- a) Water Modeling Results Organized by:
 - i. Average Day
 - ii. Maximum Day
 - iii. Peak Hour
 - iv. Maximum Day plus Fire Flow
 - b) Sewer Modeling Results Organized by:
 - i. Average Day
 - ii. Peak Hour
 - c) The following information is to be included for the above scenarios:
 - i. Junction/Node report showing node label, elevation, demand in gpm, hydraulic grade line in feet, pressure in psi, and assigned pressure zone for that node (zone assignment to node shall be in accordance with the existing operation of the service area and in accordance with the City's naming conventions). Also, for phased developments, reports and exhibits should identify those nodes that are active and those that are inactive for various model runs.
 - ii. Pipe report showing pipe label, start/stop node, length, diameter, Hazen-Williams "C" value, flow, velocity, headloss,] gradient, and intended year of installation.
 - iii. Pump report showing pump label, elevation, discharge, discharge pump grade, and pump head. An attachment to the pump reports should also be included to show assumed pump patterns and efficiency curves for any pumps modeled in the hydraulic analysis.
 - iv. Control valve report showing valve label, elevation, diameter, valve status, and from/to hydraulic grade line.
 - v. Tank report showing tank label, base elevation, maximum elevation, volume, hydraulic grade line, and flow.
 - vi. Reservoir report showing reservoir label, elevation, hydraulic grade line, and outflow.
 - vii. A separate fire flow report for the maximum day plus fire flow scenario shall be submitted. The fire flow report is to show the following information for all nodes: node label, satisfies fire flow constraint, needed fire flow, available fire flow, total flow available, residual pressure, minimum system pressure, and minimum system pressure node
 - viii. An extended period simulation (EPS) model for all systems showing storage tank levels varying with time may be required for complex system designs, to verify adequate fire flow storage and also to verify that wells have sufficient capacity for tank replenishment during maximum day demands. Where an EPS model is used, an explanation will be required for the basis of diurnal demand patterns, and the basis of demand allocation. A clear explanation will also be required for the naming convention used for the different model scenarios. Finally, detail will be required on how the source of water has been modeled. A summary of the techniques used to generate the hydraulic model and engineering analysis should clearly be described.
 - c) 11" X 17" (24" X 36" for large developments as applicable) and PDF color exhibit for peak hour. Average day and maximum day exhibits may be required. Exhibits to include:
 - i. Pipes and nodes labeled.
 - ii. Pressures at nodes.
 - iii. Major roadways labeled.
 - iv. Pipe size shown by color.
 - v. Major contour lines shown.
 - vi. Pressure zone boundaries.
 - d) Cost Estimate, sealed by a professional engineer registered the State of Arizona
12. Figures, exhibits, tables, spreadsheets, etc. to be placed in the body of the report where possible.

DESIGN CRITERIA FOR WATER SYSTEMS

1. Demands

Land Use	Unit	Avg Day Demand (ADD) (gpd/EDU)	Max Day PF (ADD x PF = MDD)	Peak Hour PF (ADD x PF = PHD)
Active Adult	Dwelling	209	1.8	3.0
Single Family	Dwelling	375	1.8	3.0
Single Family Manufactured / Mobile	Dwelling	253	1.8	3.0
Multiple Family	Dwelling	242	1.8	3.0
Commercial	Acre	1,700	1.8	3.0
RV Parks	Space	161.5	1.8	3.0
Warehouse/Big Box Retailer	1,000 SF	30	1.8	3.0
Open Space/Parks	Acre	1,800	N/A	N/A
School	Acre	1,700	N/A	N/A
Resort	Room	450	1.8	3.0
Hotel (No Restaurant)	Room	140	1.8	3.0
Hotel (with Restaurant)	Room	200	1.8	3.0

Notes:

¹Please contact the City's Utility Department for Resource Data on other demand types.

²Acreage is based on gross number of acres.

³Developed Open Space includes general landscaped areas where irrigation will be required, such as road medians and areas to be maintained by HOAs.

2. Specific Modeling Requirements:

Demands should be distributed among nodes to provide a reasonable reflection of the expected system demand distribution. Where demands are grouped and represented by only a few nodes those demands should be allocated to the nodes with the highest elevation as well as the furthest point from the development's point of supply.

3. Pressures:

Minimum Pressure	55 psi static; 45 psi at peak hour demand; 25 psi at max day demand + fire flow demand
Maximum Pressure	All structures shall have an individual pressure reducing valve on the property owner side of the meter. Areas where the pressures are higher than 80 psi may require a PRV station or modification to the distribution system. Distribution systems shall not be designed to operate at pressures greater than 120 psi. All design shall be reviewed and approved by the City's Utilities Department.

4. Velocity & Headloss:

Below summary table shows the minimum and maximum velocity and pipe slope a water pipeline shall be designed to meet the City's design criteria:

Purpose of Service	Pipe Size, in.	Flow Criteria	Max Velocity, fps
Distribution Main	6 to 12	Max Day + Fire	10
Transmission Main	Size > 12	Peak Hour of Max Day + Fire	8 or 10
Well Transmission Main	Size > 8	1.5 x Max Day of Well Supply	8

Dynamic headloss (static + friction) in the pipe shall be maximum of 10-ft per 1,000 LF of pipe. A larger pipe diameter may be required if this criterion is not met.

5. Hazen-Williams Coefficient 130 (for new PVC pipes)

Where development models include existing pipes, appropriate coefficients will need to be selected. Where an existing calibrated model exists, the coefficients in the existing model must be used. If there is no existing calibrated model, the applicant's engineer will need to consult with the City's Utilities Department to identify suitable coefficients.

6. Fire Flows

Fire flows must be in accordance with jurisdictional Fire Marshal requirements. Provide a written statement from the jurisdictional Fire Marshal that states the minimum required flows and duration by class of customer.

7. Storage Requirements

Following are the minimum storage requirements for a project.

Storage Type	Capacity
Standby Storage	2x Average Day Demand (ADD)
Operational Storage	15% ADD
Equalization Storage	30% Max Day Demand (MDD) +
Emergency reserve	25% x Fire Flow requirements

8. Booster Pump Station

For booster pump stations supplying zones with reservoirs, Firm Capacity – Shall meet or exceed the max day + 150 gpm fire flow replenishment; with the largest pump out of service for the pressure zone(s) that the booster station serves. Shared redundancy between pressure zones may be acceptable via a PRV (with the prior approval of the City) provided adequate redundancy exists in the higher zone. Additional surge protection, water hammer and dead head design requirements may be required by the City's Utilities Department.

For booster pump stations supplying zones without reservoirs that include hydropneumatics tanks, Firm Capacity – Shall meet or exceed the greater of peak hour flow or max day + fire flow; with the largest pump out of service for the pressure zone(s) that the booster station serves. Shared redundancy between pressure zones may be acceptable via a PRV (with the prior approval of the City) provide adequate redundancy exists in the higher zone. Additional surge protection, water hammer and dead head design requirements may be required by the City's Utilities Department.

9. Water Valves

Following table outlines the requirements for water valve location for a project.

Valve Location	Requirements	Comments
At an Intersection	Number of radiating mains minus one	Un-valved branch is the line that supplies flows to the intersection
Valve spacing for Residential developments	Less than 800 LF	Per ADEQ Bulletin #10
Valve spacing for Commercial/Industrial developments	Less than 600 LF	
Well Transmission Main	Less than 1,000 LF	
Canal, Wash, Highway and Intersection Crossings	Valves on Each side of crossings	

Additional water valves may be required as per the City's Utilities Department for maintenance.

10. Wells

Where developments are supplied solely by groundwater wells, the following criteria must be met:

Firm Capacity: Any wellfield supplying a booster station must meet the maximum day demand for the entire station with the greatest producing well out of service. Single source wellfields are not allowed. Proposed wells supplying directly into the distribution system are not acceptable. See Exhibit E

Permitted Capacity: The total *permitted* capacity of a wellfield shall be adequate to meet the anticipated total annual demand for the development.

Well transmission lines shall have an 8" minimum diameter. Where a transmission line will have multiple wells connected to it, the pipe shall be sized such that **all** wells connected to that line can run simultaneously at their full capacity while meeting the velocity and headloss constraints defined in this guide.

Additional requirements may be needed as per City's Utilities Department.

11. Fire Hydrants

Fire hydrant spacing shall be in accordance with the requirements of the local jurisdictional agency. Normal spacing for hydrants shall be less than 600 LF for residential development. Hydrants shall have a maximum spacing of 300 ft. for multi-family and commercial development. Dead end water lines serving a hydrant shall be minimum 8-in diameter.

The City requires that four (4) Clow Medallion dry barrel iHydrants be installed per section. With one (1) being installed in each pressure zone. If there are more than four (4) pressure zones in a section, additional iHydrants will need to be installed to ensure there is at least one (1) hydrant installed per pressure zone.

12. Air/Vacuum Release Valves

Air vacuum release valves shall be located at high points and at vertical realignments of the water line.

13. Pressure Reducing Valves

Pressure reducing valves (PRV) shall be located on transmission/distribution mains to maintain design pressure ranges in accordance with the design criteria listed hereon and per City Utility Department approved water master plan. PRV locations must be coordinated with and approved by the City's Utilities Department. PRV sizing shall be based on anticipated minimum/maximum flow ranges.

14. Crossings

All waterline crossings at the washes, channels, highways, or intersections shall use MEGALUG restrained joint ductile iron pipe (Class 350) or fused PVC (fPVC) or HDPE pipe materials. The depth requirement for installing waterlines at crossings shall be as follows:

- a) The minimum cover over the pipe shall be greater than or equal to two (2) feet below the scour depth (based on Scour Analysis described below). It shall meet at minimum all requirements per the Arizona Department of Environmental Quality's Engineering Bulletin No. 10.
- b) The minimum cover over the pipe shall be greater than listed below based on the 100-year flow rate of the wash or channel as shown in the table below. Note that the "additional depth" in the table refers to the depth of pipe that must be added to the normal cover requirements that are provided in Detail No. 350-1.

100-Year Flow Rate, cfs	Additional Cover over Pipe, ft
1 to 49	2
50 to 99	2.5
100 to 499	3.5
Greater than 499	Scour Analysis; minimum 4-feet

Details on the determination of the 100-year flow rate shall be submitted to the City's Utilities Department for review. The Scour Analysis shall be in accordance with the Arizona "State Standard for Watercourse System Sediment Balance" (SS5-96), Guideline 2, Level III, as published by the Arizona Department of Water Resources (<http://www.azwater.gov/azdwr/SurfaceWater/FloodManagement/StateStandards.htm>).

Note: If a sediment transport analysis has been performed by the Flood Control District of Mohave County for the subject wash crossing, this can be submitted to Utility for review, and this may eliminate the need for additional analysis.

- c) A Welded Steel Pipe casing shall be required at all crossings as determined by the City's Utilities Department.
- d) The minimum cover over the pipe shall be greater than six (6) feet below the above ground surface at every major intersection and highway crossings. Additional depth may be required as per local and state jurisdictions such as Mohave County, ADOT, etc. A Welded Steel Pipe casing is required and shall be at minimum 12-in greater than the carrier pipe size at these crossings.

15. Minimum Residential Potable Water Meter Sizing

All residential meters shall be sized in compliance with the current Uniform Plumbing Code (UPC) and any applicable municipal or other governmental requirements. For residential meters 1-inch or larger, the applicant shall submit architectural calculations and others as applicable to the City's Utilities Department for approval. For residences that include fire sprinklers or landscape irrigation, the meter size shall be the greater of the following:

- a) meter size as determined by the current UPC, or
- b) from each fire sprinkler zone within the residence, the highest of these fire flows must be in accordance with the table below (i.e., if the calculated fire sprinkler flow is 31 gpm, then a 1-inch meter will be required), or
- c) the landscape irrigation flow must be in accordance with the table below:

Minimum Meter Size, in	Maximum Allowable Fire Flow or Irrigation, gpm
5/8	20
3/4	30
1	50
1 1/2	100
2	160
3 and larger	Determine on case-by-case basis per AWWA M22

The maximum flows provided in the table above should only be imposed on the meter for short, intermittent periods. Meters should not be operated on a continuous 24-hour service at flows greater than one-half of the maximum flows provided in the table above.

16. Service Line Size

The minimum service line size is 1-inch, installed in accordance with the City's STD. DET. 342. The appropriate adapter shall be installed with the meter box as shown on STD. DET. 342-. Where the water meter size is greater than 1-inch, the service line must be the same size as the meter. The diameter of new service lines cannot exceed 50% of the service main diameter. A new water main extension may be required where the City determines that existing main capacity has been exceeded.

17. Meter Location

- a) Install meters side-by-side, straddling the property lines where possible, not at road intersection corners, and not adjacent to fire hydrants.
- b) Each service line requires a separate tap to the main.
- c) Residential fire sprinkler and irrigation water service is permitted through the domestic service line and meter.
- d) Commercial developments require separate water meters for building and landscape.

- e) Each parcel of land must have its own separate service line and meter. A single service line and a master meter can be used for two or more buildings located on the same lot such as an apartment complex, trailer courts or similar projects covering one lot. In high density applications where an assured continuous water supply must be maintained, the development must have two master meters, each with its own service connection to Utility's main to create a secondary looped connection to the development.
- f) No service connections or fire protection systems will be made to water lines greater than 12 inches in diameter.
- g) Existing service lines that will not be used by a development shall be abandoned and plugged at the main.

18. Water System Layout

- a) To provide appropriate (i) water pressure, (ii) water circulation, (iii) redundancy, and (iv) minimize taste and odor issues, all water mains must be designed with a minimum of two sources (**looped configuration**) – see “Dead-End Lines” below for exceptions.
- b) Water and sewer mains must have a minimum distance of 12-feet from buildings or retaining walls, as measured from the edge of the building foundation or wall to the outside of the main. In rare cases where a water or sewer main must encroach within 12-feet from a building or retaining wall, additional protection is required. Additional protection may include the use of a sleeve for the main, or modifications to the footing of the structure, to prevent damage in the event of a main break.
- c) Ninety-degree (90-degree) fittings are not allowed in rights-of-way.

19. Dead-End Lines

Dead-end lines with no service connections are not allowed. Where dead-end lines with service connections do occur, cap dead-end lines with a curb stop (blow off) with flushing pipe per City STD Detail 390-1. All dead-end lines will be approved on a case-by-case basis.

20. Thrust Blocks

Thrust blocks are not allowed in rights-of-way. Use restrained joints per MAG Standard Detail 303-1 and 303-2 in rights-of-way in place of concrete thrust blocks. Fused PVC (fPVC) or HDPE is allowed where each pipe joint is fused using butt-fusion or electro-fused equipment by a certified operator as per the manufacture.

21. Water and Sanitary Sewer Main Separation

Water main and sanitary sewer mains shall be in accordance with MAG standards except that the water main shall not be less than 12-in above the sanitary sewer main and at least 6-in above a sewer service line. If a water main crosses under the sanitary sewer main, the separation must be a minimum of 24-in below the sewer line. If this criterion is not being met, the applicant and its engineer shall coordinate with the City's Utilities Department to approve a design exception.

22. Water Main and Storm Drains/Culverts Separation

Water mains shall, whenever possible, maintain a 6-foot horizontal and 2-foot vertical separation from storm drains and culverts. Water mains crossing less than 2 ft below a storm drain or culvert shall require additional protection such as concrete encasement or the use of ductile iron pipe for the storm drain or culvert. If this criterion is not being met, the applicant and its engineer shall coordinate with the City's Utilities Department to approve a design exception.

23. Water Main and Other Utilities Separation

Water mains shall, whenever possible, maintain a 6-foot horizontal and 1-foot vertical separation from underground dry utilities (telephone, gas, electric, CATV, fiber optics, etc). Water mains crossing less than 1 ft above or below the utility shall be backfilled with clean, dry sand for the full width of the trench crossing and minimum of 5-ft on each side of the crossing. If this criterion is not being met, the applicant and its engineer shall coordinate with the City's Utilities Department to approve a design exception.

24. Water Main Cover

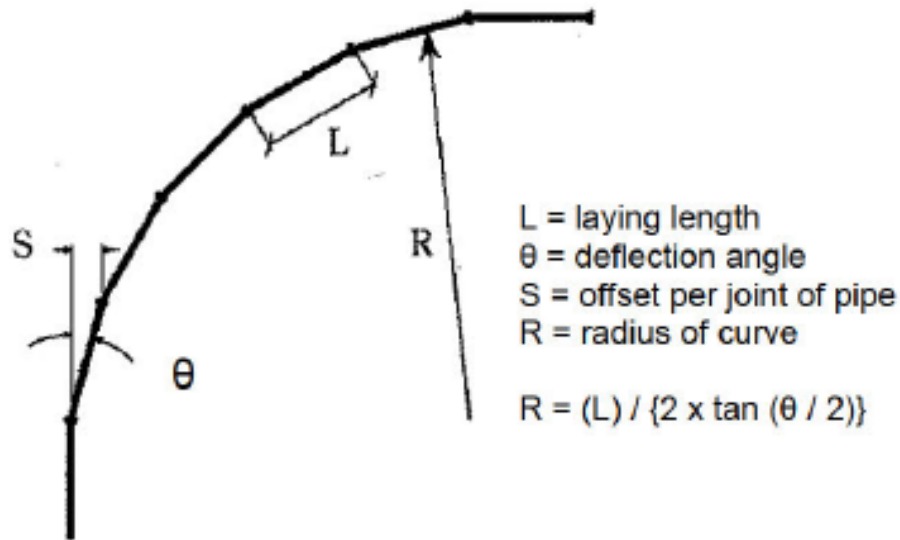
Following is the minimum pipeline cover required on water main located in the public right-of-way and easement's location:

Pipe Size, in	Pipe Material C900 or C905	Minimum Cover, in
Size <= 8	PVC DR 14; DIP	36
Size >= 10	PVC DR 14; DIP, STL	48

City's Utilities Department may require additional pipe cover at a major crossings, intersection, or other design scenarios for future development.

25. Curvilinear Alignments

Pipe curvilinear alignments can be designed as per the below equation and figure shown. Locatable marker balls are required at each joint along the curve. Additional requirements by pipe material are described below:



$$R = \{(L) / \{2 \times \tan (\theta / 2)\}\}$$

Where;
 L = laying length
 θ = deflection angle
 S = offset per joint of pipe
 R = radius of curve

PVC C900 Pipe:

A 12-in and smaller diameter PVC C900, DR14 Pipe shall have maximum deflection angle of 2.0-degree with a laying length of 20-ft. In accordance with AWWA C605-94, section 5.6, the bending of the PVC Pipe barrels larger than 12-inch (300-mm) nominal diameter is not allowed due to the forces required. The curved alignment of PVC pipelines larger than 12-inch (300-mm) in diameter shall be determined by one-half the pipe manufacturers published axial-joint-deflection limits. Manufacturer's technical data sheets shall be submitted to Utility for review and approval.

Ductile Iron Pipe, AWWA C150/151/153:

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Max Deflection Angle</u>	<u>Offset per joint of pipe</u>	<u>Min. Curve</u>
8"-12"	18'	2.5 °	9.4"	413'
14"-16"	18'	2.0 °	7.5"	516'
18"-20"	18'	1.5 °	5.7"	688'
24"	18'	1.0 °	3.8"	1032'
8"-12"	20'	2.5 °	10.4"	459'
14"-16"	20'	2.0 °	8.4"	573'
18"-20"	20'	1.5 °	6.2"	764'
24"	20'	1.0 °	4.1"	1146'

26. Facility Access

An all-weather paved access shall be required to operate and maintain all infrastructure such as valves, wells, booster pump stations, tanks, and others appurtenances proposed on the project. City's Utilities Department may allow a gravel access road in-lieu of paved access road with the HOA's responsibility to maintain all-weather access road for the City to operate and maintain its infrastructure.

DESIGN REQUIREMENTS FOR FIRE LINES

1. Fire line connections to The City's mains shall be used for fire protection systems only. Metered services cannot be connected to fire lines.
2. The minimum size fire line connection shall be 4 inches.
3. For fire lines, backflow prevention devices are required within 75 feet of the main. If the building riser is within 75 feet from the main, then a vertically mounted backflow prevention device may be located on the building riser. If the building riser is further than 75 feet from the main, then a backflow prevention device shall be installed as close as practicable to the service connection (property line).
4. Backflow prevention devices are not required for private hydrant connections that are not looped and that do not have fire sprinkler connections.
5. Backflow prevention devices shall have been issued a certificate of approval by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research. The certificate of approval shall be forwarded to The City's Backflow Prevention Specialist prior to The City's Final Acceptance of the fire lines.
6. Backflow prevention devices shall not be located in rights-of-way, sidewalks, driveways, visibility triangles, or other locations where accidental damage or visibility obstruction would likely occur.
7. Backflow prevention devices shall be fully accessible for testing, repairs, and replacement. There shall be an unobstructed radius of not less than four - feet from the outer perimeter of each backflow prevention device.
8. Per the Uniform Plumbing Code (610.2), in the absence of specific pressure drop information, the diameter of the inlet or outlet of any backflow prevention device or its connecting piping shall not be less than the diameter of such water distribution piping to the fixtures served by the device. If available, pressure drop information shall be provided with the submitted plans.
9. Per the Uniform Plumbing Code (603.3.11), looped on-site fire line systems shall have backflow preventers at each point of connection to the public water system.
10. A control valve is required at ALL fire line connections to public water mains. The control valve shall not be located in sidewalks, driveways, curbs or gutters.
11. Thrust blocks are not allowed in rights-of-way.

DESIGN CRITERIA FOR WASTEWATER SYSTEMS

A hydraulic analysis must be performed for the proposed wastewater collection system and submitted as part of the Master Plan. The design methodology shall be presented and appropriately referenced. The results of this analysis shall be presented in tabular form with at least the following information presented:

- pipe number
- to/from manhole number
- pipe size
- pipe slope (slopes that are less than minimum design shall be noted)
- average daily flow
- peak hour flow
- d/D ratio at peak hour
- velocity at peak hour

An analysis of sewer force mains must be performed, including impacts due to pump surge, and submitted as part of the master plan. Force main hydraulic losses shall be performed using the Darcy-Wiesbach equation. A 24" X 36" color exhibit, as well as PDF, showing existing sewer collection system, flow contributing area, pipe sizes, sewer line and manhole number locations, flow direction, property boundaries, contour elevations, etc. shall be submitted as part of the Master Plan. The Master Plan shall be signed and sealed by a Registered Professional Engineer registered in the state of Arizona and submitted to Utility for review and approval.

1. Average Daily Wastewater Design Flows:

Land Use	Unit	Average Daily Flow (gpd/unit)	Peak Hour Peaking Factor (PF)
Active Adult	Dwelling	190	3.0
Single Family	Dwelling	240	3.0
Single Family Manufactured / Mobile	Dwelling	180	3.0
Multi-Family	Dwelling	180	3.0
Commercial	Acre	1,500	3.0
RV Parks	Space	100	3.0
Industrial/Big Box Retail	1,000 SF	25	3.0
School	Acre	1,500	3.0
Resort	Room	380	3.0
Hotel (no restaurant)	Room	100	3.0
Hotel (with restaurant)	Room	150	3.0

¹Acreage is based on gross number of acres.

2. Minimum Slopes and Cleansing Velocities:

The minimum slope for any sewer main shall not be less than 0.34% unless approved by the Utility Department. Sewer mains shall be designed to achieve a cleansing velocity of 2 feet per second under peak flow conditions or shall have a minimum slope that exceeds 1%.

3. Sewer Capacity Ratio

The capacity ratio of flow depth within the pipe to the diameter of the pipe under peak hour flow conditions shall not exceed 0.5 for sewer mains 12 inches in diameter and smaller, and 0.75 for sewer mains larger than 12 inches in diameter, respectively. A Manning’s coefficient of 0.013 shall be utilized for calculations.

4. Minimum Pipe Diameter

A minimum sewer main diameter is 8 inches. City will allow a 6-in diameter pipe if number of dwelling services with are less than 20 and meets minimum and maximum slope requirements.

5. Depth of Cover

Following table shows pipe depth for each pipe diameter and material being used on a project.

Pipe Size, in	Pipe Material	Minimum Cover, ft
6<= Size <= 12	PVC SDR 35	5
12 < Size <= 18	PVC SDR 35	6
18 < Size <= 30	PVC SDR 35	8

City’s Utilities Department may require additional pipe cover at a major crossings, intersection, or other design scenarios for future development.

6. Crossings

All sewer main crossings at the washes, channels, highways, or intersections shall use SDR 26 fused PVC (fPVC) or HDPE pipe materials. The depth requirement for installing sewer main at crossings shall be as follows:

- a) The minimum cover over the pipe shall be greater than or equal to five (5) feet below the scour depth (based on Scour Analysis described below). It shall meet at minimum all requirements per the Arizona Department of Environmental Quality’s Engineering Bulletin No. 10.
- b) The minimum cover over the pipe shall be greater than listed below based on the 100-year flow rate of the wash or channel as shown in the table below. Note that the “additional depth” in the table refers to the depth of pipe that must be added to the normal cover requirements that are provided in Detail No. 350-1.

100-Year Flow Rate, cfs	Additional Cover over Pipe, ft
1 to 49	5
50 to 99	6
100 to 499	7
Greater than 499	Scour Analysis; minimum 7-feet

Details on the determination of the 100-year flow rate shall be submitted to the City’s Utilities Department for review. The Scour Analysis shall be in accordance with the Arizona “State Standard for Watercourse System Sediment Balance” (SS5-96), Guideline 2, Level III, as published by the Arizona Department of Water Resources

(<http://www.azwater.gov/azdwr/SurfaceWater/FloodManagement/StateStandards.htm>).

Note: If a sediment transport analysis has been performed by the Flood Control District of Mohave County for the subject wash crossing, this can be submitted to Utility for review, and this may eliminate the need for additional analysis.

- c) The sewer lines must be designed and constructed with an extension of at least 10-ft beyond the boundary of the 100-year storm scouring.
- d) The minimum cover over the pipe shall be greater than ten (10) feet below the above ground surface at every major intersection and highway crossings. Additional depth may be required as per local and state jurisdictions such as Mohave County, ADOT, etc. A Welded Steel Pipe casing is required and shall be at minimum 12-in greater than the carrier pipe size at these crossings.

7. Manhole Rim Elevations

All manhole rim elevations must be above the 100-year floodplain elevation. Concealed pick-hole manhole covers are required where covers are located within 3 feet of the edge of a gutter, in areas that are unpaved, in areas that are prone to flooding. Rim elevations should be set 0.2 feet above finish grade in all unpaved areas. Manholes are not permitted in washes.

8. Minimum Manhole Diameter

Minimum diameter for sewer manhole is listed below:

Pipe Size, in	Pipe Depth, ft	Manhole Diameter, ft
8 <= Size <= 10	3 <= Depth <= 25	4
12<= Size <= 28	3 <= Depth <= 15	5
	16<= Depth <= 25	5
30 and above	Approved by City	Approved by City

Note: All sewer manholes shall have a frame and cover with "BULLHEAD CITY UTILITIES" marking on the cover and purchased through The City of Bullhead City.

9. Maximum Manhole Spacing

Manholes shall be installed at all grade changes, size changes, alignment changes, sewer intersections, and to comply with the following spacing requirements:

Pipe Size, in	Max Manhole Spacing, ft
8 <= Size <= 10	500
12<= Size <= 30	500
30 =>	600

10. Manhole Stub Outs and Knock Outs

Stubs from manholes should be a maximum of 5-ft in length to provide for future main extensions when required by the City. If under pavement, may be extended.

11. Manholes

Manholes shall be in accordance MAG standards, except no steps shall be installed in any manholes. Manholes will be specified as follows:

Standard concrete manhole – Sewer mains 6" to 10" shall have a 24" frame and cover.

Armorock polymer concrete manhole or approved equivalent - 12" and larger shall have a 30" composite frame and cover.

Composite manholes - may be required under specific circumstances as determined by City.

At a minimum Armorock polymer concrete manholes are required under the following conditions:

Manholes for sewer lines 12" or larger

Manholes that receive wastewater from force mains

Drop manholes

Manholes deemed necessary by City

12. Manhole Covers

a) Manhole covers for lines 10" and smaller shall have a 24" frame and cover. Sewer lines 12" and greater shall have a 30" frame and cover. Frame and covers shall be purchased from the City of Bullhead City.

b) Polymer manholes will require corrosion resistant grade rings and composite frames and covers. Frames and covers shall be purchased from the City of Bullhead City.

13. Manhole Invert Drops

- a) If a manhole has a sewer direction change that is less than 45 degrees, then the manhole should be designed for a 0.1-foot drop across the manhole.
- b) If a manhole has a sewer direction change that is greater than or equal to 45 degrees, then the manhole should be designed for a 0.2-foot drop across the manhole.
- c) Drop manholes shall have internal drops
- d) Drop manholes shall have RELINER, drop blower, or approved equal
- e) Drop manholes are required when there is a drop of 2' or greater
- f) Drop manholes should be per City Standard Detail No. 426
- g) Drop manholes less than 2' must be approved by City
- h) All clamps pipe supports / braces must be 316" stainless steel

14. Cleanouts

Cleanouts, instead of manholes, may be installed at the end of sewer lines that are less than 200 feet in length. Service connections are not allowed at the ends of cleanouts or within 5 feet of a cleanout.

15. Force Mains

- a) Force mains shall be designed to maintain a minimum flow velocity of 3 feet per second and a maximum flow velocity of 7 feet per second.
- b) Appropriate valves and controls are required to prevent draining back to the lift station.
- c) Air release valves shall be installed at all high points along the force main to eliminate air accumulation. Location of ARV's should be installed 24 or 30 inch minimum away from any pipe bell.
- d) All sewage force main pipe shall be PVC C900 DR14 with restraint joints and fittings, minimum pressure 250. All ductile iron pipe shall be polyethylene wrapped the entire length in accordance with MAG section 610.6. Thrust blocks are not acceptable on the force mains.
- e) A Hazen Williams Coefficient of 130 shall be used for calculations.

16. Sewer Lift Stations

Sewer lift stations shall be designed with a minimum of 2 pumps, one duty and one standby. Pump capacity shall be based on one pump exceeding the peak design flow. The lift stations shall be capable of storing a minimum of one hour of peak flows. Emergency power is required via an onsite emergency generator when the average inflow into the lift station exceeds 10,000 gallons per day.

17. Curvilinear Alignments

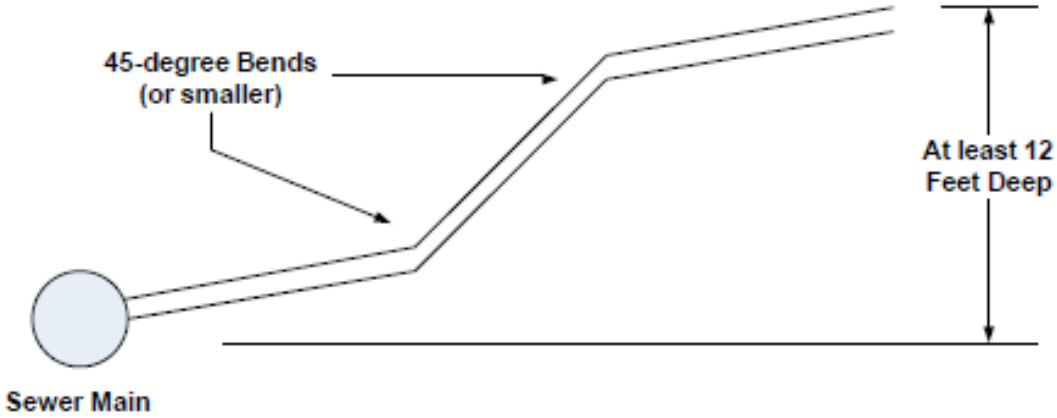
PVC SDR 35 Pipe

Pipe Diameter	Laying Length	Max Deflection Angle	Offset per pipe joint	Min Curve
in	ft	deg	in	ft
8 <= Size <= 15	12.5	2.5	6.5	287
	20	2.5	10.5	458
18 <= Size <= 48	As per the manufacture			

The use of reduced pipe lengths must be clearly noted on the construction plans for Contractor's attention.

18. Service Lines

No bends in sanitary sewer service lines are allowed except for services that are 12 feet deep or deeper, which may use vertical bends. For services that are 12 feet deep or deeper, a long-radius 45-degree bends may be used as illustrated below.



Existing sewer service lines that have been stubbed out to a property shall be used; however, where the use of stubbed out lines are not feasible, please contact Engineering Division.

19. Sewer Main Separation

- a) Water and sewer mains must have a minimum distance of 12-feet from buildings or retaining walls, as measured from the edge of the building foundation or wall to the outside of the main. In rare cases where a water or sewer main must encroach within 12-feet from a building or retaining wall, additional protection is required. Additional protection may include the use of a sleeve for the main, or modifications to the footing of the structure, to prevent damage in the event of a main break.
- b) Water main and sanitary sewer mains shall be in accordance with MAG standards except that the water main shall not be less than 12-in above the sanitary sewer main and at least 6-in above a sewer service line. If a water main crosses under the sanitary sewer main, the separation must be a minimum of 24-in below the sewer line. If this criterion is not being met, the applicant and its engineer shall coordinate with the City's Engineering Division to approve a design exception.

20. Facility Access

An all-weather access shall be required to operate and maintain all infrastructure such as valves, sewage lift stations, manholes and other appurtenances proposed on the project. City's Utilities Department may allow a gravel access road in-lieu of paved access road with the HOA's responsibility to maintain all-weather access road for the City to operate and maintain its infrastructure.

CHAPTER 3

CONSTRUCTION DRAWINGS

CONSTRUCTION DRAWING REQUIREMENTS

- 1) Label all construction drawings "Water" and/or "Sewer" as applicable.
 - 2) Construction drawings shall be designed and scaled to fit on 24" x 36" sheets of paper.
 - 3) A Professional Civil Engineer registered in the State of Arizona must sign the construction drawings.
 - 4) Construction drawings shall meet the requirements of the Arizona Department of Environmental Quality, Engineering Bulletin #10 and A.A.C. R18-5-502 for water, and A.A.C. R18-9-E301 for Sewer.
 - 5) Submit all design calculations and other supporting data with the construction drawings.
 - 6) Show The City's "Material Specifications" and "General Notes" on the drawings, as well as all itemized quantities separated for facilities that will be Utility-owned versus those that will not be City owned.
 - 7) Show The City's logo, water and/or sewer owner information, The City's approval signature block and As-Built block on the cover sheet of the drawings.
 - 8) Identify the Applicant-owned facilities and City-owned facilities.
 - 9) The drawings shall include the Northing + Easting Coordinate System. The coordinate system should be NAD1983, State Plane Arizona West Zone, US Feet.
 - 10) Sewer drawings shall include sewer services to the easement or right-of-way line.
 - 11) Water drawings shall show the size and location of all water services and meters. Stubs for services for future development will be approved on a case-by-case basis.
 - 12) Waterlines 12" or larger, and sewer lines 8" or larger, shall be shown in profile with the appropriate elevations (plan and profile views). Vertical deflections of waterlines shall be profiled regardless of size. Utility crossings of any waterline shall be shown in profile and dimensioned for minimum clearances and/or separations. All sewer mains shall be profiled.
 - 13) Show all referenced details required by The City on the drawings. Clearly reference where the appropriate detail item is called out.
 - 14) Show easements for City-owned facilities on private property. If a plat is not required, submitted for approval on 8 ½" X 11" sheets, a metes and bounds easement legal description and exhibit signed and sealed by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona.
 - 15) Submit drawings to The City for review and approval in the following two ways:
 - a. Drawings with less than 10 sheets: pdf on a flash drive, CD or emailed to Development Services.
 - b. Drawings with more than 10 sheets: pdf on a flash drive, CD, and one hard copy delivered to Development Services
- Note: Electronic submittals may be provided by Applicant established FTP site.
- 16) Submit an itemized Engineer's cost estimate for construction of City-owned facilities, sealed and certified by a Professional Civil Engineer, registered in the State of Arizona. Provide these estimates on 8 ½" X 11" sheets of paper separately for water and sewer.
 - 17) The drawings shall include a Master Water and/or Sewer Drawings sheet.
 - 18) Provided a site plan showing roadways and facilities on 8 ½" X 11" sheets of paper.
 - 19) The drawings shall include a summary table showing quantities for all sewer and water constructed items. Include sizes and materials.
 - 20) Show stationing along the sewer alignment and roadway centerline offset of the water and sewer mains and related services (water and sewer) and appurtenances.
 - 21) The cover sheet of the drawings shall contain an index map showing water and/or sewer facilities as well as the corresponding sheet number. Include a key map on each subsequent plan view sheet.
 - 22) Show station and offset, along with northing and easting coordinates for waterlines, all valves, fittings, vertical and horizontal offsets, hydrants, meters, and services.
 - 23) Show station along the sewer alignment and offset, along with northing and easting coordinates for sewer lines, manholes, cleanouts and services.
 - 24) The Utility owner information with logo, and The City's General Notes, Material Specifications and Standard Details are available in digital format. Digital files are located on Bullhead City's website.
 - 25) For assistance, please contact the Utilities Department as listed in the Contact List section in this guide.
 - 26) Include the following information on the cover sheet of the drawings: (see next page)

WATER AND/OR SEWER OWNER/OPERATOR



PLAT DEDICATION VERBIAGE

The following plat dedication verbiage shall be on the final recorded plat if any of the facilities to be owned by The City will be outside of dedicated rights-of-way and separate easements are not provided:

PERPETUAL WATER AND SEWER EASEMENT ("EASEMENTS") AS DESCRIBED IN THE PLAT ARE GRANTED TO THE CITY OF BULLHEAD CITY TO CONSTRUCT, OPERATE, AND MAINTAIN WATER AND SEWER LINES AND APPURTENANT FACILITIES (COLLECTIVELY, "FACILITIES") UPON, ACROSS, OVER AND UNDER THE SURFACE OF THE EASEMENTS, TOGETHER WITH THE RIGHT TO OPERATE, REPAIR, REPLACE, MAINTAIN, AND REMOVE THE FACILITIES FROM THE PREMISES; TO ADD OR TO ALTER THE FACILITIES, AND TO PROVIDE GRANTEE WITH REASONABLE INGRESS AND EGRESS TO THE FACILITIES. GRANTEE WILL HAVE UNRESTRICTED ACCESS TO THE EASEMENT FOR THE ACTIVITIES DESCRIBED ABOVE AND FORMAL NOTIFICATION OR APPROVAL BY ANY ASSOCIATION PRIOR TO ACCESSING THE EASEMENT WILL NOT BE REQUIRED.

GRANTOR SHALL NOT ERECT OR CONSTRUCT OR PERMIT TO BE ERECTED OR CONSTRUCTED ANY BUILDING, STRUCTURE OR SIMILAR IMPROVEMENT WITHIN THE LIMITS OF THE EASEMENT GRANTED HEREIN, GRANTOR SHALL NOT, NOR PERMIT, THE GRADE OVER GRANTEE'S FACILITIES TO BE SUBSTANTIALLY ALTERED WITHOUT, IN EACH INSTANCE, THE PRIOR WRITTEN CONSENT OF GRANTEE, AND GRANTOR AGREES THAT NO OTHER PIPES OR CONDUITS SHALL BE PLACED WITHIN THE PREMISES SUBJECT TO THE EASEMENT GRANTED HEREIN, EXCEPT PIPES CROSSING GRANTEE'S FACILITIES AT RIGHT ANGLES, IN WHICH CASE, A MINIMUM VERTICAL DISTANCE OF TWO (2) FEET (AS MEASURED FROM THE CLOSEST POINTS ON THE OUTSIDE EDGES) SHALL BE MAINTAINED BETWEEN GRANTEE'S FACILITIES AND SUCH OTHER PIPES OR CONDUITS. UNLESS GRANTEE EXPRESSLY CONSENTS IN WRITING OTHERWISE, ANY AND ALL SEWER PIPES CROSSING THE EASEMENT GRANTED HEREIN SHALL BE LAID BELOW GRANTEE'S FACILITIES. HOWEVER, GRANTOR SHALL HAVE THE RIGHT TO CONSTRUCT AND ERECT FENCES, TO INSTALL LANDSCAPING, PARKING FACILITIES AND DRIVEWAYS, AND TO ESTABLISH OTHER USES THAT ARE NOT INCONSISTENT WITH USES WITHIN THE LIMITS OF SAID EASEMENT IN A MANNER THAT WILL NOT UNREASONABLY INTERFERE WITH GRANTEE'S ACCESS TO THE FACILITIES.

“AS-BUILT” PLAN REVIEW REQUIREMENTS

- 1) Plans shall be 24" x 36" (two blue line copies), each submittal until approved.
- 2) Plans must be fully approved and signed by all required agencies.
- 3) Sealed and Certified by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona.
- 4) Station/offset and state plane northing/easting coordinates on all water fittings, including valves, tees, bends, all vertical and horizontal changes, etc.
- 5) Station/offset and state plane northing/easting coordinates on all sewer manholes, clean-outs, and other facilities.
- 6) Swing ties to fixed points may be required for commercial projects that do not have a roadway centerline for stationing within a reasonable distance from the project.
- 7) Distances from lot lines to sewer taps.
- 8) Call out all water and sewer pipe lengths between fittings and branches.
- 9) Elevations for all DIP sections regardless of the pipe diameter.
- 10) As-Built plan and profiles for all sewer lines including manhole rim and invert elevations.
- 11) As-Built plan and profiles for all water lines.
- 12) As Built all changes in pipe materials and sizes.
- 13) Correct street names, addresses and lot numbers.
- 14) Written approval by The City is required prior to submitting three sets of as-built drawings on full-size bond paper, one set on 11" x 17" paper, and one set on flash drive in both CAD and PDF formats.
- 15) The City's receipt and approval of as-builts is a condition to The City's final approval of water and sewer facilities. In addition, no refunds will be issued on facilities until as-builts have been received and approved by The City and The City's final acceptance has been granted.

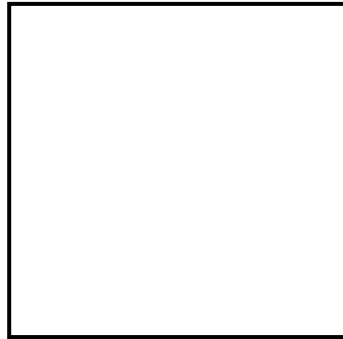
WATER/SEWER “AS-BUILT” CERTIFICATION

The following “As-Built” certification shall be on the cover sheet of the plans:

WATER/SEWER “AS-BUILT” CERTIFICATION

I hereby certify that the “as-built” measurements as shown herein were made under my supervision or as noted and are correct to the best of my knowledge after due review. Additionally, I hereby certify that all mains and services have been installed within the limits of easements dedicated to Bullhead City or inside dedicated street rights-of-way or public utility easements.

Seal



CHAPTER 4

CONSTRUCTION INSPECTION

PROCEDURE FOR SCHEDULING WATER LINE CONSTRUCTION INSPECTIONS

To schedule appointments, contact City's Engineering Division at (928)763-9400 and ask for Engineering Inspector.

or see the "Contact List" near the front of this guide for direct phone numbers.

NOTE: When appointments are arranged at least 48 hours in advance, the inspection/test will be conducted as scheduled. When appointments are requested for the same day, City's Engineering Inspector will conduct the inspection/test based upon their availability. City's Engineering Inspector and the Applicant's contractor can schedule inspections in the field. A minimum of the following inspections is required for acceptance of a project by the City's Utilities Department:

- 1) Open trench for safety equipment and trench shoring before pipe is installed in the trench.
- 2) After bedding (from bottom of trench to midpoint of pipe) has been placed into trench and properly compacted.
- 3) After pipe, bends, fittings, joint restraints, etc. have been installed in trench, but before backfilling is started to verify position and type.
- 4) Inspect after backfill, material, installation of marking tape and prior to other backfilling of trench.
- 5) After each lift of backfill material has been placed into the trench and properly compacted.
- 6) Valve blocking and restraint joints where required. Thrust blocks are not acceptable.
- 7) Compaction testing and sampling.
- 8) Pressure test for tapping sleeve.
- 9) Pressure test for waterline.
- 10) Waterline chlorine injection testing.
- 11) Bacteriological sampling.
- 12) Operational Inspection
- 13) Developing Punchlist items
- 14) Final Inspection and re-inspection if required.

NOTE: If the Applicant's Contractor proceeds with construction before having approval from the City's Construction Inspector, the Applicant's Contractor will be required to expose the pipeline, valve, restraint joints, etc., at no cost to the city, to permit inspection by the City's Construction Inspector. The required exposure of pipeline by the Applicant's contractor shall not deem acceptance of facility by the city. The city reserves the right to reject any facility not properly scheduled for inspection by the city for any reason. The rejection shall be final.

PROCEDURE FOR SCHEDULING SEWER LINE CONSTRUCTION INSPECTIONS

To schedule appointments, contact City's Engineering Division at (928)763-9400 and ask for Engineering Inspector.

or see the "Contact List" near the front of this guide for direct phone numbers.

NOTE: When appointments are arranged at least 48 hours in advance, the inspection/test will be conducted as scheduled. When appointments are requested for the same day, City's Engineering Inspector will conduct the inspection/test based upon their availability. City's Engineering Inspector and the Applicant's contractor can schedule inspections in the field. A minimum of the following inspections is required for acceptance of a project by the City's Utilities Department:

- 1) Tying off and installation of sewer plugs in existing downstream pipe.
- 2) Open trench for safety equipment and trench shoring before pipe is installed in the trench.
- 3) After bedding (from bottom of trench to midpoint of pipe) has been placed into trench and properly compacted.
- 4) After pipes, fittings, manholes, etc., have been installed in trench and before backfilling is started.
- 5) After each lift of backfill material has been placed into the trench and properly compacted.
- 6) Each new manhole.
- 7) Connecting to an existing manhole.
- 8) Installation of service tap before service line is connected to saddle.
- 9) Compaction testing and sampling.
- 10) Low-pressure air test on sewer line.
- 11) Post manhole ring adjustment Hydrovac to ensure MH and lines do not have debris.
- 12) Ball and flush each pipeline, followed with mandrel testing of the pipeline.
- 13) Vacuum testing of each manhole
- 14) Schedule City's Utilities Department to conduct CCTV testing of the pipeline
- 15) Operational Inspection
- 16) Developing Punchlist items
- 17) Debris for line cleaning must be kept on site for inspection
- 18) Final inspection and re-inspection if required.

NOTE: If the Applicant's Contractor proceeds with construction before having approval from the City's Construction Inspector, the Applicant's Contractor will be required to expose the pipeline, valve, restraint joints, etc., at no cost to the city, to permit inspection by the City's Construction Inspector. The required exposure of pipeline by the Applicant's contractor shall not deem acceptance of facility by the city. The city reserves the right to reject any facility not properly scheduled for inspection by the city for any reason. The rejection shall be final.

CHAPTER 5

BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL

BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL PROCESS

Backflow prevention and Cross-Connection Control regulations are detailed in Chapter 13.11 of the Bullhead City Code

BACKFLOW PREVENTION APPROVAL PROCESS

Approval Process (see flowchart)

- 1) The Applicant will submit Backflow Prevention Assembly (BPA) specifications with the Design Plans during the Application Process. Specifications shall include location of the proposed BPA, the manufacturer, model, and size of BPA, and the purpose of the waterline on which the BPA will be installed (fire line, irrigation, domestic/multipurpose). The Applicant will include the class of fire line. All BPA's must be lead free in accordance with the definition of lead free in section 1417 of the Safe Drinking Water Act.
- 2) After approval of the BPA specifications by the City's Utilities Department, the Applicant will install and test the BPA in accordance with A.A.C. R-18-4-215F, Bullhead City's standards, and approved Design Plans. The Applicant will submit the post installation test report to the City Engineer.
- 3) The Applicant/Contractor will schedule the operational inspection of the BPA with The City's Water Quality Specialist (WQS).
- 4) The Water Quality Specialist will confirm the correct installation of the BPA. Once the Water Quality Specialist confirms correct installation of BPA the new water service passes city's Final Inspection (provided that all other Operational Inspection items have no deficiencies).

PREMISES REQUIRING BACKFLOW PREVENTION

STANDARDS

All water lines which do not serve a single-family residence require a backflow prevention assembly (BPA). BPA's must be approved by University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCCHR). The approval list may be found on the USC-FCCCHR website. BPA's increase in degree of protection from DCDA's to RP's. The highest degree of protection for a cross connection is an Air Gap.

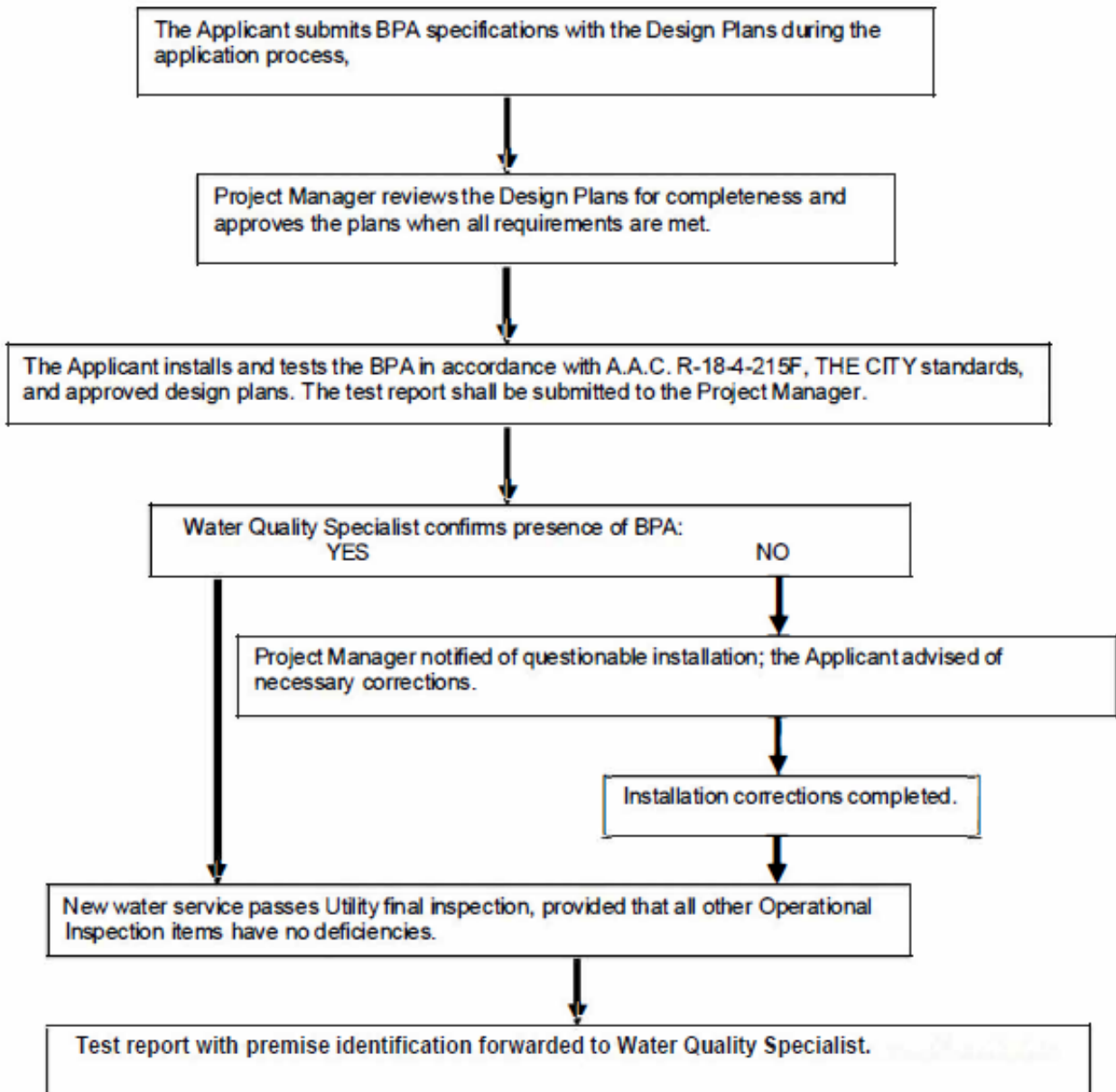
IRRIGATION - A Reduced Pressure Principle Assembly (RP) is the only BPA that can be used for irrigation.

FIRE LINES – A Double Check Detector Assembly (DCDA) is the minimum protection BPA that can be used for class 1 & 2 fire protection lines.

DOMESTIC / MULTIPURPOSE SERVICE – An RP is the only BPA allowed for a service line that is not a class I or II FIRE LINE.

HIGH HAZARD APPLICATIONS – Air Gaps will be required for water lines servicing areas with high hazard of contamination. High hazard applications will be determined on a case-by-case basis.

BACKFLOW PREVENTION OPERATIONAL APPROVAL FLOWCHART



CHAPTER 6

PRETREATMENT REQUIREMENTS

PRETREATMENT PROCESS

Pretreatment regulations are detailed in Chapter 13.08 of the Bullhead City Code

PRETREATMENT APPROVAL PROCESS

Approval Process

Applicant shall prepare and submit Sewer Plans in accordance with the requirements outlined in Chapter Three.

- 1) The City's Water Quality Specialist (WQS) will be available to discuss pretreatment requirements. The Applicant is encouraged to contact The City's Water Quality Specialist for special instructions that may apply to developments which will have an industrial or commercial discharge to the sewer.
- 2) If the business occupying the building is expected to generate an industrial or commercial (such as car wash or food service) wastewater discharge, then the Applicant or business owner must fill out an Industrial Discharge Sewer Agreement (IDSA) application and submit the application, with plans, to the WQS.

Pan Review

The plan review shall confirm the need, size, location, and other requirements of the pretreatment necessary to control discharges. Written approval from the Utility must be obtained prior to installation of the pretreatment equipment. The review of such plans and operating procedures shall in no way relieve the user from the responsibility of modifying such facilities as necessary to produce discharge acceptable to the City.

Industrial Discharge Criteria

If the discharges expected from this facility are subject to the requirements of **40 CFR 405 – 471** the Applicant must contact the Water Quality Specialist to obtain an IDSA application and a Baseline Monitoring Report as required by **40 CFR 403.12**.

Dental Facilities

Dental Facilities are required to fill out a One-time Dental Compliance Report as required in **40 CFR 441.10**. Contact The City's WQS for the Compliance Report.

Food Services Facilities Criteria

Any drains that are used to convey wastewater that has the potential to contain grease from food preparation and cleaning operations must discharge to a properly sized Gravity Grease Interceptor (GGI), Hydro-mechanical Grease Interceptor (HGI) when appropriate, or an alternative grease intercepting device (note, the use or placement of industrial food grinders and/or garbage disposals in food establishments will not be allowed). This includes but is not limited to: drains from pre-rinse and or prewash sinks; one, two, three or four compartment sinks; meat prep sinks; wok stoves; kitchen floor drains; floor sinks; soup kettles; rotisseries with drains; steam ovens with drains; food prep sinks; hand wash sinks; dishwashers; self-cleaning ventilation/exhaust hood; food waste disposal units and mop sinks. No waste from water closets, urinals, and other fixtures conveying human waste shall drain into or through the GGI.

Any business requiring a GGI shall have that GGI serving that business only. Shared GGIs are only allowed under limited circumstance and must be approved by the Utility Water Quality Specialist. Any approval for a shared GGI will require the owner or property manager to be responsible for the maintenance of the GGI. This agreement must be in writing and be provided to the Utility prior to any approval of shared GGIs. All GGIs and associated plumbing shall be designed and installed by a licensed plumber or contractor. GGIs shall be installed for easy access, inspection and cleaning. Each compartment shall be accessible by a traffic rated manhole. The inlet and outlet manholes shall be located directly above the inlet and outlet piping "Ts", per Bullhead City's Detail 450-1. The "T" on the inlet piping must be provide with a removable cap. Sweeping cleanouts must be installed before and after the GGI.

The sizing of the interceptor shall be determined using the following Tables 1-3 (Sizing based on Uniform Plumbing Code 2012). If the GGI is being sized for a vacant shell building, Table 3 shall be used to determine the GGI volume. Alternative grease interceptor-type devices may be used with prior approval.

Drainage Fixture Units for Food Service Facilities:

Fixture Type*	Drainage Fixture Unit Value (DFU)	Quantity	Total
2-Compartment Sink	2		
3-Compartment Sink	3		
Automatic Dishwasher less than 2-in Drain	3		
Automatic Dishwasher greater than 2-in Drain	6		
Food Prep Sink	2		
Hand Sink	2		
Mop Sink/Mop Basin	3		
Pre-Rinse Sink	3		
Sink w/Food Waste	3		
Rotisserie w/Drain	3		
Tilt Soup Kettle	3		
Wok Stove	4		
Floor Drain 2-in & 3-in	2		
Floor Sink 2-in	4		
Floor Sink 3-in	6		
Floor Sink 4-in	8		

TOTAL DFUs _____

Note:

**Fixture type not specifically identified in the 2012 Uniform Plumbing Code. DFU value assigned for calculation convenience.*

Minimum GGI Size based on Total DFUs:

Total DFU (from above table) *	GGI Volume (gal)
Up to 21 DFUs	750
22-35 DFUs	1000
36-90 DFUs	1250
91-172 DFUs	1500
173-216 DFUs	2000
217-307 DFUs	2500
308-342 DFUs	3000

Note:

**Applicant shall contact City's Utilities Department when DFUs are greater than 342.*

GGI sizing for Unfinished Building Shells:

GGI Inlet Pipe Size (in)	GGI Size (gal)
2	750
3	1000
4	2000

APPEDDIX

ENGINEERING DETAILS

(INCLUDING GENERAL NOTES AND MATERIAL SPECIFICATIONS)