

DEVELOPMENT PROCESS MANUAL

Chapter 5: Water and Wastewater



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5. WATER AND WASTEWATER INFRASTRUCTURE DESIGN

5.1 Introduction

5.1.A Purpose

The purpose of this design standards manual is to provide guidelines and minimum design criteria for the design of water and wastewater systems in the City of Rio Rancho either as part of Capital Improvement Program projects or as private development projects that will construct and dedicate the systems to the City.

It is the intent of the City of Rio Rancho Utilities Department to adhere to all applicable Federal, State, and local regulations and guidelines for water and wastewater systems design.

The design manual applies to existing systems that are being expanded, modified, upgraded, and/or rehabilitated. Additionally, the manual applies to the construction of all new facilities. It should be noted that this document is not intended to be used as a replacement for construction specifications. It is the design criteria for engineers, developers, etc., to use when designing water and wastewater infrastructure within the City of Rio Rancho.

All units of measurement used in this manual are U.S. customary standard units unless otherwise noted.

5.1.B Applicability

The design standards set forth in this manual are promulgated by the Development Services Department or designee of the City of Rio Rancho pursuant to the authority granted to him/her in the City of Rio Rancho Code of Ordinances Title V: Public Works, Chapter 51 - Water and Wastewater Rules and Rates, Section 51.24 - Main Extension Policy, Including Subdivisions.

The administration of these standards including interpretation, enforcement, revision, waiver, and variance is hereby delegated to the Development Services Department or designee or an appointed representative.

Standards included in this manual do not supersede applicable Federal and State requirements. In addition, these standards shall meet the requirements of all local and regional authorities such as the Southern Sandoval County Arroyo and Flood Control Authority (SSCAFCA).

5.1.C Effective Date of Standards

These standards shall be effective immediately upon the Development Services Department or designee's signature and shall supersede all former applicable engineering standards for utilities design and construction.

5.1.D Revisions

These standards may be revised, amended, or added to periodically. Such revisions, amendments, and additions shall be binding and effective when published.

5.1.E City of Rio Rancho Utilities Department

These standards shall apply to the design, installation, operation, and maintenance of all water and wastewater facilities under the control of the City of Rio Rancho Utilities Department. Such control shall be exercised in accordance with all applicable ordinances of the City of Rio Rancho.

Adherence to these standards is required by any person, including any owner, operator, or agent of an owner or operator of any water or wastewater facility regarding any water or wastewater system related improvements. Variation or deviation from the standards herein is not allowed without permission of the Development Services Department or designee. All water and wastewater system construction (including connections, disconnections, repairs, new waterline and sewer line construction, or other such work) to the water and wastewater system operated by the City of Rio Rancho Utilities Department, in direct violation of any standards herein is subject to the enforcement of corrective action.

5.1.F Definitions

Alkalinity – The quantitative capacity of water or water solution to neutralize an acid. It is usually measured by titration with a standard acid solution of sulfuric acid and expressed in terms of its calcium carbonate equivalent. A moderate amount of alkalinity in water is desirable because it reduces the effect of corrosion.

Ammonia – A form of nitrogen that exists in aqueous solution as either the ammonium ion or ammonia, depending on the pH of the solution.

Average Day Demand or Flow – The average daily demand or flowrate occurring over a 24-hour period based on total annual demand or flowrate data.

Biochemical Oxygen Demand (BOD) – The amount of oxygen consumed in the oxidation of organic matter by biological action under specific standard test conditions. Widely used as a measure of the strength of sewage and wastewater.

“C” factor – Hazen-Williams’ roughness coefficient describing the roughness of the pipe in which the flow occurs.

Chemical Oxygen Demand (COD) – The amount of matter, both organic and inorganic, in a water or wastewater, which can be oxidized by boiling with a strong oxidizing acid under standard test conditions and expressed as the equivalent amount of oxygen.

Crown – The highest point on a transverse section of conduit.

Duty Point – The intersection of the system curve and the pump curve which gives the operating point of the given pump for a given pipeline system.

Fire Flow – A volume of water required to provide fire protection.

Hazen-Williams’ Formula – The most widely used empirical headloss equation.

Headloss – A decrease in water pressure during flow due to internal friction between molecules of water, and external friction due to irregularities or roughness in surfaces past which the water flows.

Infiltration - Water entering a sewer system, including sewer service connections, from the ground through such means as defective pipes, pipe joints, connections, or manhole walls.

Infiltration/Inflow (I/I) – Extraneous flows in sewers.

Inflow – Stormwater runoff entering the sewer system from sources such as roof leaders, yard and areaway drains, manhole covers, cross connections from storm drains and catch basins, and combined sewers.

Minimum Day Demand or Flow - The minimum demand or flowrate that occurs over a 24-hour period based on annual operating data.

Nitrate – A form of nitrogen that is the most highly oxidized. Nitrates are commonly found in well water from agricultural areas. It comes from fertilizers, industrial wastes, septic systems, and animal wastes. High amounts of nitrate affect the blood's ability to carry oxygen.

Nitrite – A highly unstable form of nitrogen which is easily oxidized to the nitrate form. It is an indicator of past pollution and is extremely toxic to most fish and other aquatic species.

Parts Per Million (ppm) – A common basis for reporting the results of water and wastewater analyses, indicating the number of parts by weight of a dissolved or suspended constituent, per million parts by weight of water or other solvent. In dilute water solutions, one part per million is practically equal to one milligram per liter.

Maximum Day Demand or Flow – The maximum demand or flowrate that occurs over a 24-hour period based on annual operating data.

Peak Hour Demand or Flow – The peak sustained hourly demand or flowrate occurring during a 24-hour period based on annual operating data.

Peaking Factor – The ratio of peak flowrate or demand to average flowrate or demand.

pH – The reciprocal of the logarithm of the hydrogen ion concentration. The pH scale is from zero to 14, and 7.0 is the neutral point, indicating the presence of equal concentrations of free hydrogen and hydroxide ions. pH values below 7.0 indicate increasing acidity, and pH values above 7.0 indicate increasing base concentration.

Phosphorus – An essential element to the growth of algae and other biological organisms.

Pump Curve – Also referred to as a pump characteristic curve or performance curve shows the relationship between head developed by the pump, its efficiency, its brake horsepower, and the rate of discharge.

Soffit – The bottom of the top of a pipe. In a sewer pipe, the uppermost point on the inside of the structure.

Springline – The line of the outermost points of the sides of the conduit.

Sulfate – Sulfate is a natural forming mineral found in water. Sulfate affects the taste of water and when combined with bacteria or heated may affect the odor.

Sulfide – A product of the biological reduction of sulfates under anaerobic conditions.

System Curve – A graphical relationship between system head (developed from ordinates which are the sum of the static lift and the pipe friction) at various discharge/flow conditions.

Total Kjeldahl Nitrogen (TKN) – Total of the organic and ammonia nitrogen.

Total Suspended Solids (TSS) – The suspended fraction of the solids in a water sample that can be removed through filtration.

5.1.G Abbreviations

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
AWWA	American Water Works Association
BMPs	Best Management Practices
BOD5	5-day Biochemical Oxygen Demand
C.F.R.	Code of Federal Regulations
COD	Chemical Oxygen Demand
D	Pipe Diameter
d	Partial Depth Of Flow In Pipe
DAR	Design Analysis Report
DIP	Ductile Iron Pipe
DU	Dwelling Unit
EPA	Environmental Protection Agency
ft	Feet
fps, ft/s	Feet Per Second
gal/ac-day	Gallons Per Acre Per Day
gpd	Gallons Per Day
gpm	Gallons Per Minute
HDPE	High Density Polyethylene Pipe
ID	Inside Diameter
MGD	Million Gallons Per Day
mpd	Minutes Per Day
NEMA	National Electrical Manufacturers Association

NGVD	Natural Ground Vertical Datum
NH4	Ammonia
NMAPWA	New Mexico Chapter – American Public Works Association
NMED	New Mexico Environment Department
NO3	Nitrates
NO4	Nitrites
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NPT	National Pipe Thread
OD	Outside Diameter
PC	Point Of Curvature
PRV	Pressure Reducing Valve
psi	Pounds Per Square Inch
PVC	Polyvinyl Chloride
Q	Full Pipe Flow Rate
q	Partial Flow Rate In Pipe
SCADA	Supervisory Control and Data Acquisition
SSCAFCA	Southern Sandoval County Arroyo and Flood Control Authority
SWPPP	Storm Water Pollution Prevention Plan
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
USGS	United States Geological Society
%	Percent

5.1.H Standard Specifications and Details

The standard specifications and standard details relating to water and wastewater systems that are referenced in this manual include the following:

- **New Mexico Standard Specifications and Details for Public Works Construction sponsored and distributed by the New Mexico Chapter – American Public Works Association (NMAPWA) Specifications Committee.** These specifications and details are herein referred to as NMAPWA

Specifications and Details. These specifications and details are revised and updated periodically and are available through the New Mexico Chapter of APWA.

- **City of Rio Rancho Supplements to New Mexico Standard Specifications and Details for Public Works Construction.** These specifications and details are herein referred to as Supplemental Details or Supplemental Specifications. These specifications and details are updated and revised periodically and are available through the Utilities Department.
- **Uniform Standard Details and Drawings developed by the City of Rio Rancho Utilities Department.** These details and drawings are herein referred to as Standard Details and Standard Drawings.
- **American Water Works Association (AWWA) Standards sponsored and distributed by the AWWA Standards Committee.** These standards are intended to represent a consensus of the water industry that the product described will provide satisfactory service. These standards are updated and revised periodically and are available through AWWA.
- **American National Standards Institute (ANSI) Standards sponsored and distributed by the ANSI Technical Committees.** These standards are intended to serve as a guide to aid the manufacturer, the consumer, and the general public in the use of various products, processes, and/or procedures. These standards are updated and revised periodically and are available through ANSI.
- **American Society for Testing and Materials (ASTM) Standards sponsored and distributed by the ASTM Technical Committees.** These standards are intended to provide a forum for producers, users, ultimate consumers, and those having a general interest to meet on common ground and write standards for materials, products, systems, and services. These standards are updated and revised periodically and are available through ASTM.
- **Code of Federal Regulations, 40 C.F.R. – Protection of Environment.** The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.
- All other related standard specifications and details that are applicable but not listed here.

5.1.I General Notes

Water and Wastewater General Notes are available from the Utilities Department at the City's website: www.rnm.gov.

5.1.J Standard Products List

An approved standard products list for water and wastewater facility system components can be found in on the City's website.

5.1.K Availability Statement Process

Availability statements shall be obtained in accordance with the Utilities Department. A copy of this document and a copy of the water and wastewater service availability information request form are included on the City's website.

5.2 Water Distribution and Transmission Systems

5.2.A General

The City of Rio Rancho's Water Utility Department has dual functions. It supplies potable water for industrial, commercial, and domestic use and supplies water for fire protection. This document in conjunction with the City of Rio Rancho's Standard Drawings provides guidance and minimum basic design criteria and standards, as set forth by the Utilities Department, for providing and maintaining the

public water utility distribution system of the City of Rio Rancho. It is intended for use in the planning and design processes. Where not specified in these standards, the Development Services Department or designee will specify the standards to be applied to the design and construction of public water utility improvements to protect the public health, safety, and welfare of all water users served by the City of Rio Rancho.

5.2.B Governing Regulations

Ordinances, policies, and planning documents related to the design and operation of water systems include the following:

- City of Rio Rancho Code of Ordinances Title V: Public Works, Chapter 51, Water and Wastewater Rules and Rates.
- Water System Comprehensive Planning Model for the City of Rio Rancho.
- Guidelines of Water Supply Systems and Treatment Works in New Mexico, Environmental Improvement Division.

5.2.C Line Sizing and Demand Requirements

5.2.C.I. GENERAL REQUIREMENTS

The following general requirements must be followed when commencing a water system design.

1. The sizing and routing of Master Plan lines must be coordinated with the “Water System Comprehensive Planning Model” for the City of Rio Rancho and approved by the Utilities Department. Specific requirements for providing water service to any parcel or development will be defined in a water (and sewer) availability statement/recommendation from the Utilities Department. The procedure for obtaining the availability statement is outlined in Section 5.1.K of this document.
2. Pressure zone boundaries must be considered in the design of all systems.

5.2.C.II. DOMESTIC DEMAND

Water infrastructure for all proposed commercial, industrial, and residential developments shall, at a minimum, be sized to provide Maximum Day Water Demand flows plus fire flow protection. The fire flow requirement shall apply to both private sprinkler systems and public fire hydrants. The average day water demand for residences within the Rio Rancho water utility is estimated at 300 gallons/day per residence. Using a peaking factor of 2.167, peak day water demands are calculated at 650 gallons/day per residence. Water demand estimations for non-residential applications are listed in Table 5.1. These average day demands are derived from the land-use sewer design flows. These values assume that water usage is approximately 133% of the estimated average sanitary sewer design flows. Although the list is not all-inclusive, it does serve to establish a general base line for system evaluation and analysis. It should be noted that in all non-residential development projects, specific water demand determinations should be calculated and provided to the Development Services Department or designee during the design and approval process. If a proposed development does not fit within the categories listed above, consult with Development Services Department or designee for determination of the appropriate water demand. The Development Services Department or designee may adjust average day demands based on the specific design of the development.

Table 5.1: Average Day Water Demands for Non-Residential Applications		
Development Type/Land Use	Average Day Demand	Units
Light Commercial	1,750	gal / ac-day
Heavy Commercial	8,500	gal / ac-day
Light Institutional	325	gal / ac-day
Heavy Institutional	2,550	gal / ac-day
Light Industrial	640	gal / ac-day
Medium Industrial	2,400	gal / ac-day
Heavy Industrial	13,320	gal / ac-day

5.2.C.III. FRICTION FACTOR

For line sizing and design purposes the Hazen-Williams formula should be used. A friction coefficient, “C” factor, of 120 should be used for all new DI water main design calculations. A friction coefficient, “C” factor, of 130 should be used for all new PVC and HDPE water main design calculations.

5.2.C.IV. PEAKING FACTORS:

Maximum day and peak hour demands are important in the sizing of various parts of the water system. Maximum day use is used to ensure that water production facilities are adequately sized to match maximum day use and is also used to size storage facilities. Peak hour use is the maximum amount of water used in any single hour of a day and is used in sizing storage facilities and transmission / distribution lines. Table 5.2 shows the water demand peaking factors that are to be used to determine the peak hour and maximum day water demands for residential and non-residential development types.

Table 5.2: Water Demand Peaking Factors		
Development Type/Land Use	Average Day to Peak Hour	Average Day to Maximum Day
Residential Development	3.5	2.167
Non-Residential Development	2.5	1.5

5.2.C.V. WATER DEMAND CALCULATION EXAMPLE

For clarification, the following example illustrates typical calculations performed to determine the design demands and quantities involved in a hypothetical system design.

EXAMPLE: Hypothetical Water Demand/Flow Evaluation

ASSUME: 100 Dwelling Unit Residential Subdivision Development

CRITERIA: Average day demand = 300 gallons/day/residence

Average demand for subdivision = 300 gallons/day x 100 = 30,000 gpd = 30,000 gpd/
1,440 min/day = 20.8 gpm

Maximum Day demand for subdivision = 30,000 gpd x 2.167 = 65,010 gpd = 65,010 gpd/
1,440 min/day = 45.1 gpm

Peak hour demand = 30,000 gpd x 3.5 = 105,000 gpd = 105,000 gpd/1440 min =
72.9 gpm

5.2.D General Water Main Design Criteria

5.2.D.I. GENERAL

All issues and elements presented in this section are typically included and must be addressed in all water distribution infrastructure projects.

5.2.D.II. JURISDICTIONAL AGENCY APPROVALS

One very critical task in the early stages of the project is the development of an agency approval list. These approvals and/or close coordination required by these agencies will impact the successful and timely completion of the project. All appropriate department levels affected within the City, County, State, and Federal agencies need to be contacted for their individual requirements.

5.2.D.III. ENVIRONMENTAL AND CULTURAL REGULATORY REQUIREMENTS:

This section is not intended to be all encompassing, rather provide an overview of the environmental and cultural requirements and the typical agency involvement. A thorough consideration of the environmental and cultural impact of the project at its specific location shall be evaluated to identify the various requirements. Private developers shall be responsible for regulatory compliance and for obtaining the required permits for their projects.

1. In specific areas where a project impacts Water of the United States, a Clean Water Act, Section 404 Permit shall be required from the U.S. Army Corps of Engineers.
2. Compliance is required with the U.S. EPA under the Stormwater National Pollutant Discharge Elimination System (NPDES) general permit for stormwater discharges from construction sites. Coverage under the general permit is required for all operators of construction sites that disturb one (1) or more acres of soil through grading, trenching, or excavation.
3. Projects shall not adversely impact threatened or endangered species or their habitat and shall comply with the Federal Endangered Species Act. To address any biological requirements, an assessment report of the project may be required by the U.S. Fish and Wildlife Service and the New Mexico Fish and Game Department.
4. Projects shall not adversely impact historic or prehistoric properties. Projects shall comply with the National Historic Preservation Act and the State Historic Preservation Act.

5.2.D.IV. COMMUNITY NOTIFICATION AND PUBLIC INVOLVEMENT

The City is committed to early citizen notification and involvement. Identifying neighborhood concerns is a priority and good communication is required throughout the public involvement phase of all projects.

5.2.D.V. ALIGNMENT AND EASEMENT REQUIREMENTS

The following alignment and easement requirements shall be followed for water line designs.

1. Water lines are to be located within the public right-of-way and aligned in accordance with the “Typical Plan View for Streets” drawings in Section 5.4.I.I. . Water lines shall be located so they can be maintained without disturbing any sidewalk, curb, gutter, structure, or any other utility.
 - If it is not possible to utilize designated public right-of-way or align in accordance with the Utility Locations, alternate alignments will be considered by the Development Services Department or designee.
2. If not in a public right-of-way, the water line must be located in a permanent easement. A permanent easement must be granted and dedicated to the City of Rio Rancho for the exclusive use of water and sanitary sewer unless shared use with other utilities is coordinated and approved in advance by the Utilities Department. A minimum easement width of 20 feet (or more) is required for a single utility and 25 feet (or more) for water and sewer both within the same easement.
3. Water and sewer easements shall be free of all obstructions and shall at all times be accessible to City service equipment. No buildings, sport courts, walls, fences, shade structures, nor permanent structures of any kind shall be constructed upon, over, or under and water line easements. Since water mains can be damaged by tree roots, trees shall not be planted within 10 feet of the centerline of the water main. No landscaping shall be placed and/or planted within the easement that would render the easement inaccessible by equipment. The Utilities Department has the right to have any obstruction removed without notice to the property owner and all cost associated with the removal shall be the property owner’s responsibility. The maintenance of all landscaping in water line easements is the responsibility of the property owner.

5.2.D.VI. ACCEPTABLE PIPE MATERIALS

The type of pipe to be installed shall comply with these standards, meet NMAPWA specification, and shall be based upon applicable design flows, pressures, site conditions, corrosion protection, and maintenance requirements. Water lines shall be either polyvinyl chloride pipe (PVC), ductile iron pipe (DIP) or High-density polyethylene pipe (HDPE).

5.2.D.VII. RADIUS OF CURVATURE

The minimum radii of water line curvature are shown in Table 5.3.

Table 5.3: Minimum Radius of Curvature			
Pipe Type	Pipe Diameter	Joint Length (ft.)	Minimum Radius (ft.)
DIP	4-12	20	300
PVC	8	20	250
PVC	10	20	310
PVC	12	20	370

Minimum radius of curvature for C-906 smooth-walled HDPE pipe shall be based on manufacturer's recommendations but as a minimum shall be based on the following Table 5.4 and equation:

Table 5.4: Minimum Allowable Bending Radius for AWWA C-906 HPDE Pipe	
DR Ratio	Minimum Radius Factor, K_{mrf}
32.5	40
26	36
21	32
17	26
13.5	24
11 or Lower	20

By multiplying the minimum radius factor, K_{mrf} , by the outside diameter, D , of the pipe being installed the minimum bending radius, r_m , may be calculated using Eq. 24-1

$$(Eq. 24.1) r_m = D \times K_{mrf}$$

Where r_m is in inches.

5.2.D.VIII. WATER MAIN EXTENSIONS

The City's policy on water main extensions is contained in the City of Rio Rancho Code of Ordinance Title V: Public Works, Chapter 51 Water and Wastewater Rules and Rates, Section 51.24 Main Extension Policy, including Subdivisions:

1. For the purposes of irrigation, if purple pipe/effluent/reuse lines are available within 200 feet of the development, in-place infrastructure is required to be extended and used for irrigation purposes within the development.
2. Exception: if the City determines there is not enough effluent water available for irrigation purposes on the property, the City may waive this requirement.

When new water main extensions are required, water service connections shall be provided to all adjacent properties. These service connections shall:

1. Be sized appropriately for the anticipated future development of the adjacent property.
2. Extend from the main to the property line.
3. Be properly capped and documented on as-built drawings.
4. Include all necessary easements for future access and maintenance.
5. Be installed in accordance with Standard Drawing W-06 and related service connection details.

5.2.D.IX. HYDRAULIC REQUIREMENTS

The Utilities Department may require a hydraulic modeling analysis be conducted at the cost of the developer. This requirement may be in addition to the analysis that was part of the availability statement submittal. This analysis will identify any new requirements or connection alternatives and will help determine the appropriate size of the infrastructure.

5.2.D.X. THRUST RESTRAINT

Joint restraint shall be used at all valves and fittings and/or where joint restraint devices are specified by the approved construction plans. Restrained joint calculations shall be prepared and submitted when necessary.

5.2.D.XI. CORROSION PROTECTION

Corrosion protection will be required for all water system improvements where corrosive soil conditions are encountered.

5.2.D.XII. SEPARATION FROM SANITARY SEWER MAINS

To minimize the potential for cross contamination, water mains shall have at least 10 feet horizontal separation from any existing or proposed sewer line or water reuse line. In situations where it is not feasible to maintain a 10-foot separation the design engineer may propose a reduced distance. Such reductions may only be approved and granted by the Development Services Department or designee and may be allowed provided the water main is laid in a separate trench or an undisturbed earth shelf located on one side of the sewer line at an elevation so that the bottom of the water main is at least 18 inches above the top of the sewer line.

1. Water mains crossing sewer lines shall be laid to provide a minimum separation of 18 inches between the outside of the water main and outside of the sewer line. This separation shall be maintained where the water main is either above or below the sewer line. Where possible the water main should always be above the sewer line. The crossing shall be arranged so that the water main joints will be equidistant and as far as possible from the sewer line.
 - Where it is impracticable to obtain proper horizontal and vertical separation, the sewer line shall be designed and constructed equal to the water main and shall be pressure tested to assure watertightness. Encasement of the water line may also be required by the Development Services Department or designee.
2. Water mains shall not pass through or come in contact with any part of a sewer manhole.

5.2.D.XIII. SEPARATION FROM STORM DRAINS AND CULVERTS

Water mains shall maintain six (6) feet horizontal and 18 inches vertical separation from storm drains and culverts. Water mains crossing less than two (2) feet below a storm drain or culvert shall require additional protection such as the use of a pipe casing. Whenever possible the water line should be placed above the storm sewer.

5.2.D.XIV. SEPARATION FROM OTHER UTILITIES

Water mains shall maintain a minimum six (6) feet horizontal separation and one (1) foot vertical separation to any underground dry utility where possible; all measurements are clear distance measurements. Conflict review may be required.

5.2.D.XV. CROSS CONNECTIONS AND BACKFLOW PREVENTION

No physical connection shall be made between potable and non-potable sources. Any such connection is considered a cross connection. Refer to the City of Rio Rancho's Building Code for specific provisions regarding cross connections and backflow prevention. Backflow preventers shall be installed in accordance with Standard Drawings available on the City's website.

5.2.D.XVI. START-UP AND COMMISSIONING PERIOD

The construction project is functional only after demonstrating the completion and approval of pressure testing, bacteriological testing, and final inspections in accordance with AWWA, etc. Then, an acceptable flushing schedule and chlorine residual monitoring plan must be prepared to maintain and demonstrate an acceptable level of turnover during the early period of new project commissioning. Once this body of work has been completed, start-up and demonstration period are ready to begin. The start-up details and duration of commissioning shall be identified 30 days prior and listed in the project scope of work.

5.2.E Water Services

5.2.E.I. GENERAL

The following general requirements pertain to water services. All requirements and standards are as set forth in the City of Rio Rancho Code of Ordinance Title V: Public Works, Chapter 51 Water and Wastewater Rules and Rates, Section 51.08 Service Connections, and the City of Rio Rancho's Standard Drawings.

When new water main extensions are required, water service connections shall be provided to all adjacent properties. These service connections shall:

1. Be sized appropriately for the anticipated future development of the adjacent property.
2. Extend from the main to the property line.
3. Be properly capped and documented on as-built drawings.
4. Include all necessary easements for future access and maintenance.
5. Be installed in accordance with Standard Drawing W-06 and related service connection details.

5.2.E.II. STANDARDS

Water services are water system extensions that are tapped onto the distribution system to provide water to consumers. Water services are subject to the requirements set forth and described in these standards and as shown in the Standard Detail Drawings.

5.2.E.III. POINT OF SERVICE

The Utilities Department shall determine the point of service to any premises. All lots shall have access to water service line. The Utilities Department shall be called upon for exact information regarding the service line location.

5.2.E.IV. WATER SERVICE CONNECTIONS

Water service connections shall adhere to the City's policy as described in the City of Rio Rancho Code of Ordinance Title V: Public Works, Chapter 51 Water and Wastewater Rules and Rates, Section 51.08.B Water Service Connections.

5.2.E.V. WATER SERVICE LATERALS

All water service laterals shall be installed in accordance with the Standard Detail Drawings in Section 5.4.I.I.

5.2.E.VI. BACKFLOW PREVENTION

Backflow preventers shall be required in the construction of all new commercial, industrial, and public authority services where water is used in any process which, in the opinion of the Utilities Department, could constitute a cross connection or health hazard. Backflow preventers shall be installed in accordance with Standard Drawings, refer to the City's website.

5.2.F Distribution Mains – Design Criteria

5.2.F.I. GENERAL

Distribution mains are typically 8 inches through 12 inches in diameter. Project designs shall make every effort to loop water mains throughout the development.

5.2.F.II. INSTALLATION

Construction of water-related public improvements shall be in compliance with these standards and the Standard Drawings available on the City’s website.

5.2.F.III. PIPE SIZING

The design engineer shall size all distribution system pipes and appurtenances in accordance with the provisions of this manual and applicable ordinances. Distribution mains shall be a minimum of 8-inches in diameter.

The following is a generalized pipe size guideline that is subject to refinement in the design analysis. Distribution mains shall be sized such that:

1. Velocity does not exceed whichever is limiting of the following:
 - a. three (3) feet per second (fps) for maximum day flow or
 - b. ten (10) fps for fire flow plus average day, or
 - c. head loss does not exceed 10 feet/1000 feet.
2. Under normal operating conditions, the range of system pressures is between 30 psi and 125 psi.
3. Pressure and flow capacity data for both existing and future conditions in the City’s major water distribution system is to be obtained from the Utilities Department for use in the design and analysis of all proposed system improvements.

5.2.F.IV. LOCATION/ALIGNMENT:

A six (6) foot minimum horizontal and one (1) foot minimum vertical exterior surface separation from any parallel underground dry utility is required. In all major streets and other active utility corridors, a utility conflict review is required.

5.2.F.V. DISTRIBUTION MAIN COVER:

Distribution mains shall adhere to the minimum cover requirements shown in Table 5.5 and the Standard Drawing available on the City’s website.

Table 5.5: Minimum Cover Requirements	
Condition	Depth of Bury (Ft.)
Paved Street (Top of Pavement)	4
Unpaved and Maintained Street	5
Unpaved and Un-maintained Street	6

5.2.F.VI. TAPS

All taps approved onto a main shall be installed under “wet tap” conditions, using a tapping tee and valve, which allows the distribution main to always remain in service.

5.2.F.VII. VALVES

Valves on mains 12-inch and smaller shall be gate valves and shall be the same size as the main lines. Gate valves shall be iron-bodied, resilient seat or epoxy coated double disc, with non-rising stem conforming to AWWA C-500 or C-509. Valves shall open counterclockwise and shall be rated for a design working pressure of 200 psi or 1½ times the working pressure whichever is greater. Double disc type valves shall be bronze mounted with parallel seats. All buried valves shall have one 2-inch square operating nut. Mechanical or push-on joints appropriate for buried installations shall be provided.

Table 5.6: Valve Spacing	
Type of Development/Land Use	Maximum Valve Spacing (Ft)
Residential	750
Commercial and Industrial Development	500

1. Extension stems with a 2-inch square operating nut and a support for the upper end of the extension shall be provided for all valves installed more than 4 feet deep. The operating nut shall be located within 4 feet of the finished grade. Extension stems shall be mechanically connected to the operating nut. Extension stems shall be fabricated from solid steel shafting not smaller in diameter than the stem of the valve or from galvanized steel pipe having an inside diameter (ID) not smaller than the outside diameter (OD) of the valve stem. Extension stems shall be connected to the valve by a flexible socket type coupling. All connections shall be pinned, keyed, or socket type. Pipe couplings will not be acceptable. Each extension stem for a buried valve shall extend within 6 inches of the ground surface, shall be provided with spacers that will center the stem in the valve box, and shall be equipped with a wrench nut.
2. A valve shall be located on each side of a canal, arroyo, railroad, and freeway crossing.
3. Avoid valve locations in curbs, sidewalks, driveways, multi-use paths, on-street bike lanes, and valley gutters.
4. Isolation valves for fire hydrant assemblies shall follow the Standard Drawing, refer to City website.
5. Valves shall be located at the point of curvature (PC) of the curb return at street intersections and should be aligned with extensions of property lines or right-of-way lines where possible.
6. Valve boxes and covers shall be provided for all buried distribution system line valves in accordance with Standard Drawings provided on the City’s website. Valve boxes shall be adjustable cast iron type with a deep skirted lid. Valve boxes shall be a minimum of 4 inches in diameter and shall have a minimum thickness at any point of 1/16 inch and shall be provided with suitable cast iron bases and stay-put covers. Covers shall have cast thereon “WATER” on the top. They shall be as manufactured by Parkson, Tyler, APCO, or approved equal.
7. The valve box shall have at least 6 inches adjustment above and below specified depth of cover over pipe.
8. Valves shall be located to provide maximum accessibility for emergency access. Valves shall not be placed in locations that may be subject to routine parking or storage operations.

5.2.F.VIII. RESTRAINT SYSTEMS

All valves and fittings shall be restrained by using a joint restraint system compatible with the type of pipe. The Utilities Department shall approve all restraint systems. The length of the restraint system shall be shown on the construction plans and complete supporting data on the restraint system design shall be submitted to the Utilities Department for review and approval. Refer to Standard Detail Drawings on the City's website for typical joint restraining lengths for various size of pipe.

1. Joint follower gland-type restraint systems may be used for 12-inch diameter pipe and smaller, including the following devices:
 - a. "EBAA Iron, Inc." Megalug – PVC and DI compatible series.
 - b. "Uniflange" – PVC and DI compatible series.

5.2.F.IX. LOOPING AND TERMINAL MAINS

System looping and terminal main requirements are summarized below:

1. Where possible, all distribution mains shall be looped into the existing and proposed water distribution system to ensure at least two feed sources and to maintain system pressure.
2. Where allowed, terminal or dead-end distribution mains shall not be more than 600 feet long, measured along the entire centerline length of the terminal main from the connection main to the terminus. The City of Rio Rancho reserves the right to reduce the length if conditions warrant in order to maintain fire flows.
3. All terminal mains shall have a fire hydrant at the terminus. Fire hydrant installations shall be offset from the terminus to ensure that the hydrant can be removed for maintenance while the terminal main remains in service. Fire Hydrants shall be installed in accordance with the Standard Drawing available on the City's website.
4. Service taps along terminal mains shall not be located closer than 3 feet to the terminus nor located between the fire hydrant connection and the terminus.

5.2.F.X. EXTENSIONS

Water mains shall extend to the far edge of the property being served plus 10 feet or to the edge of the platted subdivision, whichever is greater, to ensure perpetuation of the water distribution system. The location, size, and configuration of the proposed development or subdivision, with respect to the existing water distribution system, may dictate that water mains be extended to the far edge of more than one property or subdivision boundary to accommodate system perpetuation.

5.2.F.XI. FUTURE CONNECTIONS

When future main extensions are provided for by "stub-out" or terminal connections, the stub-out or terminal main extension shall extend 20 feet beyond the pavement and be valved so that only one valve must be closed when the future main is extended. The valve shall be restrained to the existing distribution main to allow closure of the stub-out or terminal main section without creating a pressure separation of the valves from the in-service distribution main. When future connections are made, the entire main beyond the stub-out or terminal main extension shall be flushed, chlorinated, and pressure tested.

5.2.G Transmission Mains – Design Criteria

5.2.G.I. GENERAL

Transmission water mains are typically 16 inches in diameter and larger. No service taps are permitted on transmission mains. 14-inch waterlines are not acceptable to the City.

5.2.G.II. PIPE SIZING:

Transmission mains shall be sized to carry the designed maximum day flow required without exceeding the velocities and headlosses shown in Table 5.7 below:

Table 5.7: Allowable Velocity/Headloss		
Pipe Size (in.)	Max. Allowable Velocity (ft/s)	Max. Allowable Headloss (ft/1000 ft)
16	5	2
20	5	1.5
24 and larger	5	1

Note: The above table is based on a Hazen-Williams pipe roughness coefficient of $C = 120$.

5.2.G.III. LOCATION/ALIGNMENT

A stationed horizontal alignment of the proposed transmission main is required to define the route with lines, angles, and curvatures referenced to land corners and other official survey control points when available. Negative stationing will not be allowed. Vertical alignment must be carefully considered in the design of transmission mains. A profile shall be provided for all transmission main designs.

1. To facilitate City review of a proposed main, a profile of the entire main shall be provided on a single sheet in condensed form.
2. A roller coaster type of vertical alignment shall be avoided to minimize air pocket formation at the high points of the profile. Design of the main shall provide for a minimum number of high and low points consistent with economic feasibility.

5.2.G.IV. TRANSMISSION MAIN COVER

Transmission mains shall adhere to the minimum cover requirements shown in Table 5.8 and pipe bedding per Standard Drawing on the City’s website, required by the City of Rio Rancho. As the transmission main size increases, the minimum cover requirements may increase. If finished grade cannot be identified a minimum of 18-inches additional cover is required.

Table 5.8: Minimum Cover Requirements	
Condition	Depth of Bury (ft)
Paved Street (Top of Pavement)	4
Unpaved and Maintained Street	5
Unpaved and Unmaintained Street	6

5.2.G.V. TAPS

No main extension or fire hydrant taps smaller than 6 inches in diameter shall be installed in any main 16-inches or greater. Service line taps shall not be installed in any transmission main. Unless otherwise approved by the Development Services Department or designee, all taps installed onto a transmission main shall be made under “wet tap” conditions, using a tapping tee and valve, to allow the transmission main to remain in service.

5.2.G.VI. VALVES

Valves on 16-inch mains and larger shall be butterfly valves. Valves on transmission lines larger than 16 inches shall be full size butterfly valves with flanged end connections. Valve boxes shall be placed over valve operators as shown in Standard Drawing on the City’s website.

1. Butterfly valves shall be rubber-seated conforming to the AWWA C504 and designed for buried service.
2. The valves shall be designed to operate as open or closed with a design velocity of 8 fps.
3. The valves shall have a cast iron body with mechanical joint ends conforming to ANSI 21.11, AWWA C111 and shall be rated for a design working pressure of 150 psi or 1½ times the working pressure whichever is greater.
4. Valves shall be manufactured by Keystone or approved equal.
5. Discs shall be cast or ductile iron with stainless steel, type 304, either stub or one-piece shafts.
6. Shaft bearings shall be the bushing type of nylon or Teflon.
7. Seats shall be rubber vulcanized to the body and designed to provide bubble tight shutoff.
8. The valve operator shall be traveling-nut type in an enclosed body, sealed to prevent the entrance of groundwater up to 5 feet above the valve.
9. Table 5.9 below shows the maximum spacing for valves on transmission mains.

Table 5.9: Valve Spacing	
Pipe Size (inches)	Maximum Valve Spacing (ft)
16-30	2500
Greater than 30	5000

10. If the Utilities Department requires the installation of electronic monitoring and remote operation equipment, the line valve must be a butterfly valve with a rectangular vault, housing the valve operator and telemetry equipment. Each installation will require individual details. The design engineer shall check with the Utilities Department on acceptable equipment and specific design requirements.
11. In addition to the valve spacing requirements listed above, valves shall be installed at the following locations:
 - a. At all connections with transmission mains. Where a distribution main connects with a transmission main, a valve shall be installed on the distribution main at the transmission main.

- b. Where possible, valves shall be aligned with extensions of property lines or right-of-way lines. Valves shall not be placed in locations that may be subject to routine parking or storage and shall not be placed within public sidewalks, multi-use paths, or on-street bike paths.
- c. On all legs of tees or cross.

5.2.G.VII. RESTRAINT SYSTEMS

All valves and fittings shall be restrained by using a joint restraint system compatible with the type of pipe. The Utilities Department shall approve all restraint systems. The length of the restraint system shall be shown on the construction plans and complete supporting data on the restraint system design shall be submitted to the Utilities Department for review and approval. Refer to Standard Drawings on the City's website for appropriate joint restraining lengths for various size of pipe.

1. Joint follower gland-type restraint systems may be used for 16-inch diameter pipe and larger including the following devices:
 - a. "EBAA Iron, Inc." Megalug - PVC and DI compatible series.
 - b. "Uniflange" - PVC and DI compatible series.

5.2.G.VIII. BYPASS ASSEMBLIES

Transmission mains between valves shall be treated as an independent unit with provisions for dewatering, filling, removing air and adding air as appropriate for the transmission main construction and maintenance. In all transmission mains, a bottom tangent flanged outlet shall be provided at all profile low points, and a top tangent flanged outlet shall be provided at all profile high points.

5.2.G.IX. AIR/VACUUM VALVE ASSEMBLIES

All air/vacuum valve assemblies for transmission mains require individual approval by the Utilities Department. Air/vacuum relief valve assemblies shall be installed in accordance with Standard Drawing available on the City's website at high points in the transmission main at locations approved by the Utilities Department.

5.2.G.X. PRESSURE BLOW-OFF ASSEMBLIES

All blow-off assemblies/flushing valves for transmission mains require individual approval by the Utilities Department. Pressure blow-off/flushing valves assemblies shall be installed in accordance with the Standard Drawing available on the City's website at low points in the transmission main at locations approved by the Utilities Department. Pressure blow-off assemblies/flushing valves are to be used only when it is determined that a fire hydrant is not appropriate. Blow off hydrants to be clearly identified to not be confused with a fire hydrant for fire protection.

5.2.G.XI. DESIGN SURVEY REQUIREMENTS

To establish the vertical profile of the transmission main, an existing and finished ground surface profile of the proposed alignment based on City of Rio Rancho datum and tied to at least two survey benchmarks is required. Additional semi-permanent benchmarks shall be established every 1500 feet along the route by closed loops of third-order accuracy. The existing ground profile shall consist of

ground surface elevations along the proposed transmission main centerline at every 100-foot station and at pronounced grade breaks.

1. Topographical features within the street or right-of-way and any topographic feature outside the right-of-way, which may interfere with the operation or installation of the transmission main, shall be accurately surveyed and depicted on the plans. Topographic features may be compiled by aerial photogrammetry or field survey methods.
2. In areas where the ground slope perpendicular to the centerline of the transmission main exceeds 5%, cross sectional data shall be surveyed at all 100-foot station profile points and shall extend at least 25 feet to each side of the centerline.
3. All utility crossings or close utility interference shall be located and exposed by potholing. The design survey shall record the size, nature, and location of the potential interference by station, offset, and elevation.

5.2.H Fire Hydrant Criteria

5.2.H.I. GENERAL

The purpose of this section is to clarify City of Rio Rancho requirements for fire hydrants. Adherence to these requirements is necessary to provide a usable, readily accessible water supply for maintenance and firefighting purposes. Fire hydrants shall be installed in accordance with Standard Drawing W-15 available on the City’s website.

5.2.H.II. ORDINANCE REQUIREMENTS

All fire line installations shall conform to the specifications of NMAPWA, and all requirements and standards are as set forth in the City of Rio Rancho Code of Ordinance Title V: Public Works, Chapter 51 Water and Wastewater Rules and Rates and Standard Drawing W-13 on the City’s website.

5.2.H.III. FIRE FLOW DEMAND

The required fire flow and maximum day flow rate shall be available in the system. The municipal fire flow required by the City for any one particular location varies depending on the land use and/or the building type or use. The number of hours that the required fire flow shall be available also varies depending on the land use. Table 5.10 outlines required fire protection flows. It should be noted that this table is not all-inclusive for every type of development and/or land use. It is the responsibility of the design engineer or architect to coordinate all fire flow requirements with the Development Services Department or designee and Fire Marshall, as the Utilities Department and/or the Fire Department may require a fire flow greater than those shown in Table 5.10.

Table 5.10: Minimum Fire Flow Requirements	
Type of Development/Land Use	Fire Flow Demand (gpm)
Single-Family Residential Development	1500
Multi-Family Residential Development	1500
Commercial Development	3000
Institutional Development	3000
Industrial Warehouse Development	4000

5.2.H.IV. GENERAL DESIGN STANDARDS

Fire hydrants must be located where they can be quickly found and easily used by fire engines arriving at an incident. Standardized location criteria are based on predictability, visibility, unobstructed accessibility, the type of development, Fire Department tactical needs, and the expected route fire engines will travel to the site.

Determining proper fire hydrant location requires application of engineering judgment and common sense to the specific conditions found in each project. Minor variances in the locations or spacing of individual hydrants may be approved provided the functional intent of these design standards is achieved.

1. All fire hydrants shall be Kennedy Guardian Model K-81 or Mueller Super Centurion 200, conforming to AWWA C502, the City of Rio Rancho Standard Drawing W-3 15 on the City's website, and the standard products list.
2. Locate fire hydrants where they are readily visible by fire engines traveling along the street or approaching on intersecting streets. Never obscure or obstruct hydrants behind fences, gates, walls, or landscaping.
3. Existing fire hydrants on major streets, collector streets, or any other street having four (4) or more lanes of traffic, which are not divided by raised median islands can be included in the coverage analysis. If the streets are divided by raised median islands, then the existing hydrant can only be included in the coverage analysis if its location is on the same side as the new development.
4. When designing a fire hydrant layout, the "first" hydrant is to be located at street intersections and at the main entrance(s) into a subdivision, apartment complex, or commercial development. Additional hydrants must then be spaced approximately evenly between these points at a distance not to exceed the maximum spacing between hydrants (see Table 5.11). Spacing is measured along route of travel of a fire engine.
5. Fire hydrants separated from a subdivision, building, or other development by continuous fence, wall, or other obstruction cannot be counted as providing protection to that subdivision or development.
6. A fire hydrant shall be placed within 30 feet of the end of all dead dead-end water mains greater than 100 feet to facilitate flushing and maintenance of the water main (including all cul-de-sacs). Refer to Standard Drawing W-3 15 on the City's website.

5.2.H.V. RESIDENTIAL SUBDIVISION HYDRANT LOCATION STANDARDS:

Fire hydrant locations will be reviewed and approved as part of the subdivision approval process and the following general design standards apply:

1. Start by locating a fire hydrant at the intersection of each public and/or private street entrance into the subdivision unless an existing fire hydrant meets spacing requirements.
2. Then space additional fire hydrants approximately 500 feet apart along all public and/or private streets within the subdivision and along all perimeter streets.
3. For cul-de-sacs, a fire hydrant shall be placed within 30 feet of the dead dead-end water main. If dead end lines lengths are such that additional hydrants are required, assure that a minimum of 30 feet along the line is required between the fire hydrant and the line termination.

5.2.H.VI. COMMERCIAL AND MULTI-FAMILY HYDRANT LOCATION STANDARDS:

Fire hydrant locations will be reviewed and approved as part of the site plan/building permit approval process. Provide a site plan showing all existing and proposed fire hydrant locations, all designated fire lanes, and all fire department connections for building standpipe or sprinkler systems for comment and approval by the Fire Marshal.

5.2.H.VII. FIRE HYDRANT SPACING

Table 5.11 shows the maximum spacing for fire hydrants. Spacing distance shall be measure along the centerline of the street or route, which the fire truck will most likely travel.

Type of Development/Land Use	Maximum Fire Hydrant Spacing (ft)
Single-Family Residential	500
Single- Family Residential Cul-de-sac	350
Two story Townhouses and Apartments	300
Commercial and Industrial Development	300
Institutional Development	300

Fire hydrants shall not be placed within six (6) feet of an above ground obstruction and shall have a minimum of 15 inches of clearance between ground and the lowest hydrant outlet cap and shall be as approved by the Fire Marshal. If required by the Utilities Department, hydrants shall be located within water easements providing at least six (6) feet of clearance on all sides of the hydrant, including protective bollards as directed.

5.3 Water Production Facilities

5.3.A General Requirements

5.3.A.I. GENERAL

This document in conjunction with City of Rio Rancho’s Standard Drawings, located on the City’s website, provides guidance and minimum basic design criteria and standards, as set forth by the Utilities Department for water production facilities within the City of Rio Rancho. It is intended for use in the planning and design process. Where not specified in these standards, the Development Services Department will specify the standards to be applied to the design and construction of water production facility improvements in order to protect the public health, safety, and welfare of all those served by the water system in the City of Rio Rancho.

5.3.A.II. PROJECT SITE REQUIREMENTS

Prior to beginning the design of the facility, a detailed project site study and/or report shall be completed. This analysis should be conducted with input from the Utilities Department to ensure that the lot or land area that is being considered is an adequate size and that the location has a functional hydraulic gradient. A hydraulic modeling analysis shall be performed on each project consistent with the

City's master plan. If appropriate the report must address the existing water source to provide adequate flow, static pressure, and fire flow. Consideration should also be given to electrical power supply to the facility.

5.3.A.III. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

All facilities shall include installation of full SCADA current technology meeting the City's equipment requirements and specifications. The system is intended to provide continuous system status allowing operations staff to respond in a timely fashion to operational needs and emergency equipment failures. Installation of SCADA equipment is not limited to the following but includes testing, startup, and commissioning of the RTU, antenna, radio cable and all required accessories. The facility shall be interfaced and coordinated with the City's system host location. All equipment required to be installed at the facility shall be SCADA compatible.

5.3.A.IV. ELECTRICAL POWER SUPPLY

The electrical design will include the service entrance, switch gear, motor control system, VFD cabinets system (if required), standby power system, conduit, wiring, lighting systems, SCADA, instrumentation systems and air-conditioned cabinets where necessary.

5.3.A.V. ON SITE SODIUM HYPOCHLORITE GENERATION

All production facilities shall expect to incorporate on-site sodium hypochlorite generation. The following requirements are not all inclusive but are intended to establish a benchmark for design to begin considering individual project needs. This process will require the installation of a building capable of maintaining a controlled environment for efficient equipment operation. The building needs to be large enough to house the salt (brine) tank, electrolytic cell / electrolyzer unit, hypochlorite solution tank, a water softener unit, a water chiller and to keep direct sunlight away from sensitive equipment. A waste connection to the sanitary sewer system or an on-site holding tank is also required.

5.3.A.VI. VALVES

Valves shall be specified that are appropriate for potable water use from proven manufacturers. A piping/valve schedule shall include the valve size, type, class, flow range, actuator type, etc. Design consideration shall locate and install all valves in a manner that they can be operated without entering a vault to mitigate confined space regulations.

5.3.A.VII. ELECTROMAGNETIC FLOW METER

Each production facility requires the installation of a site production electromagnetic flow meter system with isolation valves for maintenance and repair. The meter design shall be an above ground installation with a rate of flow and totalizer read head. If a meter is designed below grade, it shall be equipped with a signal converter which can be mounted inside the facility and read by an operator without entering a confined space.

5.3.A.VIII. OPERATIONS AND MAINTENANCE MANUAL

An engineering consultant shall complete the preparation of operation and maintenance manuals and present them to the project manager before final project completion. A draft submittal of the manuals is

to be submitted to the project manager for approval prior to start-up and commissioning. An electronic copy of the O & M document in the current approved software shall be included.

5.3.A.IX. START-UP AND COMMISSIONING PERIOD

The construction project is functional only after demonstrating the completion of pressure testing, bacteriological testing, and a final inspection. An acceptable flushing schedule and chlorine residual monitoring plan must be prepared to maintain and demonstrate an acceptable level of turnover during the early period of new project commissioning. Once substantial completion has been satisfied, the start-up and commissioning period is ready to begin. The start-up details and duration of commissioning shall be identified early on and listed in the project scope of work by the design engineer.

5.3.B Pressure Reducing Stations

5.3.B.I. GENERAL

Pressure Reducing or Regulating Valves (PRV) are utilized to control services pressures between pressure zones within the distribution system. When water main extension plans are submitted for review and water availability analysis, the need for a PRV installation will be determined and located based on existing pressure zone boundaries and the existing distribution system layout by the Utilities Department on a case-by-case basis.

5.3.B.II. PILOT CONTROLS

Unless otherwise directed by the City all PRV installations shall include a valve control system, which includes pilot controls for pressure reducing and pressure sustaining functions. The pilot controls shall be field adjustable to accommodate any setting resulting in a customer pressure between 50 psi and 100 psi.

5.3.B.III. DESIGN STANDARDS

New sites will be designed to meet capacity requirements using a dual or multiple valve arrangement. Bypass piping shall be ductile iron. A gate valve shall be installed both upstream and downstream of each PRV. Sizing of a PRV shall be based on the manufacturer's recommendations as determined by the design flow. PRVs and vaults shall be constructed in accordance with Standard Drawings available on the City's website.

5.3.B.IV. TELEMETRY

In certain situations, the Utilities Department shall require monitoring of the valve(s) via SCADA equipment.

5.3.C Pumping Facilities

5.3.C.I. GENERAL

Water pumping facilities and booster stations shall conform to the requirements as set forth in NMED's Recommended Standards for Water Facilities and these design guidelines.

5.3.C.II. PUMPING UNITS AND SIZE

Pumping stations shall consist of a combination of pumps with the capacity to provide fire demand plus maximum day demand. Pumps meeting peak hour demand will be required for any closed loop configurations. Special care shall be exercised in the selection of pumping units and associated components to prevent pressure surges and ensure the suitability, flexibility, and adaptability of the units to the hydraulic conditions of the system from which water is taken and the system into which water is pumped.

1. The horsepower rating of each pump motor shall be such that the motor will carry continuously the maximum load that is possible to develop at any point on the pump curve without exceeding 95 % of the motor nameplate rating and without using the service factor.

5.3.C.III. DESIGN CRITERIA

The minimum requirements by the Utilities Department for pumping facilities and booster stations are as follows:

1. Pump station shall be secured against unauthorized entry.
2. Building architecture shall be aesthetically pleasing and compatible with the surrounding area and meet current building codes.
3. For new facility sites, provide an eight (8) foot tall masonry perimeter wall with locked entrance enclosing the compound. The wall shall be compatible with the surrounding environment, including landscaping. For existing facility sites improvements should include screen walls for exposed equipment such as surge tanks.
4. The facility entrance shall have a heavy-duty cantilever slide access gate with an electric operator with battery backup and at least 20 feet clear entry space.
5. The station shall have a paved or graveled access road at least 12 feet wide with maximum slope not to exceed 12%. A 42-foot radius turn-around shall be provided if the access road exceeds 50 feet in length.
6. The interior of the compound shall be surfaced with 4-inches compacted aggregate base.
7. Pump station shall be located and designed to provide service vehicle access to major station components for maintenance and inspection purposes. This includes access and parking for several vehicles on pump station site.
8. Down cast facility lighting shall be provided with at least one photocell-operated light. A manual light switch shall be located next to the access gate in the interior of the compound.
9. A backup/emergency power supply capable of operating the pump station for eight hours during power outages shall be supplied. Specific criteria for backup generation type and capacity shall be given during the design process by the Utilities Department.
10. Provide a spare pump and motor for backup capability.
11. Heavy equipment access for a boom crane or pump rig shall be incorporated in the site layout.
12. The site shall be graded to provide adequate drainage away from structures and to prevent water from backing up into the pump station from other sources.
13. Provide a frost proof gravity line or sump pump for pump station drainage.
14. Provide ventilation, heating, and cooling in the pump station.
15. **Supervisory Control and Data Acquisition (SCADA):** All facilities shall include installation of full SCADA current technology meeting the City's equipment requirements and specifications. The system is intended to provide continuous system status allowing operations staff to respond in a

timely fashion to operational needs and emergency equipment failures. Installation of SCADA equipment is not limited to the following but includes testing, startup, and commissioning of the RTU, antenna, radio cable and all required accessories. The facility shall be interfaced and coordinated with the City's system host location. All equipment required to be installed at the facility shall be SCADA compatible.

16. Ample clearances between equipment shall be provided for operation and maintenance activities. Sufficient space shall also be provided for future pump(s) and piping.
17. Piping configurations shall include the following minimums:
 - a. All piping within the pump station shall be lined and provided with restrained joints and be either DIP or fabricated steel.
 - b. Isolation valves shall be provided for each pump assembly.
 - c. Discharge piping shall include:
 - i. End spools.
 - ii. Flow control or check valve.
 - iii. Spool with NPT tapped outlets or welded couplings to accommodate a flow sensor and pressure gauge, etc.
 - iv. Hand wheels for all above ground gate or butterfly valves.
 - v. Reducing wye at the manifold.
 - vi. Restrained flexible closure section for access.
18. Pump discharges shall be joined to a common header, which shall pass through an electromagnetic flow meter with isolation valves and a valved bypass.
19. A pressure relief/surge anticipator valve shall be provided between the discharge header and the supply line.
20. Depending on the motor size and electrical power system, provide soft start/soft stop motor starter that provides a wider range of rotor torque control at start up and shut down.
21. Surge protection and control shall be provided.
22. Electric power controls.
23. Corrosion protection for underground steel and iron.
24. On-site sodium hypochlorite generation system (if applicable).
25. All equipment exposed to weather shall be capable of operating under the local exposed conditions. This shall include meeting the appropriate NEMA rating and temperature ranges expected or as established by the Utilities Department.
26. Provide local and remote instrumentation for monitoring the following:
 - a. Discharge valve positions.
 - b. Discharge header pressure and flow.
 - c. Digital readout of Reservoir level (if applicable).
 - d. Upstream pressure (if applicable).
 - e. Suction header pressure (if applicable).
 - f. Pump status (on-off).
 - g. Gas engine stand-by generator status (on-off).
 - h. Total kilowatt demand (station).
 - i. Pump motor amperage and voltage with motor overload failures.
 - j. Flowrate (through flowmeter).
27. Provide sensors and alarms to detect the following local and remote:
 - a. Water on the floor.
 - b. Bearing RTD for each pumping unit bearing.

- c. Motor windings RTD for each pumping unit.
 - d. Building doors intrusion and interior motion detection.
 - e. High and low room temperature.
 - f. Electrical ground fault.
 - g. Low accumulator pressure (if applicable).
 - h. Power failure.
 - i. High and low reservoir level (if applicable).
 - j. Fire and/or smoke.
 - k. Tank minimum level (if applicable).
 - l. Tank overflow (if applicable).
28. All facilities require site plan and building safety review and approval by the Utilities Department. Such review may result in additional requirements that must be satisfied.

5.3.D Wells

5.3.D.I. GENERAL

Wells shall conform to the requirements as set forth in NMED's Recommended Standards for Water Facilities and these design guidelines. A drilling permit from the New Mexico State Engineer's Office shall be obtained. A design report of system capabilities and production influence will be required.

5.3.D.II. DESIGN CRITERIA

The minimum requirements by the Utilities Department for wells are as follows:

1. For new facility sites, an eight (8) foot tall masonry perimeter wall with locked entrance enclosing the compound. The wall shall be compatible with the surrounding environment, including landscaping. For existing sites, an eight (8) foot tall masonry screen wall shall be installed around exposed facilities such as pump and motor assemblies.
2. The facility entrance shall have a heavy-duty cantilever slide access gate with an electric operator with battery backup and at least 20 feet clear entry space.
3. The station shall have a paved or graveled access road at least 12 feet wide with maximum slope not to exceed 12%. A 42-foot radius turn-around shall be provided if the access road exceeds 50 feet in length.
4. The interior of the compound shall be surfaced with 4-inches compacted aggregate base.
5. Service vehicle access to major station components shall be incorporated in the station design.
6. Down cast facility lighting shall be provided with at least one photocell-operated light. A manual light switch shall be located next to the access gate in the interior of the compound.
7. A backup power supply capable of operating the pump station for eight hours during power outages shall be supplied. Specific criteria for backup generation type and capacity shall be given during the design process by the Utilities Department.
8. Heavy equipment access for a boom crane or pump rig shall be incorporated in the site layout.
9. The site shall be graded to provide adequate drainage away from structures.
10. On-site sodium hypochlorite generation system.
11. Well casing (sizing, below grade placement, material, etc).
12. Screen (sizing, below grade placement, material, etc).
13. Column pipe (sizing, below grade placement, material, etc).
14. Discharge piping plus head.
15. Check valve on discharge line.

16. Hose bib type sampling tap on well side of check valve.
17. Well vent.
18. Pump plus motor (type and configuration – turbine/in-line, pitless adapter).
19. Sanitary well seal (air and watertight).
20. Pump base concrete slab.
21. Air release valve between the pump and check valve.
22. After placement of the pump, wells shall be disinfected.

5.3.D.III. ADDITIONAL DESIGN REQUIREMENTS

The following are additional design criteria as required by the Utilities Department.

1. Well casings shall be made of steel, be continuous and watertight from top to bottom except for well screens. The casing shall extend a minimum of 24 inches above the 100-year flood level of record.
2. Well vents shall be made of steel and terminate a minimum of 24 inches above the final ground elevation and not less than 24 inches above the 100-year flood level of record, whichever is higher. The vent shall be covered with a number 16 mesh screen. Any equipment that will permit direct open access to the well shall also meet the height requirements and shall be sealed or screened to prevent entrance of foreign matter, surface water, or contaminants into the well.
3. The pump base concrete slab shall extend a minimum of three (3) feet from the center of the well, be 6-inches thick and slope away from the well head a minimum of $\frac{1}{4}$ inch per foot. The site shall drain away from the well and be protected against erosion and surface runoff from entering the well.
4. The well screen diameter shall be the minimum size permitted that will maintain an aperture entrance velocity of 0.1-0.5 feet per second (fps) and a vertical velocity within the screen barrel of five (5) fps or less. The screen length, aperture size, and construction shall be in accordance with AWWA A100.
5. The well shall be sealed and protected from the entry of contaminants or water from any source other than the selected aquifers. Sealing of the well shall consist of grouting the following:
 - a. The annular space between the casing and the bore hole to a minimum depth required to exclude pollution, or 50 feet, whichever is greater.
 - b. All zones containing water of undesirable quality or zones to be protected but excluded from the final well completion. These areas shall be grouted from at least five (5) feet above the zone to at least five (5) feet below the zone.
 - c. All passages or formations that pollutants may enter such as outcrops, old wells, excavation, limestone, sandstone, fractured rocks.
6. Joints between screen sections and blank casing spacers shall be welded or threaded and be watertight, straight, and strong as the screen.
7. The top of the well shall be constructed so that no foreign matter or surface water can enter during or after construction. On completion of the well, the well shall be temporarily capped to prevent surface pollutants from entering until pumping equipment is installed.
8. Below ground pits to house pumping equipment are prohibited.
9. Wells shall be constructed round, plumb, and true to line within the following tolerances:
 - a. Maximum allowable horizontal deviation from the vertical shall not exceed $\frac{2}{3}$ of the smallest inside diameter of the part of the well being tested per 100 feet of depth.

- b. The alignment must be satisfactory for the successful installation and operation of the permanent pumping equipment.
 - c. Wells shall be tested for alignment and plumb in accordance with AWWA A100, Section 8.
10. New wells shall be performance tested to acquire water samples and to determine well capacity, draw down, and production on a long-term basis. Testing methods shall be in accordance with AWWA A100, Section 10.
 11. All facilities require site plan and building safety review and approval by the Utilities Department. Such review may result in additional requirements that must be satisfied.

5.3.E Water Storage Facilities

5.3.E.I. GENERAL

Water storage facilities shall conform to the requirements as set forth in NMED's Recommended Standards for Water Facilities and these design guidelines. All storage facilities shall have built-in provisions to drain, access, and clean the storage tank including a suitable source of water. The overall objectives of finished water storage are to:

1. Assist in meeting peak hour requirements.
2. Equalize system pressures.
3. Provide emergency water supply in case of component failure.
4. Provide for fire flows.
5. Provide additional treatment (if needed).
6. Permit high service pumps at treatment plants to operate at a relatively uniform rate.

5.3.E.II. DESIGN CRITERIA FOR STORAGE CAPACITY

Storage facilities shall have sufficient capacity to meet allocated domestic demands, fire flows, and emergency flows. Domestic demands are established using the criteria set forth in these standards. The Utilities Department requires that storage facilities accommodate the following. The minimum requirements by the Utilities Department for water storage facilities are as follows:

1. An eight (8) foot tall masonry perimeter wall with locked entrance enclosing the compound. The wall shall be compatible with the surrounding environment, including landscaping.
2. The facility entrance shall have a heavy-duty cantilever slide access gate with an electric operator and battery backup with at least 20 feet clear entry space.
3. The station shall have a paved or graveled access road at least 12 feet wide with maximum slope not to exceed 12%. A 42-foot radius turn-around shall be provided if the access road exceeds 50 feet in length.
4. The interior of the compound shall be surfaced with 4-inches compacted aggregate base.
5. Service vehicle access to major station components shall be incorporated in the station design including driving the perimeter of the tank.
6. Down cast facility lighting shall be provided with at least one photocell-operated light. A manual light switch shall be located next to the access gate in the interior of the compound.
7. The site shall be graded to provide adequate drainage away from structures.
8. On-site sodium hypochlorite generation system (if applicable).
9. On-line free chlorine analyzer with SCADA output.
10. Steel Storage Tank shall be designed to AWWA D-100 Standards and Concrete Storage Tanks shall be designed to AWWA D-110 Standards.

11. Storage tank with acceptable interior and exterior coating systems for potable water.
12. Concrete foundation ring.
13. Inside and outside steel ladders.
14. Outside stairway with locking security gate at base.
15. Probe bottles.
16. Exterior water level indicator.
17. Intruder resistant tank vent housing.
18. Thirty-six-inch square-hinged roof access openings with inside ladder.
19. Cathodic protection.
20. Overflow pipe and splash pad.
21. Overflow weir.
22. 24-inch flanged inspection hatch centered over weir.
23. Hinged shell manhole.
24. Altitude valves, isolation valves, bypass line, and vault (as necessary).
25. Tank outlet line.
26. Tank inlet line.
27. Booster station suction line (where applicable).
28. Tank drain.
29. Disinfection system.
30. Electrical and telemetry system.
31. Pressure transmitter for telemetry.
32. A clear area around reservoir to allow vehicle passage. Clearance width shall be sized in consultation with the Utilities Department.

5.3.E.III. CHLORINATION SYSTEM REQUIREMENTS

Due to the nature of storage projects, no set design criteria can be maintained for all sites. A general set of criteria has been developed to provide guidelines for the design of each site. Based on previous analysis, the following is a list of these general guidelines:

1. Monitor the chlorine residual in a continuous sample taken from a location that will be representative of the chlorine level in the reservoir.
2. If the chlorine residual falls below a set point of 0.2 ppm, for example, then the chlorine additive system is activated.
3. When the chlorine system is activated, a recirculation pump starts, and a chlorine solution is added to the water to raise the free chlorine level in the recirculation water to approximately 0.8 ppm (with the capacity to go to 1.0 ppm or higher).
4. The recirculation pumps will be sized to turn the full volume of the reservoir over in a maximum of three (3) days. Each site will have somewhat different points from which the recirculation pump will draw suction. The typical discharge point will be approximately 180 degrees from the inlet/outlet piping. Using this piping system, the chlorinated water will be dispersed into the stored water and eventually turn the volume of reservoir over with chlorinated water.
5. When the chlorine residual in the continuous sample reaches a set point of about 0.8 ppm, the recirculation pump and the chlorine feed facilities will stop.
6. When the chlorine residual in the continuous sample reaches a set point of approximately 0.4 ppm, the recirculation pump, without the chlorination system, will be started. This will help to circulate

any newly added water with adequate chlorine residual and maintain a minimum chlorine level in the reservoir.

Table 5.12: Chlorine Facilities Minimum Design Criteria	
Item	Design Criteria
Low Level Chlorine	0.2 ppm
High Level Chlorine	0.8 ppm
Design Chlorine Dosage	1.0 ppm
Volume Turnover Maximum Time Required	3 days
Chlorine Monitoring	Constant, amperometric method

5.3.F Well Abandonment

1. Production and monitoring wells no longer in use shall be plugged in such a manner as to prevent migration of surface runoff or ground water along the length of well casing as required by the Office of the State Engineer. Where possible, this shall be accomplished by removing well casing and pumping expanding cement from the bottom to top of well using a tremie pipe. If casing cannot be removed, the casing shall be ripped or perforated, and pressures grout its entire length.
2. Filling with bentonite pellets from the bottom to the top is an acceptable alternative to pressure grouting.
3. After abandonment, written notification must be submitted to the NMED GWPPS (New Mexico Environment Department Ground Water Pollution Prevention Section) with date and method of abandonment.

5.4 Wastewater Collection System

5.4.A General Requirements

This document in conjunction with City of Rio Rancho’s Standard Drawings, located on the City’s website, provides guidance and minimum basic design criteria and standards, as set forth by the Utilities Department, for providing and maintaining the public sewage collection system of the City of Rio Rancho. It is intended for use in the planning and design process. Where not specified in these standards, the Development Services Department or designee will specify the standards to be applied to the design and construction of public sanitary sewer improvements to protect the public health, safety, and welfare of all those served by the sewer system in the City of Rio Rancho.

5.4.B Submittals

A design or Utility Engineering report shall be completed and submitted to the Utilities Department unless waived by the Development Services Department or designee. The requirements and format of this report are outlined and detailed in Chapter 2 of the DPM.

5.4.C Wastewater Design Flows

5.4.C.I. GENERAL

Wastewater design flows utilized in the preparation of engineering design reports, plans, and specifications shall as a minimum conform to the criteria set forth in this section. Alternate methods for determining design flows will be considered by the Utility Systems Engineer on a case-by-case basis.

5.4.C.II. POPULATION DENSITIES

The City of Rio Rancho uses a population equivalent of 2.78 persons/dwelling unit (DU) for the determination of wastewater flows.

5.4.C.III. AVERAGE DAILY FLOWS

Average daily flow estimates based on land development/use shall conform to Table 5.13. The average day values indicated in the table represent minimum estimates for determining design flows. Where a proposed development is known (based on specific applications and/or use), and the anticipated wastewater flows exceed the minimum forecast demands, the greater flow shall be used to determine the design flows. Where the project land does not fit within the tabulated categories, an average daily unit flow of 210 gallons per dwelling unit per day shall be used.

Type of Development/Land Use	Average Daily Flow
Residential	175 gpd/DU
Light Commercial	1,230 gal/ac-day
Heavy Commercial	5,968 gal/ac-day
Light Institutional	226 gal/ac-day
Heavy Institutional	1,788 gal/ac-day
Light Industrial	447 gal/ac-day
Medium Industrial	1,680 gal/ac-day
Heavy Industrial	9,266 gal/ac-day

5.4.C.IV. PEAKING FACTORS

All gravity sewers, lift stations, and force mains shall be designed for peak flow conditions. Peak dry weather flow is calculated as the product of the peaking factor and the average daily flow. For all sewer main diameters, a peak dry weather factor of 3.0 shall be used unless otherwise approved by the Utilities Department.

5.4.C.V. WASTEWATER COLLECTION MAIN DESIGN FLOW CRITERIA

The following is a list of the major design flow criteria for wastewater collection lines.

1. Wastewater collection mains shall be designed to convey the peak flow.
2. Wastewater collection mains shall be designed to meet minimum slope and velocity requirements as set forth in these design standards, see Table 5.14.
3. Wastewater collection mains designs shall avoid exceeding maximum slope and velocity conditions as set forth in these design standards, see Table 5.14.
4. The peak flow shall be determined using average day flows adjusted by a peaking factor and including the allowed and any existing system infiltration or inflow.
5. Flow capacity and loading data of existing and future conditions for the City's major wastewater collection system shall be obtained from the Utilities Department for use in designing and analyzing proposed improvements.
6. Average day and ultimate/final design flow estimates shall be well documented and shall include calculations for the following: the ultimate service area, population density, existing and anticipated wastewater flow, existing and anticipated industrial/commercial discharge, and projected infiltration/inflow.
7. Surface water, ground water, or cooling water shall not be discharged into the wastewater collection system. Prohibited connections include roof drains, storm inlets, foundation perimeter drains, area drains for open patios or driveway entrances to parking structures, and ground water sump systems.

5.4.D Gravity Sanitary Sewer Lines – Design Criteria

5.4.D.I. GENERAL

All issues and elements presented in this section are typically included and must be addressed in all wastewater infrastructure projects. The design and construction of gravity sanitary sewer mains shall conform to the design standards in this manual and Standard Drawings on the City's website.

5.4.D.II. JURISDICTIONAL AGENCY APPROVALS

One very critical task in the early stages of the project is the development of an agency approval list. These approvals and/or close coordination required by these agencies will impact the successful and timely completion of the project. All appropriate department levels affected within the City, County, State, and Federal agencies need to be contacted for their individual requirements.

5.4.D.III. ENVIRONMENTAL AND CULTURAL REGULATORY REQUIREMENTS

This section is not intended to be all encompassing, rather provide an overview of the environmental and cultural requirements and the typical agency involvement. A thorough consideration of the environmental and cultural impact of the project at its specific location shall be evaluated to identify the various requirements. Private developers shall be responsible for regulatory compliance and for obtaining the required permits for their projects.

In specific areas where a project impacts Water of the United States, a Clean Water Act, Section 404 Permit shall be required from the U.S. Army Corps of Engineers.

Compliance is required with the U.S. EPA under the Stormwater National Pollutant Discharge Elimination System (NPDES) general permit for stormwater discharges from construction sites.

Projects shall not adversely impact threatened or endangered species or their habitat and shall comply with the Federal Endangered Species Act. To address any biological requirements, an assessment report of the project may be required by the U.S. Fish and Wildlife Service and the New Mexico Fish and Game Department.

Projects shall not adversely impact historic or prehistoric properties. Projects shall comply with the National Historic Preservation Act and the State Historic Preservation Act.

5.4.D.IV. COMMUNITY NOTIFICATION AND PUBLIC INVOLVEMENT

The City is committed to early citizen notification and involvement. Identifying neighborhood concerns is a priority and good communication is required throughout the public involvement phase of all projects.

5.4.D.V. ACCEPTABLE PIPE MATERIALS

The type of pipe to be installed shall comply with these standards, meet NMAPWA specifications, and shall be based upon applicable design flows, pressures, site conditions, corrosion protection, and maintenance requirements. Gravity sewer mains shall be either polyvinyl chloride pipe (PVC), or high-density polyethylene pipe (HDPE).

5.4.D.VI. ROUGHNESS COEFFICIENT

The wastewater collection system shall be designed for gravity (open channel) flow conditions, using a Manning's roughness coefficient, "n factor," of 0.009 for HDPE (smooth wall), 0.011 for PVC pipe.

5.4.D.VII. PIPE SIZING

Gravity sewer lines shall be sized to accommodate the peak design flow subject to the following limitations:

1. At the peak dry weather flow condition, the following shall be maintained for gravity sewer pipes:
 - a. d/D ratio shall be no greater than 0.75.
 - b. q/Q ratio shall be no greater than 0.85.
2. The minimum pipe size shall be 8 inches.
3. All changes in pipe size shall require a manhole at the size change. The design shall call for differing pipe sizes to match soffits at the entrance and exit of the manhole. The soffit is the bottom of the top of the pipe or the uppermost point on the inside of the structure.

5.4.D.VIII. DEPTH/COVER

Gravity sewer lines shall be sufficiently deep to ensure gravity drainage of service connections and avoid conflicts of service connections with water mains and dry utilities. Sewer lines shall be installed at the depth required to serve the ultimate gravity drainage area, which may include areas outside of the development project.

5.4.D.IX. MINIMUM COVER:

All collection mains shall have a minimum depth of cover of four (4) feet, measured from the top of the pipe to the final surface grade.

5.4.D.IX.a. Shallow Cover Protection

Where collection main depths are less than four (4) feet, and the main is located under a right-of-way, street, driveway, parking lot, or areas where live loading is a concern, special pipe materials (such as ductile iron pipe) or other structural measures (such as concrete or steel encasement) shall be provided in accordance with Standard Drawing S-5 on the City's website.

5.4.D.IX.b. Provision for Basements:

Proposed collection mains shall be designed with adequate depth to provide wastewater service to basements, where possible and appropriate.

5.4.D.X. SLOPE AND VELOCITIES

Sewers shall be laid with a constant and uniform slope between manholes. All changes in slope shall require a manhole at the slope change connection. Collection mains shall be designed with an adequate slope to achieve flow velocities of at least 2.0 ft/s when flowing full. Design velocities shall not exceed 10 ft/s. Table 5.14 shows the minimum and maximum slopes required in different size gravity sewer pipes.

Table 5.14: Minimum and Maximum Design Slopes		
Pipe Size in inches	Minimum Design Slope %, (ft/ft)	Maximum Design Slope 5, (ft/ft)
8	0.500 (0.0050)	8.50 (0.0850)
10	0.280 (0.0028)	6.25 (0.0625)
12	0.220 (0.0022)	5.00 (0.0500)
15	0.150 (0.0015)	3.75 (0.0375)
18	0.120 (0.0012)	2.80 (0.0280)
21	0.100 (0.0010)	2.40 (0.0240)
24	0.080 (0.0008)	2.00 (0.0200)
27	0.068 (0.00068)	1.70 (0.0170)
30	0.060 (0.0006)	1.50 (0.0150)
36	0.048 (0.00048)	1.15 (0.0115)

5.4.D.XI. ALIGNMENT AND EASEMENT REQUIREMENTS

The following alignment and easement requirements shall be followed for gravity sewer line designs. Note that these requirements will be different for sanitary sewers that are HDPE.

1. Sewers shall be laid with straight alignments between manholes.
2. Sewer alignment shall not meander across the street centerline.
3. Sewers shall be located in street rights-of-way and the alignments shall be parallel to property lines or street centerline, or as close as possible.
4. Sewer lines are to be located within the public right-of-way and aligned in accordance with the Utility Locations as shown in the Typical Plan View for Streets” drawings in Section 5.4.I.I. . Sewer lines shall be located so they can be maintained without disturbing any sidewalk, curb, gutter, structure, or any other utility.
 - If it is not possible to utilize designated public right-of-way or align in accordance with the Utility Locations, alternate alignments will be considered and must be approved by the Development Services Department or designee.
5. If not in a public right-of-way, the sewer line must be located in a permanent easement. A permanent easement must be granted (and dedicated to the City of Rio Rancho) for the exclusive use of sanitary sewer and water unless shared use with other utilities is coordinated and approved in advance by the Utilities Department. A minimum easement width of 20 feet (or more) is required for a single utility and 25 feet (or more) for sewer and water both within the same easement.
6. Sewer and water easements shall be free of all obstructions and shall at all times be accessible to City service equipment. No buildings, sport courts, walls, fences, shade structures, nor permanent structures of any kind shall be constructed upon, over, or under and water/sewer line easements. No landscaping shall be placed and/or planted within the easement that would render the easement inaccessible by equipment. The Utilities Division has the right to have any obstruction removed without notice to the property owner and all cost associated with the removal shall be the property owner’s responsibility. The maintenance of all landscaping in sewer line easements is the responsibility of the property owner.

5.4.D.XII. SEWER MAIN CONNECTIONS AT MANHOLES

Gravity sewer main connections (not services) at a manhole are described as the upstream pipe connection, the downstream pipe connection, and the intersecting pipe connections. Gravity sewer main connections shall be in accordance with Standard Drawings available on the City’s website. There shall be no more than four main connections at a manhole.

1. Flow will not be permitted to change horizontal flow direction by more than 90 degrees in a manhole. Under the following conditions, the maximum horizontal change in flow direction permitted will be 50 degrees although special design considerations will be made where the situation warrants:
 - a. All lines larger than 36 inches.
 - b. Any lines with design flow greater than 3.0 MGD and a design velocity of 5.0 ft/s or greater.
 - c. Any junction of two flows, each with design flow greater than 3.0 MGD, where one line has a design pipe velocity of 5.0 ft/s or greater.
2. The upstream pipe shall be the same or smaller diameter than the downstream pipe. The design shall call for differing pipe sizes to match soffits at the entrance and exit of the manhole.

3. Where onsite sewage collection systems from developments connect to mains on arterial streets, the invert of the intersecting pipe should be at or above the crown elevation of the downstream pipe. Intersecting pipes shall be of equal or smaller diameter than the downstream pipe.
4. In all cases, the invert of the downstream pipe shall be at least 0.1 feet lower than the invert of the upstream pipes and intersecting pipes and shall be low enough to maintain the energy gradient across the manhole.

5.4.D.XIII. CROSS CONNECTIONS

There shall be no physical connections between a public or private potable water supply system or storm drainage system and a sanitary sewer, or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply or storm drainage system. No water pipe shall pass through or come into contact with any part of a sanitary sewer manhole.

5.4.D.XIV. SEPARATION FROM WATER MAINS

To minimize the potential for cross contamination, gravity sanitary sewer mains and force mains shall be laid at least 10 feet horizontally from any existing or proposed water line. In situations where it is not feasible to maintain a 10-foot separation the design engineer may propose a reduced distance. Such reductions may only be approved and granted by the Development Services Department or designee and may be allowed provided the sewer main is laid in a separate trench or an undisturbed earth shelf located on one side of the water line at an elevation so that the bottom of the water main is at least 18 inches above the top of the sewer line.

1. Gravity sanitary sewer mains and force mains crossing water lines should be laid to provide a minimum separation of 18 inches between the outside of the sewer main and outside of the water line. This separation should be maintained where the sewer main is either above or below the water line. Where possible the water main should always be above the sewer line. The crossing should be arranged so that the water main joints will be equidistant and as far as possible from the sewer line.
 - Where it is impracticable to obtain proper horizontal and vertical separation, the sewer line should be designed and constructed equal to the water main and should be pressure tested to assure water tightness. Encasement of the water line may also be required by the Development Services Department or designee in accordance with Standard Drawing S-5 on the City's website.

5.4.D.XV. SEPARATION FROM STORM DRAINS AND CULVERTS

Sewer mains shall maintain six (6) feet horizontal and 18 inches vertical separation from storm drains and culverts as measured between the crown of the lower and invert of the upper where possible. Sewer lines crossing less than two (2) feet below a storm drain or culvert will require pipe encasement. Whenever possible, the sanitary sewer should be placed below the storm sewer.

5.4.D.XVI. SEPARATION FROM OTHER UTILITIES

Sewer mains shall maintain a minimum six (6) feet horizontal separation and two (2) feet vertical separation to any underground utility where possible, all measurements outside to outside.

5.4.D.XVII. LOCATOR TAPE AND TRACER WIRE

Install detectable marking tape continuous over the top of the pipe. The marking tape shall be buried eighteen (18) inches over the top of the buried gravity or force main. If curvilinear, a 12-gage tracer wire shall also be buried along with the pipe.

5.4.D.XVIII. BUOYANCY

Buoyancy of sewers shall be considered, and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

5.4.D.XIX. TRENCHING, BEDDING, AND BACKFILL

Trenching, bedding, and backfill for shall conform to NMAPWA standards and Standard Drawing S-4 on the City's website.

5.4.D.XX. TESTING PROCEDURES

Air testing, exfiltration testing, vertical deflection testing, and televising of sanitary sewer pipes shall follow and adhere to the requirements and protocols as outlined in the NMAPWA specifications.

5.4.E Manholes – Design Criteria

5.4.E.I. GENERAL

The design and construction of gravity sanitary manholes shall conform to the design standards in this manual and Standard Drawings S-1, S-2, and S-3 on the City's website.

5.4.E.II. MANHOLE LOCATIONS

Manholes shall be installed at the following locations:

1. Changes of grade or slope.
2. Changes of pipe size.
3. Changes of horizontal or vertical alignment.
4. Changes in pipe material.
5. Pipe intersections except with service connections less than 8-inches in diameter.
6. Service connections 8-inches in diameter and larger.
7. The end of each public sewer line.
8. At distances not to exceed the spacing shown in Table 5.15.

Where feasible, manholes are to be installed at street intersections. Manholes should also be located outside of bike lanes, sidewalks, or multi-use paths whenever possible. Manholes shall not be located in areas subject to immersion during storm events, such as gutters and ponding areas.

Direct access by maintenance vehicles shall be provided to each manhole. The access drive shall be a minimum of 10 feet in width and shall be an all-weather surface, such as asphalt or concrete paving, or adequate gravel base and shall be capable of supporting maintenance vehicles weighing up to 14 tons.

5.4.E.III. MANHOLE SPACING

Manholes shall be required along collection mains at distances not greater than the maximum manhole spacing as shown in Table 5.15 below.

Table 5.15: Maximum Manhole Spacing	
Pipe Size (in)	Maximum Manhole Spacing (ft)
≤ 21	450
≥ 24	500

5.4.E.IV. MANHOLE DIAMETER

The minimum manhole diameters and standard frame and cover sizes for various pipe sizes are shown in Table 5.16 below.

Table 5.16: Minimum Manhole Diameters			
Pipe Diameter (in)	Manhole Dept (ft)	Minimum Manhole Diameter (in)	Minimum Frame and Cover Diameter (in)
≤ 15	≤ 12	48	30
≥ 15	> 12	72	30

5.4.E.V. CLEAN OUTS

Shall conform to the design standards within this manual and Standard Drawing available on the City's website. Clean outs are not permitted on mains.

5.4.E.VI. MANHOLE STUB OUTS

Manholes on the boundaries of subdivisions and at other locations directed by the Development Services Department or designee shall include full line size stubs with shaped inverts, oriented to accommodate future connections or extensions. All 20-foot stub outs shall be plugged.

5.4.E.VII. MANHOLE SEPARATION FROM WATER MAINS

No water pipe shall pass through or come into contact with any part of a sewer manhole or connection structure.

5.4.E.VIII. DROP MANHOLES

Drop manholes shall be required where the invert of the upstream pipe section entering the manhole is greater than two (2) feet above the invert of the downstream pipe section exiting the manhole. Drop manholes shall be designed and constructed in accordance with Standard Drawing S-10 on the City's website.

5.4.E.IX. FLOW CHANNEL

Flow channels shall be required in all manholes, connecting the inverts of the upstream and downstream pipe sections. The flow channel straight through a manhole shall be made to conform as closely as possible in shape, and slope to that of the connecting sewers. Flow channel height and slope requirements are shown in Tables 5.17 and 5.18 below.

Table 5.17: Minimum Flow Channel Heights	
Pipe Diameter (in)	Minimum Flow Channel Heights
< 15	½ of the pipe diameter (to pipe centerline)
≥ 15	¾ of the pipe diameter

Table 5.18: Minimum Flow Channel Slopes	
Type of Manhole/Flow Channel	Minimum Flow Channel Slope
Manholes on continuous slope, straight alignment pipelines	2.5% slope from entrance to exit
Manholes at changes in pipe size	Match soffits at entrance and exit of manhole

5.4.E.X. BENCH

A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench shall be sloped to provide a minimum 3-inch fall from the top of the bench to the crown of the pipe or one-half inch per foot (1/2"/ft), whichever is greater. No lateral sewer, service connection, or drop manhole pipe shall discharge onto the surface of the bench. Refer to Standard Drawing S-3 on the City's website.

5.4.E.XI. WATER TIGHTNESS

Manholes shall be of the pre-cast concrete or cast-in-place concrete type. Manhole lift holes and grade adjustment rings shall be sealed with non-shrinking mortar. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place. Refer to Standard Drawing S-3 on the City's website. Other materials may be used for specific applications as approved by the Development Services Department.

5.4.E.XII. COVERS

Where manholes must be located within the 100-year floodplain, or in a location where runoff may accumulate and pond, the manhole shall be installed with a watertight, bolting-type cover to prevent inflow/outflow. The manhole ring shall be bolted to the manhole cone to prevent possible damage due to surcharge. Locked manhole covers with bolting-type covers may be desirable in isolated easement locations or where vandalism may be a problem. Manhole frames and covers shall be designed and constructed in accordance with Standard Drawings S-1 and S-2 on the City's website.

5.4.E.XIII. TESTING

Manholes shall be tested for leakage in accordance with NMAPWA specifications.

5.4.E.XIV. CORROSION PROTECTION FOR MANHOLES

Where corrosive conditions due to septicity or other causes are anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes.

5.4.F Service Connections

5.4.F.I. GENERAL

Service connections to the City of Rio Rancho wastewater system shall conform to Article 51.08 of Chapter 51 of the Rio Rancho Code of Ordinances and Standard Drawings S-6, S-7, and S-8 on the City's website.

When new sanitary sewer main extensions are required, sewer service connections shall be provided to all adjacent properties. These service connections shall:

1. Be sized appropriately for the anticipated future development needs of the adjacent property.
2. Extend from the main to the property line.
3. Be installed at an appropriate depth to serve future gravity flow from the adjacent property.
4. Be properly capped and documented on as-built drawings.
5. Include all necessary easements for future access and maintenance.
6. Be installed in accordance with Standard Drawings S-6, S-7, and S-8.

5.4.F.II. TAPS

Wastewater service connections to newly constructed collection mains shall require the installation of a tee or wye, in conformance with these standards. A directional fitting shall be used at all tap connections.

5.4.F.III. SEPARATE SERVICE TO LOTS

All platted lots, whether existing or proposed as part of a subdivision, shall front on, and have a separate wastewater service connection to a collection main without crossing adjacent lots.

5.4.F.IV. SERVICE ALIGNMENT

Wastewater services shall be installed perpendicular to the collection main, for that portion of the service line that is located in the public right-of-way or easement. Where this is not possible, the wastewater service alignment shall be subject to determination by the Development Services Department or designee.

5.4.F.V. SERVICE CONNECTION SIZES

Table 5.19 below shows the service connection sizes based on the development type.

Table 5.19: Service Connection Sizes	
Development Type	Service Connection Size (in)
Residential Lots	4 or 6
Commercial Lots	Minimum 6
Multiple Family Lots	Minimum 6
Industrial Lots	Minimum 6

5.4.F.VI. SEPARATION FROM WATER SERVICE

Wastewater services shall maintain a minimum horizontal separation of ten (10) feet from water services.

5.4.F.VII. MAXIMUM MAIN SIZE FOR TAPS

Service connections shall not be directly made into sewer mains 30-inches in diameter and larger. Service connections shall require a minimum 8-inch public sewer main extension, which shall be constructed from the nearest downstream manhole to the point of service.

5.4.F.VIII. PROHIBITED CONNECTIONS

No surface water or ground water may be discharged into the wastewater service. Prohibited connections include roof drains, storm inlets, foundation perimeter drains, area drains for open patios or driveway entrances to parking structures, and ground water sump systems.

5.4.F.IX. MANHOLE CONNECTIONS

Service connections to manholes shall be avoided, except where:

1. The service size is 8 inches in diameter or larger (which requires the installation of a manhole).
2. The service connection is tied to a terminal manhole, located at the end of a cul-de-sac or easement, and there is no possibility of extending the collection main in the future.
3. The service connection elevation cannot be tapped above the springline of the sanitary main.

5.4.F.X. SERVICE CONNECTION INSTALLATION

Service connections to the sewer main shall be watertight and not protrude into the sewer. Saddle type connections shall not be used. All materials used to make service connections shall be compatible with each other and with pipe materials to be joined and shall be corrosion proof.

1. Normally taps extend at right angles to the main. When a tap is made at a manhole the tap may be installed at an angle to the main providing the installation does not restrict flow. The invert of the service connection shall be at or above the crown of the sewer main.

5.4.G Wastewater Lift Stations

5.4.G.I. GENERAL

Shall be designed according to the NMED, Construction Programs Bureau, “Recommended Standards for Wastewater Facilities, latest version.”

5.4.G.II. DESIGN ANALYSIS REPORT (DAR)

In addition to meeting the requirements set forth in the “Recommended Standards for Wastewater Facilities, latest edition,” the design engineer shall submit a DAR to the City of Rio Rancho, Utility Department, for review.

1. Table 5.20 summarizes the minimum requirements of a lift station DAR.

Table 5.20: Lift Station DAR Requirements	
Item	Description
1	Average Influent Station Flow, gpm
2	Peaking Factor
3	Wet Well Volume, gallons, and cubic feet
4	Average Flow Fill Time, minutes
5	Peak Flow Fill Time, minutes
6	Diameter of Proposed Force Main, inches
7	Velocity in the forcemain under normal operating conditions (if multiple pumps are used, velocity for each multiple pump operation condition should be shown)
8	Pump and System Curve with Duty Point, including the Duty Point for parallel pump operation if applicable.
9	Pump Time based on Average Flow, minutes
10	Pump Time based on Peak Flow, minutes
11	Number of Pump Cycles per Hour
12	Surge Analysis and Recommendations
13	4 floats – “stop”, “lead”, “lag”, and “high”
14	Grading and Drainage Plan – Slope site for accessibility of a vector truck (<3%)
15	Instrumentation and Control considerations including SCADA, alarms, etc. Provide a transducer with digi-gauge output to SCADA

Table 5.20: Lift Station DAR Requirements	
Item	Description
16	Site Layout including emergency generator (ATS) location and overflow prevention location, a 12-foot all weather access road, and a security fence with a 14-foot-wide rolling gate for service vehicles.

- All new lift stations shall be provided with an on-site, permanently installed, emergency generator sized to provide emergency electrical service to the site. Calculations justifying the size of the generator shall be provided. In addition, the lift station shall have a spare pump and site lighting.

5.4.H Force Mains

5.4.H.I. GENERAL

All force mains shall be designed according to the NMED, Construction Programs Bureau, "Recommended Standards for Wastewater Facilities, (latest version)."

5.4.H.II. CLEANOUTS

Cleanouts will be installed at a maximum spacing of every five hundred (500) feet or not to exceed a volume of wastewater over three thousand (3,000) gallons between cleanouts whichever is shorter. Special consideration will be given to cleanout spacing where the required force main diameter is larger than twelve (12) inches. The cleanouts will be constructed in accordance with the City of Rio Rancho Standard Drawing, unless otherwise specified by the City of Rio Rancho Development Services Department or designee.

5.4.H.III. LOCATOR TAPE AND TRACER WIRE

Install detectable marking tape continuous over the top of the pipe. The marking tape shall be buried eighteen (18) inches over the top of the buried force main. 12 gage tracer wire shall also be buried along with the pipe.

5.4.H.IV. LEAKAGE TESTING

All force mains within the City of Rio Rancho wastewater service area shall be hydrostatic tested at a minimum of fifty (50) psi above the design working pressure.

5.4.I Appendices

5.4.I.I. WATER / WASTEWATER STANDARD DETAILS AND DRAWINGS

The most current standard details and drawings are available from the Utilities Department at the City's website.

S-1	Sewer Manhole Cover Type "C"
S-2 (1 of 2)	Sewer Manhole Frames and Covers
S-2 (2 of 2)	Sewer Manhole Frames and Covers
S-3 (1 of 2)	Standard Concrete Manhole
S-3 (2 of 2)	Standard Concrete Manhole
S-4	Pipe Bedding
S-5	Pipe Encasement
S-6	Standard Sewer Service Connection
S-7	Typical Sewer Lateral Connection
S-8	Existing Main - Typical Sewer Lateral Connection
S-9	Standard Air Test for Sewer Mains
S-10	Drop Manhole Connection
S-11	Cradling and Encasement
S-12	Service Line Cleanout
S-13	Chimney Pipe and Base
S-14	Electronic Marker Disk
S-15	Force Main Discharge Manhole
S-16	Force Main Cleanout
S-17	Sanitary Sewer Air Release Valve (ARV)

Water – Standard Details and Standard Drawings

W-1	Reduced Pressure Principle Backflow Prevention Assembly (RPBA)
W-2	Enclosures
W-3	Fire Hydrant Assembly
W-4	Valve Box Assembly
W-5	1"-2" Service Laterals (w/ Curb) Compression
W-6	Concrete Thrust Blocks
W-7	Pipe Bedding
W-8 (1 of 2)	Standard PRV Station
W-8 (2 of 2)	Standard PRV Station
W-9	Standard PRV Station – Structural Details
W-10	Thrust Tie Detail
W-11	Meter Installations 3" or Larger
W-12	Meter Installation Larger than 2" (Double Meter)
W-13	Fire Line Reduced Pressure Valve Assembly
W-14	2" Pressure Vacuum Breaker
W-15	Flushing Valve
W-16	Anchor Block for Vertical Bends
W-17	Retrofit 2" to 1-1/2" Meter
W-18	Retrofit 2" to 1" Meter
W-19	Restrained Joint Lengths (Example)
W-20	Restraining Joint Lengths (Example)

Water Meter Details

WMD-1	Single Service with Curb (Profile)
WMD-2	Single Service Material List/Notes/Diagram

WMD-3	Double Service with Curb Profile
WMD-4	Double Service Parts Diagram
WMD-5	Typical Profile Layout for Paved Streets with Curb
WMD-6	Typical Plan View for Paved Streets with Curb
WMD-7	Unimproved Road Profile with No Curb
WMD-8	Unimproved Road Plan View with No Curb
WMD-9	Service Line Diagram
WMD-10	Meter Can Lid Details
WMD-11	Meter Can Details