CHAPTER 4 – WATER PRODUCTION FACILITIES

4.1 GENERAL REQUIREMENTS

A. General: This document in conjunction with City of Rio Rancho's Standard Drawings, located in the appendix, provides guidance and minimum basic design criteria and standards, as set forth by the Department of Public Infrastructure 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 City Engineer or designee 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.

B. 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 Department of Public Infrastructure to ensure that the lot or land area that is being considered is an adequate size and is consistent with the City's master plans. 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.

4.2 PRESSURE REDUCING STATIONS

A. General: Pressure Reducing or Regulating Valves (PRV) are utilized to control pressures between distribution 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 zones and the existing distribution system layout by the Department of Public Infrastructure on a case-by-case basis. In certain situations, the Department of Public Infrastructure shall require monitoring of the valve(s) via SCADA equipment. PRVs and vaults shall be constructed in accordance with Standard Drawings W-8 and W-9 in Appendix C.

4.3 PUMPING FACILITIES

A. General: Water pumping facilities and booster stations shall be designed to maintain the sanitary quality of pumped water and shall conform to the requirements as set forth in NMED's Recommended Standards for Water Facilities and these design guidelines.

B. Pumping Units and Size: Pumping stations shall consist of a combination of pumps (at least two units should be provided) with the capacity to provide fire demand, maximum day demand, and maximum hour demand. With any pump out of service, the remaining pump(s) should be capable of producing the maximum day pumping demand of the system. Special care shall be exercised in the selection of pumping units and associated components to prevent pressure surges and insure 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.

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% the motor nameplate rating and without using the service factor.

C. Design Criteria: The minimum requirements by the Department of Public Infrastructure 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.
3. 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.
4. The facility entrance shall have dual-swing access gates with at least 16 feet clear 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 site shall be located so that it is not subject to flooding.
8. 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.
9. 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.
10. 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 Department of Public Infrastructure.
11. Provide a spare pump for backup capability.
12. Heavy equipment access for a boom crane shall be incorporated in the site layout.
13. 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.
14. Provide a frost proof gravity line or sump pump for pump station drainage.
15. Provide ventilation, heating, and cooling in the pump station.
16. Provide sound attenuation in residential areas as required by the Department of Public Infrastructure to meet 40 decibels at the property at any time.
17. Provide local and remote electronic telemetry equipment for monitoring discharge pressure and pump motor status.
18. Ample clearances between equipment shall be provided for operation and maintenance activities. Sufficient space shall also be provided for future pump(s) and piping.
19. In general, piping should:
    a. Be designed so that friction losses are minimized,
    b. Not be subject to contamination,
    c. Have watertight joints, and
    d. Be such that each pump has an individual suction line or that the lines be manifolded that they will insure similar hydraulic and operating conditions.
20. Piping shall be protected against surge or water hammer and provided with suitable restraints where necessary. Check valves and flow control valves are recommended

for this purpose. A surge control study may be appropriate, especially for large pumping stations.

21. The suction piping should be arranged to avoid high points where air or gas may collect. The discharge piping should be arranged to avoid high points and air relief valves should be provided at high points.
22. Pipe supports shall be provided to keep weight off the pump. All discharge piping shall be rigidly piped to prevent movement.
23. Suction couplings should be provided on the pump to permit removal and replacement of the pump. The coupling is best located on the suction side due to less frequent pressure variations in the suction line.
24. The discharge isolation valve shall be located downstream from the check valve.
25. The allowable fluid velocities in the suction and discharge piping when the pumps are operating are as follows:
    a. Less than 6 fps for suction piping,
    b. Less than 10 fps for discharge piping, and
    c. In multi-pump suction manifolds, the velocity in the manifold pipe shall be less than 3 fps.
26. Discharge piping shall include:
    a. End spools
    b. Flow control or check valve
    c. Spool with NPT tapped outlets or welded couplings to accommodate a flow sensor and pressure gauge, etc.
    d. Hand wheels for all above ground gate valves
    e. Reducing wye at the manifold
    f. Restrained flexible closure section for access
27. Pump discharges shall be joined to a common header, which shall pass through an above ground flow meter with isolation valves and a valved bypass.
28. A pressure relief valve shall be provided between the discharge header and the supply line.
29. Depending on the motor size and electrical power system, provide reduced voltage motor starters.
30. Electric power controls.
31. Corrosion protection for underground steel and iron.

32. On-site chlorine generation equipment.
33. 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 Department of Public Infrastructure.
34. Provide local and remote instrumentation for monitoring the following:
    a. Discharge valve positions.
    b. Discharge header pressure and flow.
    c. Reservoir level (if applicable).
    d. Upstream pressure (if applicable).
    e. Suction header pressure (if applicable).
    f. Pump status (on-off).
    g. Diesel engine stand-by generator status (on-off).
    h. Total kilowatt demand (station).
35. Provide sensors and alarms to detect the following local and remote:
    a. Water on the floor.
    b. Bearing high temperature for each pumping unit bearing.
    c. Motor windings high temperature for each pumping unit.
    d. Pump building door intrusion.
    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.
36. All facilities require site plan and building safety review and approval by the Department of Public Infrastructure. Such review may result in additional requirements that must be satisfied.

4.4 WELLS

A. 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.

B. Design Criteria: The minimum requirements by the Department of Public Infrastructure for wells 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 dual-swing access gates with at least 16 feet clear 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. Heavy equipment access for a boom crane shall be incorporated in the site layout.
8. The site shall be graded to provide adequate drainage away from structures.
9. On-site chlorine generation.
10. Well casings shall be continuous and watertight from top to bottom except for well screens. The surface shall extend a minimum of 24 inches above the 100-year flood level of record.
11. The well screen diameter shall be the minimum size permitted that will maintain an aperture entrance velocity of 0.1-0.5 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.

12. Joints between screen sections and blank casing spacers shall be welded or threaded and be watertight, straight and strong as the screen.
13. The well shall be sealed and protected from the entry of contaminants or water from any source other than the selected aquifers.
14. 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.
15. 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 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.
16. Well vents shall also 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.
17. 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 ¼ inch per foot. The site shall drain away from the well and be protected against erosion and surface runoff from entering the well.
18. Provide a check valve on discharge line.
19. Provide a hose bib type sampling tap on system side of check valve.
20. Provide an air release valve between the pump and check valve.
21. Below ground pits to house pumping equipment are prohibited.
22. 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 and approved by the Department of Public Infrastructure.

23. After placement of the pump, wells shall be disinfected.
24. All facilities require site plan and building safety review and approval by the Department of Public Infrastructure. Such review may result in additional requirements that must be satisfied.

4.5 WATER STORAGE FACILITIES

A. 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 for draining as well as access and provisions for cleaning including a suitable source of water. The overall objectives of finished water storage are to:

1. Assist in meeting peak flow requirements.
2. Equalize system pressures.
3. Provide emergency water supply in case of component failure.
4. Provide for fire flows.
5. Provide additional needed treatment.

B. Design Criteria: The minimum requirements by the Department of Public Infrastructure 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 dual-swing access gates with at least 16 feet clear 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 any electrical components of the tank 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 Department of Public Infrastructure.
8. Other important design considerations and features are summarized in Table 4.1.

Table 4.1: Water Storage Design Considerations and Features

Water Storage Design Considerations and Features	
1. Heavy equipment access	13. Overflow weir
2. Adequate drainage from structures	14. 24" flanged inspection hatch centered over weir.
3. On-site chlorine generation	15. Hinged shell manhole
4. Acceptable interior and exterior coating systems for potable water	16. Altitude valve, isolation valves, bypass line, and vault
5. Concrete foundation ring	17. Tank discharge line and tank fill line
6. Inside and outside steel ladders	18. Booster station suction line (where applicable)
7. Outside ladder safety cage	19. Tank drain
8. Probe bottles	20. Disinfection system
9. Water level indicator	21. Electrical and telemetry system
10. Tank vent housing	22. Pressure transmitter for telemetry
11. Two separate 24" square-hinged roof access openings (one with inside and outside ladder)	23. Clear area around reservoir to allow vehicle passage
12. Overflow pipe and splash pad	24. Cathodic protection

C. **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 in order to provide guidelines for the design of each site. Based on previous analysis, the following table identifies the minimum design criteria for chlorine facilities:

Table 4.2: 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