

**CITY OF MOAB
RESOLUTION #46-2017**

**A RESOLUTION ADOPTING THE WATER SYSTEM DESIGN CRITERIA MANUAL,
WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA MANUAL, AND APWA
MANUAL OF STANDARD SPECIFICATIONS (UTAH CHAPTER)**

WHEREAS, the City, to maintain the quality of new infrastructure improvements, desired to assess and update its minimum criteria and standards for said improvements; and,

WHEREAS, the Moab City Council (Council) approved Ordinance No. 2017-02, a temporary moratorium on new commercial site plan applications pending the revision of city ordinances relating to said criteria and standards; and,

WHEREAS, with the aid of a consultant, Hansen, Allen & Luce, Inc., appropriate criteria and standards were developed or selected from existing sources.

NOW, THEREFORE, be it Resolved by the Moab City Council, that the *Water System Design Criteria Manual*, *Wastewater Collection System Design Criteria Manual*, and *APWA Manual of Standard Specifications (Utah Chapter)* are adopted.

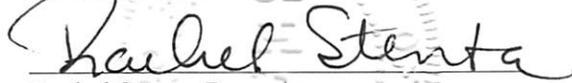
PASSED AND APPROVED in open Council by a majority vote of the Governing Body of Moab City Council on August 8, 2017.

SIGNED:

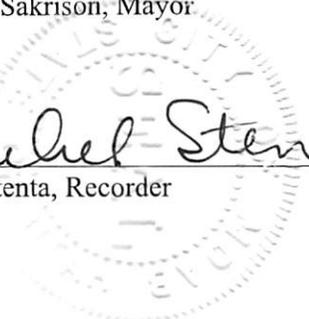


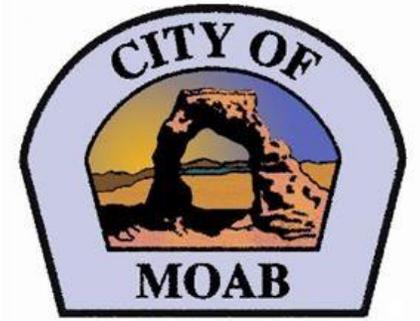
David L. Sakrison, Mayor

ATTEST:



Rachel Stenta, Recorder



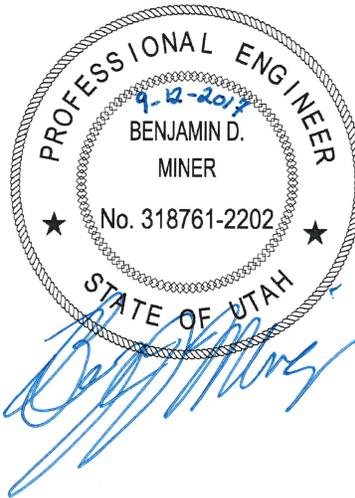


WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA MANUAL

Adopted: August 8, 2017

CITY OF MOAB

WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA MANUAL



**HANSEN
ALLEN
& LUCE_{inc}**
ENGINEERS

Adopted: August 8, 2017

Table of Contents

Contents

1.1 Introduction	1
1.2 Jurisdiction	1
1.3 Purpose	1
1.4 Amendments and Revisions.....	1
1.5 Enforcement Responsibility	2
1.6 Review and Acceptance	2
1.7 Interpretation.....	2
1.8 Relationship to Other Standards.....	3
1.8.1 State Public Wastewater System Code and Rules	3
1.8.2 State Construction Code	3
1.9 Variances from these Criteria	3
1.10 Adoption of the Utah Chapter of the American Public Works Association (APWA) Standard Plans and Specifications	3
1.11 Gray Water Irrigation Systems.....	3
1.12 Special Wastes and Industrial Pre-Treatment	4
1.13 Acronyms	5
1.14 Definitions of Terms.....	6
2.1 Introduction	9
2.2 Planning Policy	9
2.3 Design Policy	9
2.4 Construction of Public Improvements Policy.....	9
2.5 Ownership of Public Improvements Policy	10
2.6 Operations and Maintenance Policy.....	10
2.7 Hazard Minimization and Public Safety Policy.....	10
2.8 Duty of the Engineer Preparing Development Documents	11
3.1 Introduction	12
3.2 Review Process.....	12
3.2.1 Pre-Application Consultation	12
3.2.2 Wastewater Utility Report Requirements	12
3.2.2.1 Format.....	12

Table of Contents

3.2.2.2 Stand-Alone Document.....	12
3.2.2.3 Submittal Adequacy	13
3.2.3 Review by Referral Agencies.....	13
3.3 Acceptance.....	13
3.3.1 Final Utility Report Required for Construction	13
3.3.2 Approval Limitation for Final Utility Report.....	13
3.4 Preliminary Wastewater Utility Report.....	13
3.4.1 Wastewater System Modeling.....	16
3.5. City Designation of Connection Points.....	16
3.6. Geotechnical Investigation and Report	16
3.7 Final Wastewater Utility Report	16
3.7.1 Wastewater System Modeling.....	19
3.7.2 Disclaimer.....	19
3.8 Construction Drawings	19
3.8.1 Wastewater System Improvements	19
3.8.2 Indemnification Statement	19
3.8.3 Construction Drawing Requirements.....	20
3.8.3.1 Wastewater Utility Construction Drawings	20
3.9 Record Drawings	22
4.1 Design Criteria - Reference Design Documents	23
4.2 Prohibited Installations	23
4.3 Unlawful Connections	23
4.4 Minimum Wastewater System Design Criteria.....	24
4.4.1 Design Flows	24
4.4.2 Hydraulic Design	24
4.4.3 Pipe Sizes and Grades	25
4.4.4 Selection of Pipe Material.....	25
4.4.5 General Wastewater System Layout Criteria.....	25
4.4.5.1 Location.....	25
4.4.5.2 Horizontal Layout.....	25
4.4.5.3 Vertical Layout	26
4.4.5.4 Sanitary Sewer Main Crossing a Water Main.....	26

Table of Contents

4.4.5.5 Sanitary Sewer Main Crossing of a Storm Drain	26
4.4.5.6 Limits on Minimum Vertical Clearance	26
4.4.6 Bored Crossings.....	26
4.4.7 Manholes	27
4.4.7.1 Layout.....	27
4.4.7.2 Manhole Sizing.....	28
4.4.7.3 Drop Manholes	28
4.4.7.4 Main Connections to Existing Manholes.....	29
4.4.7.5 Sanitary Sewers and Manholes Greater than 20 Feet	29
4.4.8 Inverted Wastewater Siphons	29
4.4.9 Fill Areas.....	29
4.4.10 Future Connections.....	29
4.4.11 Sanitary Sewer Service Lines.....	29
4.4.12.1 Ownership.....	29
4.4.12.2 Layout.....	30
4.4.12.3 Cleanouts	30
4.4.12.4 Structural Requirements.....	30
4.5 Easements.....	30
4.6 Sand/Oil and Grease Interceptors	31
5.1 Sewage Pump Stations (Lift Stations) and Force Mains.....	32
5.1.1 Scope.....	32
5.1.2 Compliance with State of Utah Standards.....	32
5.1.3 City Review and Approval	32
5.1.4 Flood Protection.....	32
5.1.5 Accessibility and Security	32
5.1.6 Grit	32
5.1.7 Station Ventilation	32
5.1.8 Odor Control	33
5.2 Minimum Lift Station Design Criteria.....	33
5.3 Pump Equipment and Protection	34
5.3.1 Pump Characteristics	34
5.3.2 Pump Protection	35

Table of Contents

5.4 Overflow Basins	35
5.5 Force Main Design Criteria.....	35
5.5.1 Pipe Materials	35
5.5.2 Velocity and Pipe Diameter	35
5.5.3 Pipe and Design Pressure.....	35
5.5.4 Shutoff and Check Valves.....	35
5.5.5 Isolation Valves	36
5.5.6 Combination Air Release and Air/Vacuum Valves	36
5.5.7 Drain Valves	36
5.5.8 Cleanouts	36
5.5.9 Termination.....	36
5.5.10 Identification.....	36

Chapter 1. General Provisions

1.1 Introduction

These criteria and design standards together with all future amendments shall be known as the The City of Moab Wastewater Collection System Design Criteria Manual (hereafter called “Criteria”). All utility reports and plans, analyses, and designs, submitted as a requirement of the City of Moab Regulations (hereafter called “Regulations”), shall comply with these *Criteria*.

1.2 Jurisdiction

These Criteria shall apply to all land within the incorporated area of the City of Moab, or served by the City, including any public lands. These Criteria shall apply to all systems and facilities constructed in or on City Rights-of-Way, easements dedicated for utilities across public or private property, easements for public use, and to all privately owned and maintained system facilities.

1.3 Purpose

Presented in these Criteria are the policies and minimum technical criteria for the planning, analysis and design of wastewater collection systems within the boundaries of the City of Moab and areas served by the City. All subdivisions, site plans or any other proposed construction submitted for acceptance under the provisions of the Regulations shall include adequate and appropriate wastewater system planning, analysis, and design. Such planning, analysis, and design shall conform with or exceed the Criteria set forth herein. Wastewater collection system planning, analysis, and design that require policies and technical expertise not specifically addressed in these Criteria shall follow the provisions of the Utah State Code and Utah Code Annotated. In the event of a conflict, the State of Utah Codes and Rules will prevail. Interpretation will be provided by the City of Moab and/or the Utah Department of Environmental Quality, Division of Water Quality.

1.4 Amendments and Revisions

Policies and criteria may be amended as new technology is developed or if experience gained in the use of these Criteria indicates a need for revision. All technical criteria and policy changes must be recommended by the City Engineer or Public Works Director. Minor revisions will require the approval of the City. All major revisions will require adoption, by resolution or ordinance of the City Council. The City Engineer may approve minor revisions and technical changes.

Chapter 1. General Provisions

TABLE 1-1 EXAMPLES OF MINOR AND MAJOR REVISIONS

MINOR	MAJOR
Grammar	Policy Changes
Submittal Requirements	
Clarifications	
Construction Detail Revisions for clarification, minor modification	
Technical Criteria Changes	

1.5 Enforcement Responsibility

The City shall review all wastewater system reports, plans, analyses, and designs, submitted as a requirement of the Regulations, for compliance with these Criteria. The Regulations are enforced by the City of Moab and authorized representatives.

1.6 Review and Acceptance

The City shall review all submittals for general compliance with these Criteria. An acceptance by the City **does not** relieve the Owner, Engineer, or Designer from the responsibility of ensuring that the design, calculations, plans, specifications, construction, and record drawings are in compliance with these Criteria, and in compliance with other applicable State and Federal regulations.

The City may, but is not required to, refer submittals to other agencies that have an interest or responsibility for wastewater system issues. Other review agencies may include regional, State, or Federal agencies responsible for wastewater collection, industrial pretreatment, treatment and other wastewater related issues.

1.7 Interpretation

In the interpretation and application of these Criteria, the provisions shall be regarded as the minimum requirements for the protection of the public health, safety and welfare of the residents of the City. These Criteria shall therefore be regarded as remedial and shall be liberally construed to further its underlying purposes.

Whenever a provision of these Criteria and any other provision of the Regulations or any provision in any law, ordinance, resolution, rule or regulation of any kind, contains any requirement(s) covering any of the same subject matter, the requirements that are more restrictive or impose higher standards shall govern, as determined by the City.

Chapter 1. General Provisions

These Criteria shall not abrogate or annul any binding agreements, Development Improvement Agreements, easements, permits, utility reports or construction drawings accepted by the City prior to the effective date of these Criteria.

1.8 Relationship to Other Standards

1.8.1 State Public Wastewater System Code and Rules

Public wastewater systems in the State of Utah are governed by the State of Utah Code, Annotated and the Utah Administrative Code. These codes and rules apply to policy, planning, criteria and construction of public water facilities and prevail if a conflict exists within the Criteria.

1.8.2 State Construction Code

The State of Utah Construction codes and rules, with amendments, are incorporated by reference. These codes and rules apply to policy, planning, criteria and construction of public wastewater facilities and prevail if a conflict exists within the Criteria.

1.9 Variances from these Criteria

Modifications to these Criteria shall require a formal variance request. Variances from the provisions of these Criteria may be considered on a case-by-case basis for specific applications only, and shall not establish a precedent for any other project or future development.

1.10 Adoption of the Utah Chapter of the American Public Works Association (APWA) Standard Plans and Specifications

The latest Utah APWA Manual of Standard Plans and Manual of Standard Specifications and drawings are hereby adopted as the City of Moab Standard Details and Standard Specifications for wastewater system improvements. Variance from these standards must be approved by the City. In the event that multiple standards or sections of the standard apply, the City will determine the applicable standard.

1.11 Gray Water Irrigation Systems

Gray water irrigation systems within the City of Moab are regulated by the Southeastern Utah Health Department (Health Department). Application for graywater systems must be made to the Health Department. Graywater systems must comply with Health Department requirements and the Utah Administrative Code {R317-401 U.A.C.}.

Chapter 1. General Provisions

1.12 Special Wastes and Industrial Pre-Treatment

The City shall be notified of any potential waste streams that are different than typical residential wastes in quantity or characteristics. Specifically, the following pollutants are prohibited:

- Pollutants which create a fire or explosion hazard in the City wastewater treatment plant (WWTP) or collection system, including, but not limited to, waste streams with a closed cup flashpoint of less than 140°F (60°C);
- Pollutants which will cause corrosive structural damage to the WWTP or collection system. Discharges with a pH lower than 5.0 or greater than 10 are prohibited;
- Solid or viscous pollutants in amounts which will cause obstruction to the flow in the system resulting in interference;
- Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge at such volume or strength as to cause interference in the WWTP or collection system;
- Heat in amounts, which will inhibit biological activity in the WWTP, resulting in interference, but in no case, heat in such quantities that the influent to the sewage treatment works exceeds 104°F (40°C);
- Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;
- Pollutants which result in the presence of toxic gases, vapor, or fumes within the WWTP or collection system in a quantity that may cause health or safety problems;
- Any trucked or hauled pollutants, except at discharge points designated by the WWP; or
- Any substance that contains concentrations of constituents greater than those specified in Table 1-2.

TABLE 1-2 LIMITS TO WASTEWATER DISCHARGE

CONSTITUENT	CONCENTRATION (mg/L)
Total solids (TS)	600
Volatile solids	300
Total suspended solids (TSS)	250
Volatile suspended solids	200
5-day Biochemical oxygen demand (BOD ₅)	200
Chemical oxygen demand (COD)	500
Total Nitrogen (TN)	60
Ammonia (NH ₄)	10
Total Phosphorus (TP)	10

Chapter 1. General Provisions

These special wastes may require pre-treatment, which includes providing any necessary treatment technology, equipment, disposal, and expert operators necessary for proper treatment. This proper treatment includes all resources necessary such that the waste stream delivered to the City of Moab wastewater collection and treatment facilities meets the above criteria and is acceptable to the City. The waste stream may not cause or facilitate violation of the facility's Utah Division of Water Quality discharge permit, volume and flowrate capacities and processing limitations. The developer/owner must meet with the City prior to connection to determine the specific requirements for special wastes.

1.13 Acronyms

As used in this Manual, the following acronyms shall apply:

ANSI	American National Standards Institute
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
BOP	Bottom of Pipe
CD and CDs	Construction Drawing(s)
DIA	Development Improvement Agreement
HP	High Point
IPC	International Plumbing Code
IRC	International Residential Code
LP	Low Point
Max	Maximum
Min	Minimum
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
NAVD	North American Vertical Datum
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PDF	Peak Design Flow or Portable Document Format
PE	Professional Engineer
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
SCADA	Supervisory Control and Data Acquisition
TOP	Top of Pipe
OWTS	On-Site Wastewater Treatment System

Chapter 1. General Provisions

1.14 Definitions of Terms

CITY shall mean the City of Moab, Utah.

CITY COUNCIL means the Moab City Council.

CITY ENGINEER shall mean the City of Moab Engineer or other authorized representative of the Engineering Department.

CODE or MUNICIPAL CODE shall mean the City of Moab Municipal Code, as amended.

CONSTRUCTION DRAWING(S) (CD or CDs) shall mean Construction Drawings prepared by a Professional Engineer licensed in the State of Utah for the Developer and approved by the City depicting Public and/or Private Improvements to be constructed for the Project.

CRITERIA or DESIGN CRITERIA shall mean the design criteria and requirements contained herein for wastewater facilities to be constructed in the City.

DETAILS or STANDARD DETAILS shall mean details issued by City to be used or referenced in the Construction Drawings.

DEVELOPER shall mean the party or parties desiring to construct Public and/or Private Improvements within City rights-of-way or easements, securing all required approvals and permits from the City and other applicable entities, and assuming full and complete responsibility for the Project.

DEVELOPMENT IMPROVEMENT AGREEMENT (DIA) shall mean a formal agreement between a Developer and the City that addresses development conditions and obligations.

EASEMENT shall mean the right of the City to use lands owned by a another party for the purposes of maintenance, access, utilities, drainage or other use, as specified in an agreement between the City and the other party.

ENGINEER shall mean the Professional Engineer retained by the Developer responsible for the creation and submission of utility reports and construction drawings to the City for approval for the purpose of one-time construction of facilities.

ENGINEERING DEPARTMENT shall mean the City of Moab Engineering Department.

GRAY WATER shall mean untreated wastewater, which has not come into contact with toilet waste. Graywater includes wastewater from bathtubs, showers, bathroom washbasins, clothes

Chapter 1. General Provisions

washing machines, laundry tubs, etc., and does not include wastewater from kitchen sinks, photo lab sinks, dishwashers, garage floor drains, or other hazardous chemicals

LIFT STATION shall mean a sewage pumping station.

MUNICIPAL CODE – See CODE.

OWNER shall mean the person(s) in title to any portion of the Property, according to the records of the Grand County Clerk and Recorder. The use of the singular “Owner” shall refer to all Owners of the Property.

PRIVATE IMPROVEMENTS shall mean those improvements not identified as Public Improvements, and which are not generally installed within the City rights-of-way, easements, or other City-owned lands.

PROFESSIONAL ENGINEER shall mean an individual currently registered with the Utah Division of Professional and Occupational Licensing as a professional engineer.

PROJECT shall mean the Public or Private Improvements as designated in the approved Construction Drawings to be constructed in conformance with these Design Criteria. The Project is inclusive of any and all Public or Private Improvement Projects for or within the City, whether Development Projects, Private Utility Projects, Capital Improvement Projects or other types of projects.

PROPERTY shall mean the real property located in the City of Moab.

PUBLIC IMPROVEMENTS shall mean those public facilities including, but not limited to, pavement, curb and gutter, sidewalk, pedestrian/bike/equestrian paths, storm drain facilities with related appurtenances, culverts, channels, bridges, water distribution, transmission and storage facilities with related appurtenances, wastewater collection facilities with related appurtenances, water purification facilities, pavement markings/signage/stripping, traffic signals and related appurtenances, and those processes integral to construction of other Public Improvements listed herein, which upon their completion are to be dedicated to the City for operation and maintenance by the City and which are installed within the City rights-of-way, easements, or other City-owned lands.

PUBLIC WORKS DIRECTOR shall mean the City of Moab Public Works Director

REGULATIONS shall mean the Charter, ordinances, resolutions, rules and regulations of the City, including the Code, and other provisions of all zoning, subdivision and building codes or

Chapter 1. General Provisions

any other applicable design criteria adopted by the City, as the same may be amended periodically and applied uniformly throughout the City.

SHALL shall mean a mandatory requirement or condition, as approved by the City.

STANDARD DETAILS – See DETAILS.

VARIANCE REQUEST shall mean a formal request with adequate documentation and justification for a variance from the standards, provisions, policies or submittal requirements set forth in these Design Criteria that meets the requirements in Section 1.9 of these Design Criteria.

WASTEWATER MASTER PLAN shall mean the City of Moab Wastewater Master Plan.

Chapter 2. Wastewater Collection System Policies

2.1 Introduction

Provisions for adequate service, wastewater collection and treatment are necessary to preserve and promote the general health, welfare, and economic well-being of the residents of the City of Moab. The City of Moab must provide coordination, review, and master planning of the system in order that the integration of each component of the system meets the intent and purpose of the system as a whole. The development of the City's wastewater system is governed by the policies provided below, as facilitated through the implementation of the Criteria contained herein.

2.2 Planning Policy

All developments on land within the City that are served by the City's public wastewater system shall provide planning and design for wastewater loadings, including peaking factors. Reports and plans shall be submitted for all new development and redevelopment within the City jurisdiction. These reports shall conform to the requirements set forth herein and the provisions otherwise stipulated by the City during the development process. Redevelopment shall be defined as any land disturbance or reconstruction that results in a reconfiguration of existing wastewater system facilities or an increase in demands.

During the initial planning stages of the development, a pre-application meeting shall be coordinated with the City. One purpose of this meeting is to assist the City and the developer to determine the level of wastewater service that is available and needed by the developer.

2.3 Design Policy

Wastewater system planning and design within the City shall adhere to the Criteria contained herein, the administrative rules promulgated by the Utah Division of Water Quality, the Utah Division of Water Rights (as related to return flows) and acceptance procedures of the City. Prohibited facilities and connections shall be as described in these Criteria.

2.4 Construction of Public Improvements Policy

The construction of improvements for and within the City shall conform to the City's construction permit, standard details and approved plans, and shall adhere to all City, County, State, and Federal regulations applicable to the work. This shall include the acquisition of all necessary permits, which may include, but not be limited to, stream alteration permits, discharge permits, road cut permits, flood plain related permits and letters (including FEMA review and approval when applicable), Utah Division of Water Quality approvals, traffic control permits and all other required permits and approvals. At the completion of construction, all permits and service agreements with power companies and any other private utilities shall be transferred into the Developer's name, and shall under no circumstances be transferred to, or held in the name of

Chapter 2. Wastewater Collection System Policies

the City, unless the City is the customer. Any work proposed to take place within existing City of Moab streets must be reviewed and approved by the City. The type of crossing allowed, traffic control, street repair specifications, etc. shall be as determined by the City.

Prior to placing the facilities into service and initial acceptance by the City, all construction related provisions required by the City shall be satisfied, including startup procedures, inspections and testing of the facilities, and receipt of O&M Manuals and Record Drawings. Additionally, the developer shall comply with warranty requirements included in the Developments Improvements Agreement (DIA).

2.5 Ownership of Public Improvements Policy

The delineation between City-owned and privately owned portions of the system and the associated maintenance responsibilities for each, shall be as set forth in the latest editions of the Municipal Code and Standard Details. Upon execution of Final Acceptance, sanitary sewers, force mains, lift stations, and all appurtenant City-owned facilities, shall become the sole property of the City, and full legal and equitable title thereto shall be vested in the City free and clear of any liens, claims or rights of any third party in or to the Public Improvements.

2.6 Operations and Maintenance Policy

The design of all wastewater system facilities within the City must provide for access and long-term operation and maintenance of the facilities by the City. Operation and Maintenance manuals associated with all components to be installed as part of the wastewater system shall be provided to the City with the Record Drawings, unless otherwise specifically waived by the City.

Utility easements or tracts and access easements shall be provided for all wastewater system facilities outside of public right-of-way as set forth in these Criteria, or as otherwise required by the City, and shall be adequate for the operation, maintenance and replacement of the facilities.

2.7 Hazard Minimization and Public Safety Policy

Public safety and the protection of City staff shall be an essential objective when planning, designing, constructing, operating and maintaining the City's wastewater collection system facilities. All such facilities shall be designed with careful consideration of the potential hazards associated with the use and long-term operation and maintenance of the facility. The design phase of all projects shall evaluate the health and safety risks associated with the facilities, and shall include appropriate design features to minimize these risks and to adequately protect the general public and City personnel from the hazards. Equipment for confined space entry in accordance with OSHA and other applicable regulatory agency requirements shall be provided at all City of Moab facilities, as required. Hatches with fall prevention covers, intermediate

Chapter 2. Wastewater Collection System Policies

platforms, handrails, safety lighting, ventilation etc. shall be as required by the City, or any applicable code.

2.8 Duty of the Engineer Preparing Development Documents

These standards establish criteria and policies for the design and subsequent construction of the City's public wastewater system. These standards are not intended to substitute for engineering knowledge, judgement or experience. It is the responsibility of the design (development) Engineer to understand and apply sound engineering principals related to public wastewater systems to the planning, design and construction of wastewater system improvements. It is also the responsibility of the Engineer to understand all federal, state and local regulations related to the public wastewater system.

These criteria should be reviewed by the Engineer, who shall evaluate their applicability. If the Engineer identifies criteria that are inapplicable or inappropriate in a specific location or specific situation, the engineer shall bring the issue to the attention of the City.

Chapter 3. Wastewater Collection System Submittal Requirements

3.1 Introduction

The requirements presented in this chapter shall be used to aid the Engineer or Applicant in the preparation of utility reports, modeling evaluations, and Construction Drawings for wastewater system facilities. This Chapter applies primarily to submittal requirements for wastewater collection systems and the associated Criteria provided in Chapter 4. The requirements presented herein are the minimum necessary, and will be used to evaluate the adequacy of all submittals made to the City.

3.2 Review Process

3.2.1 Pre-Application Consultation

A pre-application consultation with the City of Moab Planning Department is strongly encouraged for any type of development or redevelopment. The purpose of this meeting is to discuss general information about the project, pertinent aspects of the Criteria, the required scope of the utility reports, and any special procedures, analyses, and submittal requirements that may be applicable.

3.2.2 Wastewater Utility Report Requirements

Preliminary and final wastewater utility reports shall be provided to the City of Moab. The purpose of the preliminary wastewater utility report is to identify existing wastewater infrastructure, provide preliminary estimates of wastewater loading, provide an initial plan for wastewater infrastructure and determine the feasibility of providing wastewater service to the development via the public wastewater collection system. The purpose of the final wastewater utility report, which is to be submitted with the final construction plans, is to identify the final wastewater infrastructure plan.

3.2.2.1 Format

All required reports shall be prepared on 8½" x 11" paper (except that maps and figures shall generally be 11" x 17" or larger) and be bound, and shall follow the format contained in the report checklists. Supporting drawings, figures, and tables shall be bound into the reports or included in an attached pocket. Reports shall include a narrative presenting the project for review in accordance with the information presented in these Criteria, and the requirements established by the City for the appropriate submittal.

Paper and electronic (PDF) copies of the report shall be provided. Electronic files of computer models and GIS files shall be provided if requested by the City.

3.2.2.2 Stand-Alone Document

The wastewater utility reports shall be stand-alone documents. When references are made or assumptions are based on previously submitted reports, the reports must include the appropriate

Chapter 3. Wastewater Collection System Submittal Requirements

excerpts, pages, tables, and maps containing the referenced information. Assumptions made in previous reports must be verified and substantiated in subsequent reports. Reports shall be legible.

3.2.2.3 Submittal Adequacy

Any report with incomplete or missing information shall result in the report being returned without review. The City reserves the right to require additional information beyond that specifically required in these Criteria.

3.2.3 Review by Referral Agencies

The review and approval of the project by State, Federal, and local agencies other than the City, shall be the responsibility of the Developer. The Developer shall be required to address all referral agency comments, and to have such comments incorporated into the applicable utility report and plans submitted to the City.

3.3 Acceptance

3.3.1 Final Utility Report Required for Construction

The final wastewater utility report shall conform to the construction documents used to bid the project, and shall be approved by the City prior to the construction of any wastewater system improvements.

3.3.2 Approval Limitation for Final Utility Report

The approval of the final wastewater utility report shall expire simultaneously with the expiration of the approval of the project unless extended in conformance with the provisions of the Municipal Code. At the time the approval of the final utility report expires, the report shall be deemed invalid and a resubmittal will be required. In order to be re-approved, it must be demonstrated that the concepts, designs, and calculations presented in the report are consistent with the City's current Criteria.

3.4 Preliminary Wastewater Utility Report

The Preliminary Wastewater Utility Report shall review and discuss the existing wastewater system infrastructure and the wastewater needs of the development. The report shall also identify the existing infrastructure needed to support the development. The City Engineering Department and Public Works Department will coordinate with the developer to provide the wastewater system data needed as an input to the Engineer's design.

Chapter 3. Wastewater Collection System Submittal Requirements

The following outline sets forth the required minimum content to be provided in the Preliminary Wastewater Utility Report that shall be submitted:

I. PROJECT INFORMATION

- A. Name of Project, including legal name of development.
- B. Address.
- C. Owner.
- D. Developer.
- E. Engineer.
- F. Submittal date and revision dates as applicable.

II. PROJECT LOCATION AND DESCRIPTION

- A. Site Location.
 - 1. Site Vicinity Map.
 - 2. Township, Range, Section, and ¼ Section.
 - 3. Streets, Roadways, and Highways adjacent to the proposed development.
 - 4. Names of surrounding or adjacent developments.
- B. Description of Property and Land Use.
 - 1. Total area in acres.
 - 2. Total number of equivalent residential units (ERUs) proposed for the development at build-out with a breakdown of units by type projected by phase (if applicable) calculated by utilizing the Utah Administrative Code Minimum Sizing Requirements {R317 U.A.C.}.
 - 3. Area (acres) and land use for all parcels to be served within the development boundaries.
 - 4. Major and minor drainages and floodplains, including FEMA designations.
 - 5. Existing irrigation canals or ditches.
 - 6. Significant geologic features and topography.
 - 7. Existing On-Site Wastewater Treatment Systems (OWTS).
 - 8. Existing water wells.
 - 9. Easements/tracts may not be known initially; however, provide a statement that easements or tracts necessary for utilities will be provided at time of preliminary site plan, in accordance with City standards regarding location and size of easements and tracts.

Chapter 3. Wastewater Collection System Submittal Requirements

III. EXISTING WASTEWATER SYSTEM

A. Existing Collection System.

Discuss the existing sanitary sewers, interceptors, lift stations, and force mains in the vicinity of the development, including sizes and locations that will serve the proposed development.

IV. ESTIMATED PROPOSED LOADINGS

A. Average Day Loadings.

Estimated hydraulic and BOD₅ loadings must be provided for all phases of development. If wastewater is expected to be typical for residential wastewater, BOD₅ may be assumed to be typical. If typical, this assumption shall be stated in the report.

B. Peak Loadings.

Estimated peaking factors for hydraulic loadings shall be provided.

C. Special Waste Characteristics (if different from typical residential wastewater).

A detailed listing of special wastewater constituents shall be provided, along with a detailed description of needed treatment processes. A listing of pre-treatment processes provided by the project Owner shall be discussed in detail.

V. PROPOSED WASTEWATER COLLECTION SYSTEM

A. Proposed Collection System.

Provide a general overview of the anticipated collection system layout, and discuss any extensions from the site to the existing wastewater system that are necessary to serve the development. The locations and types of pipes, manholes, clean-outs, and other facilities shall be provided.

B. Proposed Wastewater Facilities.

Discuss any anticipated lift stations, force mains, pretreatment facilities, etc., that will likely be required to adequately serve the development.

Chapter 3. Wastewater Collection System Submittal Requirements

VI. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the report.

3.4.1 Wastewater System Modeling

The City maintains a wastewater system model. Once the preliminary wastewater system report is received and found to be adequate, the City will determine whether wastewater system modeling is required. If the modeling is required, the City will determine the level of modeling needed for the development and will estimate the cost of modeling. The developer will be responsible for the cost of wastewater system modeling.

3.5. City Designation of Connection Points

If the City of Moab determines that the Preliminary Wastewater Utility Report meets the requirements set forth in these Criteria, the City will provide wastewater service at designated tie-in points.

3.6. Geotechnical Investigation and Report

A geotechnical investigation and report is required to provide a basis for wastewater collection system design. The investigation must include boreholes or excavations to a depth at least 2-feet deeper than the bottom of the anticipated trench excavation. Samples shall be collected and analyzed at a geotechnical laboratory to determine soil classification, moisture contents, dry density, strength, water level (if detected) and corrosion potential. The investigation shall identify expansive and collapsible soils. The report shall include recommendations for foundations backfill, utility and trench construction, and compaction. The report shall include a discussion of the suitability of the on-site soils for use for the intended purposes.

3.7 Final Wastewater Utility Report

The Final Wastewater Utility Report shall describe final wastewater infrastructure, including final modeling and calculations. The Final Wastewater Utility Report shall be consistent with final construction drawings.

The following outline sets forth the required minimum content to be provided in the Final Wastewater Utility Report that shall be submitted with the Construction Documents:

Chapter 3. Wastewater Collection System Submittal Requirements

I. TITLE SHEET

- A. Name of Project, including legal name of Development.
- B. Address.
- C. Owner.
- D. Developer.
- E. Engineer.
- F. Submittal date and revision dates as applicable.

II. PROJECT LOCATION AND DESCRIPTION

- A. Site Location.
 - 1. Site Vicinity Map
 - 2. Township, Range, Section, and 1/4 Section.
 - 3. Streets, Roadways, and Highways adjacent to the proposed development.
 - 4. Names of surrounding or adjacent developments.
- B. Description of Property and Land Use.
 - 1. Total area in acres.
 - 2. Discussion of project phasing, if applicable.
 - 3. Total number of ERUs proposed for the development at build-out with a breakdown of units by type projected by phase (if applicable).
 - 4. Area (acres), land use for all parcels to be served within the development boundaries (initial and future phases, if applicable) and number of lots.
 - 5. Sizes of schools, commercial and industrial buildings (initial and future phases, if applicable).
 - 6. Major and minor drainages and floodplains, including FEMA designations.
 - 7. Existing irrigation canals or ditches.
 - 8. Significant geologic features and topography.
 - 9. Existing On-Site Wastewater Treatment Systems (OWTS).
 - 10. Existing water wells.

III. CALCULATED FLOWS

- A. Average Day Loadings.

Estimated hydraulic and BOD₅ loadings must be provided for all phases of development. If wastewater is expected to be typical for residential wastewater, BOD₅ may be assumed to be typical. This shall be stated in the report.

Chapter 3. Wastewater Collection System Submittal Requirements

B. Peak Loadings.

Estimated peaking factors for hydraulic loadings shall be provided.

C. Special Waste Characteristics (if different from typical residential wastewater).

A detailed listing of special wastewater constituents shall be provided, along with a detailed description of needed treatment processes. A listing of pre-treatment processes provided by the project Owner shall be discussed in detail.

IV. EXISTING WASTEWATER SYSTEM

A. Existing Collection System.

Discuss the existing sanitary sewers, interceptors, lift stations, and force mains in the vicinity of the development, including sizes and locations that will need to be extended to serve the proposed development.

V. PROPOSED WASTEWATER SYSTEM

A. Proposed Collection System.

Provide a description of all proposed wastewater facilities and a general overview of the anticipated collection system layout, including the proposed line sizes. Describe the tie-ins to the existing wastewater system and the sizes and lengths of any extensions necessary to serve the development.

B. Proposed Wastewater Facilities.

Discuss any lift stations, force mains, pretreatment facilities, etc., that will likely be required to adequately serve the development.

C. Land Dedication Requirements.

Generally describe any portions of the proposed wastewater system that are not planned to be located in public right-of-way, and will therefore require the dedication of tracts or utility easements to the City.

Chapter 3. Wastewater Collection System Submittal Requirements

VI. POTENTIAL DEVELOPMENT IMPROVEMENTS AGREEMENT (DIA) ITEMS

Discuss any potential DIA items such as needed off-site improvements, improvements necessary for a project or project phase to be independently sustainable, etc.

VII. POTENTIAL PERMITTING REQUIREMENTS

Generally discuss all foreseeable Federal, State, County, and Local permitting requirements associated with the project.

XI. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the report.

3.7.1 Wastewater System Modeling

The City maintains a wastewater system model. It is anticipated that wastewater system modeling will be performed once the Preliminary Wastewater Utility Report is submitted. The results of the City's wastewater modeling should be included in the Final Wastewater Utility Report. The City of Moab should be notified of any changes. The modeling will be used by the City as needed. The developer will be responsible for the cost of wastewater system modeling.

3.7.2 Disclaimer

The City is not responsible or liable for assumptions made by the Developer regarding utility information associated with the proposed development.

3.8 Construction Drawings

3.8.1 Wastewater System Improvements

Wastewater system improvements within public rights-of-way or utility easements are required to be designed, approved, and constructed in accordance with the City's Regulations, subdivision requirements of the Municipal Code, the City's Design Criteria and Standard Details, sound engineering principles, and the conditions of any variances obtained from the City.

3.8.2 Indemnification Statement

Construction Drawings are reviewed by the City of Moab for concept only. The review does not imply responsibility by the City of Moab for accuracy and correctness of calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial

Chapter 3. Wastewater Collection System Submittal Requirements

responsibility by the City for additional quantities of items shown that may be required during the construction phase.

3.8.3 Construction Drawing Requirements

In general, construction drawings shall include plan and profile drawings that convey the horizontal and vertical alignment of the improvements, and all other pertinent plans, sections and detailing necessary to construct the proposed facilities.

All construction drawings submitted to the City for review, comment, and approval of wastewater system improvements shall be prepared by, or under the direct supervision of a Professional Engineer licensed in the State of Utah. Said Professional Engineer shall be responsible for the information contained on the construction drawings, which shall bear the Professional Engineer's seal prior to final approval for construction.

The Developer, Contractor and Engineer associated with the construction drawings shall be responsible for the adequacy and satisfactory performance of the designs and the installation of all items therein, and any failure or unsatisfactory performance of the system, so constructed, shall not be a cause for action against the City. Approval of the construction drawings by the City signifies only that the construction drawings meet the minimum stipulations of these design criteria and City requirements based upon the information provided to the City by the Engineer and/or Developer, and makes no finding, representation, or warranty that the system and associated components will perform satisfactorily.

3.8.3.1 Wastewater Utility Construction Drawings

In addition to the general formatting and information to be included on all sheets of a construction drawing (e.g., north arrow, scale, project boundaries, lot lines, rights-of-way, tracts, approval blocks, etc.), the following information shall be included on the final Wastewater Utility Plans.

1. Legend: Each sheet shall show the symbols pertaining to the sheet.
2. Vertical Datum: All elevations used for the planning, design and construction of facilities shall be on the NAVD88 Datum. No conversion equation is allowed.
3. Horizontal Benchmark and Coordinates: The horizontal benchmark shall be specified. In order to facilitate the City's GIS mapping efforts, all construction drawings shall be placed in the State Plane NAD83, Utah Central Zone Coordinate System and include the coordinates of a known property corner on or adjacent to the site.
4. Plan views shall be oriented so that north is up on the sheet or to the right.
5. Overall Wastewater System Plan: In plan view, provide all information and dimensions for horizontal layout of proposed sanitary sewer and force mains including but not limited to manholes, wye connections, sanitary sewer service lines, cleanouts, lift stations, and any other appurtenances that are part of the wastewater collection system.

Chapter 3. Wastewater Collection System Submittal Requirements

Coordinates shall be provided for the locations of manholes, lift stations and other key components.

6. Plan views shall show the locations and sizes of all existing and proposed utility lines and appurtenances (water, sanitary sewer, stormwater, gas, electric, telephone, cable, fiber optic, etc.) on and adjacent to the site. Plan views shall show the location of all existing water wells and On-Site Wastewater Treatment Systems (OWTS) on and adjacent to the site.

7. Plan views shall show existing sanitary sewer and force mains with sizes; manholes; sanitary sewer service taps and lines; clean-outs; lift stations; and any other appurtenances that are part of the wastewater collection system on and adjacent to the site.

8. Plan views shall show existing and proposed curb, gutter, and sidewalks; and all existing and proposed obstructions, such as vaults, catch basins, traffic islands, street lights, walls or other permanent structures on and adjacent to the site.

9. Plan views and profiles shall show the tie-ins to the existing wastewater collection system, including sizes of existing sewers. In addition, the nearest manholes on existing sewers shall be shown or, at a minimum, the distance to these manholes shall be included on the CDs.

10. Plan views and profiles shall show all needed off-site improvements, extensions of service or upgrades to the City's wastewater collection system.

11. Plan views shall show and label as to type and width, all existing and proposed easements that are on and adjacent to the site. Recordation information shall be included for all existing easements.

12. Profile views are required for all sanitary sewers and force mains and must show proposed streets profiles and existing ground surface profiles. The following information shall be included:

- a. All high points (HP) and low points (LP) along the sanitary sewer and force mains shall be identified;
- b. Where required by these Criteria, combination air release and air/vacuum valves and drain valves shall be shown on force mains, with the TOP elevations provided.
- c. All utility crossings shall be identified.

13. Profile views or plan views: Adequate pipe elevation information is required for all utility crossings of water, sanitary sewer, force main, stormwater, gas, electric lines, etc. The following information shall be included:

- a. Types and sizes of the utility lines at the crossing and the location of the crossing.
- b. If any pipes at a crossing are to be encased, the coordinates at each end of the encasement, and the type and thickness of the encasements shall be specified. In addition, all utility crossing shall include either:

Chapter 3. Wastewater Collection System Submittal Requirements

- (1) A reference to the sheet where the crossing information is shown; or
- (2) TOP and BOP elevations and vertical clearance at the crossing with a callout of “(Min. = 1.5’)” wherever the clearance is 2 feet or less.

14. Wastewater System Details: All pertinent details related to wastewater system improvements, such as manholes, outside drop manholes, sanitary sewer service line connections, sanitary sewer clean-outs, proposed utility crossings, including concrete blankets, trenching, etc., shall be shown on detail sheets on the construction drawings. References to the Utah APWA plans may be provided. In this case, the detail drawings don't need to be provided in the plan set.

3.9 Record Drawings

All wastewater system improvements constructed within public rights-of-way and dedicated easements must be formally accepted by the City.

Chapter 4. Wastewater Collection System Design Criteria

4.1 Design Criteria - Reference Design Documents

Standards and reference publications pertinent to the design of wastewater facilities within the City are listed below. Unless otherwise specified, the latest editions shall apply.

- Utah State Code, Annotated
- Utah Administrative Code
- Utah American Public Works Association (Utah APWA)
- All applicable International Codes recognized by the City including, but not limited to, the International Building Code (IBC), the International Plumbing Code (IPC), the International Fire Code (IFC), the International Residential Code (IRC), and the International Mechanical Code (IMC)
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- Utah Department of Environmental Quality (UDEQ)
- City of Moab Municipal Code
- City of Moab Wastewater Master Plan
- *Gravity Sanitary Sewer Design and Construction (Current Version). Manuals and Reports on Engineering Practice No. 60.* American Society of Civil Engineers/Water Pollution Control Federation.

4.2 Prohibited Installations

The following installations are prohibited unless otherwise approved by the City. Items listed below reference sections contained in these Criteria that provide the minimum design requirements to be addressed should a variance be pursued.

- On-Site Wastewater Treatment Systems (OWTS)
- Private Ejector Pumps and Private Lift stations, unless approved by the City
- Inverted Wastewater Siphons
- Manholes and sewer lines over 20 feet deep
- Elevated Wastewater Pipelines

4.3 Unlawful Connections

It shall be unlawful to discharge roof drainage, foundation drainage, sump pumps, surface drainage, storm water, solid wastes, or any other illicit discharges to the wastewater collection system..

Chapter 4. Wastewater Collection System Design Criteria

4.4 Minimum Wastewater System Design Criteria

This section presents the minimum technical criteria for the analysis and design of wastewater systems within the boundaries of the City of Moab and other areas served by the City, including collection sewers, sanitary sewer service lines, and the applicable appurtenances associated with these installations. Any special criteria beyond those contained herein, and as determined necessary by the City, shall be discussed at the pre-application consultation (or as the issue arises).

4.4.1 Design Flows

Average daily loadings, peaking factors and average annual loadings shall be based on the criteria included in the current Utah Administrative Code and based upon information included in the Wastewater Master Plan. This information is currently located at {R317-3 U.A.C.}. The City may adjust the loading values based on the evaluation of actual use data, a current master plan or other conditions determined to affect the safety and welfare of the public.

4.4.2 Hydraulic Design

Wastewater systems shall be designed to provide a minimum velocity of 2.0 feet per second at the peak design flow. In situations where the minimum velocity of 2.0 feet per second cannot be met, an explanation and justification shall be included in the Final Wastewater Utility Report. The maximum velocity shall not exceed 10 feet per second.

Drop manholes shall be provided to break steep slopes to limit the velocities in conformance with this criterion. Where drop manholes are impractical for velocity reduction, the sewer must be approved by variance and shall be of PVC or other abrasion resistant material approved by the City.

Where actual flow will be much below normal for several years, the minimum velocity shall be achieved by suitable grades at the initial design flow rate. Care shall be taken to design invert elevations at manholes in such a manner that the energy gradient is consistently falling in the direction of the flow.

Sanitary sewers shall be sized to convey the peak design flow in accordance with the following table:

Pipe Diameter (inches)	Maximum Depth of Flow/Pipe Diameter
≤ 15	0.5
>15	0.75

Computation of velocity of flow shall be based on a coefficient of roughness "n" in the Manning formula as follows: **n = 0.013 (min).**

Chapter 4. Wastewater Collection System Design Criteria

At all junctions where a smaller diameter main discharges in to a larger one, the crowns (obverts) of the two pipes shall have matching elevations. No surcharging of sanitary sewer lines is allowed.

4.4.3 Pipe Sizes and Grades

Sanitary sewer shall be a minimum of 8 inches in diameter. Service lines shall be a minimum of 4 inches in diameter.

The minimum sewer slopes shall comply with the slopes included in Table R317-3-2.3(D)(4) of the Utah Administrative Code.

4.4.4 Selection of Pipe Material

Gravity sewers in the City collection system shall be constructed of PVC, or fiber-glass reinforced polymer mortar, unless special conditions require another material. Force mains shall be PVC or HDPE. Other pipe materials must be approved by the City prior to use. If concrete is to be used, the collection system must be evaluated for sulfide corrosion risk and corrosion mitigation measures must be implemented as needed. Sewers at stream crossings or crossings with water lines shall be ductile iron in accordance with {R317 U.A.C.}. Materials for building sewers (between structures and the City collection main) shall be in accordance with plumbing code.

4.4.5 General Wastewater System Layout Criteria

4.4.5.1 Location

All sanitary sewers and appurtenances shall be installed in dedicated rights-of-way or dedicated utility easements. Sewers or manholes shall not be installed parallel to, and directly below, any concrete such as sidewalks, trails, curbs, or gutters. In general, sanitary sewers shall be located in public streets near the center of the south or west lane. Sanitary sewers and manholes shall not be located in vehicle wheel paths. A sewer shall not be closer than 5 feet to a gutter. Sanitary sewer lines and manholes shall not be located within detention pond areas.

Where it is necessary to locate a sanitary sewer main along back lot lines, the alignment shall be specifically approved by the City. Manholes installed along lot lines shall be provided locking-type covers.

4.4.5.2 Horizontal Layout

Sewers shall be laid with a minimum separation of 10 feet horizontally, edge-to-edge, from all water lines. Sewers shall have a minimum separation of 10 feet horizontally, centerline-to-centerline, from all other existing or proposed utilities wherever possible. The City of Moab must specifically approve any variance from these requirements in the event that it has been determined that it is impossible to maintain the specified horizontal separation distances.

Chapter 4. Wastewater Collection System Design Criteria

Sewers adjacent to developments shall be designed to extend along the entire frontage of the property to be served, from property line to property line, with termination in a manhole. This provides for wastewater service for adjacent Developers or Builders in the future. Within developments, sanitary sewers shall be extended at least ten feet horizontally uphill from the lowest lot corner of the uppermost lot, and shall terminate in a manhole.

4.4.5.3 Vertical Layout

Sanitary sewers shall have a minimum cover of 5 feet to finished ground surface, and a maximum cover of 20 feet unless otherwise approved by variance. Sanitary sewers shall be deep enough to collect wastewater from all basements by gravity flow. When less than 9 feet of elevation difference exists between the finished lot grade at the building line and the top of the sanitary sewer main, such conditions shall be clearly addressed in the required Utility Reports, with notes provided on the record drawings indicating which lots are served by a "shallow sanitary sewer." Appropriate elevation information shall be provided on the record drawings for all such mains. For sewers that receive or will receive flow from offsite, the minimum depth to the sewer is 9 feet, unless otherwise approved by the City.

4.4.5.4 Sanitary Sewer Main Crossing a Water Main

When it is necessary for sewers to cross public water system pipes, the crossings shall be in accordance with the State of Utah requirements. These requirements are located at {R309-550-7 U.A.C.} and {R317-3-2.9(B)(1) U.A.C.}.

4.4.5.5 Sanitary Sewer Main Crossing of a Storm Drain

When sanitary sewers or force mains cross a storm drain, regardless of vertical clearance and which pipe crosses over the other, each joint of the storm sewer within the trench width of the crossing shall be encased in a concrete collar at least 6 inches thick and extending at least 6 inches each side of each joint.

4.4.5.6 Limits on Minimum Vertical Clearance

Under no circumstances shall the minimum vertical clearance between any two crossing utilities be less than 12 inches unless approved by the City.

4.4.6 Bored Crossings

When a sewer passes under a State roadway, an arterial or collector roadway as defined by the City, railroad, drainage or irrigation ditch, the sewer shall be located within bored steel casing pipe, unless otherwise allowed to be open cut by the jurisdictional entity being crossed. The carrier pipe shall be supported by casing spacers. The casing shall be sealed around the sewer at the casing ends. The casing shall have a minimum of 5 feet of cover. The casing pipe shall extend the entire width of the right-of-way or easement of the crossing structure, or as directed by the City or other jurisdictional entity.

Chapter 4. Wastewater Collection System Design Criteria

Crossing at ditches shall include cutoff walls at each side of the crossing, either as required by the jurisdictional entity, or as analyzed and designed by the Engineer at the direction of the Engineering Department.

Casing pipe shall be smooth-walled, non-coated pipe of welded steel construction conforming to ANSI/AWWA C200, and shall be seamless or straight seam steel pipe with minimum yield strength of 35,000 psi. The casing pipe shall be new material and have a minimum wall thickness as follows unless specified otherwise.

Carrier Pipe Nominal Diameter	Min. Casing Pipe O.D.	Min. Wall Thickness*
4"	12"	0.250"
6"	14"	0.3125"
8"	16"	0.3125"
12"	20"	0.3750"
*The boring contractor shall determine and provide a greater wall thickness if needed. Other pipe sizes shall be designed by a professional engineer and submitted to the City of Moab for review.		

The Engineer shall evaluate the risk of corrosion to the casing based on the corrosivity of the surrounding soils, as well as any known risks from nearby stray current, buried electrical lines, nearby impressed current corrosion protection systems or other factors. For each casing installed, the Engineer shall provide a written evaluation as to whether corrosion protection is needed. If needed, the Engineer shall provide a design for corrosion protection. The City preference is for sacrificial anodes systems rather than impressed current systems. The design shall be submitted to the City for review. Long-term maintenance of the system, including anode assessment and replacement, shall be addressed in the evaluation.

4.4.7 Manholes

4.4.7.1 Layout

1. Location: Manholes for access to sewers shall be provided at the following locations:
 - a. All junctions of sanitary sewers.
 - b. All points of change in alignment, grade or pipe size.
 - c. All points of industrial and commercial discharge to facilitate observation and sampling.
 - d. The upstream terminus of the main.
 - e. Cleanouts shall not be allowed to replace manholes on sanitary sewer lines 8 inch and larger.

2. Alignment and Spacing: Sewer manholes shall be aligned and spaced as follows:

Chapter 4. Wastewater Collection System Design Criteria

- a. Sewers shall be installed in a straight alignment, both in line and grade, and not curved between manholes.
 - b. Maximum spacing between manholes shall be 400 feet for lines 15 inches or smaller and 500 feet for lines 18 inches and larger.
 - c. Maximum change in alignment shall not exceed 90 degrees.
 - d. Manhole lids shall not be aligned with vehicle wheel paths, or within 2 feet either direction of the street crown.
 - e. No drop-in style riser or paver rings are allowed. Grade rings beneath the ring and cover are allowable for final grade adjustment with a maximum of 12 inches.
3. Access: Provisions for manhole access shall be as follows:
- a. Manholes shall not be located in areas that are subject to flooding from surface runoff. If the possibility of surface runoff flooding cannot be avoided, a watertight lid as approved by the City shall be installed to prevent inflow.
 - b. Manholes shall be located in areas that allow direct access by maintenance vehicles when it is not feasible to locate the manhole in a public street.
 - c. Manholes shall not be located in open space access roads, wherever possible. If it is impossible to locate a manhole outside an access road, then the cover shall be at the grade of the access road and a 10' x 10' concrete collar shall be installed around the manhole. All manholes located outside dedicated street right-of-way shall be designed and constructed with a locking-type cover and the manhole ring shall be bolted to the manhole cone and the manhole lid shall be raised in accordance with the City's Standard Detail. Marker shall be installed to mark the location of manholes outside of pavement.
 - d. All manhole lids shall be depressed ¼" to ½" below any adjacent finished street surface.

4.4.7.2 Manhole Sizing

Manholes for sanitary sewers up to 18 inches in diameter shall have an inside diameter not less than 4-feet. Manholes for sanitary sewers 18 inches to 36 inches shall have an inside diameter of not less than 5-feet. Manholes for sanitary sewers 36 inches to 54 inches shall have an inside diameter of 6 feet. Manholes for sanitary sewers over 54 inches shall be of special design. If the angle of deflection does not permit use of a 6 foot inside diameter manhole, then a special manhole detail must be submitted for review and approval by the City. There shall be a bench located below the bottom manhole ladder rung.

4.4.7.3 Drop Manholes

1. Drop manholes shall be in accordance with the City's standard details.

Chapter 4. Wastewater Collection System Design Criteria

4.4.7.4 Main Connections to Existing Manholes

No new connection shall be made with existing manholes. When connections are required at the location of an existing manhole, the manhole shall be replaced unless otherwise approved by the City.

4.4.7.5 Sanitary Sewers and Manholes Greater than 20 Feet

Where sanitary sewers or manholes cannot be designed at depths less than 20 feet, a variance shall be obtained.

4.4.8 Inverted Wastewater Siphons

The design of inverted wastewater siphons, or sag pipes, shall be avoided, unless approved by the City. When inverted siphon construction is deemed necessary and approved by the City, the facility shall have at least two separate barrels with a minimum pipe size of 8 inches, and shall include appurtenances for convenient flushing and maintenance. Inlet and outlet structures shall have adequate clearance for access and maintenance operations, and sufficient head shall be provided and pipes sized to ensure velocities of at least 3.0 feet per second under average flow for both initial and future build-out conditions. The inlet and outlet shall be arranged so that normal flows can be diverted to one barrel, and that either barrel may be removed from service for cleaning or repair.

4.4.9 Fill Areas

Where sanitary sewer lines will be constructed in fill areas, all fill materials shall be placed and compacted to final grade prior to the installation of the sanitary sewer line and appurtenances.

4.4.10 Future Connections

Manholes shall have pipes stubbed out that are sized to accommodate flows from the upstream basin whenever a future extension of the sanitary sewer main is anticipated. The main line stub-out shall be capped and sealed.

4.4.11 Sanitary Sewer Service Lines

All single family residential dwellings, each individual unit in multi-family complexes, and each commercial business and industrial customer shall be served by a separate, independent sanitary sewer service line. The City Engineer may approve the use of a single service line for multi-family residences.

4.4.12.1 Ownership

After a building is connected through a service line to the sanitary sewer, the service shall become a part of the building, and the Owner of the premises shall be responsible for the operation and maintenance of the entire service line (building sewer) between the building and the City sewer, excluding the wye at the connection. Although the service line up to the wye is the responsibility of the Owner, the service lines and associated connections to the main shall be inspected and tested by the City prior to backfill. The inspection of service line stub-outs will

Chapter 4. Wastewater Collection System Design Criteria

take place at the same time inspections are conducted for the installation of the sanitary sewer main. Inspection of the entire service line will be made when the service line is extended to the building.

4.4.12.2 Layout

The Owner shall install a service line stub-out from the sanitary sewer main to each individual lot. Where sidewalks are proposed to be constructed, the stub-out shall be constructed to 15 feet beyond the back of the sidewalk. Where sidewalks will not be constructed, the stub-out shall be constructed a minimum of one foot beyond the property line. The stub-outs shall be plugged and the end marked with a green painted T-post installed in the ground directly above the location of the plugged end.

4.4.12.3 Cleanouts

Cleanouts shall be required on wastewater service lines in accordance with the City standard details and in accordance with plumbing code.

4.4.12.4 Structural Requirements

A. Under Roads - All structures and pipe placed under public roads shall be of sufficient strength to support, with an adequate factor of safety, the backfill, road surfacing and H-20 traffic load per AASHTO Standard Specifications.

B. Steep Grades - Concrete anchors shall be provided for sewers on slopes of 20% or greater, or where wastewater velocities exceed 15 feet/second. The purpose of the anchors is to secure the sewer against lateral or axial displacement.

4.5 Easements

Where sewers cannot be installed in right-of-way, they shall be located within utility easements approved by the City and shall be centered in the easement. All utility easements shall have a minimum width of at least two times the depth to the pipe invert. The minimum easement width shall be 20 feet for one utility, 30 feet for two utilities, and 40 feet in width for three utilities. Site-specific circumstances may dictate the need for wider easements. Utility easements and dedicated utility tracts shall be defined by bearings and distances around the perimeter of the easement. Centerline legal descriptions are not acceptable.

All utility easements shall be for the exclusive use of the City. No permanent structures, (e.g., retaining walls, trees, light pedestals, sign foundations, power poles, mailboxes, sheds, buildings, etc.), shall be placed in the easement.

Chapter 4. Wastewater Collection System Design Criteria

4.6 Sand/Oil and Grease Interceptors

Sand/oil and grease interceptors shall be installed on service lines from commercial and industrial properties discharging oil and grease. The owner shall prepare sizing calculations for the interceptor for City review. At the City's option, the City will size the interceptor. The interceptors shall include a sampling port which extends into a manhole or other City approved structure which causes the discharged fluid to drop vertically at least 3-inches so that a samples may be collected. The connection must be in a location accessible by City inspectors so that samples can be collected.

Chapter 5. Sewage Pump Station (Lift Station) and Force Main Criteria

5.1 Sewage Pump Stations (Lift Stations) and Force Mains

5.1.1 Scope

New lift stations are discouraged and shall only be allowed in those locations where there is no feasible way the development can be served by gravity extension of the City's existing wastewater collection system.

5.1.2 Compliance with State of Utah Standards

Lift stations shall be designed in accordance with the State of Utah standards, currently located at {R317-3-3 U.A.C}. Lift stations shall also be design in accordance within the applicable building codes.

5.1.3 City Review and Approval

New lift stations must be approved by the City. If approved, the Developer shall submit a utility report with a complete set of design calculations and drawings for review and acceptance by the City.

5.1.4 Flood Protection

Lift station structures and the associated electrical and mechanical equipment shall be protected from damage by the 100-year flood, and shall remain fully operational and accessible during such an event. Local, State and Federal regulations pertaining to floodplain shall be satisfactorily accounted for in the design. Grading shall be provided to protect the site by directing surface flows away from the facilities.

5.1.5 Accessibility and Security

Lift stations shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys. Depending on the nature and location of the facility, security fencing with controlled entry keypads, card-reader access to buildings, security cameras, lockable access hatches, and motion-detection safety lighting may be required.

5.1.6 Grit

Where it is necessary to pump wastewater prior to grit removal, the design of the wet well and lift station piping shall receive special consideration to avoid operational problems from the accumulation of grit.

5.1.7 Station Ventilation

Adequate ventilation at lift stations shall be provided to mechanically ventilate the dry well, and if screens or mechanical equipment requiring maintenance or inspection are located in the wet well, it shall also be mechanically ventilated. There shall be no inter-connection between the wet well and dry well ventilating systems. In pits over 15 feet deep, multiple inlets and outlets are

Chapter 5. Sewage Pump Station (Lift Station) and Force Main Criteria

required. Switches for the operation of ventilation equipment should be clearly marked and conveniently located. Consideration should be given to automatic controls where operations may be intermittent.

Where excessive moisture or low temperatures are a concern, consideration shall be given to installation of heating and/or dehumidification equipment.

5.1.8 Odor Control

Unacceptable levels of odors may be produced at lift stations and within force mains due to excessive hydrogen sulfide generation. Odor control systems are required.

5.2 Minimum Lift Station Design Criteria

The following design criteria shall be applicable to lift stations:

1. Lift stations must be equipped with instrumentation and SCADA equipment to collect and transmit all relevant data.
2. Backup electrical power provided by a diesel or natural gas generator with an automatic transfer switch in an all-weather enclosure shall be provided to insure that all lift station components function properly for a period of at least one week in the event that the primary power is lost. Electrical power to the lift station site shall be underground. In addition, an emergency overflow basin shall be provided that will accommodate a minimum 12 hours of storage at the peak daily loading rates. The basin shall be designed and configured to allow for complete draining after an overflow event, either by gravity or submersible sump pumps permanently installed in the basin.
3. Lift stations shall include a wet well sized to reduce the cycling of the pumps and the settling of solids from the flows.
4. A corrosion protection system shall be applied to, and shall completely cover all interior surfaces of wet wells, and any in-line vaults or manholes that precede the wet well. The system shall be specifically designed to protect concrete from hydrogen sulfide corrosion.
5. All lift station wet wells shall be considered an explosion hazard. All electrical equipment and wiring installed therein shall be designed for this hazard.
6. Installation of suitable devices for measuring, recording and totalizing sewage influent and effluent flow and power consumption shall be included.

Chapter 5. Sewage Pump Station (Lift Station) and Force Main Criteria

7. The lift station design shall consider changes in flows over the life of the station and allow for proper operation of the station and force main throughout the intended design life.
8. Where high groundwater conditions are possible, buoyancy of the lift station structures shall be evaluated and protected against flotation.
9. The lift station shall include a wet well bypass-to-overflow basin to allow the wet well to be temporarily removed from service for maintenance.

5.3 Pump Equipment and Protection

Pumping equipment shall be specifically designed and rated for wastewater service. For wastewater lift stations with an ultimate rated capacity of 1 MGD or less, the City will consider the use of either self-priming pumps in a wet well, or self-priming pumps in a wet well / dry well configuration. For stations with an ultimate capacity in excess of 1 MGD, only a wet well self-priming configuration with the pump located above the wet well and above ground will be accepted.

5.3.1 Pump Characteristics

1. Pumps shall be specifically designed and rated for wastewater service.
2. The design Engineer shall consider pump efficiency in the design with the intent to maximize pumping efficiency and minimize electrical power demand.
3. Wastewater level measurement equipment shall be provided and shall be connected with the City SCADA system.
3. The lift station shall be provided with multiple pump units programmed to alternate sequentially. Should only two units be provided, equal capacity is required, and each pump train shall be capable of handling the peak flow. Pump redundancy is required so that pumps may be taken out of service for maintenance.
4. The station shall be designed such that the number of motor starts per hour shall not exceed 10, or the number of starts recommended by the motor manufacturer, whichever is less. Duplex pump operation and controllers shall be provided such that the lead and lag pump positions are alternated with each successive motor start.
5. Provisions acceptable to the City shall be made to facilitate the removal of pumps, motors, and other mechanical and electrical equipment. Typically, in wet well / dry well stations, a bridge crane shall be provided for removing pumps. In suction lift stations, slide or overhead rails with hoists for removing pumps shall be provided. In wet well stations, rails shall be provided.

Chapter 5. Sewage Pump Station (Lift Station) and Force Main Criteria

5.3.2 Pump Protection

Pumps handling raw wastewater shall be preceded by approved grinders that are installed to protect the pumps from clogging damage by reducing the particle size of wastewater solids in the flow stream. The grinder shall be located in a lined vault or manhole that precedes the wet well. Grinder pumps may be used in wet well settings for flows less than 1 MGD.

5.4 Overflow Basins

Overflow basins for lift stations shall be sized to contain the volume of 12 hours the Average Daily Flow at build-out. The basin shall be designed and configured to allow for complete draining after an overflow event, either by gravity or submersible sump pumps permanently installed in the basin. Basins shall be designed to include a vault or manhole outside the overflow basin to facilitate the complete removal of any liquid that accumulates in the basin, and shall require the installation of a pipe between the basin and vault, with positive slope to the vault. A pump-back or gravity system shall be included in the lift station design to return wastewater to the wet well.

5.5 Force Main Design Criteria

5.5.1 Pipe Materials

Force main pipe materials, including restraint devices and fittings, shall be PVC or HDPE. Use of other materials must be approved by the City.

5.5.2 Velocity and Pipe Diameter

Sanitary sewer force mains shall be a minimum of 3 inches in diameter. At the design pumping rate (initial and ultimate), the velocity shall be at least 3 feet/second, but not more than 7 feet/second.

5.5.3 Pipe and Design Pressure

The force main, joint restraint, thrust blocking, and station piping shall be analyzed and designed to withstand water hammer pressures and associated cyclic reversal stresses that are expected with the cycling of wastewater lift station pumps. Water hammer shall be evaluated for the normal operation of the lift station, as well as for a power outage while the pumps are running.

5.5.4 Shutoff and Check Valves

Suitable shutoff and check valves shall be placed on the discharge line of each pump. Check valves shall be suitable for the material being handled and shall be placed on the horizontal portion of discharge piping except for ball checks, which may be placed in the vertical run. Valves shall be capable of withstanding operational design pressures and water hammer.

Chapter 5. Sewage Pump Station (Lift Station) and Force Main Criteria

5.5.5 Isolation Valves

Isolation valves shall be installed at intervals no greater than 1,000 feet along force mains.

5.5.6 Combination Air Release and Air/Vacuum Valves

Combination air release and air/vacuum valves shall be located at force main high points, on pump discharge piping as close as possible to the check valve, and between isolation valves. During the design, the Engineer shall consider the economics of air valve installation against the installation of deeper force main piping. The evaluation shall take into account the installation and long-term maintenance costs of the air valves. The valves shall be specifically designed for wastewater service and be sized per the manufacturer's recommendations. Air valves on force mains shall be contained in a vault and vented above ground. A manually controlled isolation valve suitable for wastewater service shall be installed between the force main and air valve.

5.5.7 Drain Valves

When required by the City, the Engineer shall include at least one force main dewatering connection at the lift station and additional drains at other major force main low points. The design shall consist of as few low points along the force main as is practically possible. Drains shall generally include a plug valve installed on a tee and drain piping to an existing sanitary sewer manhole, or to a separate manhole that can then be pumped by City personnel. Provisions shall be made to drain the force main back to the wet well.

5.5.8 Cleanouts

Cleanouts shall be provided in the force main at distances not to exceed 500 feet.

5.5.9 Termination

Force mains shall transition into the gravity wastewater system at a dedicated manhole. The connection of the force main to the manhole shall be made by connecting the force main to a short section of gravity main stubbed out from the manhole. The gravity stub shall be a size that is equal to or larger diameter pipe than the force main, and shall be installed at an elevation that will prevent wastewater from discharging back into the force main when the gravity system is flowing full. The manhole interior shall be coated for protection against hydrogen sulfide corrosion. The manhole and its opening shall be oversized to permit retrieval of cleaning pigs and ancillary equipment. The manhole at the discharge point shall not be an in-line gravity manhole.

5.5.10 Identification

Minimum identification requirements for force mains shall consist of tracer wire and warning tape as required for potable water mains, and green marked polywrap for ductile iron pipe. The warning tape shall be labeled, "Caution: Buried Force Main Below".