CITY OF RENO

PUBLIC WORKS DESIGN MANUAL

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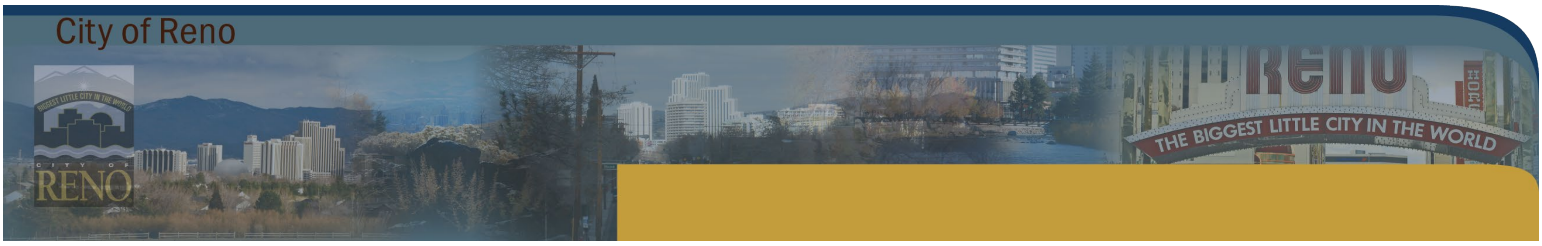
MARCH 2026



Updates to the design manual will be posted on our website. Please check often. No hard copies will be mailed out.

Visit our design standards website at: https://www.reno.gov/government/departments/public-works/engineering-standards.

Please call 775-334-2548 if you have questions, and your call will be directed to the appropriate person.

City of Reno Public Works Department
Capital Projects Division
1 East 1st Street
Reno, Nevada

Thank you.

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PART 1 - IMPROVEMENT STANDARDS

SECTION 1 – DESIGN MANUAL PURPOSE AND DEFINITIONS

1-1 PURPOSE

The purpose of this manual is to establish minimum requirements for design, plans, testing, inspection, and supporting documents for construction of streets, bikeways, alleys, drainage, grading, erosion control, sewerage, traffic signals, street lighting, site access, and utilities in the City of Reno. The requirements herein, unless otherwise noted, apply to public and private improvements. This manual refers to and is to be used in conjunction with the Standard Specifications for Public Works Construction (SSPWC) and Standard Details for Public Works Construction, latest editions. Additional design publications referenced herein include, but are not limited to:

- A Policy on Geometric Designs of Highways, American Association of State Highway and Transportation Officials (AASHTO)
- AASHTO Roadside Design Guide
- American National Standard Practice for Roadway Lighting, Illuminating Engineering Society of North America
- American National Standards Institute (ANSI), Standards
- Asphalt Institute Manual Series No. 1, MS-1 Thickness Design
- City of Reno Wastewater Lift Station Design Standards
- Flood Insurance Rate Map, Federal Emergency Management Agency (FEMA)
- Floodways Map, FEMA
- Guide for the Development of Bicycle Facilities, AASHTO
- Guidelines for Urban Major Street Design, Institute of Transportation Engineers
- HEC-1, HEC-2, HEC-RAS, Army Corps of Engineers
- Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration (FHWA)
- Reno Municipal Code (RMC)
- Technical Release No. 55, Urban Hydrology for Small Watersheds, United States Department of Agriculture Natural Resources Conservation Service
- The Blue Book: A Reference Manual of Nevada Law Governing Design for the Construction Industry, Nevada State Board of Architecture, Interior Design and Residential Design
- Truckee Meadows Construction Site Best Management Practices Handbook, Truckee Meadows Regional Stormwater Quality Management Program
- Truckee Meadows Structural Controls Design and Low Impact Development Manual, Truckee Meadows Stormwater Quality Management Program

The requirements herein apply to a public works project, subdivision, conditional use permit, site plan review, parcel map, map of dedication, zone change, annexation, excavation/encroachment permit, or building permit.

The City does not assume maintenance responsibility for access, drainage facilities, sanitary sewer facilities, and their associated structures located outside the limits of dedicated street rights-of-way or public easements, or which are not constructed to City standards for public facilities.

Private facilities for access, drainage, and sewerage located on private streets, lots, or parcels are to be owned and maintained by the property owners.

All onsite private improvements are certified to the City of Reno Development Services Department, Building & Safety Division, except as provided herein.

1-2 RELATIONSHIP TO OTHER CITY-ADOPTED PLANS AND POLICIES

The adoption of this manual is consistent with, compatible with, and furthers the goals, policies, objectives, and programs of ReImagine Reno: The City of Reno Master Plan (hereinafter, Master Plan). No regulatory decision by an appointed or elected official or any City employee shall be made with respect to design, plans, testing, inspection, and supporting documents of the practice of engineering that is not in substantial compliance with the Master Plan as officially adopted or amended.

Users of this manual are cautioned that other policies or standards may apply. Examples include those provided by the Regional Transportation Commission; State of Nevada Department of Transportation; Washoe County; City of Reno, Fire Department; City of Reno, Parks and Recreation and City of Reno, Downtown Redevelopment District.

1-3 OMISSIONS

This manual is intended to cover only standard situations encountered in design. Non-standard situations that arise and are not covered in this manual are to be designed in accordance with accepted engineering practices, the SSPWC, and Standard Details for Public Works Construction. Such designs shall contain supporting data, shall be subject to the approval in writing of the City Engineer, and shall not be authorized in any case for any purposes of mere convenience or economy.

Atypical situations may arise with respect to standards covered by this manual, and in such cases, the City Engineer may authorize alternative standards, provided that any such alternative standards are the equivalent of the design standards and are in accordance with accepted engineering practices, provided that such alternatives shall not be authorized in any case for any purposes of mere convenience or economy, and provided further that such alternatives with all supporting data be submitted to the City Engineer in writing for review and approval.

Additional information, explanation, calculation, details, non-standard parts approvals, warranties, instruction manuals, references, or other design elements may be required at the discretion of the City Engineer.

1-4 DEFINITIONS

The following words and phrases, when used in this manual, shall have the meanings respectively ascribed to them:

accessibility - The extent to which facilities are usable by people with disabilities, including wheelchair users.

ADA - Americans with Disabilities Act of 1990, a federal law.

ADT - Average Daily Traffic. An estimate or statistical value of traffic volume based on actual traffic counts, or counts generated by an acceptable software model, using a particular street or intersection that is adjusted to account for typical day of the week and month of the year variations. This term is also sometimes used to express the estimated daily trip generation for a particular land development.

alley - An access way which is used primarily for vehicular service access to the back side of properties otherwise abutting on a street.

AM Peak Hour - The highest traffic volumes during four consecutive 15-minute periods usually between the hours of 7:00 AM and 9:00 AM.

APWA - American Public Works Association

AWG - American Wire Gage

AWWA - American Water Works Association

Benefit District - The geographic area established and defined in the Regional Road Impact Fee Ordinance, within which regional road impact fees collected in the District are required to be spent in the District to ensure that feepayers receive sufficient benefit from regional road impact fees paid.

bicycle - A device propelled by human power upon which a person may ride, having two tandem wheels either of which is over 14 inches in diameter, or every such device generally recognized as a bicycle though equipped with two front or two rear wheels except a moped.

bicycle facilities - A general term denoting improvements and/or provisions made by public agencies to accommodate or encourage bicycling, including parking facilities, mapping all bikeways, and shared roadways not specifically signed or designated for bicycle use.

bicycle Lane (bike lane) - A portion of a roadway which has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

bicycle path (bike path) - A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way.

bicycle route (bike route) - A segment of a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational markers, with or without a specific bicycle route number.

bikeway - Any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

building permit - The development permit issued by the City before any building or construction activity can be initiated on a parcel of land.

capacity (roadway) - The maximum number of vehicles which have a reasonable expectation of passing over a given section of a street in one direction, or in both directions of a highway, during a given time period, under prevailing traffic conditions, expressed in terms of vehicles per hour or maximum critical turn volumes, each of which is described under Level of Service. Capacity is measured in the Regional Road Impact Fee Ordinance and the Regional Capital Improvement Plan during the PM Peak Hour.

CIP - Capital Improvements Plan

City Attorney - That official elected to the office of City Attorney of the City of Reno, or their designee.

City Engineer - That official charged with the title of City Engineer of the City of Reno, or their designee.

City of Reno - City of Reno Public Works Department

City Standards - The current edition in effect at time of project approval of "Construction Standards" and SSPWC, as defined herein and as adopted by City Council. The most current standards shall apply at the time of project approval or submittal of the building permit.

code - An article of the RMC together with related adopted documents.

collector - A street functional classification which relates to master plan documents and design standards. Collectors link local streets in neighborhood areas to arterial streets and provide access to abutting properties. STOP signs are often found at intersections with local streets, and intersections with arterial streets may have traffic signals. Typical width (curb to curb) is 40' in residential areas and 50' in commercial areas, with speed limits of 25 or 30 miles per hour (mph).

Construction Standards - The Standard Details for Public Works Construction (Orange Book) or as amended by the Supplemental Standard Drawing Details, and the Public Works Design Manual (PWDM) as adopted by City Council.

Construction Standards: Downtown Redevelopment District - The most current standards, specifications, and details available from the City of Reno Downtown Redevelopment Agency, also commonly called "Redevelopment Standards", "Downtown Standards", "Streetscape", etc.

critical drainage area - The floodplain area where the existing drainage system is inadequate, or where some other unusual drainage pattern or criteria exists.

default - Failure of the subdivider/developer to complete the improvements listed in Exhibit "A" of the improvement agreement within the period concurred to by the City Council including any applicable extensions in time. May also refer to the security posted by the subdivider/developer to ensure that improvements will be completed, has lapsed, or been revoked by the surety.

design engineer - Nevada Licensed Civil Engineer hired to provide design services.

developer - Any party who causes property to be improved and/or developed.

development - Any man-made changes being made to real property.

Development Services - City of Reno Development Services Department

DIP - Ductile Iron Pipe

Director of Development Services - That official charged with the title of Director of Development Services of the City of Reno, or their designee.

Director of Public Works - That official charged with the title of Director of Public Works of the City of Reno, or their designee.

Director of Utility Services - That official charged with the title of Director of Utility Services of the City of Reno, or their designee.

drainage plan - A plan prepared and sealed by a Nevada Licensed Civil Engineer, for the collection, transportation, treatment, and discharge of stormwater within and from a subdivision/development.

drainage report - A technical engineering report prepared and sealed by a Nevada Licensed Civil Engineer, whose purpose is to identify and define drainage characteristics associated with a proposed development and to define possible problems and conceptual solutions. In its final form, the drainage report shall transform the defined conceptual solutions to a final drainage plan.

driveway - A privately owned and maintained vehicular access not used for address assignment and excluding alleys.

driveway: shared - A driveway serving more than one owner, requiring approval of the City Engineer and a recorded shared access easement from each impacted property owner.

engineer - Any person who is retained as a consultant by the owner/developer and is legally authorized to practice civil engineering in the State of Nevada in accordance with NRS Chapter 625 and includes Project Engineer and Engineer of Record (EOR) as used in this title.

EOR - Engineer of Record. Any person who is retained as a consultant by the owner/developer and is legally authorized to practice civil engineering in the State of Nevada in accordance with NRS Chapter 625 and maintains a valid City of Reno business license.

EPA - Environmental Protection Agency

FHWA - Federal Highway Administration

final plat - A map prepared in accordance with the provisions of Nevada Revised Statute (NRS) Chapter 278 and City Code.

Fire Chief - That official charged with the title of Fire Chief of the City of Reno, or their designee.

first flush - Runoff from a defined precipitation event which results in a displacement of most pollutants from impervious surfaces.

freeway - Freeways are intended to move large volumes of traffic at high speeds through and between urban centers. No direct access to abutting properties is permitted and all surface streets crossing the facility are grade-separated. Speeds are normally 50 – 65 mph and right-of-way widths are typically 150’ – 300’.

HOA - Homeowner’s Association

Improvement Agreement - An agreement executed between the City of Reno and the owner of land to be subdivided or developed where developer built public improvements are to be installed, modified, or removed.

Improvement Plans of Record - The plans accepted by the City as the official plans of the subdivision or development which are placed on file with the City.

interceptor - A pipe having a minimum inside diameter of 18 inches, which conveys sewage and feeds by gravity to a publicly owned and maintained Water Reclamation Facility

LOS - Level of Service. A qualitative measure describing operational conditions, from “A” (best) to “E” (worst), within a traffic stream or at intersections, which is quantified for street segments by determination of a volume to capacity ratio (V/C), which is a measurement of the capacity of a street which is being utilized by traffic, and which is

quantified for signalized intersections in terms of either vehicle delay or total critical hourly volumes. The V/Cs for LOS "A" through "E" for street segments are:

Level of Service	Maximum Volume/ Capacity Ratio	Major Arterial	Minor Arterial	Collector	Freeway Ramp
LOS "A"	0.60	435	390	390	960
LOS "B"	0.70	507	455	455	1,120
LOS "C"	0.80	580	520	520	1,280
LOS "D"	0.90	653	585	580	1,140
LOS "E"	1.00	725	650	650	1,600

Intersection LOS may be measured either in terms of vehicle delay or in terms of total critical turning movements, as follows:

Level of Service	Delay (seconds)	Maximum Critical Volume
LOS "A"	≤ 10	900
LOS "B"	> 10 - ≤ 20	1,050
LOS "C"	> 20 - ≤ 35	1,200
LOS "D"	> 35 - ≤ 55	1,350
LOS "E"	> 55 - ≤ 80	1,500

Local Street - A low speed, low traffic volume street having a maximum average daily traffic volume of 1,000 trips or, serving a maximum of 100 single family lots, and conforms to the description in the Master Plan.

lot - Any distinct parcel, or any portion of real property divided with the intent of transfer of ownership or for building development.

LID - Low Impact Development. LID features are considered public domain treatment controls. The principles and techniques used in designing sites (starting from site layout and grading and compaction phases of construction) that disturb only the smallest area necessary, minimize soil compaction and imperviousness, preserve natural drainages, vegetation, and buffer zones, and utilize onsite stormwater treatment techniques. LID sites reduce and compensate for development's impact(s) on hydrology and water quality. Rather than conventional hardpiping from impervious surfaces, use of features such as vegetated swales, bioretention systems, and permeable pavements are used.

Major Arterial - A functional classification for a street that accommodates large volumes of through traffic between city districts. Direct access is discouraged to individual properties, although limited access to major projects (e.g., business park, shopping mall, etc.) is allowable, provided such access does not compromise the roadway's ability to handle large volumes of through traffic. Access, parking, and loading may be restricted or prohibited to improve capacity. Traffic signals are located at intersections with other arterials and some collector streets. The typical width provides for six travel lanes; speed limits on major arterials are usually 40-50 mph.

major drainage facility - All storm drainage swales, channels, piping, basins, and appurtenances associated with drainage of stormwater from a drainage basin of 100 acres or greater.

Master Plan - ReImagine Reno: The City of Reno Master Plan. A comprehensive, long-term general plan for the physical development of the City in accordance with NRS 278.150 et sequia. The form of the Master Plan is defined by NRS 278.200.

mechanical stabilization - The application or use of structural measures such as rock riprap, gabions, and permeable grid pavers to provide sufficient soil cover to prevent soil movement by action of wind, water, or structure loading. Stabilization may include incorporation of vegetative measures if approved, so that in combination the structural and vegetative measures will provide an appropriate level of protection. The City Engineer will determine whether the proposed methods are appropriate.

Minor Arterial - A minor arterial provides traffic access between neighborhoods and city centers. The minor arterial street is subject to some access control, channelized intersections, and parking restrictions, and is signalized at intersections with major arterial streets, other minor arterial streets, and some collector streets. The City standard width of 68' allows for one left turn lane and four travel lanes. Speed limits on minor arterials are typically 30-45 mph.

MPO - Metropolitan Planning Organization. Planning agencies consisting of a board representing a county and each incorporated city within it. The role of the MPO is to coordinate planning activities within the county. The RTC is the MPO for Washoe County.

NAC - Nevada Administrative Code, the codified, administrative regulations of the Executive Branch of Nevada

natural watercourse - A natural creek, stream, or river, whether seasonal, intermittent, or perpetually flowing.

NDOT - Nevada Department of Transportation

NDEP - Nevada Division of Environmental Protection Bureau of Water Pollution Control

non-site related improvements - Capital improvements and right-of-way dedications for street improvements to the arterial streets and collector streets identified in the Regional Road Impact Fee CIP that are not Site Related Improvements.

NRS - Nevada Revised Statute. A codified collection of laws enacted by the State of Nevada.

Ordinance - A law or decree enacted by the Reno City Council.

Overlay Zoning District - An overlay district, whether general or a planning area, is a zone which is superimposed on a base zone thus establishing additional regulations which restrict, prohibit, or add to the base zoning regulations set forth in RMC 18.08. Examples include Regional Center Plans and Transit Oriented Development Corridors.

Owner - The person, partnership, firm, corporation, or association having sufficient proprietary interest in the land sought to be subdivided or developed to commence and maintain proceedings to subdivide or develop the same per RMC.

parcel map - A map filed pursuant to NRS 278.461 to 278.469 inclusive, and City Code, which creates four or fewer lots, parcels, sites, units, plots, or interest. The City of Reno does not include streets offered for dedication as one of the four or fewer parcels. Minimum lot sizes are exclusive of areas encumbered by access easements.

pedestrian way - A pedestrian walkway constructed on a public easement or dedicated right-of-way.

PM Peak Hour - The highest traffic volumes during four consecutive 15-minute periods usually between the hours of 4:00 PM and 6:00 PM.

PROWAG - Public Right-of-Way Accessibility Guidelines

Project Manager - An individual who meets the following criteria:

Has been designated by their employer as that company's Project Manager on a given project,

Has the responsibility and authority of planning and execution of the project, including:

1. Conformance to all applicable safety standards, quality control standards, quality assurance compliance
2. Scheduling of various construction activities, including coordinating sub-contractor activities, delivery of materials, and adherence to local ordinances for working hours
3. Coordination of required meetings and inspections with local government entities
4. Coordination of required permitting for project work
5. Change order decision making
6. Dispute resolution authority

PRV - Pressure Reducing Valve

PVC - Polyvinyl Chloride

PWDM - City of Reno Public Works Design Manual. This guide.

Q capacity - Maximum volumetric flow rate for a storm drain system. Q5 corresponds to volumetric flow rate anticipate for a 5year storm event, Q100 for the volumetric flow rate for a 100year storm event.

Rational Method - A simple procedure for calculating the direct precipitation peak runoff from a watershed basin using the rainfall intensity, the area of the watershed, and the runoff coefficient appropriate for the type of watershed runoff surface.

Reclaimed Water Customer – A city park or golf course, business, HOA, developer, or other entity utilizing reclaimed water treated effluent from the City of Reno.

Reclaimed Water Service Provider - City of Reno Public Works Department

Region - See “Truckee Meadows Region”.

Regional Road Impact Fee - A fee collected at the time of building permit issuance from traffic-generating land developments. Fees are subsequently utilized to fund road capital improvements identified in the Regional Road Impact Fee CIP.

Regional Road Impact Fee CIP - The Regional Road Impact Fee CIP is the listing of road capital improvements necessary to maintain regional LOS standards relative to traffic volume increases associated with land development activity.

Regional Road Impact Fee Network - All major arterial streets, minor arterial streets, and collector streets that are within the Service Area, including proposed arterial streets and collector streets necessitated by projected future traffic generating land development activity as identified in the Regional Road Impact Fee CIP.

RMC - Reno Municipal Code. A codified collection of laws enacted by the Reno City Council.

RJ-DIP - Restrained Joint Ductile Iron Pipe

Road Capital Improvement - Includes the transportation planning of, preliminary engineering, engineering design studies, land surveys, alignment studies, right-of-way acquisition, engineering, permitting, and construction of all necessary features for any street construction project on any arterial or collector street in the Regional Road Impact

Fee CIP, undertaken to accommodate additional traffic resulting from new traffic generating land development, including but not limited to: (a) construction of new through lanes, (b) construction of new bridges, (c) construction of new drainage facilities in conjunction with new street construction, (d) purchase and installation of traffic signals, including new and upgraded signalization, (e) construction of curbs, gutters, sidewalks, medians, and shoulders, (f) relocating utilities to accommodate new street construction, (g) the construction and reconstruction of intersections, (h) the widening of existing streets, (i) bus turnouts, (j) acceleration and deceleration lanes, (k) interchanges, and (l) traffic control devices. Does not include sound walls or landscaping.

RTC - Washoe County Regional Transportation Commission. A governing board representing Washoe County its two incorporated cities, Reno and Sparks. The Commission consists of five board members: Two Washoe County Commissioners, two Reno Council members, and one Sparks Council member.

RTP - Regional Transportation Plan

Security – A notarized letter of credit furnished by a bank or financial institution authorized to do business in the State of Nevada, in the form approved by the City Attorney; or in lieu thereof, a cashier's check or a certified check of the subdivider/developer made payable to the City of Reno; or a cash deposit with the City in lawful money of the government of the United States, provided further that under no circumstances shall the words be construed to authorize or permit a personal bond or security other than that described herein.

Service Area - The area encompassed within the boundaries of the Truckee Meadows Region, designated for the imposition of regional road impact fees and the collection and expenditure of funds under the provisions of the Regional Road Impact Fee Ordinance. The service area specifically excludes the Washoe County High Desert Planning area, the Washoe County Truckee Canyon Planning Area, and the Washoe County Tahoe Planning Area. Regarding Citifare transit service, service area is defined as the area with 1/4 mile of a bus route.

Sidewalk - A public pedestrian walkway located adjacent to or immediately near a street.

Site Related Improvements - Those capital improvements and right-of-way dedications and/or site related improvements not included in the Regional Road Impact Fee CIP that provide direct access to the development. Direct access improvements include but are not limited to the following: (a) site driveways and streets; (b) right and left turn lanes leading to those driveways and streets; (c) traffic control measures for those driveways; (d) frontage street; and (e) local and/or private streets.

SSPWC - Standard Specifications for Public Works Construction, Sponsored and Distributed by: Regional Transportation Commission of Washoe County, Carson City, Churchill County, City of Reno, City of Sparks, City of Yerington, Washoe County, as adopted by the City Engineer.

Stable Rock - A rock slope as certified by a Nevada Licensed Civil Engineer that will stand near vertical and provide perpetuity and stability against weathering.

Standard Details - The City of Reno Public Works Standard Details

Street - A way for vehicular access and address assignment whether designated as a street, freeway, highway, parkway, throughway, road, avenue, drive, lane, boulevard, place, or however otherwise designated, but not including alleys or driveways.

Street Designation - The categorization of a street as local, collector, arterial, etc., based on the average daily traffic (ADT) at ultimate buildout and/or Master Plan functional classification.

Street: Private - A street which is to be owned and maintained by parties other than the City or other government agency.

Street: Public - A street owned by the City or other government agency.

Structural Treatment Controls - Devices that are constructed to provide temporary storage and treatment of stormwater runoff and non-stormwater flows. They can be public domain or manufactured (proprietary) treatment controls. Public domain treatment controls are those that can be designed by an engineer and have been implemented and tested by numerous communities throughout the nation. Manufactured (proprietary) treatment controls are patented devices that have been engineered and constructed by private companies.

Subdivider - A person who owns and causes land to be divided by means of a subdivision, parcel map, or record of survey.

Subdivision - Pursuant to NRS 278.320, any land, vacant or improved, which is divided or proposed to be divided into 5 or more lots, parcels, sites, units, or plots for the purpose of any transfer or development, or any proposed transfer or development.

Surveyor - A person who is retained by the owner/developer and is currently licensed to practice land surveying in the State of Nevada in accordance with NRS Chapter 625.

TAZ - Traffic Analysis Zone. A small geographic area used for transportation planning purposes. The metropolitan area is divided into hundreds of TAZs.

Temporary Work - A period of time not to exceed 18 months.

TIP - Transportation Improvement Program. A regional TIP is required each year. The TIP is prepared annually by the MPO and identifies federally funded transportation projects.

Title 18 - The Annexation and Land Development Code of the City of Reno, as adopted by Ordinance by the City of Reno Council.

TMRDM - Truckee Meadows Regional Drainage Manual

TMRPA - Truckee Meadows Regional Planning Agency

TMSA - Truckee Meadows Service Area. The defined areas within which municipal services and infrastructure will be provided.

TMWA - Truckee Meadows Water Authority

Traffic Calming - The combination of mainly physical measures that reduce speeds and/or volumes of motor vehicles on a roadway with calming features, alter driver behavior, and improve conditions for non-motorized street users.

Tree Work Permit - Permit required from City of Reno Urban Forestry Division before removing, pruning, or planting tress within City rights-of-way or on other City property.

Trip - A one-way movement of vehicular travel from an origin (one trip end) to a destination (the other trip end).

Trip Generation - The attraction or production of trips caused by a certain type of land development.

Truckee Meadows Region - The entirety of the City of Reno, the entirety of the City of Sparks, and that area of unincorporated Washoe County that has been subject to transportation modeling in the development of the Regional Road Impact Fee CIP.

VMT - Vehicle Miles Traveled. Refers to the number of miles traveled by all vehicles within a specified area over a specified time.

Water Supply Ditch - A ditch conveying water for domestic or agricultural purposes that is owned and/or controlled by a ditch or utility company.

WTS - Water Technical Sheet

SECTION 2 – GENERAL PROCEDURES AND REQUIREMENTS

2-1 PLANS REQUIRED

A. Complete plans for all proposed streets, bikeways, alleys, drainage, grading, erosion control, sewerage, traffic signals, street lighting, site access, utilities, and related public and private improvements, including any necessary dedications and easements, shall be submitted to the City for review and approval. Reports, studies, and supporting documentation of the plans shall be submitted to the City for review and approval. Copies of rights-of-entry obtained from adjacent properties, if required, shall be provided to the City prior to approval of plans.

12-2 DESIGN PROFESSIONAL REQUIRED

A. All plans and specifications for improvements which are to be accepted for maintenance by the City and private onsite drainage, grading, and utility plans shall be prepared by a State of Nevada Licensed Design Professional or Engineer of the appropriate discipline of engineering covering the work submitted.

B. Acceptance of improvement plans by the City is based on the assumption that the information contained on the plans and supporting documents is correct and does not subrogate the Design Professional or Engineer's responsibility for this project. Any and all errors and omissions related to the design are the responsibility of the Design Professional or Engineer.

2-3 WORK IN CITY RIGHTS-OF-WAY AND EASEMENTS

A. The following shall govern work performed within City rights-of-way, easements, and waterways:

B. An excavation and encroachment permit shall be issued in accordance with Reno Municipal Code (RMC) and Public Works Excavation and Encroachment Permit Program for all works performed in City rights-of-way or easements.

C. Contractors that work within the City right-of-way shall be licensed by the State of Nevada to perform the work specified on the plans and bonded as required and as specified in the RMC.

2-4 IMPROVEMENT PLAN SUBMITTAL REQUIREMENTS AND GENERAL REVIEW PROCESS

A. Projects requiring planning and/or zoning-related permits (entitlements) will require submission of preliminary engineered plans, drawings, or studies. Specific requirements vary based on planning permit or entitlement type in accordance with Title 18. Please refer to reno.gov for the current versions of the Planning Submittal Requirements and forms.

B. Site improvement plans for building permits and subdivisions shall conform to the requirements in Section 3 of this Public Works Design Manual (PWDM). Development Services shall act as the lead department in the submittal process for improvement plans. Submittal package shall be submitted to Development Services per the appropriate submittal from or application process.

C. Where the improvement plans submitted cover only a portion of ultimate development, the plans submitted shall be accompanied by the approved tentative plan or study plan of the ultimate development.

D. Once the submittal has been deemed complete, plans will be distributed by Development Services to the appropriate and applicable Departments/Divisions for review, comment and approval, including but not limited to:

1. Development Services - Planning, Engineering, and Building
2. Fire
3. Utility Services
4. Public Works - Traffic Engineering and Excavation and Encroachment

E. As applicable each department will review the improvement plans and forward comments to Development Services. The applicant shall respond directly to the Engineering Division of Development Services to address each department's comments. The City will not approve the plans until all other departments have accepted the plans along with any other agencies requiring approval.

F. Should there be required alterations or revisions to the plans as submitted, Development Services will return one copy with the corrections marked or indicated thereon. If the plans submitted are not prepared in accordance with these Improvement Standards or are not in keeping with the standards of the profession, Development Services may return them unmarked and unapproved. Continued deficient submittals may result in the referral of the principal Design Professional to the appropriate state board for possible disciplinary action.

G. Separate submittal of plans to other agencies may be required for approval.

H. No plans will be approved nor construction authorized until the City signifies approval, an improvement agreement has been completed, necessary security has been issued, and all required outstanding fees are paid.

2-5 DEVIATION FROM STANDARD AND DESIGN EXCEPTIONS.

A. The Engineer shall not deviate from the PWDM Improvement Standards without the approval of a design exception.

B. All requests for approval of exceptions from the design requirements contained within this PWDM shall be submitted in writing to Development Services.

C. Development Services will coordinate with the applicable Department/Division for approval or denial.

D. Approval for exceptions shall be sought as early as possible in the project development process, particularly where the project concept depends on the proposed design exceptions.

E. Design exceptions shall not be considered for cost or ease of construction.

F. Requests for design exceptions shall include the following:

1. A statement of the specific standard for which a design exception is requested.

2. An excerpt of the plans as required to support the design exception request.
3. A thorough but brief description of the reason for the request for the design exception.
4. Requests for design exceptions must be sealed and signed by the Design Professional in responsible charge of the design element.

2-6 OTHER AGENCY REVIEW AND APPROVAL

A. Prior to City approval, the Engineer is responsible for obtaining the approval and necessary permits of other governmental/municipal agencies or utilities when their facilities are involved and/or the plans include work within an agency's jurisdiction.

2-7 INSPECTION REQUIREMENTS

A. Any improvement which will ultimately be owned and maintained by the City shall be inspected during construction to verify conformance to PWDM standards. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases.

B. Inspection shall be performed in accordance with the City's Quality Assurance Program of the PWDM, Standard Details, and the SSPWC.

C. Any improvement constructed without inspection as provided above, shall be deemed as not complying with the Improvement Standards within this manual and may not be accepted by the City of Reno for maintenance purposes.

2-8 IMPROVEMENT PLAN REVISIONS DURING CONSTRUCTION

A. Should changes become necessary during construction, the Engineer shall first obtain the consent of the City and shall then resubmit the title sheet and the plan sheets affected for approval. The changes on the plans shall be made in the following manner:

1. The original proposal shall not be eradicated from the plans but shall be lined out.
2. The changes shall be clearly shown on the plans with the changes and approval noted on the revision signature block.
3. The changes shall be identified by the revision number in a triangle delineated on the plans adjacent to the change and on the revision signature block.
4. In the event that eradicating the original proposal is necessary to maintain clarity of the plans, approval must first be obtained from the City.

B. Minor changes that do not affect the basic design or contract may be made, with the authorization of the City, upon completion of the work before final acceptance of the completed improvements.

C. Certification by the Engineer of the finished pad elevations of subdivision lots shall be required prior to final acceptance of the subdivision improvements.

2-9 RECORD DRAWINGS

A. The Engineer shall maintain an accurate record of all approved deviations from the plans before and during construction. Upon completion of work all redlined sets shall be converted to a single Record Drawings set and submitted to the City.

B. Upon completion of the project, and prior to acceptance by the City for maintenance, Record Drawings noting all of the changes in the improvements constructed from the design plan shall be submitted to the City in PDF format.

C. The cover sheet shall include the following statement signed by the engineer in responsible charge: “These record drawings reflect the original City approved design and City approved revisions thereto, along with all field modifications reported by the contractor”.

D. Each sheet shall be marked “RECORD DRAWING”.

SECTION 3 – IMPROVEMENT PLAN REQUIREMENTS

3-1 GENERAL

A. In order to provide consistency for plan review and construction, improvement plans shall be submitted to the City in accordance with the requirements of this section.

B. Improvement plans shall be prepared for all public and private work required of subdivisions, site development and all improvement work performed within City right-of-way or easements.

C. Any changes to approved plans prior to or during construction shall be resubmitted for approval prior to installation.

3-2 HARD COPY AND ELECTRONIC SUBMITTALS

A. Upon acceptance of the plan by the City, the Engineer shall provide three sets of prints of plans, Engineer wet stamped sealed and signed.

B. In lieu of hard copy submittals, the plan may be electronically submitted to the Development Services Department following current procedures and applicable Nevada Administrative Code (NAC) and NRS.

3-3 ENGINEER REQUIREMENTS

A. All plans and specifications for improvements which are to be accepted for maintenance by the City, private onsite drainage, all grading and all utility plans shall be prepared by an Engineer of the appropriate discipline of engineering covering the work submitted and conform to requirement and standards of this section.

B. The Engineer shall add the following note to the plans: In the event of conflict between these plans and RMC, RMC shall prevail.

3-4 PAPER SIZE, NORTH ARROW, AND SCALE

A. All improvement plans shall be submitted on 24” × 36” paper. Only common engineering scales shall be used.

B. Each sheet of the plans shall have a north arrow and indicate the scales used. Scale shall be chosen that clearly identifies the improvements.

C. A bar scale shall be included.

3-5 DRAFTING STANDARDS

A. The PWDM does not have detailed drafting standards however, at a minimum: All line work must be clear, sharp, and of appropriate weight. Letters and numerals must be 0.1” minimum height, well formed, and sharp.

B. When showing existing pavement or concrete in relation to new work, suitable line types, line weights, shading, hatching and delineation shall be made of the new work. Shaded areas shall not occlude underlying information.

C. Line work and text shall not intersect underlying information. Sharp, solid arrowheads shall terminate dimension lines.

D. The City reserves the right to reject any set of plans that is determined to be illegible as determined by the City.

3-6 HORIZONTAL AND VERTICAL CONTROL

A. Horizontal Control. The purpose of this requirement is to promote a common, multi-jurisdictional county-wide parcel database in support of a Geographic Information System (GIS). The Interlocal Agreement contains digital base map standards for submittals.

Improvement plans shall conform to the following horizontal control requirements:

1. Improvement plans, all land division maps, reversionary and amended maps, records of survey for boundary line adjustments, commercial and industrial development, and waiver of parcel map require positioning and orientation to a common horizontal datum jointly adopted by the July 14, 1998, Interlocal Agreement between Washoe County and the cities of Reno and Sparks.
2. An approved listing of geodetic control monuments may be obtained from the office of the Washoe County Surveyor. A minimum of two of these control points must be tied-in and utilized to position and orient all mapping to a common basis at ground level. This is to be the basis of bearings expressed on all maps submitted for approval.
3. Datum for the horizontal control is the North American Datum of 1983 as identified on Record of Survey No. 2775, filed in the office of the Washoe County Recorder on September 21, 1994, as Document No. 1834848.
4. The combined mapping factor in Reno for West Zone (Nev. 2703), Nevada State Plane Coordinate conversion from Grid to Ground is 1.000197939; Ground to Grid is 0.999802100.
5. Surveyors are advised that these values result in coordinates on a localized, mean ground surface network that has been devised for uniform GIS mapping and related digital submittal purposes only. Survey level control and other geodetic work must adhere to procedures that will result in true, official State Plane Coordinate values.
6. Mapping required to be digitally submitted and oriented to the localized regional control system must also contain sufficient information to maintain and carry forward a historical lineage to the legal cadastral fabric.

B. Vertical Control

1. Vertical control benchmarks shall be clearly indicated on the plans as to location, description, elevation, and datum.

2. The datum shall be that of the National Geodetic Survey, North American Vertical Datum of 1988, or its successor. The Reno Vertical Control System is based upon the above datum. Consult the latest edition of the Reno Vertical Control System directory, or contact the Survey Section of the City of Reno Engineering Division for location and elevation of the nearest official benchmark. Benchmarks shall be clearly shown on the title sheet and all grading and plan and profile sheets.

3-8 TITLE BLOCK

A. Each sheet shall include a title block which shall be located along the right-hard margin (24" side) and which shall contain the following:

1. Sheet title
2. Sheet number and total sheets
3. Date
4. Scale
5. Company name, Engineer's name, signature, and seal. Signature on seal shall conform to NAC
6. Project title
7. The title block shall be either across the bottom or along the right edge of each plan sheet.

3-9 EXISTING FACILITIES

A. All existing facilities shall be shown for a minimum distance of 100' beyond the boundary of development or where proposed improvements meet existing conditions. Pertinent existing facilities shall be shown, including but not limited to:

1. Pavement delineation and traffic signage
2. Medians
3. Driveways (on both sides of street along the project frontage)
4. Curbs, specifying type (rolled curbs or vertical curbs)
5. Sidewalks
6. Pedestrian Ramps
7. Location and size of all underground utilities, including but not limited to water, gas, electrical, communications, storm drainage, and sanitary sewer.
8. Utility pole and transformers.
9. Location of all overhead electrical lines
10. Limits of 100-year, water surface elevations where applicable
11. Structures

12. Trees and other foliage
13. Traffic signals, cabinets, pull boxes, traffic loops with detectors, “homerun”, and hand holes
14. Streetlights, cabinets, pull boxes, and underground electrical conduits or overhead power.
15. Drainage Ditches
16. Fire Hydrants
17. Retaining walls
18. Any other features which may affect the design requirements for the project area

B. Contours and elevations: Existing contours at 2’ intervals and supporting spot elevations shall be shown on applicable plans sheets and extend 100’ minimum beyond the limits of work

3-10 PLAN SHEETS ORDER OF BINDING

A. Order of binding shall be as follows:

1. Title sheet
2. Notes, Legend, and Abbreviations
3. Sheet Index
4. Record Map Sheets (as required)
5. Demolition Plan
6. Site Improvement Plan
7. Utility Plans
8. Grading and Drainage Plans
9. Plan and Profile Sheets
10. Work Within Rights-of-way or Easements (as necessary)
11. Signage and Striping Plan.
12. Traffic Signal Improvements (as required)
13. Cross Sections (as required)
14. Standard Detail Sheets
15. Special Detail Sheets
16. Landscaping and Irrigation Plans
17. Geotechnical Test Pits and Boring Logs
18. Hydrology Basin Map(s) (from drainage report)
19. Erosion and Sediment Control Plan

20. Additional Plans Necessary for Construction of Project

3-11 TITLE SHEET REQUIREMENTS

A. All improvement plans shall have the following information as a minimum on the cover sheet:

1. Vicinity map
2. Site plan or entire subdivision/parcel map
3. Street names
4. Adjacent subdivision and/or property information, including names, lot lines and lot numbers, and/or Assessor's Parcel Number(s), as possible.
5. Property lines, as possible.
6. Scale of drawings, including scale bar
7. Index of sheets
8. Signature and revision blocks
9. Owner information, including address and phone number
10. Civil Engineer and company information, including address and phone number
11. Landscape Architect and company information (as required), including address and phone number
12. Geotechnical Engineer and company information (as required), including address and phone number
13. Basis of bearings
14. Basis of elevations
15. RMC 18.04.1202(b)(2)b requires the title sheet to contain the statement by the Civil Engineer of responsible charge:

    "These plans, sheets 1 through, have been prepared in accordance with the approved tentative map, city council conditions of approval, and the Reno Municipal Code."
16. Project scope
17. List of related permits and entitlements with permit number

3-12 NOTES, LEGENDS, AND ABBREVIATIONS

A. Plans shall include reference to applicable specifications and version.

B. Notes, legends, and abbreviations shall include but not be limited to:

1. Construction work hours and days as conditioned by RMC or entitlement.
2. Reference to additional permits such as encroachment permit and tree work permit when required.

3-13 SHEET INDEX

A. Sheet indices shall be provided indicating the location sheet number for grading, utility, and plan and profile sheets as they relate to the overall project.

3-14 RECORD MAPS (AS REQUIRED)

A. Record maps shall be included as applicable, including but not limited to:

1. Final Map
2. Parcel Map
3. Map of Dedication
4. Record of Survey
5. Existing FEMA

3-15 DEMOLITION PLANS (AS REQUIRED)

A. For developments with existing improvements to be removed, a demolition plan shall be provided indicating existing features to be removed and features to remain in place. All public improvements shall be protected in place unless identified for removal and replacement. Replacement of such public improvements shall be included with demolition permit requirements.

B. All abandoned or unused sanitary sewer laterals shall be removed to the sewer main and capped within 1' of the sanitary sewer main.

C. When demolition work is performed under separate building permit, the permit number and as-built demolition plans shall be included with all subsequent grading and/or site improvement plans.

3-16 SITE IMPROVEMENT PLANS

A. For development projects abutting existing street or right-of-way, a site plan shall be provided indicating all the onsite and street frontage improvements required for the development. Sufficient dimensions shall be provided to demonstrate compliance to PWDM and Standard Details. Plans shall be scaled at 1" = 20' and at a minimum shall indicate the following:

1. Street names and indication of public or private
2. Alleyways
3. Existing and proposed curb and gutter
4. Existing and proposed sidewalk
5. Existing and proposed parkways and/or landscape areas
6. Existing and proposed driveway approaches
7. Access points for pedestrians and/or vehicles

8. ADA accessible route within the right-of-way
9. ADA accessible ramps
10. Streetlights
11. Existing and proposed traffic signs
12. Traffic signals
13. Pedestrian amenities
14. Street restoration limits
15. Curb and street striping
16. Parking striping
17. Property lines
18. Adjacent property owners, APNs, and subdivision names
19. Project boundary, phase lines
20. Setbacks
21. Vehicular and bicycle parking calculations and statistics
22. Bicycle parking locations

3-17 UTILITY PLANS

A. The utility index shall be contained on a single sheet of the subdivision or development showing the general location of sanitary sewer and storm drain systems, identifying and numbering all manholes and structures and indicating improvements as either public or private as appropriate. Structure numbering shall match that in the sanitary sewer or storm drainage reports.

B. The utility index shall be scaled no greater than 1" = 100'. For larger developments the utility index sheet shall be shown on several sheets scaled at 1" = 20' or 1" = 40' for clarity. A key map shall be provided on each sheet to indicate the sheet location as it relates to the overall development. Match lines shall be provided at the limits of sheet view.

C. All rear lot drainageways and piping to offsite systems and drainageways shall be included.

D. Sanitary and storm drain facilities shall include the size of the pipe and the direction of flow.

E. Utility plans shall also indicate all other existing aboveground and underground facilities, including but not limited to proposed services for water, gas, electric, telephone, cable television, fire hydrants, streetlights, valves, major utility junction boxes, and communication lines.

3-18 GRADING AND DRAINAGE PLANS

A. Grading and drainage plans shall depict existing contours as fine continuous or dashed lines and proposed contours as solid lines.

B. Elevations of contours shall be labeled as appropriate.

C. All cut and fill slopes shall be labeled as 2:1, 3:1, 4:1, etc., with slope symbols.

D. Retaining walls shall be labeled with top and bottom elevations, maximum height, wall type, and an elevation view, if required, all clearly identified as requiring a separate building permit and special inspection

E. Mainline and intersecting street grades shall be shown in percent.

F. Peak flows shall be shown, for the 5-year and 100-year storms, entering and leaving the subdivision or development. Include the 100-year flood line.

G. Spot elevations on streets, top of curbs, retaining walls, and lots; surface drainage improvements; drainage arrows showing individual lot drainage shall be shown.

H. Grading and drainage plans shall include all soil report requirements.

I. Grading and drainage plans shall include all storm drain systems with lines, manholes, catch basins and 5-year and 100-year flows. Any catch basin bypass or 100-year breakout flows shall be clearly identified on the drainage report, plan, and profile sheets.

J. Grading and drainage plans shall include all concrete swales, including overflow swales, cross sections identifying base flood elevations for predevelopment conditions in flood hazard zone “A”.

K. Grading and drainage plans shall include information showing before and after conditions for Conditional Letter of Map Revision, Letter of Map Revision, and critical flood zones, and any other pertinent and offsite drainage features.

3-19 STREET PLAN AND PROFILE SHEETS

A. General requirements

1. Plan and profile sheets shall have minimum scales of 1” = 10' vertical and 1” = 40' horizontal.
2. Streets and access roads shall include the name of street and stationing on plan view and in title block
3. The plans shall clearly indicate, in plan and profile, the distinction between existing conditions and proposed improvements and designate improvements as public or private.

B. The stationing and orientation on the plan and profile sheet shall be from south to north and west to east as practical.

C. Street plan at a minimum shall include the following:

1. Existing and proposed right-of-way monuments.
2. Existing facilities.
3. Right-of-way widths.
4. All easements.
5. Station of the limits of improvements.
6. Intersecting streets and names.

7. Centerline stationing.
8. Beginning and ending of horizontal curve.
9. Point of compound horizontal curves.
10. Horizontal curve data (centerline radius, length, central angle and tangent distance).
11. Indicate benchmark location and elevation.
12. Match lines.
13. Traffic control devices.
14. Show location of any borings, test pits, and monitoring wells.
15. Street lighting.

D. Street profile view shall be drawn along the street centerline. Street profile at a minimum shall show the following:

1. Station and elevation of the limits of improvements.
2. Existing facilities.
3. Existing ground and proposed finish grades at a minimum of 50' increments.
4. Tangent slopes.
5. Grade breaks.
6. Beginning and Ending of vertical curve station and elevation.
7. Vertical curve elevations and data (length of vertical curve and rate of vertical curve "K").
8. Station and elevation of intersecting streets.
9. Match lines.
10. Groundwater elevation from soils report where available.

E. Storm Drain**:** Where public storm drains are located within a public or private street section, they shall show on the street plan and profile sheets; where exterior to a street section, storm drains shall show on separate plan and profile sheets, indicating the appropriate easements and easement widths.

1. Plan sections for all storm lines shall show, at a minimum, the following:
    a. Location of pipe in relation to street centerline and/or easements, property lines, etc.
    b. Type and location of manholes and catch basins showing the station, number, and rim elevations of each.
    c. Size, class, and type of pipe including catch basin leads.
    d. Type, location, Q capacity, Q5, Q100 of storm flows of inlet and outlet structures, catch basins and catch basin leads, bypass, and overflows.
    e. Location and type of maintenance access roads to manholes or structures, where required.

f. Typical channel section, where required.

g. Indicate benchmark location and elevation.

h. Existing utilities; extent, location, and size of riprap or energy dissipater at discharge points.

i. Match lines.

j. Type of water quality treatment feature and connection to storm drain system.

2. Profile sections for all storm drain shall show, at a minimum, the following:

a. Existing and finished surface grades and pipe profile showing type, size, slope, Q capacity, Q5 and Q100, the velocity flowing full and the hydraulic grade line if Q100 > Q capacity, and labeling of clearances.

b. For channels, also show the depth of flow for the 5-year and 100-year storms, Q capacity, freeboard, maximum slope, minimum slope, and maximum and minimum velocities.

c. Manhole station, number, rim elevation, and invert elevation of all pipes entering or exiting, and distance between manholes.

d. Existing utilities with pertinent elevations, including labeling of clearances.

e. Match lines.

f. All piping, identified as public or private.

F. Sanitary Sewer: Where public sanitary sewers are located within a street section, they shall show on the street plan and profile sheets; where exterior to a street section, sanitary sewers shall show on separate plan and profile sheets, indicating the appropriate easements and easement widths.

1. Plan sections for all sanitary sewers shall show at a minimum the following:

a. Location of pipe in relation to street centerline and/or easements, property lines, etc.

b. Type and location of manholes showing the station, number, and rim elevations of each.

c. Size, class, and type of pipe.

d. Service lateral locations with reference to station and property lines (where lateral locations are not shown on utility plans).

e. Location and type of maintenance access roads, where required.

f. Benchmark location and elevation.

g. Existing and proposed utilities, including labeling of horizontal clearances.

h. Match lines.

2. Profile sections for all sanitary sewers shall show, at a minimum, the following:

a. Existing and finished surface grades.

b. Pipe profile showing type and class, size, slope, and velocity for half-full flow.

c. Manhole type, station, number, rim elevation, and invert elevation of all pipes entering or exiting.

d. Distance between manholes.

e. Existing and proposed utilities with pertinent elevations, including labeling of vertical clearances.

f. Match lines.

g. All piping, identified as public or private.

3-20 TRAFFIC SIGNS AND PAVEMENT MARKINGS.

A. Traffic signs and pavement markings (both existing and proposed) to remain in place or to be removed, relocated, or installed shall be shown. Include appropriate notes, MUTCD designations, and standard detail references. Use a separate sheet for extensive or complex traffic device work; separate plan sheets are not required for minor work. These plans shall also show curb markings and parking meter poles, when appropriate.

3-21 TRAFFIC SIGNAL PLANS

A. Plan sheets for the modification of existing traffic signals shall show both existing and proposed improvements. Plans shall show underground utilities, traffic lane configuration, channelization, property lines, curbs, and such other existing or proposed physical features as may be likely to affect the signal installation. Reference NDOT standard plans and specifications, or appropriate City of Reno equipment standards, Construction Standards, or the SSPWC.

3-22 STREET SECTIONS, PAVEMENT STRUCTURAL SECTION AND CROSS SECTIONS

A. Street sections shall conform to the requirements of the PWDM. A typical street section for each street classification, maintenance access road, and emergency access road to be improved shall be provided. Sections shall indicate street name and stationing, and delineate all improvement dimensions. At minimum the following shall be included for each section:

1. Street Classification
2. Right-of-way width
3. Street width (Face of curb to face of curb)
4. Bike lane width (if required by street classification)
5. Type of Curb and Gutter
6. Sidewalk width
7. Landscape parkway width
8. Public Utility Width
9. Type of base and surface improvements

B. Pavement Structural Sections shall conform to the requirements of the PWDM and be consistent with the Geotechnical Report. A pavement section shall be provided for each street classification, maintenance access road, and emergency access road and include the following:

1. Each pavement lift shall show depth, indicate Type 2 or 3, oil grade, 50 or 75 blow, and percentage of air voids.
2. Material and depth of base course with compaction requirements.
3. Subgrade shall reference the geotechnical soils report and include information on the resilience modulus, subgrade preparation, and compaction requirements for each pavement section.
4. Geogrid and/or geotextile for subgrade stabilization may be allowed with approval of the City Engineer. The location and type of Geogrid and/or Geotextile to be used shall be indicated by street and stationing.

C. Additional cross sections should be provided to depict non-typical design features or special conditions. These include but are not limited to:

1. Property boundary slopes.
2. Retaining and terraced walls.
3. Improvements abutting natural drainage areas.

3-23 STANDARD DETAILS

A. Standard Details shall be provided for all public infrastructure to be constructed.

B. Engineer shall provide the current version of all applicable Standard Details. Standard Details shall include the City of Reno detail title block with detail name number and date. Modification to standard details shall not be allowed without a design exception from the Utility Services Director or City Engineer as applicable. Details are made available for download on Public Works page of reno.gov website.

3-24 PROJECT SPECIFIC DETAILS

A. When project specific details are included they shall clearly indicate locations on the plans where they apply. The details shall indicate all materials to be used and methods and means for construction. The details shall not conflict or relax the requirements of the PWDM, Standard Details or SSPWC.

3-25 LANDSCAPE AND IRRIGATION PLAN AND DETAILS

A. Revegetation plan

1. The revegetation plan shall address revegetation of all disturbed areas contained within the site that are not formally landscaped, including rockery walls and riprap slopes, with a native seed mix in accordance with plans developed for the site by a certified professional in erosion and sediment control, a Landscape Architect, or other qualified erosion control professional.

2. The revegetation plan shall include specifications to stockpile existing topsoil and vegetative strippings and reapply the material to all disturbed areas that are not formally landscaped.
3. Where low impact development (LID) features are proposed that incorporate the use of vegetation, mulch or other similar elements, plans are required to be prepared and sealed by a Nevada Licensed Landscape Architect. Plans shall incorporate proposed maintenance procedures and inspection frequencies for each different type of LID feature installed.

B. The irrigation plan shall be submitted with the landscape plans and approved prior to final landscape improvement plan approval.

C. The irrigation plan shall show scale, north arrow, locations of adjacent streets, property lines, easements, sidewalks, drives, paved areas, buildings, street trees, and any other natural or manufactured site features influencing the use of the site.

D. The irrigation plan shall be prepared at a scale of 1” = 40' or 1” = 20' or another scale approved by staff, which allows for maximum clarity of the proposal. Irrigation plans shall be the same scale as the landscape plan.

E. The irrigation plan shall graphically and through notes depict a water-efficient design consistent with the landscape and grading plans.

F. The irrigation plan shall show identify and describe automatic irrigation components to ensure that vegetation is adequately serviced through water conserving features.

G. The irrigation plan shall indicate the system point of connection and size, water pressure available, and maximum demand of the system in gallons per minute.

H. The irrigation plan shall specify the manufacturer’s name and equipment identification number.

I. The irrigation plan shall indicate the reduced pressure backflow preventer. Refer to water purveyors for requirements for backflow preventers.

J. The irrigation plan shall show all locations of irrigation valves, controllers, hose bibs, quick coupler valves, sprinkler heads, and backflow preventers. Sprinkler location on plans shall also include pattern of sprays (i.e., full circle or half circle), psi, radius of throw, and gallons per minute.

K. Irrigation details shall be used to clarify particular situations. Typical details should include backflow preventers, valves, irrigation heads, and irrigation controller.

L. The irrigation plan shall show and note hydrozones. The delineation of hydrozones should take into account like water demand plants, slopes, environmental factors, and water pressure.

M. The irrigation zones on the irrigation plan should substantially correspond to the hydrozones on the landscape plan and be labeled by precipitation rates and method of water application (drip, spray, etc.).

3-26 GEOTECHNICAL TEST PITS AND BORING LOGS

A. All boring and test pit logs shall be incorporated into the plans. Where ground water is encountered, the elevation of ground water shall be indicated in all profiles. Where percolation or flooding basin tests have been performed, this shall also be indicated in all profiles.

3-27 SITE DRAINAGE PLAN

A. The site drainage map shall be included from the drainage report, as referenced in Section 8-5.

3-28 STORMWATER QUALITY MANAGEMENT PLAN (SWPPP)

SECTION 4 – STREETS

4-1 GENERAL

A. Unless otherwise specified by City ordinance, the SSPWC, Standard Details for Public Works Construction, or items in this section, design of all streets and related improvements shall conform to the following: National Association of City Transportation Officials Urban Street Design Guide and AASHTO A Policy on Geometric Designs of Highways and Streets, latest editions. The more restrictive standard shall prevail for design.

B. All public and private streets and alleys within a subdivision or development shall be improved and conform to the requirements of the PWDM and Reno Municipal Code.

C. Additional right-of-way shall be provided near intersections as required by the City Engineer in order to facilitate turning movements and pedestrian facilities.

D. At least two separate points of ingress and egress conforming to City standards shall be provided to serve a subdivision or development unless otherwise approved by the City Engineer with concurrence by the Fire Chief. Road widths can be impacted by the needs or requirements of the Fire Department.

E. Streets or access facilities that form a boundary to or are necessary to serve the subdivision or development which are not within the boundaries of the subdivision or development shall be improved with development to standards required by the City Engineer to promote public safety and welfare.

F. All necessary right-of-way or easement acquisition outside the boundaries of a subdivision or development, including any agreements as to access, ownership, and maintenance, shall be completed prior to approval of a final map or prior to the issuance of any building permit for a development, whichever is first.

G. Additional standards that may apply include, but are not limited to, Redevelopment Streetscape standards, Regional Center Plans, Transit Oriented Development Corridor Plans, Conditional Use Permit, Specific Plan District, Planning Overlay, Neighborhood plans, per Title 18.

H. When making a connection to an existing street end, the developer shall be responsible for removing and reconstructing up to a maximum, based on field inspection, of 20’ of the existing roadway to make a satisfactory connection as required by the City.

I. The developer shall be responsible for constructing or modifying curbed median islands for new streets where required by these standards, or when required for traffic control on existing streets as a result of the development, as determined by the City Engineer.

J. The applicant shall be responsible for all drainage facilities (bridges, pipes, culverts, and appurtenances) crossing new streets within, adjacent, and contiguous to the project.

K. The applicant shall be responsible for all associated modifications to allow for access in accordance to Public Right-of-Way Accessibility Guidelines (PROWAG), latest edition as published by the United States Access Board, including but not limited to sidewalk ramps, striping, and audio pedestrian buttons.

L. Maintenance of parkways will be the responsibility of the adjacent property owner, homeowner’s association, or landscape maintenance district.

4-2 STREET CLASSIFICATION AND DESIGN WIDTH

A. Local Street: Local streets provide direct access to abutting parcels. Local streets are designed for the lowest traffic volumes with the lowest speeds and narrower widths. Generally, local streets have a maximum ADT of 1,000 and service a maximum of 100 residential units with direct access.

B. Minor Collector: Minor collectors function as connections between local streets and major roadways and provide access to abutting parcels. STOP control is often found at intersections with local streets and traffic signals with major roadways. Generally, minor collectors have speed limits of 25 to 30 miles per hour, a maximum ADT of 5,000, and service a maximum of 500 residential units.

C. Major Collector: Major collectors function as connections between local or residential collectors and arterial streets. When a major collector exceeds 4,000 ADT, direct access to new residential properties is prohibited and RTC Access Management Standards shall be reviewed appropriately. Generally, major collectors have speed limits of 25 to 40 mph and ADT up to 10,000. STOP control is often found at intersections with minor roadways and traffic signals are often found at intersections with major roadways. Constructed widths may be reduced for those collectors with less than 4,000 projected trips, no truck traffic and no frontage provided to adjacent parcels, however the dedicated right-of-way shall be sufficient to allow for future roadway needs.

D. Minor Arterial Street: Minor arterial streets provide traffic access between neighborhoods and city centers. Minor arterials are subject to access control, channelized intersections, parking restrictions, and signalized intersections with other major roadways and some collector streets. Typical speed limits range from 30 to 45 mph. Appropriate traffic studies and engineering design should be used to determine roadway widths and structural sections and in no case shall these be less than City standards.

E. Major Arterial Street: Major arterial streets accommodate large volumes of through traffic between city districts. Direct access to individual properties is strongly discouraged, and parking and loading may be restricted or prohibited to improve capacity. New major arterials should be intersected by other major arterials, minor arterials, and some collector streets. Appropriate traffic studies and engineering design should be used to determine roadway widths and structural sections and in no case shall these be less than City standards.

F. Unless otherwise determined by the Regional Transportation Commission Street & Highway Policy, existing right of way constraints, or approved private roadways and at the approval of the City Engineer, the minimum street design and geometric standards must conform to the Street Classification Design Widths table below.

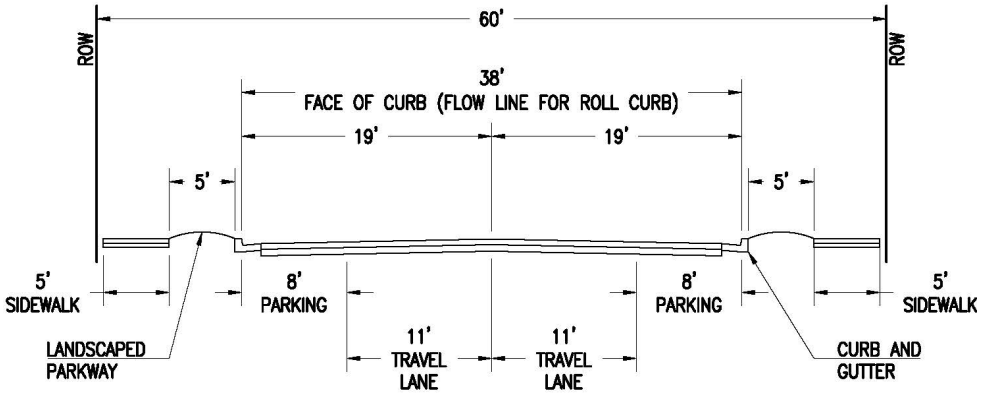
Street Classification Design Widths

Parameter	Local	Minor Collector	Major Collector	Minor Arterial	Major Arterial
Right-of-way (ROW) Width (ft)	60	58[c]	81	107	120
Face of Curb to Face of Curb Width (ft)	38	36[c]	48	63	85
Travel Lanes (minimum number)	2	2	2	4	6+
Sidewalk Width (ft)	5	5	6	6	6
Parkway Minimum Width (ft)	5	5	5	5	5
On Street Parking (Allowed)	Yes	Yes[a,c]	No	No	No
Parking Width	8	8	No	No	No
Bikeway Required	NA	Yes	Yes	Yes	Yes
Bike Lane Width Minimum (ft)	NA	5[b]	7[d]	-	-
Shared Use Path[e,f,g]	NA	NA	Yes[e]	Yes[f]	Yes[g]
Shared Use Path Width (ft)	NA	NA	12	12	12
Turn Pocket Width (ft)	NA	NA	12	14	14
Average Daily Traffic (ADT)	< 1,000	< 6,000	< 8,000	< 15,000	< 30,000
Units	< 100	NA	NA	NA	NA
Posted Speed Limit (mph)	25	25 – 30	30 – 35	30 – 45	Note

a. No parking when posted speed limit is greater than 30 mph
b. Bike lane shall have a 2ft buffer if ADT is greater than 4,000 or posted speed is greater than 30 mph.
c. When Minor Collector includes parking, and buffered lanes, minimum ROW width shall be 74ft, and all other attributes shall widen accordingly.
d. Major Collector bike lane shall have a 2ft buffer minimum.
e. Shared use path for Major Collector shall be required if ADT is greater than 7,000 or posted speed is greater than 35 mph. The shared use path may be used to substitute sidewalk on one side of the road.
f. Shared use path may be used to substitute sidewalk on one side of the road for Minor Arterial.
g. Shared use path on both sides of the road shall be required in lieu of sidewalk for Major Arterial.
Note: For Major Arterials, appropriate engineering analysis and design shall guide the appropriate posted speed limit.

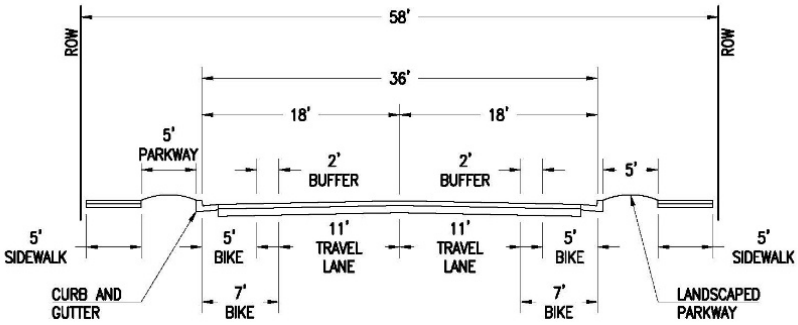
Local 60’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

LOCAL



Minor Collector (Minimum) 58’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

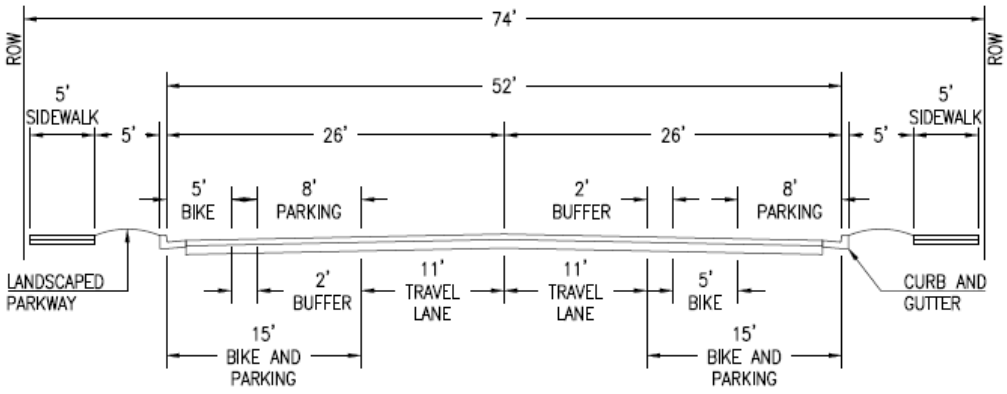
MINOR COLLECTOR-MIN



MINOR COLLECTOR
NO PARKING - PARKWAY BOTH SIDES

Minor Collector Maximum 74’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

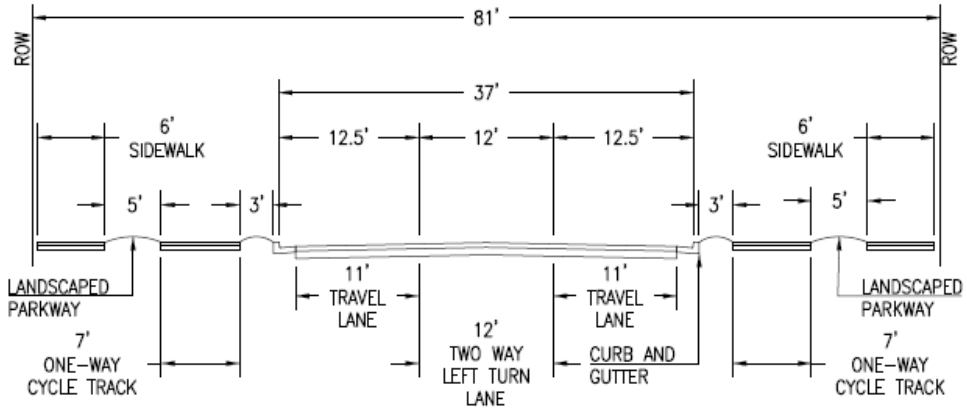
MINOR COLLECTOR-MAX



MINOR COLLECTOR
PARKING BOTH SIDES - PARKWAY BOTH SIDES

Major Collector 81’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

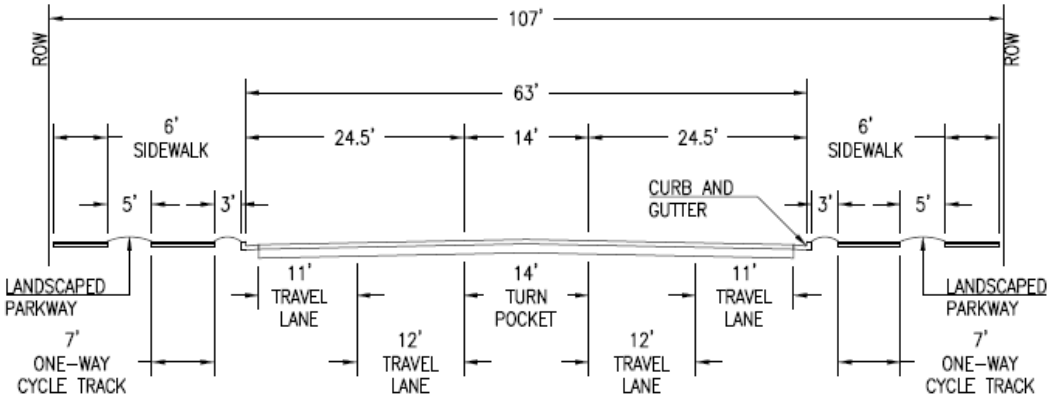
MAJOR COLLECTOR



MAJOR COLLECTOR "C"
NO PARKING - PARKWAY BOTH SIDES

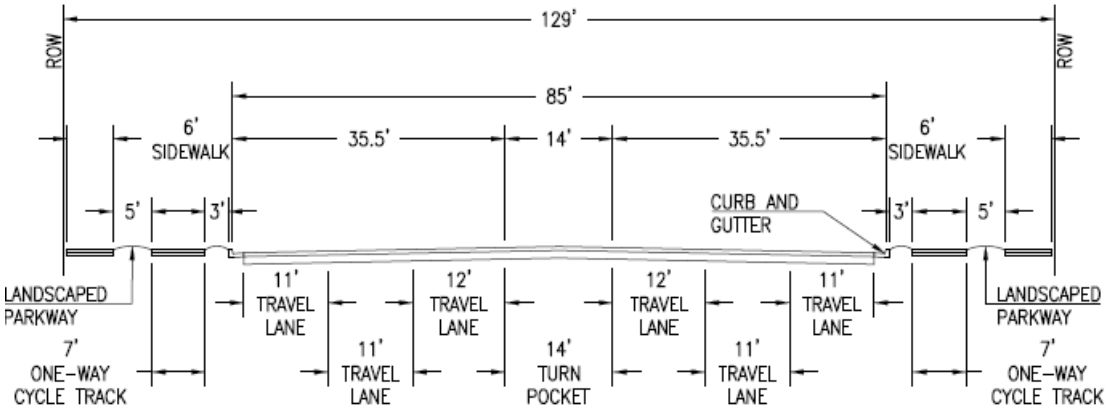
Minor Arterial 107’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

MINOR ARTERIAL



Major Arterial 129’ RIGHT OF WAY (TYPICAL) NOT TO SCALE.

MAJOR ARTERIAL



4-3 ADDITIONAL STREET DESIGNATIONS

A. Industrial: Industrial roadways are lower volume roads servicing a majority of non-residential lots that provide direct access to commercial and industrial lands. Approximate ADT is less than 6,000 with a high percentage of trucks (greater than 4%).

B. Concrete Streets: Concrete streets are roadways surfaced with Portland cement concrete pavement. Concrete street characteristics such as mix design, thickness, structural section, reinforcement, jointing, and type are determined through proper laboratory tests, engineering judgement, and design principals.

C. Alleyway: Alleyways are narrow passageways generally located between or behind buildings for the purposes of utility services, waste collection, and sometimes property access.

D. Private Street: Streets that are privately owned and maintained.

E. Emergency Access Road: Roadways with restricted access intended for Emergency Services only.

F. Maintenance Access Road: Maintenance access roadways are intended for vehicular access for maintenance of sanitary sewer and storm drain facilities and their related appurtenances.

G. Roadway Reconstruction Street: Roadways that are reconstructed as part of any requirement from the City, whether it is a condition of approval from City Council, Planning Commission, or Development Services, part of an agency capital improvement plan, or any other requirement not addressed within the RMC.

4-4 PAVEMENT DESIGN AND STRUCTURAL SECTIONS

A. The minimum design life of the structural section shall be 20 years. Design of the structural section for Hot Mix Asphalt (HMA) for both public and private streets shall conform to the procedures as set forth in the current Asphalt Institute Manual Series No. 1, based on subgrade strength values determined by Resistance (R) value. Subgrade shall be corrected to a minimum R value of 30. Sufficient tests shall be made to evaluate fully each different soil type in the project.

B. A soils report indicating the R value of the base (i.e., subgrade) soil, along with calculations for structural pavement sections shall be prepared by a Nevada Licensed Civil Engineer and submitted with any plan indicating construction of roadway.

C. Aggregate base material shall meet the requirements of Type 2, Class B crushed aggregate base of SSPWC.

D. HMA shall be:

1. Type II with hydrated lime (mineral filler) added at 1.5% of the weight of dry aggregates, except:
    a. Type III shall be used for the top lift on all local streets
    b. Asphalt cement grade PG64-28NV shall be used for the top 2” minimum on all finished pavements.

E. Minimum structural section for both public and private improvements shall conform to the table below:

Street Classification	Aggregate Base	Hot Mix Asphalt/PCC
Local Street	6”	4” HMA
Collectors/Industrial	8”	5” HMA
Arterials	12”	6” HMA
Emergency Access	Based on Engineered Design	2” HMA
Maintenance Access	Based on Engineered Design	2” HMA
Alleyway	8”	6” PCC
Concrete Street*	6”	9” PCC

Footnote: Concrete streets “white paving” may be permitted upon approval of structural designs by the City Engineer.

F. With approval by the City Engineer and provided the minimum R value of 30 is obtained, the subgrade soil beneath the curb and gutter and pavement section may be lime treated per geotechnical recommendations.

G. In transition areas from one street width to another street width standard, the heavier structural section shall be used in the transition area.

H. Recycled asphalt base material may be utilized as a substitute for Type 2, Class B, aggregate base for use under bituminous pavement if it meets the SSPWC requirements for Type 1 Recycled Asphalt Concrete Base. Recycled asphalt base shall not be substituted for Type 2, Class B, aggregate base under any Portland cement concrete structure.

I. At the approval of the City Engineer for street reconstruction, AC grindings may be combined, in place, with base course and subgrade, per gradation requirements in SSPWC. Sufficient test results shall be provided to the City Engineer prior to approval for use.

J. Slurry seal of streets shall be required on all new acceptances.

K. To assure proper future pavement mating, paper joints shall be used at the ends of any new public pavement project (saw cutting shall not be allowed). In addition, the terminus of adjoining asphalt pavement pull lines are to be staggered a minimum of 3’.

L. Where paving or overlays involve intersections of secondary and primary streets, the intersection paving joint shall be located in the secondary street, a minimum of 4’ off the gutter line of the primary street, and neat lined for the subsequent paving of the adjoining street. Asphalt concrete pavement joints/seams will not be allowed in any drainage flow lines. Any alternate paving configurations must be approved by the City Engineer.

4-5 HORIZONTAL AND VERTICAL STANDARDS

The following standards for the design of profiles shall govern the preparation of plans for proposed improvements.

A. Horizontal curves shall not be introduced at or near the top of a pronounced crest vertical curve or near the bottom of a pronounced sag vertical curve. Consideration shall be given for stopping sight distances, as set forth by AASHTO.

B. Minimum horizontal curve radii shall be as specified in the table below:

Street Classification	Minimum Design Speed (mph)	2% Crown (feet)	2% Super-elevation (feet)	4% Super-elevation (feet)
Local Streets:				
Serving less than 20 lots	20	100		
Serving between 20 & 50 lots	25	185		
Serving more than 50 lots	30	300	250	230
Collector Streets	30	430	335	300
Minor Arterial Streets	40	820	630	565
Major Arterial Streets	50	1,390	1,045	925

C. Curves on any street, except local streets, shall be separated by a tangent of not less than 100'. No local street in a residential district shall have a tangent greater than 600', unless it can be demonstrated that the tangent is visually broken by a vertical curve or that it is needed to preclude a traffic hazard. A successful street design will result in traffic calming and reduce the need for future installation of traffic calming measures.

D. Vertical curves shall be provided wherever the algebraic difference between two intersecting grades meet the following criteria:

1. Greater than 1.0% on roadways 35 mph design speed or greater.
2. Greater than 2.0% on roadways less than 35 mph design speed.

E. Vertical curves shall be of sufficient length to provide the following:

1. Minimum sight and stopping distances as established by AASHTO.
2. Minimum design speeds as follows:
   a. 30 mph for local and collector (minor and major) streets.
   b. 40 mph for minor arterial streets.
   c. 50 mph for major arterial and expressway streets.

F. Grades and cross slopes

1. Minimum Grades: All streets shall have a minimum longitudinal grade of 0.6%.
2. Maximum Grades: major collector, arterial, and expressway streets shall have a maximum grade of 6.0%.
3. Maximum Grades: minor collector, local streets, alleys, emergency access roads, and maintenance access roads shall have a maximum grade of 6.0% except as otherwise approved because of topographical constraints as detailed below:
   a. Minor collector and local streets with a northern exposure may be allowed a maximum grade of 10.0% with City Engineer approval.

b. Minor collector and local streets with a southern exposure may be allowed a maximum grade of 12.0% with City Engineer approval.

c. Maintenance access roads shall have a maximum grade of 12%

4. Grades in excess of 8.0% shall be limited to a horizontal tangent length of 400' and shall be provided with landings contiguous to both sides of the steeper section. Each landing shall have a grade of 6.0% or less, and a length of at least 100'.

5. Grades in excess of 10.0% shall be limited to a horizontal tangent length of 200' and shall be provided with landings contiguous to both sides of the steeper section. Each landing shall have a grade of 6.0% or less, and a length of at least 100'.

6. On long grades, the steeper grades shall be provided near the bottom of the ascent wherever possible, with shallower grades near the top of the ascent.

7. The normal street crown cross slope is 2.0% from the centerline to the lip of gutter. The roadway cross slope shall be a minimum of 1.0% and a maximum of 4.0%.

8. A cross slope of less than 2.0% shall only be allowed for road reconstruction and not in new development.

9. Unless otherwise approved by the City Engineer, the crown shall be at the centerline of the traveled way.

10. Super-elevated "sloped streets" may be allowed with City Engineer approval.

11. Grade breaks should extend to street crown. Offset crowns may be used, if they meet the requirements of PROWAG and are approved by the City Engineer.

4-6 STREET INTERSECTIONS AND SITE ACCESS

A. Street spacing and intersection placement shall be as follows:

Minimum Distance Between Intersections		
Street Classification	**Downtown CBD[1]**	**Outside Downtown**
Major Arterial	⅓ mile (1,760')	½ mile (2,640')
Minor Arterial	¼ mile (1,320')	⅓ mile (1,760')
Major Collector	600'	800'
Minor Collector	400'	400'
Local	200'	200'

1. CBD as defined in Reno Municipal Code 6.04.090

B. Median openings on arterial and collector streets that have continuous raised center medians will not be permitted unless all the following conditions exist:

1. The property to be served is a major traffic generator and has a minimum continuous frontage of 600' along the major street, or access easements are recorded to allow use of the opening by a minimum of two properties which combined generate sufficient traffic to warrant the opening.
2. The median opening is not less than 700' from an intersection with an arterial street.
3. The median opening is not less than 400' from an intersection with a collector or local street.
4. The median opening is not less than 600' from any other existing or planned midblock median opening.
5. Sight distance is adequate for the design speed of the major street.
6. All costs such as base material, pavements, safety lighting, traffic signals, landscaping, irrigation, reconstruction, or utility relocation required by a midblock opening will be borne by the requesting party.
7. The design of median openings shall be subject to the requirements and approval of the City Engineer including storage lengths and tapers to AASHTO requirements.

C. All regional roads shall follow RTC Access Management Standards as outlined in the most recently adopted RTP.

D. Where conflict exists between RTC Access Management Standards and this Design Manual, the more restrictive requirement shall apply.

E. All streets shall intersect at 90°± 5° angle to each other. This angle shall be maintained for a minimum distance equivalent to the right-of-way width measured from the curb return.

F. Streets shall not be designed to intersect on the inside of a horizontal curve nor on the opposite side of a crest vertical curve if the sight distance will be inadequate for drivers to enter the traffic flow or cross the street safely.

G. Street grades of intersections that are signalized or without stop or yield control shall not exceed 5.0% for a minimum distance of 50' measured from the extension of the face of curb of the primary street through the intersection.

H. Street grades of intersections that are stop or yield control shall not exceed 2.0% for a minimum distance of 50' measured from the extension of the face of curb of the primary street through the intersection.

I. Street intersections of two local streets in a stop condition do not require a vertical curve at the intersection of the crown section with the street grade. Other street intersections shall require a vertical curve transition at the intersection of the crown section with the street grade designed to AASHTO standards.

J. Street intersections shall not be allowed when the grade on the primary street exceeds 6.0% with a northern exposure and 8.0% with a southern exposure.

K. At each right-angle street intersection, the property line at each corner shall be rounded with a minimum radii listed in the table below. The major street shall dictate the minimum radii. The City Engineer may require a different radius when streets intersect at an angle other than 90°, or to accommodate existing and future utility and public improvements, including drainage and traffic control facilities.

Street Classification	ROW Radii (feet)	Top back of curb radii
Local Street	15	20
Collectors/Industrial	20	25
Minor Arterials	23	30
Major Arterials	33	40

L. When driveways are abandoned or relocated, the driveway sections must be removed and replaced with standard curb and gutter, sidewalk, and if applicable, parkway.

M. Major commercial driveways requiring a Traffic Impact Analysis or a Traffic Entry and Access Study as detailed in Title 18 as determined by the City Engineer, may be considered as intersecting streets and shall conform to the same offset requirements.

N. Driveways and intersections on major collectors and arterials shall be evaluated for right turn pockets.

O. Driveway spacing, clearances, and return radii shall be in accordance with the City Standard Details, RTC Access Management Standards, and Title 18 where appropriate.

4-7 SIGHT DISTANCE AND VISIBILITY AT INTERSECTIONS

A. Street intersection sight triangles shall conform to the requirements of AASHTO geometric design for highway and streets. Both approach and departure site triangles shall be considered in design.

B. The triangle visibility control area shall be evaluated to AASHTO requirements. No signs, plantings, structures, natural growth, fences, walls, or any other type of obstruction to a clear view higher than 3' above the nearest pavement surface (or traveled area where no pavement exists) shall be installed within the triangle visibility control area. Exceptions include tree canopies, permitted signs that provide a minimum clearance of 7' measured from the existing grade, or as determined by the City Engineer.

C. Sight triangles shall be demonstrated on applicable plan sheets on all approaches of intersections of collectors, arterials, driveways, or alleys on roadways with an ADT greater than 4,000. The City Engineer may require additional sight triangles as needed.

4-8 CUL-DE-SACS, HAMMERHEADS AND KNUCKLES

A. Cul-de-sacs shall conform to International Fire Code requirements. Shared driveways may be terminated in a hammerhead. The minimum lot frontage on cul-de-sac streets shall be 30'. "Dead End" signs shall be posted on cul-de-sacs with length greater than 100'.

B. Minimum grades around cul-de-sac bulbs and within knuckle-type intersections shall be 0.5%.

C. Maximum grade on cul-de-sacs shall be 6.0%.

D. The street crown within cul-de-sac bulbs and knuckle type intersections may be increased to a maximum of 4.0% from the centerline to the lip of gutter.

E. Knuckle turnouts are not allowed on streets serving more than 20 lots.

F. Minimum right-of-way for cul-de-sac bulbs shall be 6" beyond the curb if no sidewalk is required or 6" behind the sidewalk if sidewalk is required.

G. Temporary cul-de-sac bulbs shall have a minimum 50' radius.

H. Temporary cul-de-sac bulbs shall be constructed with a minimum of 2" HMA on 6" aggregate base with asphalt curbing when located within the development. When located within an adjacent future developable area, it shall conform to temporary emergency access road standards within an access easement and be approved by the Reno Fire Department. Temporary cul-de-sacs shall not be accepted by the City of Reno until they are reconstructed to permanent street standards.

4-9 PARTIAL STREET

A. Partial streets may be permitted by the City Engineer along the boundary of a subdivision or property of the development where the full right-of-way cannot be dedicated or where the complete street cannot be constructed but will ultimately be constructed with adjacent or continuing development.

B. Partial streets shall be constructed to a complete half of the final geometric and structural section and shall in no instance have a minimum paved with less than 24', with no parking.

C. Curb, gutter, sidewalk, streetlights, and parkway adjacent to the subdivision shall be provided.

D. Partial streets that terminate adjacent to an intersection or driveway shall be tapered 45° to the street if right-of-way is available.

4-10 PRIVATE STREETS

A. Private streets shall be designed and constructed to the requirements of this design manual. Signs shall be posted stating "Private Street, Not Maintained by City". Additional requirements for private streets are included in Title 18.

B. Gated private streets shall provide a means to turn around if gates are closed. All gates shall be "click to enter" per Fire Department standards. Maintenance of the gates shall be by the private development.

4-11 EMERGENCY ACCESS ROADS

A. Minimum width of 24' with a minimum centerline turning radius of 40', unless otherwise approved by the Fire Marshal.

B. Grades shall not exceed the maximum for local street grades per Section 4-5.

C. The structural section shall be designed to support a tandem axle loading of 30 tons, with a minimum of 2" of HMA.

D. Access ways shall be constructed to provide adequate roadside drainage consistent with City standards.

E. Emergency access roads shall always be open and usable. Where required, access to the roadway at each entrance shall be controlled by an "Emergency Access Control Gate", shall be posted "For Emergency Vehicles Only", and shall incorporate strobe actuated gate opening devices. Installation and maintenance of the roads, gates, and mechanical equipment shall be by the private development.

F. All emergency access roads shall provide for vehicles to enter traffic nose first.

4-12 MAINTENANCE ACCESS ROADS

A. Vehicular access roads for maintenance of City owned sanitary sewer and storm drain facilities and their related appurtenances shall meet the following criteria:

1. Minimum un-encroached width of 12 feet clear of all lateral obstructions with a minimum centerline turning radius of 40'.
2. Grades shall not exceed the maximum for local street grades per Section 4-4.
3. The structural section shall be designed to support a tandem axle loading of 25 tons, with a minimum of 2" of HMA.
4. Access ways shall be constructed to provide adequate roadside drainage consistent with City standards.

B. Driveway entrances for maintenance access roads shall meet the Standard Details for commercial driveways and include removable bollards per the Standard Details.

C. Where sewer or storm drain manholes are located behind sidewalk, a commercial rated driveway entrance shall be provided with appropriate access to include, as a minimum, a surrounding 4' asphalt concrete pad located outside the concrete manhole collar.

D. All maintenance access roads shall provide for vehicles to enter traffic nose first.

E. Dead-end access roads in excess of 150' shall require termination in a hammerhead, turnaround, or 'Y'-turn.

4-13 SIDEWALKS, CURB AND GUTTERS, AND DRIVEWAYS

A. Public sidewalks, curbs, and gutters shall be installed with all new developments. Sidewalks may be omitted where the sidewalk has been waived in accordance with RMC 18.04.502.

B. Existing improvements shall be replaced when those improvements are deteriorated or displaced, including paving between the street cut and gutter line on all streets.

C. At existing or future RTC RIDE bus stops, appropriate easements or rights-of-way shall be dedicated and bench/shelter pads constructed. Coordination with RTC shall occur for the placement and details of the bus stop, with approval from the City Engineer.

D. No obstruction (i.e., power poles, electric transformers, streetlights, signal poles and controls, water meter boxes, pull boxes, mailboxes, etc.) shall be allowed to be located within public sidewalks, pedestrian ways, or within the triangle visibility control area as defined in Section 4-6. A minimum unobstructed clearance of 48" shall be maintained from any obstacle. Additional right-of-way or easement shall be provided where required.

E. Any construction work beneath existing concrete structures (i.e., sidewalks, curbs, gutters, aprons, walls, etc.) that are within the public right-of-way shall require removal and replacement of the affected concrete

structure. Construction operations (i.e., tunneling, directional drilling, boring, etc.) shall not be allowed under any of the above stated concrete structures.

F. Sidewalks

1. Pedestrian ways shall be provided from all public sidewalks to the entrance of buildings.
2. Necessary rights-of-way shall be dedicated or easements granted for the pedestrian ways.
3. In new developments, sidewalk requirements shall be determined at the time of tentative map or parcel map approval, typically on both sides of all streets, public and private, unless otherwise approved through the entitlement process.
4. Curb returns shall be constructed to meet PROWAG. A minimum of one mid-block ramp shall be provided at 'T' intersections. Alignment of ramps and crosswalks shall provide for minimum pedestrian exposure to traffic during crossing of streets.

G. Curbs and gutters

1. Minimum Grades: All gutters shall have a minimum longitudinal grade of 0.5% for curbed pavements.
2. Glue-down curbs are not permitted for new construction.

H. Driveways

1. Driveway spacing and location shall conform to the Standard Details for driveway geometrics.
2. Driveways shall be designed as nearly perpendicular as possible to the adjoining street or cul-de-sac.
3. Unused driveway aprons that do not provide access onto private property, or portions hereof, shall be replaced with new curb, gutter, sidewalk, and parkway as needed.
4. Driveways accessing public streets with no curbs and gutters and sidewalks shall be paved with asphalt concrete or Portland cement concrete.

4-14 BIKEWAYS

A. The design of bikeways shall conform to the AASHTO "Guide for Development of New Bicycle Facilities", latest edition, unless otherwise specified by City Ordinance, SSPWC, Standard Details, or items in this section.

B. Where bike lanes are required, street sections may vary.

C. The structural section for these separated facilities shall be based on a soils report recommendation. The minimum structural section shall be 2" of Type III PG 64-28NV HMA over 6" of Type II Class B aggregate base, except where they are integrated with adjoining pavement for vehicular access, the associated minimum street structural section shall apply.

4-15 ALLEYS

A. Alleys required to serve a development or project shall be constructed as part of the project.

B. Existing improved alleys serving a project shall be reconstructed or repaired as part of the project if deteriorated, as defined herein:

1. No alley repair or reconstruction work shall be required for an addition consisting of 500 square feet or less to an existing structure, or tenant improvement/interior remodel consisting of 1,000 square feet or less.

2. The main alleyway entrance where the alley meets the street shall be reconstructed when those improvements are deteriorated or displaced in accordance with the Guidelines for Determination of Deteriorated Sidewalks, Curb and Gutter.

3. The alley shall be reconstructed for the length of the property abutting the alleyway and shall be full width when that alleyway has a Pavement Condition Index as defined by ASTM standards less than 65.

4. Multifamily properties greater than four units and commercial properties shall reconstruct the alley full width from the main alley access point to the furthest property line perpendicular to the alley when that alleyway has a Pavement Condition Index as defined by ASTM standards less than 65.

5. Additional improvements not adjacent to the project parcel may be required if needed to provide safe and adequate access to the property.

C. Longitudinal grades of the alley shall conform to the standards for streets in Section 4-4.

D. Alleys shall have a minimum cross slope of 2.0% from the property line toward the center of the alley.

E. Alleys shall have a minimum structural section of 5” Portland cement concrete on 6” Type II Class B aggregate base per the Standard Details with a subgrade corrected to a minimum R value of 30. Alleyways shall not be constructed with HMA.

4-16 PROWAG

The requirements of this section apply in circumstances including, but not limited to street reconstruction, structural overlay, pedestrian access projects, traffic signal construction, traffic signal modifications, and right-of-way adjacent to private developments which change the use of the land.

The requirements of this section do NOT apply in maintenance activities including, but not limited to slurry seal, crack seal, micro-seal, traffic signal maintenance, street lighting, sidewalk repair, asphalt patching, underground utility work, and traffic calming.

A. PROWAG shall be used as guidance for the development and design of projects. During the planning stages, each project scope of work shall be evaluated and efforts made to incorporate accessibility features to the maximum extent feasible.

B. No projects shall be approved which reduce accessibility in the right-of-way. Street furniture, fences, walls, benches, bus stops, shelters, signs, poles, utility covers, landscaping, and other impediments to accessibility shall not be placed on the public sidewalk or in the public right-of-way in a manner which impedes the required continuous width of the pedestrian access route.

C. It shall be the responsibility of the Project Engineer or Architect to ensure compliance with PROWAG for the project.

D. During the planning and design of projects in the public right-of-way, efforts shall be made to incorporate appropriate elements which create an accessible path of travel through the project to the maximum extent feasible in compliance with PROWAG. In each circumstance where it is determined that the addition of an accessible path of travel is not feasible, a statement shall be prepared and stamped by the engineer or architect responsible for the design of the project and approved by the City Engineer.

E. Priorities for addressing accessible path of travel are lack of curb ramps, obstructions to travel path, excessive cross slopes on driveways, excessive cross slope on sidewalk, and deteriorated surface with less than 0.5' surface discontinuity.

F. Traffic signal projects requiring major modifications to the traffic signal, installation of new traffic signals, or replacement of existing traffic signals shall incorporate accessible pushbuttons and audible signals.

G. In areas where on-street parking spaces are marked or metered, accessible parking spaces in compliance with PROWAG shall be added during street rehabilitation projects.

SECTION 5 – GRADING, SLOPE TREATMENT AND EROSION CONTROL

5-1 GENERAL

A. This section provides design criteria and guidance for all land-disturbing activity to manage and control the amount of pollutants in stormwater discharges, soil erosion, sediment discharge, and mud and dirt deposits on public roadways and in municipal storm sewer systems caused by construction activities.

B. These guidelines are applicable to all land-disturbing activities.

C. Specific additional requirements concerning this issue shall include but not be limited to:

1. Applicable RMC
2. The Truckee Meadows Construction Site Best Management Practices Handbook
3. The Truckee Meadows Structural Controls Design and Low Impact Development Manual

5-2 SLOPES

A. Cut and fill slopes may not exceed 2:1, unless it can be justified by the project's Geotechnical Engineer that the slopes are in stable rock and adequately protected against erosion or constructed with approved walls subject to the approval of the City Engineer.

B. Cut and fill slopes between 3:1 and 2:1 shall be stabilized by mechanical stabilization, or by landscape materials if approved. The requirement for mechanical stabilization or landscape materials may be waived by the City Engineer if it can be demonstrated that some other means of restoration will be effective (See Section 5-8).

C. Except in areas located within single family lots or along common lot lines between single family residences, cut and fill slopes between 3:1 and 5:1 shall be stabilized by landscape materials, hydroseeding, or seeding, and all methods shall be irrigated until established to the satisfaction of the City.

5-3 PLAN SHEET DETAILS

A. Revegetation plan

1. The revegetation plan shall address revegetation of all disturbed areas contained within the site that are not formally landscaped, including rockery walls and riprap slopes, with a native seed mix in accordance with plans developed for the site by a certified professional in erosion and sediment control, a Landscape Architect, or other qualified erosion control professional.
2. The revegetation plan shall include specifications to stockpile existing topsoil and vegetative strippings and reapply the material to all disturbed areas that are not formally landscaped.
3. Where LID features are proposed that incorporate the use of vegetation, mulch or other similar elements, plans are required to be prepared and sealed by a Nevada Licensed Landscape Architect. Plans shall incorporate proposed maintenance procedures and inspection frequencies for each different type of LID feature installed.

5-4 BOUNDARY GRADING

A. Improvements fronting public and private streets, including new driveway approaches, parkways, and sidewalks, shall be designed and graded to ensure stormwater flows conveyed by the street section are contained within the public right-of-way or private street easement.

B. The designer shall consider grading accommodations for utilities within public utility easements adjacent to public and private streets.

C. Grading shall accommodate vision triangles in accordance with Section 4.

5-5 INTERIOR GRADING

A. To prevent damage to structures due to stormwater over-topping the curb, building pads (finish grade) shall be set a minimum of 1' above the top of curb located at the point of primary access, or drainage around building pads shall be designed such that no building shall be subject to flooding as a result of stormwaters over-topping the curb or driveway approach along any public or private street.

B. Cutoff swales shall be required at the top of cut or fill slopes to intercept runoff from the slope above and restrict erosion. Swales shall discharge into approved drainage facilities.

5-6 RETAINING WALLS

A. Retaining walls, wall footings, and wall stabilization components shall not encroach into the right-of-way.

B. Retaining walls shall be located at least 18" behind a sidewalk and at least 6' behind the face of a curb where no sidewalk is provided.

C. Reinforced concrete swales shall be provided along the top of retaining walls to intercept runoff from the slope above when runoff is directed toward the wall. Swales shall be sized to accommodate design storms and sedimentation loading. Runoff from wall swales shall discharge into approved drainage facilities.

D. Retaining walls shall be engineered with appropriate wall drains. Wall drains shall discharge into approved drainage facilities. Wall drains shall not daylight through a curb without the use of an approved sidewalk cross drain.

E. Retaining walls and wall footings along property lines shall not encroach into adjacent properties without appropriate easements granted by the adjacent property owner.

F. Walls shall be designed to comply with vision triangles in accordance with Section 4-6 Sight Distance and Visibility at Intersections.

5-7 MAINTENANCE OF ACCESS TO UTILITY FACILITIES

A. Maintenance access to public sanitary sewer and storm drain facilities located on private property shall be maintained by the underlying property owner in accordance with a recorded sanitary sewer and/or storm drain easement.

5-8 SLOPE STABILIZATION

A. Seeding slope stabilization - for slopes flatter than 3:1 or as otherwise alternatively approved by the City:

1. Preparation: When possible, topsoil should be salvaged prior to construction. Topsoil is generally defined as the top 6" to 12". When possible, topsoil should be salvaged when moist but not wet. Storage of topsoil should be accomplished in shallow piles less than 2' deep. The topsoil should be placed no more than a few days prior to seeding to prevent weed invasion and wind and rain erosion. If topsoil is not salvaged, the following preparation must be adhered to.

   a. After slopes have been compacted, the top 3" of soil shall be disked and 3" of fine sandy loam topsoil, free of rocks, shall be rototilled into the disked surface. A soil test of the mixture shall be performed by an approved licensed soil testing laboratory capable of completing a standard Agricultural Soil Nutrient test as approved by the City. The cost for the test shall be paid by the developer. The soil shall meet the following minimum criteria:

Soil Attribute	Attribute Limit
Soil pH	6.8 – 8.2
Nitrates	80 lbs/acre
Phosphorus	75 lbs/acre
Salinity	Less than 2 ds/m

   b. The developer shall make the necessary amendments or fertilizer additions to the soil mixture as recommended by the soil testing firm to meet the minimum criteria. The application of any amendments or fertilizer shall be done under the observation of the Landscape Architect at the site and the soil mixture shall be retested by the testing firm. This procedure shall continue until a satisfactory mixture has been obtained.

2. Application: The seed mixture and application rate for slope stabilization shall be to the approval of the Landscape Architect and provide a variety of grasses, shrubs, and wildflowers which provide erosion control and are in keeping with the surrounding site. This will avoid the establishment of a monoculture or single species stand. Variation in soil, elevation, site exposure, and climate must be considered when blend is specified. Specification of blends must include species by category and Pure Live Seed (PLS) lbs/acre. PLS equals the percent of purity times percent of germination. Seed blends must be applied at a minimum rate depending on application method. Immediate erosion control shall be accomplished by the use of nurse grass crop which will provide 50% coverage in the first year of growth. Nurse grass crop must be a minimum of 15% of the overall seed blend.

   Drilling typically provides high germination rates and is a preferred application method. Seed shall be drilled into the soil to a depth recommended by the seed supplier. Seed drilling should be conducted along the contour to avoid erosion from water flowing down drill furrows. A minimum application rate of 20 PLS lbs/acre should be specified when drilling is provided.

   Broadcast seeding shall be applied at a minimum rate of 32 PLS lbs/acre and is recommended where slopes are too steep for seed drilling equipment or too rocky to allow effective drilling. To improve seed/soil contact the area must be raked or harrowed just before seeding. Raking or harrowing is also

recommended after broadcasting is complete. Broadcasting must not be done on windy days and uniform coverage shall be provided.

3. Irrigation: All slopes shall be irrigated until established as approved by the City. Temporary irrigation must be in place to ensure germination. To prevent rills created by irrigation heads, an area of rock or bark mulch must be provided around each sprinkler head and over-irrigation must be avoided to prevent ponding of water.

B. Slope stabilization - for slopes between 3:1 and 2:1:

1. Mechanical slope stabilization - Standard requirement:

a. Rock riprap shall be used for slope stabilization. It shall contain a minimum of four fractured faces and be placed to a minimum depth of 12". A minimum of 75% of the riprap shall be 8" diameter rock or greater.

Within one week of installation, the riprapped slope shall have an approved hydromulch seed mix applied. Hydromulch shall consist of degradable green-dyed wood cellulose fiber or 100% recycled long-fiber pulp, free from weeds or other foreign matter toxic to seed germination.

Seed mix shall be a blend of grasses and wildflowers which are specified to match locally adapted species. Variation in soil, elevation, site exposure, and climate must be considered when blend is specified. Shrubs may also be added to mix if sufficient growth area is provided. Specification of blends must include species by category and PLS lbs/acre. PLS equals the percent of purity times percent of germination. Seed blends must be applied at a minimum rate of 15 PLS lbs/acre.

If hydromulch is not used on the project, color of rock must be similar to the native rock within the area and approved by staff. A combination of landscape plants and hydromulch is encouraged. The use of landscape plants requires the use of a drip irrigation system.

b. Engineered retaining walls, rockery, concrete or alternate masonry as approved by the City Engineer may be used to form terraces which will eventually catch grade. The minimum dimension of a terrace shall be 8' to allow for adequate drain rock and planting areas. In no case shall walls and terraces exceed 2:1.

Terraces must be backfilled at the surface with a minimum of 12" of salvaged topsoil. Within one week of installation the terraces shall have an approved hydromulch seed mix applied. A seed mix of grasses, shrubs and wildflowers shall be used at a minimum of 32 PLS lbs/acre. If irrigation is not provided a tackifier must be applied and hydromulch applied in spring or fall.

c. The use of an approved erosion control mat may be allowed upon the recommendation of a licensed civil or geological engineer or Landscape Architect and approval of the City Engineer. Erosion control mats must be a thin excelsior matrix with netting top and bottom. Other types of matrix may be allowed with approval of the City Engineer. Mats must be photodegradable with an average blanket life of 12 months. Blankets must be laid and slope seeding must be done to manufacturers' specifications. Seeding is required in addition to this mechanical stabilization in accordance with 5-8A above.

2. Landscape slope stabilization, alternate method - All slope stabilization plans shall be approved by the City:

   a. Preparation: Landscape materials may be obtained for transplant from a nursery in containers or bareroot. Live plants may also be salvaged from the site during grading. Salvaged plants have a higher degree of success if collected with as much native soil as practical. Soil preparation should be followed as in Seeding Slope Stabilization (5-8A).

   b. Installation: Landscaping with live plants may be done exclusively or in conjunction with the seeding slope stabilization plan. Revegetation with live plants is warranted when a more rapid plant establishment is needed than can be met through seeding. All stock, whether purchased or salvaged, should be handled as little as possible before transplanting. Only a minimum number of seedlings necessary to complete a designated section of the planting should be removed from their containers/packaging at one time. The planting area should be fully prepared with all personnel ready to plant when seedlings arrive. Short term storage at the planting site can be facilitated by "heeling in" as directed by the nursery.

   c. Holes can be made in a variety of methods but to avoid drying out the soil, only holes ready for transplant should be made. Insert plants into holes as vertically as possible. Plant roots should not be bent, kinked or tangled, or bunched up at the bottom of the hole. Once the seedling is placed in the hole, pack the soil firmly around the root in order to avoid air pockets. To assure good root contact and minimize air pockets, all transplants should be irrigated at the time of establishment. Working on steep slopes requires that planters begin at the top of the slope and traverse, eventually working downslope. The positioning of transplants on 3:1 slopes will require catchment basins approximately 12" in diameter placed around each plant.

   d. Irrigation: All slopes shall be irrigated until established as approved by the City. Temporary irrigation must be in place to assure germination. To prevent rills created by irrigation heads an area of rock or bark mulch must be provided around each sprinkler head.

SECTION 6 – TRAFFIC ENGINEERING

6-1 TRAFFIC IMPACT ANALYSIS

A. Traffic Impact Analysis (TIA) shall be required for any project meeting the requirements set forth in Title 18.

B. In addition, the City Engineer and/or City Traffic Engineer may require a TIA of any proposed project if there is cause and concern that development will conflict with existing traffic flows, may impact the traffic operation at intersections, may not provide adequate site access, or will likely adversely impact neighborhoods.

6-2 TRAFFIC STUDIES AND REPORTS

A. The Traffic Impact Analysis Guidelines adopted by the regional transportation commission shall be used for formatting any TIA, unless otherwise approved by the City's Traffic Engineer.

6-3 TRAFFIC DESIGN

A. References

1. All traffic design shall conform to the Manual on Uniform Traffic Control Devices (MUTCD), latest edition as adopted by the State of Nevada, published by the Federal Highway Administration (FHWA), The Standard Details, and the applicable provisions of the SSPWC, latest editions as adopted by the City of Reno.

B. General

1. Traffic control devices shall be installed, modified, or removed, as appropriate, on all public streets and private streets open to public travel, alleys, and bikeways either newly constructed or improved with development.
2. Traffic reports shall conform to the Regional Transportation Commission's Traffic Report Guidelines – Regional Road Impact Fee, latest edition. Final signage and striping plans shall conform to the traffic report.
3. Copies of technical analyses associated with street design and traffic device improvements shall be required.

C. Traffic signals

1. When new construction affects elements of an existing traffic signal, relocation, and/or replacement is required. After proposed traffic signal loop detector locations have been marked, City of Reno traffic signal maintenance staff will verify locations prior to construction. Damaged loop detectors shall be repaired within two working days, unless approved by the City Engineer. The City shall back charge the contractor the cost of repairs for loops that have not been repaired within the time specified. No preformed loops shall be installed within HMA pavement. Any damaged loops shall be replaced by the close of the project and no splices shall be allowed in the final product.

2. For the installation of new traffic signals or modification of existing signals, contact Public Works Department, Traffic Engineering Section for the latest Traffic Signal Controller Cabinet Specifications. Refer to Section 3 for improvement plan requirements, and Part 2 Quality Assurance Program for inspection, testing, and turn-on procedures. Refer to the Traffic Signal Pole, Traffic Signal Pole Street Name Sign, and General Traffic Signal Notes in the Standard Details.

D. Signage and striping

1. Street name signs conforming to City standards shall be installed at all intersections per the Standard Details and may be required on arterial streets in advance of intersections. Where private streets intersect public streets, standard signs which say “Private Streets Not Maintained by City” shall be installed per the Standard Details.
2. When the design speed of a curve falls below the posted speed limit, pavement markings and signage shall comply with requirements of the MUTCD. Four-inch double solid yellow centerline striping shall be installed from beginning of curve to end of curve.
3. Speed limit signs shall be installed in proximity to all arterial or collector street intersections, and on local streets having a different speed limit than the intersecting street. Speed limit signage shall be installed on all streets where the limit changes from one speed to another. Posted speeds on City streets shall be the following, unless designated otherwise by the City Engineer consistent with City policies or law.
    a. 25 mph on local and collector streets.
    b. 35 mph on minor arterial streets.
    c. 45 mph on major arterial streets.
4. When the design speed of a curve falls below the posted speed limit, pavement markings and signage shall comply with requirements of the MUTCD. Four-inch double solid yellow centerline striping shall be installed from beginning of curve to end of curve.
5. A “Dead End” sign shall be installed at the entrance to any cul-de-sac exceeding 100’ in length.
6. Driveways that intersect one-way or median divided streets shall meet the “One Way” and/or “Right (Left) Turn Only” signing requirements set forth in the latest adopted edition of the MUTCD. Corresponding pavement markings may also be required.
7. Parking control signs shall be installed and curbs painted at street intersections, at fire hydrants, adjacent to driveways, and other locations as required. Curb colors are red for parking prohibited and yellow for restricted parking. The top and face of the curb shall be painted with standard traffic paint. Parking is prohibited within 15’ of a fire hydrant, unless a greater distance is required by the Reno Fire Department. Reno Fire Department policy establishes locations for required hydrant markers.
8. Within the parking meter district, the removal, relocation, or installation of parking meter poles and parking space marking may be required. The removal or installation of parking meters shall only be performed by the City. Meter bags may be obtained from the Public Works Department.

9. When street improvements are constructed abutting existing pavement, the entire width of the street and adjacent transition areas shall be striped in accordance with applicable MUTCD and City standards. Existing, conflicting pavement markings shall be removed per MUTCD.
10. All existing or temporary pavement markings or striping shall be removed by wet sandblasting or grinding. Excess damage during removal may require slurry seal or chip seal at the discretion of the City Engineer. Existing markings shall be removed so that at least 95% of the underlying pavement is visible. Blacking out or otherwise covering existing markings shall not be permitted.
11. All longitudinal pavement striping shall consist of traffic-rated paint as specified in the SSPWC or an approved equivalent. Transverse striping, letters, and symbols shall be installed with preformed thermoplastic material conforming to SSPWC with a minimum thickness of 0.125".
12. A 24" wide white stop bar shall be installed at signalized intersections and a 12" wide white stop bar shall be installed at stop control intersections. Yield bar markings 24" by 36" shall be installed for yield control. New crosswalks shall consist of solid white thermoplastic longitudinal lines, parallel to the flow of traffic, 24" wide and 10' long, and spaced 24" apart.
13. School zones, speed limits, and required traffic devices shall be coordinated with and reviewed by Washoe County School District and Traffic Engineering.
14. Warning signs and/or retroreflective end of roadway markers shall be installed at the end of streets (except "T" intersections or fully improved residential cul-de-sacs). For street ends where there is a significant elevation change adjacent or there is a need to control access, barrier rail, guardrail, bollards, or barricades may also be required.
15. When triangular islands are constructed at street or driveway intersections, the curb shall be painted in accordance with MUTCD and reflective markers installed per the Standard Details.
16. All signs and sign posts affected by a project shall be upgraded to current City and MUTCD standards.

6-4 TRAFFIC CALMING

A. The design and placement of speed humps or other traffic calming improvements on new or existing streets shall conform to applicable City policies and standards.

B. Request and approval procedures:

1. City staff will determine if the street meets the City's basic criteria.
2. Petition for traffic calming (forms provided by the City), with signatures from at least 2/3 of residents with addresses on the street where traffic calming is desired must be submitted.
3. After receipt and verification of petition, staff will gather traffic data to determine if traffic calming is needed.
4. Fire Department approval of a traffic calming device shall be obtained by staff in writing prior to installation.

5. Staff will prioritize qualified streets for funding based on the ranking system described below. If residents wish to fund the traffic calming alternative, they must submit full payment on estimated cost before contract is sent out to bid.
6. Temporary devices approximating proposed traffic calming shall be installed and evaluated by staff for 3 – 4 months before permanent installation. Speed hump installation would be permanent.

C. Basic criteria

1. Street is classified as a minor collector or local street.
2. Two-thirds of street frontage must be residential, park, and/or school.
3. The posted speed limit is 30 mph or less.
4. The longitudinal grade of the street does not adversely affect the motorist in going through the traffic calming device.

D. Operational criteria

1. Street is at least 1,000 feet long between all-way stop or traffic-controlled intersections.
2. Minimum 85th percentile speeds are 22 mph on a 15-mph speed limit street, 32 mph on a 25-mph speed limit street, and 37 mph on a 30-mph speed limit street.
3. ADT of 4,000 vehicles or less.
4. Priority ranking will be done annually on all petitions received (including previous years) using a point system. Streets under consideration will be investigated and data accumulated. Data collection includes a traffic count, speed survey, and measurement of street frontage by houses, schools, parks, playgrounds, or multi-use dwellings.

E. Ranking points will be awarded in the following manner:

1. One point for every 50 vehicles traveling the street in a 24-hour study period.
2. One point for each percentage point of traffic exceeding the posted speed limit and one-half point for each mph speed differential between the posted speed limit and the 85th percentile speed.
3. Two points for every residential unit fronting the street.
4. One point for each 50’ of school, park, playground, or apartment frontage.

F. Location guidelines

1. The minimum distance from an intersection to a traffic calming device shall range from 0’ to 200’.
2. Any traffic calming treatment shall be visible to oncoming traffic for at least the minimum safe stopping sight distance based on the 85th percentile speed.
3. Traffic calming shall take into account existing drainage features and bicycle facilities.
4. Where possible, devices shall be located to minimize impacts to on-street parking.
5. Devices should be placed near streetlights.

6. Related signage should be placed on property lines.
7. Diverters shall not be installed where traffic is likely to be rerouted to other residential streets.

G. The location must also meet the following basic conditions:

1. Crosswalks will not be installed where the pedestrian volume is less than 10 pedestrians per hour during peak pedestrian hours.
2. If approved by the City Engineer, crosswalks installed on roadways where the 85th percentile speed exceeds 40 mph must have in-pavement flasher lights, raised medians, and other substantial safety improvements
3. Crosswalks will not be installed unless the motorist has an unrestricted view of all pedestrians at the proposed crosswalk location, for a distance not less than the stopping sight distance. Locations with restrictive views shall require special attention.

6-5 SPEED LIMIT REGULATIONS

A. Purpose: The intent of proper speed zoning is to reflect the behavior of the norm of the population and to control that segment of the population that behaves in an unreasonable manner. Generally, 85% of the motorists drive in a manner safe for prevailing road conditions. The intent of a speed zone will be to control that 15% of the motorists who drive unsafely for roadway conditions.

B. General: The City Traffic Engineer may post prima-facie 25 mph speed limit signs in low volume residential areas upon identification of speed related problems. A traffic engineering survey shall be conducted that includes a review of roadway characteristics such as alignment, grade, and roadside development; existing traffic controls; prevailing vehicle speeds, pedestrian movements, and traffic volumes; and accident history. Generally, the speed limit shall be established as close as practicable to the critical speed (85th percentile) at which motorists are using the roadway. School speed limit regulations shall be addressed as part of Section X.X.

C. Policy: Streets that carry fewer than 2,000 vehicles per day are adequately covered by NRS 484.600.

6-6 PEDESTRIAN CROSSWALKS

A. In order to be considered for a crosswalk, a location must rate at least 16 points in the point system shown in the table below

Pedestrian Volume		
Criterion	**Point Assignment**	
	Number of pedestrians	**Points**
The total number of pedestrians crossing the street under study during the peak pedestrian hour. This includes pedestrians on both sides of an intersection. Crosswalks will not be installed where the pedestrian volume (peak ped. hr.) is 10 or less	0 – 10	0
	11 – 30	2
	31 – 60	4
	61 – 90	6
	91 – 100	8
	> 100	10
Maximum		10

General Conditions	
Condition	**Points**
1. Will clarify and define pedestrian routes across complex intersections	2
2. Will channelize pedestrians into a significantly shorter path.	2
3. Will position pedestrians to be better seen by motorists.	2
4. Will expose pedestrians to fewer vehicles.	2
5. Engineering judgement, unusual conditions	2
Maximum	10

Gap Time (see worksheet in Standard Details)		
Criterion	**Point Assignment**	
	Average number of Gaps/5 min.	**Points**
The number of unimpeded vehicle time gaps equal to or exceeding the required pedestrian crossing time in an average five-minute period during peak vehicle hour.	0 – 0.99	10
	1 – 1.99	8
	2 – 2.99	6
	3 – 3.99	4
	4 – 4.99	2
	> 5	0
Maximum		10

MAXIMUM TOTAL POINTS **30**

6-7 CURB USE

A. In general, curb use shall be zoned based on parking occupancy and duration studies. Loading zones, bus/taxi zones, disables zones, and time zones shall be determined based on the criteria outlined in this section

The following zones shall be established for curb use:

B. Time Zones

1. (1 hour – 10 hours): Time zones must be justified by a parking occupancy and duration study which indicates parking in the area is utilized 70% of the time, the duration exceeds the requested time limit by at least one hour, and the time zone can be shown to benefit the area.
2. 30 Minute Zones: 30 Minute zones are not intended to replace loading zones and shall be limited to locations adjacent to businesses which meet one of the following requirements:
    a. No off-street parking.
    b. The business demonstrates a demand for short term, high turnover parking.
    c. A traffic engineering parking study indicates the street parking approaches full utilization with a duration exceeding one hour.

C. Accessible Parking Zones: Accessible parking shall comply with current RMC and PROWAG requirements.

D. Hotel Zones: New valet services on public streets will not be permitted. Hotel zones shall be limited to the main hotel entrance and shall be of sufficient length to meet loading and unloading requirements, subject to approval of the Traffic Engineer.

E. Bus zones

1. Bus zones are provided adjacent to hotels and casinos to meet the needs for passenger loading and unloading.
2. When properly marked, bus zones may be shared with taxis and/or commercial delivery vehicles. When the zones are shared, the priority use of the zones shall be as follows:

4:00 am – 9:00 am	Commercial Delivery
9:00 am – 4:00 am	Tour Buses (Charter)

3. Taxis must vacate these zones until the loading activities are completed.
4. Bus zone requirements shall be determined by the Traffic Engineer based on weekly peak day bus arrivals, data provided by the applicant. The number of bus zones shall be determined from the following table:

Bus Arrivals (24 hours)*	Bus Zones
1 – 4	1
5 – 8	2
9 – 16	3
17 – 22	4
23 – 31	5
32 – 37	6
38 – 43	7
44 – 51	8

*Inbound bus to disembark passengers, the return trip to pick passengers up included in the formula used to derive these bus zone requirements.

F. Loading zones

1. Loading zones are provided to meet the needs of adjacent land users to receive goods and supplies. Whenever possible, loading zones shall be provided off-street.

2. The need for and number of loading zones provided at any location shall be determined by the Traffic Engineer.

G. Taxi zones

1. The purpose of this policy is to establish minimum criteria for taxi zones, so that they may provide the greatest possible benefit to both pedestrians and motorists.

2. In general, taxi zones shall be established based on the minimum criteria defined in this policy.

3. The following criteria shall be used in establishing taxi zones:

    a. Curb spaces shall be available for joint use by taxi and bus or commercial delivery vehicle loading whenever possible.

    b. The priority use for zones shared by taxis and buses or commercial vehicles shall be granted to buses or commercial vehicles. Taxis must vacate these zones until the loading activities are completed.

    c. All zones available for taxi use are non-exclusive and shall be shared by all legally licensed taxi companies on a first arrival basis.

    d. The number and location of taxi zones shall be determined by the City Manager or their designated representative based on consideration of the interests of the taxi companies, adjacent land use, curb availability, and usage characteristics.

4. In general, curb use shall be zoned based on parking occupancy and duration studies. Loading zones, bus/taxi zones, disabled zones, and time zones shall be established based on the criteria outlined in this policy.

H. Median openings

1. The following warrants for median openings are established to facilitate traffic movement and promote traffic safety. Medians (center dividing strips) shall be constructed of physical substance, such as curbs, jiggle bars, or plant mix berms. Painted medians, median openings, and related left turn storage and acceleration lanes are not considered adequate.
2. Major Streets: Median openings will normally be permitted at all intersections with dedicated City streets except where such an opening will impair traffic movements. Midblock median openings or other openings with turns permitted into adjacent property will not normally be permitted unless all the following conditions exist:
    a. The property to be served is a major traffic generator and has a continuing frontage of 1,200'or more along the major street between streets which intersect the major street from the side occupied by the property.
    b. The median opening is not less than 600' from an intersection with an arterial or collector street.
    c. The median opening is not less than 400' from an intersection with a local street.
    d. The median opening is not less than 600' from any other existing or proposed midblock median opening.
    e. All costs such as base material, surfacing, safety lighting, traffic signals, reconstruction, or utility relocation required by a midblock opening will be borne by the requesting party. The design of median openings shall be subject to the requirements and approval of the City Engineer and City Traffic Engineer.
3. Divided Collector Street and Split-Level Local Streets: Median openings will normally be permitted at all intersections with dedicated City streets. Normally the spacing between median openings should be no more than 1,200'. Midblock median openings or other openings with turns permitted into adjacent property will not normally be permitted unless all the following conditions exist:
    a. The median opening is not less than 400' from an intersection with an arterial or collector street.
    b. The median opening is not less than 250' from any other intersecting street.
    c. The median opening is not less than 400' from any other existing or proposed midblock median opening.
    d. All costs of constructing the opening shall be borne by the developer or the petitioner. The design of median openings shall be subject to the requirements and approval of the City Engineer and the City Traffic Engineer.
4. Freeways and Expressways:
    a. There shall be no median openings except as designed by the responsible governmental agency.
    b. There shall be no access to any existing or proposed ramp.

6-4 TRAFFIC SIGNAL CONTROLLER CABINET SPECIFICATIONS

SECTION 7 – SEWER DESIGN

7-1 GENERAL

A. This section provides the minimum design criteria and standards to guide the design of public and private sanitary sewer infrastructure for the collection and conveyance of wastewater. These standards are intended for the design of sanitary sewer systems with gravity sewer pipes less than 18" in diameter.

B. Projects that include the design of sewer pipes greater than or equal to 18" in diameter, the Engineer shall contact the Utility Services Department to determine the design criteria and requirements prior to submitting any application or permit.

C. The sanitary sewer collection system improvements shall comply with all federal regulations, state law, and local ordinances, and shall be approved by the City. All reports, construction plans and specifications for sewer collection systems shall be prepared by a Nevada Licensed Civil Engineer.

D. The applicant shall provide the City with information as necessary to determine the adequacy of the existing sanitary sewer system to accommodate peak flows from the proposed subdivision or development from the point of connection to the nearest downstream public sanitary sewer interceptor (18" or greater) and/or public lift station.

E. All sanitary sewers, inclusive of laterals, shall be constructed to a depth sufficient to allow for gravity flow to a public sanitary sewer from all floors of residential or commercial structures. The design of a lift station should only be considered if a gravity solution does not exist.

F. Low-pressure sanitary sewer systems shall be avoided if alternative gravity options are available. When no other gravity options are available, the City shall be contacted as early as possible and before any permit submittal to discuss options, design requirements, and ownership/maintenance responsibilities.

G. Public sewerage facilities shall be installed within public street sections or public rights-of-way. A public sewerage facility may be permitted within a dedicated sewer easement such as a common area, private street, or maintenance access road in accordance with the PWDM and Standard Details. Other locations not listed above require a design exception per Section 2.

H. Sanitary sewer mains may be extended within a subdivision or development to adjacent undeveloped property for future extensions or project phases. A sanitary sewer manhole shall be placed at the terminus of the main line at the property line of the adjacent undeveloped property. Pipe extensions out of the base of the terminus manhole shall extend to a minimum length to prevent undermining to adjacent utilities, and have the end properly capped and a mechanical plug installed in the manhole.

I. Sanitary sewer lift stations shall be designed in accordance with the most recent edition of the City's Wastewater Lift Station Design Standards. All public and private lift station designs shall require review and approval prior to issuance of any site improvement permits that include the design or connection to a public or private sanitary sewer collection system.

7-2 SEWER DESIGN CRITERIA AND ANALYSIS

A. The anticipated peak flow design for the existing, proposed, and ultimate buildout conditions must be established and reflect the anticipated ultimate service area.

B. Definitions: For this section the following definitions are used:

Design Peak Hourly Flow - The design peak hourly flow is the largest volume of flow to be received during a one-hour period, during the highest seasonal/transient loading period (if applicable). Flows from tributaries containing facilities with seasonal/transient influences on hydraulic sewer loading (e.g., recreational, educational, industrial facilities, etc.) shall be based on the highest loading demand.

Sewer Lateral - Sewer lines with a nominal inside diameter of 4" or 6".

Sewer Main - Sewer lines with a nominal inside diameter of 8" or 10".

Sewer Trunk - Sewer lines with a nominal inside diameter greater than 10" and less than 18".

Sewer Interceptor - Sewer lines with a nominal inside diameter of 18" or greater.

Service Area - Tributary area to the point in the collection system being analyzed.

C. Residential peak hourly flow

1. 250 gallons per capita per day shall be used for all residential unit peak flows.
2. The following table is the minimum occupancy for dwelling units in computing peak sewer contributions:

Dwelling Unit	Sewage Contribution	Unit
Single Family Residential/Townhome	3.0	Capita/dwelling unit
Mobile Home	2.5	Capita/dwelling unit
Apartment/Condominium	2.0	Capita/dwelling unit

D. Non-residential peak hourly flow

1. The following table is the minimum quantities of sanitary sewage per acre (gross floor area) for computing sewage contributions from non-residential sources:

Development Type	Peak Hourly Flow
Office	3,200 gallons per acre per day (gross floor area)
Public Facility	3,200 gallons per acre per day (gross floor area)
Commercial	10,000 gallons per acre per day (gross floor area)
Resort Hotels and Casinos	650 gallons per room per day
Motels	500 gallons per room per day
Industrial*	3,000 gallons per acre per day (gross floor area)
(*) unless water intensive usage is identified	

E. The use of alternate flow values shall be coordinated with Utility Services prior to permit submittal. The Engineer shall provide justification and sign and seal the sewer report or letter.

F. Infiltration, inflow, and groundwater

1. Flow monitoring may be required to accurately determine offsite sewer flow in areas identified with high inflow/infiltration (I/I).
2. At no time shall stormwater, groundwater, or other surface water be allowed to enter the sewer system. Failure to prevent inflow of stormwater or other surface water into the sewer system is a violation of state/local ordinances and is subject to penalties.
3. In areas where the presence of groundwater is within 10' of the proposed finish surface, manholes shall include a waterproofing system installed on the exterior per the requirements of Section 7-6.

G. Flow monitoring

1. Upon request by the applicant, flow monitoring may be supplied to demonstrate existing peak hourly flow rates at specific locations required to analyze the sewer system for adequate capacity to accommodate the proposed development.
2. A flow monitoring plan must be provided and approved by the Utility Services Department in advance of performing any flow monitoring to be utilized for the project. The minimum requirements for the flow monitoring plan include:
    a. Capture highest seasonal/transient loading period (if applicable).
    b. Flow monitor shall capture two weeks of continuous data.
    c. Data captured in 5-minute intervals.
    d. Manhole selected shall have non-turbulent flows.

H. Alignment

1. Horizontal alignment shall be parallel to the street center line and other utilities wherever possible. Pipes shall be installed in straight segments between manholes. No curved pipes shall be allowed.
2. Vertical alignment shall provide a constant slope between manholes. If a change in slope is necessary, then the construction of a manhole at the slope change shall be required.
3. Water/sewer minimum horizontal and vertical clearance shall conform to Public Works Standard Details and the requirements of NAC 445A.

I. Design capacity

1. The depth (d/D) of the design peak hourly flow shall not exceed 1/2 full in any segment of the collection system.
2. The Engineer shall determine the adequacy of the existing sanitary sewer system to accommodate the proposed development from the point of connection of the development to the nearest sanitary sewer interceptor and/or public lift station. It shall be required to increase the sanitary sewer system capacity (existing and/or proposed) for any portions that exceed 1/2 full, unless a design exception is approved in accordance with Section 2.

3. Any sewer pipes constructed by the developer will not be allowed to connect to a smaller downstream pipe. This may require the replacement of additional existing sewer pipes regardless of their capacity.
4. The Utility Services Department may require additional modeling and analysis for high discharge developments, or where sewer capacity is limited, as determined by the City.
5. The sanitary sewer collection system shall be designed for the estimated buildout condition of the tributary area. This includes consideration of maximum anticipated offsite flow contribution. The Engineer shall contact the Utility Services Department as early as possible in the project design process before project submittal to discuss any additional peak hourly flow values to be included for the ultimate buildout conditions.
6. When the existing sewer collection system must be increased in size to accommodate the proposed development, the sewer shall be designed and constructed for the ultimate buildout conditions.

J. Hydraulic sewer design

1. Manning's Formula shall be used in computing depth of flow and velocities of all gravity flow sanitary sewers, with the roughness coefficient n value equal to 0.013.
2. Pipe slopes:
   a. Gravity sewer lines shall be designed to ensure the positive flow of wastewater and provide self-cleanings velocities. The minimum half-full flow velocity shall be two feet per second (fps), regardless of the pipe material, to limit solids deposition and sulfide production. The maximum half-full flow velocity shall be 15 fps to limit pipe wall erosion, manhole erosion, and minimize odor generation.
   b. Minimum slopes for gravity sewer lines:

Pipe Diameter (inches)	Minimum Slope (ft/ft)
8 (less than 10,000 gallons per day peak flow)	0.0100
8 (greater than 10,000 gallons per day peak flow)	0.0040
10	0.0028
12	0.0022
15	0.0015

   c. When velocities exceed 15 fps, approval is required by the Utility Services Director. Sewers on 20% slopes or greater shall be anchored securely with concrete anchors or equal, spacing as follows:

Pipe Slope (%)	Center to Center Concrete Anchor Spacing (Feet)
20 – 35	36
35 – 50	24
> 50	16

7-3 SEWER REPORTS

A. Sewer reports are required per the following tables:

Residential Units	Sewer Reporting
Less than 10	No report required
10 or Greater	Report required in accordance with this section

Fixture Units	Sewer Reporting
Less than 300	No report required
300 or Greater	Report required in accordance with this section.

B. Preliminary sewer report

1. This technical engineering report is prepared by a Nevada Licensed Civil Engineer, whose purpose is to identify and analyze the sanitary sewer capacity associated with a proposed development and to define possible problems and conceptual solutions.
2. Submittal requirements at a minimum shall include:
    a. Area of project.
    b. Tributary areas outside project.
    c. Adjacent areas.
    d. Line layout, pipe size, slope, and material type.
    e. Any non-domestic waste being introduced into systems such as industrial process waste, cooling waters, etc., and the types of pretreatment devices to be provided.
    f. Calculations showing peak flows at major junction points including flow coming from area outside the project area.
    g. Direction of flow.
    h. Cumulative peak flow from the project area to the nearest interceptor or public lift station.
    i. Zoning used to predict flows.
    j. Special areas such as hospitals, schools, large office buildings, etc.
    k. Boundaries of areas within the project which are tributary to points of major flow.
    l. Design calculations.
    m. Public vs. private piping.

C. Final sewer report

1. This report transforms the defined conceptual solutions and analysis in the Preliminary Sewer Report to a final sanitary sewer plan.

D. Sewer Report Units: For the purpose of sewer reporting the following units shall be used:

1. Flow: All flow values shall be reported as million gallons per day (mgd).
2. Velocity: All velocity values shall be reported as fps.
3. Length: All pipe lengths shall be reported as feet (ft).
4. Diameter: All pipe diameters reported shall be reported as inches (in).

E. Sewer Report Tables Format: A table (example provided below) shall be provided that includes the following columns, at a minimum, for each sewer section required to be evaluated:

1. Pipe number
    a. Pipe number for proposed infrastructure.
    b. City of Reno Pipe Number for existing infrastructure.
2. Pipe diameter [D] (in)
3. Pipe slope (ft/ft)
4. Demand existing (mgd)
5. Velocity existing (fps)
6. Depth [d] existing (in)
7. d/D existing (%)
8. Demand existing and proposed (mgd)
9. Velocity existing and proposed (fps)
10. Depth [d] existing and proposed (in)
11. d/D existing and proposed (%)
12. In cases where buildout flows are anticipated from future development, repeat columns 8 – 11 for buildout flows.

Sanitary sewer capacity summary										
Pipe	Dia	Slope	Existing				Existing and proposed			
			Demand	Velocity	Depth	d/d	Demand	Velocity	Depth	d/d
(#)	(IN)	(FT/FT)	(MGD)	FPS	(IN)	(%)	(MGD)	FPS	(IN)	(%)

F. Sewer Report Figures: Figures shall be provided that clearly and adequately show the following:

1. Existing and proposed sewer layout under evaluation, with applicable pipe and manhole identifiers.
2. Existing and proposed sewer contribution areas with associated sewer loading locations.

7-4 EASEMENTS AND MAINTENANCE ACCESS

A. Sewers located outside of the public right-of-way or within private streets shall require dedication of a sewer easement to the City.

1. The design of the public sewer easement shall conform to the following requirements:
   a. The sewer line and at each manhole shall be centered within the easement, to the highest degree possible.
   b. For sewer depths less than or equal to 7.5', the minimum width for sewer easements shall be 15'.
   c. For sewer depths greater than 7.5', the minimum width for sewer easements shall be twice the depth of the sewer line (invert to finish grade) and rounded up to the nearest 5'.
   d. Easements shall be completely on one side of the property line and shall be clear of permanent structures, building eves, root lines, and potential trunk diameter of large tree species.
   e. No trees or permanent structures shall be allowed within sewer easements.
2. Sewer maintenance access roads are defined in Section 4.

7-5 SEWER DEPTH AND SEPARATION

A. The sanitary sewer shall be placed at a depth to avoid conflict with existing and proposed utilities to maintain a consistent slope for a gravity system.

B. Minimum horizonal separation between existing and proposed non-water utilities shall be greater than 5' as measured from face-of-pipe to face-of-pipe or face-of-manhole.

C. Minimum vertical separation between existing and proposed non-water utilities less than 18" as measured from bottom-of-pipe to top-of-pipe shall be noted on the plans. Nothing less than 6" shall be allowed.

D. Sanitary sewer mains shall have a minimum cover of 4' as measured from the top of the pipe to the proposed finish grade.

E. Lateral and private sewer installations must have a minimum of 3' of cover at the property line cleanout as measured from the top of the lateral to the proposed finish grade.

F. Sanitary sewer that is proposed to be constructed at a depth of 20' or more as measured from the finished grade to the pipe invert will require special approval.

7-6 SEWER MANHOLES

A. Manholes must be located within the paved area of a right of-way or within a public sewer easement. Manholes should be located along the centerline of paved streets or centered within a multi-use or driving lane. The placement of manholes in the wheel path of vehicles shall be avoided to the maximum practicable extent possible. The placement of manholes in sidewalks, crosswalks, multi-use trails, water crossings, back or side yards, behind walls, curbs, gutters, or within 6' of abrupt surface grade changes shall also be avoided. A manhole shall be provided at any of the following locations along the sewer alignment:

1. A change in slope.
2. A horizontal bend (horizontal deflection angles greater than zero).
3. A change in nominal pipe size.
4. Where two or more incoming public sewer lines connect.
5. A terminal end.
6. A discharge point for a force main.
7. A change from private to public sewers.

B. Concrete collars shall be placed around all manholes, valves, or other appurtenances within any right-of-way or easement. Collars shall conform to the Standard Details.

C. Manhole spacing

1. 8" through 21" in diameter – 400' maximum
2. 24" and greater in diameter – 600' maximum

D. Invert elevations

1. The invert elevation for the pipe of same diameter shall have a minimum one-tenth (0.10)-foot drop between the entering and exiting pipe.

E. Pipe connections

1. Where different diameter pipes meet at a manhole, the crown of all upstream pipes shall be set at the same elevation as the crown of the downstream pipe.

F. Existing manhole connection

1. Placement of a new manhole is required if the existing manhole is in poor condition and cannot feasibly be cored into without further damaging the manhole.

2. A new pipe connection and bench shall be constructed to provide uniform flow when coring into a manhole.

G. Manhole sizing

1. Manholes shall conform to the requirements of the Standard Details and sized as follows:

   a. Type 1 Manhole shall be used when the largest pipe diameter is 8" through 12" and depths are less than 18' as measured from invert elevation to top of proposed finish grade.

   b. Type 5 Manhole shall be used when the largest pipe diameter is 15" through 27" or depths are greater than 18' as measured from the invert elevation to the proposed finish grade.

   c. The engineer shall provide a manhole structural design for pipes with a diameter larger than 27" or depth greater than 18'.

   d. Larger manholes may be required for pipe connection where the standard manhole required does not provide sufficient spacing between pipe connections.

H. Drop manholes

1. Drop manholes are discouraged and should not be used whenever alternative options are available.

   a. When conflicts arise with existing underground utilities, peak flow velocities exceed 15 fps, unusual circumstances are present, or the sewer entering the manhole is at an elevation of 2' or more above the pipe exiting the manhole, an outside drop manhole connection may be permitted and in accordance with the PWDM and Standard Details.

   b. Inside drop manholes are not permitted.

   c. When the difference in elevation between the incoming sewer and the manhole invert is less than 2' but greater than standard 0.10', the manholes may be designed for the inverts to be filleted and channeled to prevent deposition of solids upon approval. The Engineer shall present supporting calculations for hydraulic efficiency through manholes that do not meet the above requirements in addition to a custom standard detail demonstrating how the inverts are to be filleted and channeled.

I. Manhole access

1. All manholes shall be placed in a location to allow access for a 10-ton vehicle with a turning radius of 30' inside and 45' outside and vertical clearance of 16.5'.

J. Polymer manholes

1. Polymer manholes shall be required in areas determined to have a potential of generating excessive sulfide gases. Such manholes shall include, but are not limited to:

   a. Pipes 18" in diameter or greater.

   b. The first manhole originating from a sewer interceptor 18" in diameter or larger.

   c. Force main transition manholes.

K. Manholes that are anticipated to be partly below the groundwater table must have a waterproofing system installed on the exterior of the manholes. Waterproofing system must consist of an application of a self-adhesive rubber/bitumen-backed high-density polyethylene liner such as Bituthene 2000 or equal. The liner must extend above anticipated high ground water level. Waterproof concrete admixture can be approved upon request. Any pipe penetrations within the high ground water level must be sealed with compression seals.

L. Existing manholes that are to be abandoned shall be completely removed. Where the complete removal of an existing manhole is not feasible, it shall be abandoned-in-place per the Public Works Standard Details.

M. Connection to existing pipe where bypass pumping is anticipated and before issuance of a building permit, a coordination meeting shall be organized by the contractor, Project Engineer and Public Works to determine scope and schedule of work to be performed.

7-7 SEWER PIPE SIZE AND MATERIALS

A. All public and private sanitary sewer mains shall have a minimum inside diameter of 8". The following types of pipe material are acceptable for sanitary sewer mains.

1. Diameter 8" through 15" shall be SDR 35 polyvinyl chloride (PVC) solid wall plastic pipe with a minimum stiffness of 46 pounds per square inch (psi) meeting ASTM D3034.
2. The selection of pipe material for diameters greater than or equal to 18" in diameter shall adhere to Section 7-1.
3. All pipe gaskets for gravity sewer shall meet ASTM D3212 and F477.
4. Pipe material for force mains shall conform to the latest edition of the City of Reno Wastewater Lift Station Design Standards.

B. Sanitary sewer pipe that is abandoned shall be removed and disposed. Leaving sewer pipe in place and filling with concrete slurry shall require City Engineer and Utility Services approval.

C. Bedding, hunching, pipe installation, and backfill shall conform to the requirements of the Standard Details and the SSPWC.

7-8 SEWER LATERALS

A. Sanitary sewer laterals are private infrastructure up to and including the connection to the public sanitary sewer main. All costs associated with the operation, maintenance, and repair of private facilities together with necessary surface repairs shall be borne by the private property owner and not the City.

B. Sewer laterals shall be designed and constructed perpendicular to the sewer main at a minimum slope of 2% unless otherwise approved by Development Services.

C. Each lot or parcel shall have its own separate sewer lateral. New subdivisions' or developments' sewer laterals should be placed on the low side of a typical subdivision lot or similar parcel or in a location to allow for minimum 2% or greater slope from the building sewer connection to the connection at the sewer

main. Trees, above ground improvements, etc., should maintain a minimum of 5' vertical and horizontal separation from the sewer lateral and cleanout.

D. A cleanout shall be constructed per the Standard Details on the property side of the right-of-way or 1' outside of the sewer easement. No cleanout shall be permitted to be installed within the right-of-way.

E. Cleanouts shall be designed and constructed to grade with subdivision improvements or at the time connection is made to the building sewer. Unless otherwise noted on the plans, construction of the cleanout to grade is the responsibility of the contractor for the subdivision improvements. If installation of the cleanout is deferred, the plans shall call for the placement of a 4" by 4" post painted green at the end of the sewer lateral extending from the flow line to not less than 12" above ground surface.

F. Minimum sewer lateral size

1. Single-family developments laterals shall not be less than 4" in diameter.
2. Schools and commercial, industrial, and multiple residential properties that share a common lateral shall be sized appropriately for volume of flow per the latest edition of the Uniform Plumbing Code, but not less than a 6" diameter service.

G. Sewer lateral connection for new single-family development requirements

1. A 4" residential service shall connect to the new sewer main by means of a factory fitting "wye".
2. Sewer laterals must be connected to a public main that has an upstream and downstream manhole.
3. Sewer laterals shall not connect directly to a manhole nor within 5' of the face of the manhole except for terminal manholes in a cul-de-sac.
4. Sewer lateral connections to a terminal manhole in a cul-de-sac may be permitted if the following requirements are met:
    a. Maximum of three residential property laterals can be connected.
    b. No lateral connected 90° on either side of the outgoing pipe.
    c. Inlet lateral pipe crown to match the outlet main pipe crown.
    d. Laterals are buried with tracer wire for future marking purposes.

H. Sewer lateral connection for commercial, industrial, or multi-family developments

1. A 6" lateral entering an 8" or larger main must be connected by means of a wye fitting at the main.
2. An 8" lateral in diameter and larger shall be connected to the public sewer main by use of a manhole.
3. Connecting directly to a sewer interceptor with an 18" diameter or larger shall be upon approval by the Utility Services Director and will require a backflow device and a signed/recorded hold harmless agreement.

I. Sewer lateral abandonment

1. Cut and remove 1' of existing lateral and cap both ends of the existing sewer lateral to be abandoned within 6" of the sewer main.

2. Abandonment must be inspected by the City prior to backfill.

7-9 SEPTIC SYSTEM ABANDONMENT

A. Septic system abandonment is under the responsibility of Northern Nevada Public Health.

7-10 GREASE AND SAND/OIL INTERCEPTORS

A. Refer to RMC 12.16.555 for more information.

SECTION 8 – STORM DRAINAGE DESIGN

8-1 GENERAL

A. This section is intended to be used in conjunction with the Truckee Meadows Regional Drainage Manual (TMRDM). The TMRDM is the primary reference document for hydrologic criteria and drainage design for the City. The topics and criteria covered in this section are intended to:

1. Address those topics not included in the TMRDM.
2. Provide alternate or more restrictive criteria than the TMRDM.
3. Emphasize specific criteria from the TMRDM.

B. The TMRDM shall be adhered to except for those cases in which alternative or more restrictive criteria are proposed in this section, or where directed by the City Engineer. Unless otherwise noted, all requirements herein and referenced in the TMRDM apply to public and private improvements.

C. For the purposes of this section the terms “public facilities” and “City owned facilities” shall be interpreted to mean those facilities built by the City as public facilities, and those facilities built by private interests and intended for dedication to the City.

D. This section contains criteria primarily directed toward the consideration of conveyance of stormwater flows and related facilities. The Design Engineer cannot, however, overlook stormwater quality considerations and requirements during the design of conveyance facilities, as they are integrally related and will many times control or heavily influence the design of stormwater conveyance facilities. The requirements and criteria relating to stormwater quality (Section 9) are intended to work in conjunction with the requirements presented in this section, and the requirements of this section are not intended to preclude any requirement or criteria of Section 9.

E. Where ponding for infiltration is allowed for LID features external to the curb and gutter, the maximum elevation of ponded water shall also be considered. Additional easements or rights-of-way may be required.

F. Other agencies

1. Any work which requires fill be placed within the “waters of the State of Nevada” shall require a permit from the State Department of Environmental Protection prior to beginning construction. The City of Reno shall receive a copy of the State permit prior to issuance of a City permit.
2. Prior to issuance of any City permit for any facility encroaching on state right-of-way, and for disposal of any drainage onto state right-of-way, the approved NDOT encroachment permit shall be furnished to the City.

G. Flood hazard areas

1. Development within areas shown on the Flood Insurance Rate Map shall comply with RMC 18.04.102. The RMC regulates development in which any portion of a structure or facility is within a FEMA regulated Flood Hazard Area. If a structure or facility lies within two or more Flood Hazard Areas, the most restrictive regulations shall apply. Flood Zone regulations shall also apply to any portion of a

parcel within a FEMA regulated Flood Hazard Area for which grading or other improvements are proposed.

2. Construction shall meet building requirements for the Truckee River Flood Plain Storage Zone 1: Critical Flood Pool per RMC 18.04.102.

3. All Letter of Map Revision related improvements must be completed with the associated portion of the project.

H. No net loss standard

1. There shall be no net loss of wetlands, stream environments, playas, spring fed stands of riparian vegetation, and non-404 wetlands in the City, in terms of both acreage and value per RMC 18.104.103(e)

a. Playa includes that area subject to periodic inundation and that area within 50' of the normal high water mark.

I. Safety

1. When the flows, velocity, or side slope as determined by the drainage report indicate a potential safety issue, fencing shall be provided.

8-2 DRAINAGE REPORT

A. A drainage report shall be submitted for any of the following:

1. Permit relating to coverage of 10,000 or more square feet of impervious surface within the property.

2. Where development is in a critical drainage area, as determined by the Administrator.

3. Grading permit which entails 20,000 square feet or greater.

4. Subdivision Improvement Plans.

5. Where required by the Administrator.

6. Where required by a condition of entitlement.

B. The drainage report shall be signed and stamped by a Nevada Licensed Civil Engineer in accordance with City standards unless requirement is waived by the Administrator.

C. The drainage report shall be based on current zoning or Master Plan, whichever produces the greater runoff.

8-3 DRAINAGE POLICY

A. See the TMRDM for requirements.

B. Public vs. private

1. Drainage facilities on private property shall be privately owned and maintained unless it can be demonstrated that public ownership and maintenance provides a benefit to the public as a regional

flood control master plan facility or when a funding source (such as a public stormwater assessment district) has been identified for the long-term operation and maintenance of regional facilities. All regional flood control master plan facilities must be so designated by the City. The operation and maintenance of drainage facilities should not become the responsibility of private HOAs without a funding mechanism to ensure maintenance is performed.

C. Operation and maintenance plans

1. Operation and maintenance plans shall be developed for all private drainage facilities including but not limited to storm drain systems, culverts, drainage ditches and swales, and detention and retention facilities.
2. Detention and retention facilities shall include criteria for removal of sediment and other debris such as depths or percent capacity. The installation of a staff gage or similar for measurement of sediment depth is encouraged.
3. At a minimum, the operations and maintenance plan will include a site map showing the storm drainage system, ownership, maintenance procedures and inspection frequency, safety information, and responsible personnel.
4. Operation and maintenance plans must include all areas where volumetric storage mitigation occurs in the Critical Flood Pool or the North Valleys hydrologic closed basins to ensure volumetric storage is maintained.

8-4 DRAINAGE LAW

A. See the TMRDM for requirements.

8-5 DRAINAGE PLANNING AND SUBMITTAL

A. The following standards apply to the drainage report (public and private). The report is required to identify problems and present solutions with engineering documentation. Where appropriate, tabularized data on maps is preferred to lengthy written descriptions. All requirements listed in this section are in addition to the requirements of the TMRDM.

B. The proposed drainage system shall discuss runoff and other contributions, with emphasis on the following:

1. Historic storm flow rates and paths.
2. Developed storm flow rates and paths for minor and major storms.
3. Contributions added from open jointed system.
4. Demonstrate that flows are routed to a public system with adequate capacity.

C. Drainage planning and submittal shall comply with FEMA requirements, RMC 18.04.102 “Flood Hazard Areas”, and critical flood zones. Show existing and proposed Conditional Letter of Map Revision and Letter of Map Revision information and show status of submittal and review process.

D. Drainage planning and submittal shall comply with RMC 18.04.103 “Wetlands and Stream Environment Protection”.

E. Drainage planning and submittal shall comply with RMC 18.104.104 “Drainage Way Protection”.

F. Drainage planning and submittal shall note elements of energy dissipation, channel lining, and outlet protection sizing.

G. Appendices shall include:

1. Drainage plan:

    a. See the TMRDM for requirements. The site drainage plan may be at the same scale as the grading plan but must meet legibility requirements for scanned documents. Show all sub-drainage areas per catch basin or channel and tabulate existing and proposed drainage showing length, assumed velocity and time of concentration on various runs of grass, gutters, etc., cumulative time of concentration, average rainfall intensity, area, runoff coefficient (weighted if necessary), and peak flows for 5- and 100-year storms.

    b. Identification of public or private maintenance responsibilities, labeled for all drainage facilities.

    c. Both location plan (overall drainage) and subdrainage plan shall be signed and sealed by a Nevada Licensed Civil Engineer and shall be included in the construction plans for the subdivision/development.

    d. Show peak flows for 5- and 100-year storms at inlets and other sub-basin points of concentration, at discharge points and in channels. Show peak flows entering and leaving the site and trace path leaving site to nearest major drainage facility without adverse impact to downstream owners.

    e. On plan and profile sheets, show peak flows for 5- and 100-year storms at all inlets and in pipes per above, and in pipes show slope, velocity, and capacity, and hydraulic grade line if surcharged.

2. Routing and accumulative flows at the upstream and downstream ends of the site and at various critical points onsite for both minor and major runoff. Inflow and outflow for both storms for all sub basins.

3. Street cross sections showing 100-year flood levels.

4. Open channel flow in major improved channels shall be provided with the following information on plans:

    a. Channel and hydraulic grade line profiles.

    b. Channel section and lining details.

    c. Freeboard for 100-year flows.

    d. Channel capacity and storm flows, 5- and 100-year flows and velocities.

5. Storm sewers (show on plans):

    a. Hydraulic grade line profiles.

    b. Pipe capacity and 5- and 100-year flows and velocities.

8-6 RAINFALL

A. NOAA Atlas 14 shall be used for rainfall in the City of Reno (see https://hdsc.nws.noaa.gov/pfds/). See TMRDM for alternate methodology, where applicable.

B. For directly connected impervious drainage basins, such as paved areas, a minimum time of concentration (Tc) of five minutes shall be used.

C. Refer to Section 9 for additional hydrologic criteria relating to stormwater quality.

8-7 STORM RUNOFF

A. The Rational Method may be used in computations for the rate of runoff for urban and small watersheds 100 acres or less. The SCS method, SCS TR-55 "Urban Hydrology for Small Watersheds", HEC-1/HEC-HMS, or the methods outlined in the TMRDM shall be used for larger watersheds and within the North Valleys hydrologic closed basins to include but not limited to Swan Lake, Silver Lake, and White Lake basins where volumetric calculations for retention basins shall be in accordance with TMRDM.

1. Weighted values of the runoff coefficient "C" may be required where land use is most accurately described as a mixture of the land uses listed above or where it is a mixture of impervious and pervious areas and is not well represented by a single entry in the preceding list.
2. Sub-areas which include an LID feature will typically require special consideration and weighting of the runoff coefficient C. See Section 9 for specific guidance on post construction stormwater quality design considerations.
3. Additional runoff coefficients based on land use or surface characteristics can be found in the TMRDM and the Truckee Meadows Structural Controls and Low Impact Development Manual.

B. Design storm frequency

1. For streets and roads see the TMRDM for requirements.
2. For developed sites, both onsite and offsite flows are to be provided for and channelized to City standards within dedicated easements, streets, or public right-of-way to protect structures from flooding for events up to and including the 100-year return frequency storm. Additionally, onsite and offsite flows for the 5-year return frequency are to be contained within the storm drain, where less than 60 cubic fps. See Section 8-9 for additional criteria for storm drain. A lesser return period may be acceptable for some limited cases such as where minor flows are present or for improvements in built-out areas and will require prior approval by the Administrator.
3. For onsite calculations, runoff from surface drainage of streets and roads shall be computed by the Rational Method.
4. See Section 9 for additional criteria on design storm frequencies.
5. See RMC 18.04.102(c)(7) and the TMRDM for special criteria relating to the hydrologic closed basins, including but not limited to Swan Lake, Silver Lake, and White Lake. Plans shall include detention/retention basins that are adequately sized to mitigate the volumetric increase of stormwater

runoff as the result of development to a minimum mitigation ratio of 1.3:1 (1.3 cubic feet of retention for every 1 cubic foot of increased runoff) during the 100-year, 10-day storm.

C. Hydraulic design

1. Constructed public drainage facilities with design flows of 60 cubic fps or less shall be piped in accordance with City standards. Constructed drainage facilities with flows exceeding 60 cubic fps may be open channel conveyances, when approved by the City Engineer.
2. Drainage shall not be diverted from one watershed to another without prior approval from the Administrator and documentation demonstrating no adverse impact with consideration given to peak flows, flow duration, volume of flow, sediment, erosion, timing of peak flow, or other factors.

D. Site Design: Subdivisions

1. Runoff increases
    a. Development shall not increase peak runoff from a site for all storm events between the 5-year and 100-year return period unless it can be demonstrated that no adverse impacts will occur (including demonstration that any downstream storm drain system has the capacity to handle the 5-year event). Paths of the 100-year flows must be considered in the design and must not be diverted or obstructed and must be evaluated to ensure they will not cause damage to existing facilities or infrastructure (public or private). Mitigation of increases in runoff peaks and volume where downstream systems do not have the capacity to handle the increase, or where adverse impacts will otherwise occur shall be addressed though:
        1. Detention of flows.
        2. Upgrading of existing downstream system.
        3. LID.
        4. Onsite retention/infiltration system.
2. Flow Paths
    a. Surface drainage from any developed area shall not cross any property line except by way of a natural watercourse, major drainage facility, an approved drainage system within a public storm drain easement, or a permanent surface drainage easement. Historic drainages will require new easements, even if no easement existed before.
    b. Existing surface drainage from an adjoining property shall be perpetuated through the development, or other means of disposal provided.
3. Future Connections
    a. Storm drain facilities (and post construction stormwater quality treatment controls) shall be extended with a subdivision or development to adjacent undeveloped properties for future extensions in accordance with approved drainage plans (or an approved post construction stormwater management plan).
4. Curbs, Gutters, and Swales

a. Reinforced concrete interceptor swales are to be provided along the top of retaining walls and cut slopes to intercept drainage. Swales and wall drains shall discharge into approved drainages. When required by the City Engineer, reinforced concrete swales shall be provided to intercept drainage from adjacent property. Easements for reinforced concrete swales shall be established by a note on the official plat. Reference Section 5 – Grading, Slope Treatment and Erosion Control.

b. All drainage from impermeable surfaces on retail, commercial, industrial, or similarly developed sites shall be contained by Portland cement concrete curb and gutter or longitudinal valley gutter to City standards, except where required for LID features as part of the post construction stormwater quality treatment approach.

c. Surface drainage swales collecting runoff from the area of two or more lots are to be addressed through either a paved swale in accordance with City standards, or an LID feature which addresses drainage concerns, and are to be maintained and perpetuated by the property owners. Paving is not required for common side lot swales serving only two adjacent lots.

d. Standard lot line drainage swales are to be designed to carry the waters generated by a 100-year frequency storm, with a maximum of six lots contributing runoff to the swale. Discharge from swales shall be conveyed to a public drainage facility. Should it be necessary to provide for drainage from more than six lots and/or to exceed the maximum horizontal or vertical alignment (as shown in standard detail), a modified design capable of conveying the runoff from the 100-year storm may be submitted for review by the City Engineer.

e. Easements for rear lot drainage swales shall be established by a note on the official plat substantially as follows:

"The rear 5.0 feet of lots shall be subject to a permanent private and reciprocal drainage swale easement."

When appropriate add:

"Which easement shall be further reciprocal with all lots the rear lots lines of which abut such easement."

f. Curbs, gutters, and curb cuts to allow for stormwater runoff to enter treatment areas are to be constructed of Portland cement concrete, per City standards.

5. Sub-surface Drains and Landscape Drains

a. All perforated pipe used for landscape drains that connect to the public system must be enclosed around entire circumference (full envelope) in non-woven Geotextile filter fabric.

b. Sub-surface drains located in streets, parkways, medians, etc. shall extend at least 12" below the street subgrade and consist of either a narrow trench backfilled with Class B or C drain rock or a synthetic edge drain product such as MiraDrain 5000 or approved equal. Drain rock should be separated from native soil backfill by a geotextile, such as Geotex 311 or equal. In non-cohesive soils, the fabric should also be placed on the upslope side, between the native soils and the drain rock/backfill.

c. See Section 8-10.C for special criteria on connections pertaining to approved drains for the benefit of stormwater quality treatment controls and LID features.

8-8 OPEN CHANNELS

A. Design frequency

1. All open channels shall be designed to carry the runoff generated by the 100-year storm from fully developed conditions within the watershed, based on maximum density and in accordance with current zoning. This includes minor roadside channels/ditches and those found within subdivisions or other developed sites. A lesser return period may be acceptable to the City Engineer for some limited cases such as where minor flows are present or for improvements in already built-out areas, and will require prior approval. In such cases the impacts of the 100-year flows shall still be considered and shall not be exacerbated or likely to cause damage.

B. Manning's n values

1. The n value for linings shall be determined per TMRDM based on material selection. See Truckee Meadows Structural Controls Design and Low Impact Development Manual for additional guidance on n values for shallow flow depths or for materials typical of LID features.
2. The n value for large open channels in areas where wetlands vegetation or where perennial flow is expected shall be selected based on the conditions in similar channels in the region. The n value shall assume that vegetation will establish. Drainage tie-in points shall also be selected considering the presence of appropriate vegetation. Appropriate design considerations should be made for both low flow and flood flow conditions.

C. Lining

1. Lining for drainage channels shall conform to the requirements of the TMRDM.
2. For criteria on riprap sizing, see the TMRDM.
3. For riprap lined channels, 1' minimum freeboard is required.
4. Any connecting or entering channels must be designed with consideration given to the lining or erosion control measures of the primary channel, and shall not cause damage, scour, or erosion.
5. The use of grouted riprap is not allowed. Any exceptions must be approved by the City Engineer, and the installation must still conform to criteria in the TMRDM.

D. Access

1. Access is also required along drainage ditches for the entire ditch length for general maintenance, vegetation maintenance and control, herbicide spraying, and Washoe County Vector Control. This includes features intended for post construction stormwater quality management.

E. Irrigation and water supply ditches

1. Irrigation flows and public storm drain flows shall be conveyed by separate systems, unless specifically approved by ditch companies. All plans adjacent to or containing an irrigation or water supply ditch shall require the signature of the ditch company on the face of the plans or submittal of written approval from the ditch operator.

2. No public storm drainage runoff shall be allowed to flow or discharge into any irrigation or water supply ditch. Private storm drainage runoff shall be allowed to flow or discharge into an irrigation or water supply ditch only with the approval of the ditch or utility company. Where allowed, discharge of private storm drain flows into an irrigation or water supply ditch are not to be a contributing factor insofar as increasing the peak flow or total volume of water for a 24-hour, 5-year frequency storm in said facility above existing conditions.
3. All approved stormwater discharges to a natural waterway, irrigation ditch, or water supply ditch must show that source controls have been applied to the maximum extent practicable. See Section 9 for additional requirements.
4. Where irrigation or water supply ditches are located within or adjacent to a subdivision/development, improvements and access as required for the operation and maintenance of the ditch shall be provided to the ditch company's approval. Any improvements within the ditch company's easements are subject to the ditch company's approval.
5. Any irrigation or water supply ditch adjacent to residential units is to be fenced with 54” fencing, approved by the Administrator, to safeguard the general public [RMC 18.04.809(f)].

8-9 STORM DRAIN SYSTEMS

A. Design requirements

1. Whereby reason of terrain or other circumstances the City Engineer determines that piping stormwater runoff is inappropriate or unnecessary, alternative approaches may be approved.
2. Minimum design velocity shall be three fps for storm drains to avoid deposition of sediment.

B. Material

1. Corrugated metal pipe is not acceptable for storm drain systems for public improvements. All storm drain piping over 36” in diameter and located within the City right-of-way shall be a minimum of RCP Class III or the appropriate class when design requires a higher pipe support strength. Storm drain piping 36” and less shall be RCP Class III or solid wall plastic pipe with a minimum stiffness of 46 psi as specified in the SSPWC, except for culvert crossings. Individual catch basin leads may be constructed of unreinforced concrete pipe RCP Class III or solid wall plastic pipe with minimum stiffness of 46 psi as specified in the SSPWC.
2. For open-jointed storm drain pipe placed below the water table, non-woven geotextile filter fabric wrap shall be used with trench gravels enclosed around entire circumference (full envelope).

C. Minimum diameter

1. Minimum pipe diameter for any public storm drain shall be 12”, except for individual catch basin laterals not exceeding 80’ in length, which may be 10” minimum diameter.

D. Discharge to channel

1. Where storm drain discharges to a major drainageway, the storm drain shall extend, as a minimum, to the water surface elevation of the 100-year flood and be riprapped from the outlet of the storm drain to the bottom of the channel in the direction of flow.

E. Headwalls

1. Headwalls shall be placed on the inlet and outlet of all storm drain systems per applicable standards for culvert headwalls (see Section 8-11) unless due to hydraulic or geometric considerations a concrete end section is more appropriate (i.e., where a storm drain discharges to an open channel).

F. Manholes

1. Manholes shall be spaced at intervals not greater than 400' for pipes 21" diameter and smaller and at 600' maximum spacing for pipes 24" diameter and larger, unless otherwise approved by the City Engineer. Concrete collars shall be placed around all manholes, valves, or other appurtenances within any right-of-way or easement. Such collar shall encircle all casting with a minimum width of 1'. Manhole collars shall conform to standard details; all others shall extend to a minimum depth of 1'.
2. Within storm drain manholes, the difference between the invert elevations of the primary inlet and outlet pipes shall create a minimum fall of 0.1'. When smaller secondary inlet pipes are to be added to the manhole, these pipes shall be positioned to optimize flow, where possible, and to prevent adverse flow conditions, as approved by the City Engineer.
3. Manhole depth shall not exceed 25', unless otherwise approved by the Administrator.

G. Catch basins

1. Flow through catch basins (i.e., catch basins which tie into each other) shall not be allowed in public systems without prior approval from the Administrator.
2. For public systems, curb cuts shall not be used in lieu of catch basins. Whereby reason of terrain or other circumstances, the City Engineer determines that piping stormwater runoff is inappropriate or unnecessary, alternative approaches, such as for use in LID features, may be approved.

H. Abandoned pipe

1. Storm drain pipe that is to be abandoned must be solid grouted.

I. Laterals

1. For public systems, laterals from catch basins must tie into trunk lines at a manhole and may not make a blind connection. See TMRDM for special criteria where trunk lines are greater than or equal to 48". Where blind connections are specifically allowed for storm drain laterals, pipe inverts are to be at spring line or lower, preferably matching invert, and shall be positioned to provide maximum hydraulic efficiency. However, yard drains, landscaping drains, foundation drains and other similar local drain systems common to developed sites must tie directly into trunk line via a blind connection, and are not allowed to connect to manholes or catch basins. This criterion for local drain systems accomplishes the following:
    a. Discourages private interests from entering the public storm drain system for maintenance

b. Promotes orderly placement of drain lines, typically perpendicular to trunk line and front lot lines

c. Encourages consolidation of multiple drains from developed site into single conduit before connection to public system, thereby reducing utility clutter

2. Due to the special nature of LID features, especially in retrofit situations, where it is not feasible or practical to tie into the storm drain main, all City approved drains for the benefit of stormwater quality treatment controls (including edge drains where appropriate) may tie directly to catch basins and manholes with approval of the City Engineer.

J. Cover

1. Depth of cover on pipes shall be measured from bottom of A.C. to top of bells per the City of Reno Supplemental Standard Drawings.

K. Easements

1. Storm runoff generated within the boundaries of a subdivision or development which discharges from a public drainage system onto and across private property requires that a permanent easement for access and maintenance be granted to the City from the subdivision or development boundary to the point of discharge into an existing public storm drain system, major drainage facility, or natural water course. Improvements to City standards will be required to assure access and proper maintenance within said easement.

2. Easements with improved vehicular access in accordance with City standards shall be provided to publicly owned storm drain manholes, storm drain inlets and outlets, channels, storm drain basins, and associated structures not located within public right-of-way.

3. Easements for access to and maintenance of the 100-year floodplain associated with a major drainage facility or natural water course are to be provided to the City. Improved vehicular access in accordance with City standards shall be provided.

4. Storm drains located outside of the public right-of-way or within private streets shall require dedication of a drainage easement to the City.

5. The design of the public storm drain easement shall conform to the following requirements:

a. The storm drain line and at each manhole shall be centered within the easement, to the highest degree possible.

b. For storm drain depths less than or equal to 7.5', the minimum width for drainage easements shall be 15'.

c. For storm drain depths greater than 7.5', the minimum width for drainage easements shall be twice the depth of the storm drain line (invert to finish grade) and rounded up to the nearest 5'.

d. Easements shall be completely on one side of the property line and shall be clear of permanent structures, building eves, root lines, and potential trunk diameter of large tree species.

e. No trees or permanent structures shall be allowed within drainage easements.

6. See Section 8-7.D for easement requirements pertaining to site design and subdivisions.

L. Access

1. Where required, access for maintenance of facilities shall consist of a 15' easement with a 12' access road. The required surface treatment of the access road will be based on many considerations, including permeability, anticipated vehicle type and frequency, potential for erosion, slopes of adjacent terrain, priority to City, and anticipated future maintenance requirements, and is to be determined by the City. Where required adjacent a channel, the access road shall be at an elevation higher than the 100-year water surface elevation in the channel.
2. For large open channels and those facilities which in the opinion of the City may require emergency vehicle access, a 12' clear lane shall be provided for emergency vehicles at all times.
3. For channels less than 30' in top width, one maintenance access shall be provided as part of the channel improvements. For channels greater than 30' in top width, the maintenance road shall be located at the bottom of the channel or on both sides at the channel top. Access to the bottom of the channel for maintenance shall be provided at approximately every 1/4 mile.
4. Easements for access shall be dedicated "For Public Use" and shall provide for access by other public entities.
5. Maintenance access roads for storm drain structures (including inlets, outlets, and manholes) sufficient for a backhoe to clear debris from trash racks during storm events must be provided.
6. Where basins are constructed for flood control and/or water quality purposes, maintenance access must be provided to the basin floor for general maintenance including routine sediment and debris removal.

8-10 STREETS

A. Sump inlets

1. Except for where design approach varies due to LID features, catch basins shall be installed at low points of vertical curves, at all major street intersections, and at sufficient intervals to intercept the peak flow for the 5-year storm runoff such that flows will not interfere with traffic or flood adjoining property. Alternate design approaches which direct stormwater quality flows into an LID feature must still intercept and divert flows out of street sections and be no less effective or reliable than an appropriately designed catch basin for all events up to the 100-year event.
2. For all sump inlets in a street section, the inlet and connecting pipe shall be sized for the 100-year event, or a paved overland concrete swale shall be provided within a corresponding drainage easement (where necessary) to convey storm runoff in excess of the inlet or storm drain capacity for flows up to the 100-year event.
3. Where practicable, inlets shall be located on grade (not in a sump) and design site to eliminate or minimize the number of inlets in a sump condition.

B. Dry lane criteria

1. See the TMRDM for requirements.

C. General

1. See Section 8-7.D.5 for applicable requirements for edge drains in streets and medians.
2. Reinforced concrete valley gutters for public improvements may be placed at street intersections only when approved by the City Engineer.

8-11 CULVERTS

A. Design frequency

1. All culverts shall be designed to convey flows from the 100-year event based on fully developed conditions within the upstream watershed. This applies to roadway culverts, approach culverts, and culverts within subdivisions or other developed private sites. A lesser return period may be acceptable to the City Engineer for some limited cases such as where minor flows are present or for improvements in already built-out areas and will require prior approval by the City Engineer. In such cases the impacts of the 100-year flows must still be considered and must not be exacerbated or likely to cause damage.

B. Minimum size

1. For public improvements, the minimum culvert size shall be 18” in diameter for round pipe or shall have a minimum flow area of 2.2 square feet for other pipe shapes.
2. Minimum height for reinforced box culverts shall be 3’.

C. Material

1. Corrugated metal pipe is not allowed for public improvements. Corrugated metal pipe may be approved for retrofit projects to match existing systems with the approval of the City Engineer.

D. Headwalls

1. Headwalls or concrete end sections are required on all public culverts (this includes residential driveway culverts). All headwalls shall be designed with consideration given to skew angle of flows with respect to the culvert (NDOT standard culvert headwalls are acceptable and accommodate various skew angles). The City Engineer may require additional riprap armoring for any headwalls where scour or erosion is a concern, especially due to the angle of attack of any approach channel or ditch. For pipes up to and including 72” in diameter: the design, size, and material used shall comply in all cases with City standards. Headwalls for pipes exceeding 72” require special design as approved by the City Engineer.

E. Retrofit criteria

1. New developments are required to utilize storm drainage in place of roadside ditches. For those areas where retrofit of drainage systems is a factor, driveway culverts for single family residences shall be sized for 100-year flows or shall be sized for the equivalent roadside ditch flow area and be a minimum of 12” in diameter. Where headwalls are used for residential driveway culverts 18” in diameter and smaller, the following factors should be considered:

a. Environment which is friendly to the residential user.

b. Aesthetics.

c. Protecting the culvert from damage due to anticipated residential wheel traffic.

d. Protecting the culvert from equipment during removal of sediment and debris.

e. Hydraulic efficiency.

2. For such culverts, alternate headwall designs (i.e., smaller headwalls) which address these design concerns are acceptable and encouraged.

3. Roadway and offsite drainage must be appropriately addressed in any case where a roadside ditch is piped.

8-12 ADDITIONAL HYDRAULIC STRUCTURES

A. Trash racks shall be provided at the upper end of all storm drain or as approved by the City Engineer.

B. Access prevention grates shall not be placed at outlets of drainage structures.

8-13 DETENTION/RETENTION

A. Detention of 5- to 100-year storm(s) is required based on limiting conditions downstream and is many times the primary option for the mitigation of increases to peak runoff due to development.

B. See Section 9 for additional requirements pertaining to detention and retention basins. The size of required basins may be reduced through the use of LID features, with appropriate consideration given to effectiveness of LID features for longer return periods.

C. Infiltration systems shall require an infiltration test as basis of design. Percolation tests shall be performed at the depth of the proposed infiltration surface. The operation and maintenance of such a system is the responsibility of the property owner.

D. An emergency spillway shall be provided which will not cause a direct impact to neighboring sites. The TMRDM provides criteria for the design and sizing of spillways.

E. Where required, a secondary outlet (in addition to the emergency spillway) shall be provided that meets the following criteria:

1. Must be in a piped system.

2. Elevation must be above the primary outlet.

3. Must be sized assuming that primary outlet is completely plugged.

4. May tie into the conduit used for the primary outlet; its purpose is to provide an alternate outlet in case the primary outlet is plugged.

5. Must utilize a trash rack or beehive style grate.

F. Development within watersheds contributing to closed basins and intermittent lakes shall be in accordance with RMC 18.04.102(c)(7).

G. Permanent easements must be dedicated for all areas where volumetric storage mitigation is designated within watersheds contributing to closed basins and intermittent lakes.

8-14 EROSION AND SEDIMENTATION

A. See Section 5 – Grading, Slope Treatment and Erosion Control.

8-15 MAJOR DRAINAGEWAYS

A. Criteria relating to major drainageways are specified in RMC 18.04.104. Major drainageways may be either natural or improved systems, including both perennial streams and intermittent drainages meeting the applicable criteria. Development of property shall not adversely affect any major drainageway. Natural facilities shall remain in as near a natural state as is practicable with any modification proposed, including any erosion mitigation measures, addressed in the drainage report and drainage plan.

B. Embankment shall not be placed within the 100-year floodplain of a major drainage facility. For approved exceptions, the embankment shall be faced with appropriately sized riprap with freeboard required as for open channels.

C. The protection of drainageways in the City of Reno is important to public health, safety, and welfare, and their protection implements the City's mandated policies to preserve major drainage ways as open and recreational space and to save and improve these public resource areas for future generations.

D. Detention basins or other drainage facilities which result in the impoundment of runoff within a major drainageway, and which will require additional maintenance within the drainageway and significantly alter flow characteristics, are prohibited.

SECTION 9 – POST CONSTRUCTION STORMWATER QUALITY

9-1 GENERAL

A. Specific additional requirements concerning this issue shall include but not be limited to:

1. Applicable RMC
2. The Truckee Meadows Construction Site Best Management Practices Handbook

B. The Truckee Meadows Structural Controls Design and Low Impact Development Manual

C. This section provides design criteria and guidance for regulating stormwater runoff discharges from applicable land development projects and other construction activities to control and minimize increases in stormwater runoff rates and volumes, soil erosion, flooding, stream channel erosion, and non-point source pollution associated with stormwater runoff.

D. These guidelines are applicable to development activities within the applicable RMC, including but not limited to any site increasing impervious cover by 10,000 square feet or which disturb a soil area greater than 1 acre in size.

9-2 POST-CONSTRUCTION STORMWATER QUALITY MANAGEMENT

A. Post Construction Stormwater Quality Management Plan: A post construction Stormwater Quality Management Plan shall be prepared by a Nevada Licensed Civil Engineer using the Truckee Meadows Structural Controls Design and Low Impact Development Manual, and this manual as design guidance for the implementation of the post construction stormwater quality management requirements described in this section. The plan, supporting calculations, and documents may be included with the drainage report or provided as a separate document. The post construction Stormwater Quality Management Plan shall, at a minimum, include the following information:

1. Sufficient information (e.g., maps, hydrologic calculations, etc.) to evaluate the environmental characteristics of the project site, the potential impacts of all proposed development of the site as currently entitled and in future phases outlined in the entitlement, the water resources, and the effectiveness of the measures proposed for managing stormwater quality generated at the project site.
2. A site plan drawn to scale indicating the location of existing and proposed buildings, roads, parking areas, utilities, drainage patterns, easements, limits of grading, structural stormwater quality management, and sediment control facilities. The plan shall also clearly show proposed land use with tabulation of the percentage of area to be adapted to various uses.
3. Sufficient engineering analysis to show that the proposed stormwater quality management measures are capable of capturing runoff and potential pollutants from the site in compliance with this section and the specifications of the Truckee Meadows Structural Controls Design and Low Impact Development Manual. The engineering analysis must illustrate the drainage subareas and demonstrate the proposed mitigation measures, which are to be designed to meet or exceed the minimum treatment standard required. City of Reno Design Guidance Worksheets have been created to provide a consistent

submittal format and when properly completed, demonstrate sufficient engineering analysis. The City of Reno Design Guidance Worksheets are available online at www.tmstormwater.com.

4. A written or graphic inventory of the site and surrounding area as it exists prior to the commencement of the project and a description of the watershed and its relation to the project site. This description should include a discussion of soil conditions (e.g., description of soil type, infiltration/percolation rates, depth to groundwater, etc.), topography, wetlands, springs and other water bodies, and native or other vegetative areas on the site. Particular attention should be paid to environmentally sensitive features that provide specific opportunities or constraints for development.

5. A written description of the required maintenance for each proposed stormwater quality management facility that follows the inspection and maintenance procedures outlined in the Truckee Meadows Structural Controls Design and Low Impact Development Manual, which shall include, at a minimum, a site map showing the storm drainage system, structural treatment controls and LID practices, maintenance procedures, and inspection frequencies.

    a. Treatment facilities that receive stormwater from private land and are constructed on private land shall be maintained by the owner of the land upon which they are constructed.

    b. Treatment facilities that receive stormwater from public land may be constructed on public or private land at the discretion of the applicant. If they are constructed on private land, they shall be maintained by the owner of said land. If they are constructed on public land, offered for dedication, and accepted, they shall be maintained by the City of Reno, and the access and maintenance agreement will not be required.

6. Measures for controlling stormwater runoff generated from the developed portion of the site in accordance with the standards of this section to the maximum extent practicable.

7. Those elements integral to the proper functioning of each constructed phase shall be incorporated in the as-built record drawings, identifying the final design specifications for all installed stormwater management facilities, and must be sealed by a Nevada Licensed Civil Engineer, and shall be submitted after final construction is completed.

8. Digitally record GPS data identifying within 10’ the locations of structural treatment controls and LID features identified on the plan. The information shall be recorded with the current coordinate system standard and datum currently acceptable to the City of Reno.

B. Detention and retention

1. Design of detention/retention basins shall include stormwater quality treatment provisions as described in the Truckee Meadows Structural Controls Design and Low Impact Development Manual.

SECTION 10 – STREET LIGHT DESIGN

10-1 STREETLIGHTS REQUIRED

A. Street lighting shall be installed on all medium to high arterials, as defined by RTC, and on minor to major arterials as defined by the City. Safety lighting is required at a minimum for all other classifications.

10-2 STREETLIGHTS NOT REQUIRED

A. Lighting may be installed on private streets but is not required.

10-3 APPLICANT'S RESPONSIBILITY

A. All street lighting shall be the responsibility of the subdivider or developer who shall make all necessary arrangements with the utility company involved for the installation of such lights as approved by the City.

B. All street lighting within each construction phase shall be complete and operational prior to issuance of any certificate of occupancy.

10-4 GENERAL PLAN DETAILS

A. Street lighting plans shall be prepared by the utility and shall be submitted by the subdivider or developer to the Public Works Department, Traffic Engineering Section for review. Such plans shall show the location of each light, size of luminaires in watts or lumens, type of luminaire, number of streetlights, and total additional charge to the City. If a lighting analysis is deemed necessary for the proposed project, it will be the responsibility of the developer to provide the analysis. The analysis shall be in plan view format and display illuminance or luminance (foot candles) levels through light contours.

10-5 DESIGN STANDARDS

A. City requirements for lighting are outlined within the Sierra Pacific Power Company Streetlight Design Guide. All costs (installation, energy, and maintenance) associated with such lighting on private streets are the responsibility of the adjacent property owner(s). All fixture types are to comply with City of Reno standards and shall be 180° cutoff.

B. All walkway/bikeway lighting levels are to comply with American National Standard Practice for Roadway Lighting (Illuminating Engineering Society Publication No. RP-8-00).

C. Downtown Lighting Master Plan

The Downtown Lighting Master Plan outlines the current lighting levels in the downtown area. The accepted levels exceed recognized national standards in some locations. Lighting in the downtown area will be in accordance with the Redevelopment Streetscape Master Plan and as approved by the City.

10-7 STREET LIGHT DESIGN DETAILS

A. Illuminance Method Levels: The appropriate average illumination level may be determined from the following table (adapted from American National Standard Practice for Roadway Lighting, Illuminating Engineering Society Publication No. RP-8-00; Table 2):

Street Classification	Illumination Levels			Uniformity Ratio
	Commercial	Intermediate	Residential	
Major Arterial	1.3	1.1	0.8	3:1
Minor Arterial	1.6	1.2	0.8	3:1
Collector	1.1	0.8	0.6	4:1
Local	0.8	0.7	0.4	6:1
Sidewalk	0.9	0.6	0.3	6:1

All values are in foot candles, except uniformity ratio, which is average-to-minimum.

1. Commercial is defined as that portion of the City in a business development where ordinarily there are large numbers of pedestrians during business hours. This definition applies to densely developed business areas outside of, as well as those that are within, the downtown area. Commercial areas contain land uses which attract a relatively heavy volume of nighttime vehicular and/or pedestrian traffic on a frequent basis.
2. Intermediate is defined as that portion of the City often characterized as in blocks containing libraries, community recreation centers, large apartment buildings, or neighborhood retail stores.
3. Residential is defined as a residential development, or a mixture of residential and commercial establishments characterized by a few pedestrians at night. This definition includes areas with single family homes, townhouses, and/or small apartment buildings.

SECTION 11 – LANDSCAPING IN THE PUBLIC RIGHT-OF-WAY

11-1 GENERAL

A. In alignment with the City's Master Plan, the purpose of these guidelines is to provide developers, landscape architects, and engineers, with a clear understanding of the City's expectations for the planning, design, review, and maintenance of landscaping within public rights-of-way in the City of Reno.

B. Development of attractive landscaping and green spaces within close proximity to the downtown area, focal centers, and along arterial streets is encouraged.

11-2 APPLICABILITY

A. These landscape design guidelines apply to all landscaping in all new and expanding public rights-of-way in the City, to any HOA, maintenance district, or private entity that is responsible for maintaining landscaping within a local, collector or arterial street right-of-way.

B. These are not intended to apply to public street or utility reconstruction, rehabilitation, or maintenance project. These projects are reviewed through Public Works and in coordination with the Urban Forester for compliance with City standards.

11-3 LANDSCAPE PLAN APPROVAL PROCESS

A. In addition to landscape review processes outlined in Title 18, landscape plans within existing right-of-way (or right-of-way to be dedicated to the City) shall be submitted to the Development Services Department for review as part of the subdivision or site improvement plan application.

B. Once the submittal has been deemed complete, plans will be distributed by Development Services to the appropriate and applicable departments/divisions for review, comment, and approval, including but not limited to:

1. Development Services – Planning, Engineering and Building
2. Parks and Recreation, Urban Forestry
3. Utility Services
4. Public Works – Excavation and Encroachment

C. As applicable each department will review the landscape plans and forward comments to Development Services. The applicant shall respond directly to Engineering Division of Development Services to address each department's comments. The City will not approve the plans until all other departments have accepted the plans along with any other agencies requiring approval.

D. A permit, as well as an encroachment and excavation permit, must be obtained from the Urban Forester before planting trees on City of Reno property, including parkways and street rights-of-way.

E. No plans will be approved nor construction authorized until the City signifies permits have been acquired, any applicable improvement agreement has been completed, necessary bonds have been issued, and all required outstanding fees are paid.

F. Any changes to the approved landscape plans and/or landscaping installations must first be approved by Development Services and other applicable departments.

G. Development Services staff will inspect landscaping once installation is complete to ensure that it matches the approved plans. The applicant, at the applicant's cost, will be responsible for removing/amending any landscaping installations not in adherence with approved landscape plans.

11-4 LANDSCAPE PLAN REQUIREMENTS

A. Landscape plans shall be prepared and stamped by a Nevada Licensed Landscape Architect.

B. The landscape plan, through graphic symbols and notes, should comply with the planting and site criteria specified by these guidelines, and with the policies, procedures, standards, and all other requirements of the City.

C. Improvement drawings shall clearly indicate the area to be landscaped, size and species of trees and shrubs, ground cover, size and depth of mulch, depth and areas to be over-excavated and backfilled with approved soil, and conflicts with existing or proposed utilities.

D. Graphic Requirements: The landscape plan shall include scale, north arrow, all utility locations including easements, pipe and conduit, sight triangles, utility structures, hydrants, traffic boxes, light locations, boundaries, setbacks, all horizontal improvements, grading/contours, walls with top and bottom of wall elevations, and existing vegetation to remain with labels for size and species.

E. The landscape plan shall be prepared at a scale of 1" = 40' or 1" = 20', or another scale approved by staff which allows for maximum clarity of the proposal.

F. Planting Details: Tree, shrub, perennial, annual, and ground cover planting details shall be shown on the plan.

G. The landscape plan shall contain a chart that includes the plant symbol or abbreviation, botanical and common names, size at planting, and for those plants proposed in the sight triangles, plant height at maturity.

H. The landscape plan shall show the width of any of raised planters, and tree wells.

I. The landscape plan shall document the organic and inorganic soil amendments that may be added based on the results of a soil analysis.

J. Plant Selection: Trees should be selected from the approved tree list provided in the Standard Details. Shrubs and plants may be selected by the landscape architect and may be subject to approval of the Urban Forester.

K. Hydrozones: The landscape plan shall include plants with similar water needs within each site microclimate (e.g., extent of shade, direction facing, location planted, etc.) should be zoned or grouped together for efficiency of water application, to prevent water waste and to provide optimum application of water to plants.

L. Numerical Requirements: The locations and quantities of plants should comply with the requirements of this section and Title 18.

M. Mix of Species: Groupings of plants, rather than single species, are encouraged. Species selection should reflect canopy, understory, and ground cover plants that are compatible.

11-5 GENERAL GUIDELINES

A. The intent of these guidelines is to provide general direction for landscape design for parkways, medians, and intersections, near signs and lights, and in compact urban areas where tree wells are desired. Many factors affect design along streets, including use by pedestrians, the size and orientation of sidewalks, the distance from trees to buildings and fixtures, the visibility of commercial facades and signs, snow plowing and snow storage, and the speed and volume of vehicles.

B. Trees should be selected based on existing environmental conditions and to enhance adjacent property and structures.

C. Trees should have similar characteristics (in terms of form, character, and spacing patterns) on both sides of the street.

D. At mature size, residential street trees should form a continuous canopy to reinforce the street space.

E. Trees and shrubs should be an appropriate mix.

F. Trees should be selected with their mature size in mind so they have room to grow. Narrow areas suggest a narrow tree and open areas suggest a wide one.

G. Trees shall not be planted in utility easements unless permitted by the owing utility company.

H. Where trees may conflict with intersection sightlines, street signs, lights, underground utilities, utility boxes, or fire hydrants, adjust plant species or location.

I. Trees installed within rights-of-way shall have root barriers installed to contain roots for the protection of the trees, hardscape, and utility infrastructure.

J. When replacing trees in an existing right-of-way, select new trees of similar characteristics to those being replaced, including form, scale, texture, and color.

K. At intersections of streets and alleyways vision sight triangle analysis shall be performed per the requirements of this design manual to verity that trees and shrubs do not interfere with views or sight lines.

L. Trees shall be planted no closer than 20’ from street light poles. Individual site conditions may warrant an exception if approved by the City Engineer.

11-6 HARDSCAPE AREAS

A. Selecting and planting trees in dense urban areas creates special challenges that require thoughtful design and installation.

B. Where no continuous landscape parkway is proposed and space is limited, the City may allow trees to be planted in tree wells with appropriate soil volume based on tree size. It should be anticipated that the area

needed to conform to the soil volume requirements will extend under the abutting hardscape. Refer to Public Works Standard Details.

C. When tree grates are placed they shall be properly maintained to allow the tree truck to grow and not girdle the tree.

11-7 LANDSCAPE WITHIN PARKWAYS

A. Landscape parkways and sidewalks shall be placed within public rights-of-way and dimensions shall conform to PWDM Section 4 - Streets. Parkways shall not contain any turf, and shall not use any spray heads for irrigation.

B. Landscaped parkways shall include approved street trees, plants, ground cover, and/or decorative hardscape.

C. Street tree requirements

1. Mixed-Use Downtown (MD-) Districts: All street trees in the MD districts shall meet the standards of the Downtown Streetscape Design Manual. Where the Downtown Streetscape Design Manual does not identify street tree requirements, the standard requirements for arterials, collectors, and residential streets shall apply.
2. Arterial and Collector (Residential and Collector) Street Classification
    a. Unless otherwise required, trees shall be planted adjacent to the right-of-way at a minimum average rate of one tree every 30’ of street frontage.
    b. Parkway shall include a minimum of six shrubs per tree and/or living ground cover planted to achieve full coverage at maturity, except for any walkways.
3. Local (Residential) Street Classification
    a. Two street trees shall be planted for each street frontage up to 40’ in width. For streets with frontages over 50’ in width, street trees shall be planted at a minimum average rate of one tree for every 30’.
    b. Parkway shall include a minimum of six shrubs per tree and/or living ground cover planted to achieve full coverage at maturity, except for any walkways.

11-8 LANDSCAPE WITHIN MEDIANS

A. With the emphasis on a continuous street tree canopy, the medians are intended to complement that canopy. Tree and shrub spacing should be chosen to confirm to this intent.

B. Raised landscape medians are only allowed when a minimum of 20’ of clear travel width on each side of the median is maintained for emergency access.

C. Landscape medians that include trees shall be a minimum of 10’ wide, shall not contain any turf, and shall not use any spray heads for irrigation. Landscape medians that do not include trees shall be a minimum of 6’ wide for shrubs to thrive. Dimensions are measured from back of curb to back of curb of the median.

D. Planting areas in the medians that include trees shall be a minimum of 10' wide for trees to thrive (measured from back of curb to back of curb) and shall not contain turf or use any spray heads for irrigation.

E. Canopy trees shall be planted no closer than 4' from the back of curb and evergreens shall be planted no closer than 7' from the back of curb.

F. Median landscaping shall not have planting objects above 30" or below 8' within the sight triangle clear zone as defined in this PWDM.

11-9 LANDSCAPE SURFACE TREATMENT

A. Turf grass shall not be used in the public right-of-way.

B. Ground cover

1. Ground covers are beneficial in solving problematic conditions such as steep slopes or small irregularly shaped areas. They are useful in visually linking larger plant material groupings and providing leaf texture and seasonal color. Care should be given in selection of ground cover species. They should be appropriate for the intended character of the landscape. Mature height, color, texture, growth habit, disease resistance, hardiness, drought resistance, and maintenance aspects all play a role in the ultimate selection.
2. Low-growing shrubs and evergreens: These are often ideal selections for coverage, especially on slopes.
3. Perennials: These are especially effective because the local growing season is relatively short and late spring frosts and snow can impact on the bloom of trees and shrubs.
4. Annuals. These flower plantings enrich median and right-of-way landscapes and the overall richness of the City's streetscape.

C. Topsoil

1. Organic matter in the soil increases water holding capacity, helps reduce soil compaction, and promotes root development in poor soils. Soil preparation can allow moisture to be held in marginal soils up to three times longer than in unprepared soils, thus resulting in reduced irrigation demand.
2. Soil composition and soil installation shall conform to the requirements of the Standard Details.
3. All planting areas shall be over-excavated and backfilled with a quality planting soil.

D. Mulch

1. Under all trees and shrubs and anywhere in a required landscaped area not planted with live material or otherwise covered, mulch shall be provided.
2. Nonporous material, such as plastic sheets, shall not be placed under the mulch.
3. Low-flammability organic mulches shall be applied to a depth of 2" to decrease evaporation. Use fibrous shredded bark mulch as it holds together better in windy conditions.

4. Choices of non-living ground cover should be made after considering the flammability and toxicity of available types.
5. Use of non-organic mulches (gravel, rock, cobbles, and stones) shall not be used in the public right-of-way.

11-10 TREES, SHRUBS AND PLANT SPECIES AND SIZES

A. Trees and plant material shall meet ANSI American Standard for Nursery Stock.

B. Trees shall be selected from the City of Reno approved trees list contained in the Standard Details. Trees within the right-of-way shall be large-growing canopy trees, Class 3 or 4. Smaller size trees may be permitted at the approval of the Urban Forester when height and canopy constraints exist (e.g., overhead utility lines, existing walks/driveways, structures, etc.).

C. Minimum tree size at planting shall be 2" caliper and a height of 6'.

D. A mixture of deciduous and evergreen trees shall be provided and species diversity is encouraged. However, evergreens should be avoided as street trees due to issues with shading in winter resulting in ice hazards.

E. The branching height of mature trees on the traffic side of the street shall be no less than 14' above the street. Trees shall be regularly pruned to achieve this effect.

F. The branching height of mature trees on the pedestrian side of the street shall be no less than 7' above the sidewalk. Upon planting, trees shall be pruned to eliminate any hazards to pedestrians.

G. Shrubs shall be a mix of five-gallon and one-gallon container size. Of the total shrubs, at least 25% shall be five-gallon and 75% one gallon or larger.

H. Ground cover and perennials do not have a minimum size requirement. Spacing should provide 80% coverage within two to three years.

11-11 IRRIGATION DESIGN

A. Irrigation design and plans shall be prepared and stamped by a Nevada Licensed Landscape Architect.

B. All irrigation equipment and components within the City's rights-of-way shall be owned and maintained by the abutting property owner, HOA, maintenance district or private entity, unless otherwise noted on the landscape plans.

C. Irrigation design within rights-of-way shall conform to the requirements of this section and Standard Details.

D. Automatic drip irrigation shall be provided in all new parkway designs. At least one 3" PVC irrigation sleeve will be provided beneath sidewalks for each property abutting parkways.

E. Irrigation systems should be designed to permit turf grass to be irrigated separately from all other planting areas.

F. Automatic irrigation controllers should have repeat cycle capability to permit moisture to penetrate the soil rather than run off.

G. Drip lines shall be run down the side of the parkway or median and not through the middle. Lines should be buried 6" as measured from the bottom of the mulch finish grade.

H. Rainfall and freeze sensors, weather-based controllers, check valves, pressure reducers, and flow sensor valves shall be used to reduce water waste.

I. Controllers should have the capability to irrigate shrubs, flowers, and trees separately from turf, and have time capability to permit effective use of low volume systems over longer cycles.

J. Perennial and ground cover areas may be irrigated with fixed riser or shrub pop-ups.

K. Pop-up risers should be fitted with low pressure and low volume spray heads. Shrubs and trees may be irrigated by drip or low volume spray heads.

L. Where turf irrigation is abutting the right-of-way, spraying of streets, walks, driveways, buildings and fences should be avoided. If spraying of walks and bikeways cannot be avoided, the controller should be timed to spray at night to reduce conflicts with pedestrians.

M. Schedule 40 PVC with schedule 80 fittings is required on all piping up to 3" in size. For piping over 3" in size, class piping is required. Mainlines shall be a minimum of 24" deep from finish grade with approved backfill. Mainlines shall have detectable tape one foot above line. Lateral lines shall be schedule 40 with a minimum of 18" in depth with approved backfill.

11-13 MAINTENANCE REQUIREMENTS

A. General Maintenance: All landscape areas and plant materials shall be maintained in a vigorous and healthy condition, free of weeds and litter. This maintenance shall include weeding, watering, fertilizing, pruning, mowing, edging, mulching, and other needed maintenance, in accordance with generally accepted horticultural practices. This shall include using pruning standards accepted by the International Society of Arboriculture and/or the National Arborist Association.

B. Maintenance of Trees and Shrubs: Property owners are responsible for pruning and/or trimming of trees and shrubs that encroach on the public right-of-way and/or obstruct any part of the curb and gutter or sidewalk in accordance with RMC. The following guidelines shall be followed:

1. Tree limbs are to be elevated to a height of 14' above the street travel lane to the edge of the gutter line and 8' above the sidewalk.
2. Shrubs are to be pruned back a minimum of 6" behind the back of sidewalk.
3. Existing trees and shrubs near intersections are to be maintained so as not to obstruct or interfere with views or sight lines.
4. Minimum sight triangle and corner triangle distances are to be maintained for safe viewing of oncoming traffic and pedestrians. Within the sight triangle, no objects above 30"or below 8' (measured from abutting street edge) shall be permitted.

SECTION 12 – RECLAIMED WATER

12-1 STANDARDS REFERENCE

A. The following documents have been referenced in the preparation of this section:

1. Nevada Division of Environmental Protection (NDEP) WTS-1A: General Design Criteria for Reclaimed Water Irrigation Use
2. NDEP WTS-1B: General Criteria for Preparing an Effluent Management Plan
3. NDEP WTS-37: Guidance Document for Design of Wastewater Detention Basins
4. NDEP WTS-4: Guidance Document for Design of Groundwater Monitoring Wells
5. NDEP Discharge Permit application forms, Discharge Monitoring Report form, and Permit fees
6. NAC 445A.275 – 445A.280, Use of Treated Effluent (Reuse Regulations)
7. NAC 445A.6715 – 445A.67215, Water/Sewer System Separation Regulations
8. TMWA Engineering & Construction Standard Sections 8 and 8a
9. AWWA C600: Standard for Installation of Ductile Iron Water Mains and their Appurtenances
10. AWWA C605: Standard for Underground Installation of PVC Pressure Pipe and Fittings for Water
11. SSPWC, last adopted issue by City of Reno
12. Uniform Plumbing Code, Latest Edition
13. AWWA C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. for Water Transmission and Distribution
14. AWWA C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. for Water Transmission and Distribution
15. AWWA M41: Ductile-Iron Pipe and Fittings
16. AWWA C110: Ductile-Iron and Gray-Iron Fittings
17. AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
18. AWWA C105: Polyethylene Encasement for Ductile-Iron Pipe Systems
19. AWWA C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
20. AWWA C151: Ductile-Iron Pipe, Centrifugally Cast, For Water
21. AWWA C115: Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
22. AWWA C800: Underground Service Line Valves and Fittings
23. AWWA C500: Metal-Seated Gate Valves for Water Supply Service
24. AWWA C504: Rubber-Seated Butterfly Valves, 3 in. Through 72 in.
25. AWWA C515: Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service

12-2 DISTRIBUTION SYSTEM STANDARDS FOR RECLAIMED WATER TREATED EFFLUENT

A. Design standards

1. All reclaimed water treated effluent systems shall be designed and constructed in accordance with all applicable federal, state, and local laws and requirements including but not limited to those put into place by:
    a. The State of Nevada
    b. NDEP
    c. The City of Reno
    d. The applicable water purveyor
2. All reclaimed water treated effluent reuse systems must be included in an Effluent Discharge Permit issued by NDEP.

B. Hydraulic analysis

1. A hydraulic analysis shall be provided for all proposed reclaimed water treated effluent distribution systems within public right-of-way to insure adequate flow and pressures at points of service. Two (2) copies of the hydraulic analysis report shall be submitted to the City of Reno for review and approval. The final report will also be provided electronically. At a minimum, the report submittal shall include the following:
    a. Complete contact information for the Customer and the Design Engineer.
    b. Project description.
    c. Name and version of hydraulic modeling software.
    d. Site plan and grading plan
    e. Assessor's Parcel Number and address.
    f. Hydraulic model input data.
    g. Hydraulic node map. Nodes and piping elevation to be based on the grading plan and reflect final elevations.
    h. Hydraulic model output data.
2. All pump systems require coordination and approval from the City of Reno Utility Services Department. If you are designing a system with pumps, tanks, etc., contact the City of Reno Utility Services Department during the planning phase of the project. Proposed systems with pumps, tanks, and improvements involving pumps and tanks shall include a surge analysis with hydraulic model, recommendations, and supporting documentation to be submitted for review.

C. Design pressure

1. Service point(s) shall be determined by the Design Engineer to accommodate irrigation system requirements.

2. Mainline termination point(s) shall be as required by the City of Reno.

D. Pipe material type

1. PVC

a. PVC pipes shall be purple. Joints shall be bell and spigot type with gaskets designed for potable water service.

b. Sizes 4" to 12" shall meet all the dimensional, chemical, and physical requirements as outlined in AWWA C900.

c. PVC pipe connected directly to the reclaimed water mainline distribution system with no PRV shall be Pressure Class 305 (DR-14).

d. PVC pipe downstream of a PRV may be Pressure Class 235 (DR-18).

1. Sizes 14" to 30" shall meet all the dimensional, chemical, and physical requirements outlined in AWWA C905, cast iron OD.

2. PVC pipe connected directly to the reclaimed water mainline distribution system with no PRV shall be Pressure Class 200 (DR-21).

3. PVC pipe downstream of a PRV may be Pressure Class 165 (DR-25).

a. Sizes larger than 30" require special approval from the City of Reno.

4. Restrained joint PVC pipe and fittings

b. Pipe: Bell Restraint Harness

5. Sizes 4" to 12" (C900), Series 1600 Bell Restraint Harness as manufactured by EBAA Iron, Inc. or City of Reno approved equal.

6. Sizes 14" to 30" (C905), Series 2800 Bell Restraint Harness as manufactured by EBAA Iron, Inc. or City of Reno approved equal.

7. Fittings: Mechanical joint fittings with wedge style mechanical joint restraint, Megalug as manufactured by EBAA Iron, Inc. or City of Reno approved equal.

c. Ductile Iron Pipe and Restrained Joint Ductile Iron Pipe (DIP and RJ-DIP) may be used. All DIP and RJ-DIP shall receive polyethylene pipe encasement per Section 12-2P of this Standard.

d. All DIP and RJ-DIP shall meet the requirements of the following AWWA Standards:

8. AWWA C151: Ductile-Iron Pipe, Centrifugally Cast, for Water

9. AWWA C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

10. AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

11. AWWA C105: Polyethylene Encasement for Ductile-Iron Pipe Systems

12. AWWA M41: Ductile-Iron Pipe and Fittings

e. Pressure Classes for DIP and RJ-DIP sizes shall be as follows:

13. Sizes 3” to 12” shall be Pressure Class 350.
14. Sizes 14” to 20” shall be Pressure Class 250.
15. Sizes 24” to 30” shall be Pressure Class 200.
16. Sizes larger than 30” require special approval from the City of Reno.

f. RJ-DIP shall include:

i. Push-on joint with standard gasket with interlocking segments inserted through a slot in the bell face, TR Flex as manufactured by U.S. Pipe or City of Reno approved equal.

ii. Push-on joint with restrained joint gasket, FIELD LOK Gasket for specified pipe size as manufactured by U.S. Pipe or City of Reno approved equal.

iii. Mechanical joint pipe with wedge style mechanical joint restraint, Megalug as manufactured by EBAA Iron, Inc. or City of Reno approved equal.

17. Pipe Joint Deflection per AWWA C600, Table 3. Confirm manufacturer’s recommended maximum deflection will provide radii and angle points required.
18. Threaded Flanges, Ductile Iron per AWWA C115. DIP requiring threads for flanges shall not be less than that required by thickness Class 53, Pressure Class 350.
19. Flanges per AWWA C115.
    1. Ductile Iron Fittings and Restrained Joint Ductile Iron Fittings. AWWA C110, AWWA C104, Cement mortar lined and seal coated for potable water.
    2. Restrained flange coupling adapters shall include:
20. Wedge style restrained flanging system, Megaflange as manufactured by EBAA Iron, Inc. or City of Reno approved equal.
    1. Flanges, bolts and gaskets shall meet requirements in AWWA C115, Appendix A.
    2. Restrained Joint Ductile Iron Fittings shall include:
21. Mechanical joint fittings with wedge style mechanical joint restraint, Megalug as manufactured by EBAA Iron, Inc. or City of Reno approved equal.
22. Effluent service lateral pipe (1.5” and 2”)
    1. Service lateral is defined as the piping between the mainline and a meter box or meter vault.
    2. Minimum service size shall be 1.5”.
    3. Polyethylene pressure pipe shall conform to AWWA C901 for 1.5” and 2” service connections, and shall be purple or purple striped, Pressure Class 200 (DR-9).
    4. Service Line Fittings shall meet requirements in AWWA C800.

B. Buried warning and identification tape

1. Buried warning and identification tape shall be polyethylene plastic, metallic core detectable warning tape, and shall be AWWA compliant, APWA compliant, acid and alkali resistant, permanent marking, unaffected by moisture or soil, and at least five millimeters thick by 3" wide. Warning tape shall be manufactured specifically for locating, warning, and identifying buried utility lines. It shall be APWA color coded purple for reclaimed water with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification shall read "CAUTION: BURIED RECLAIMED WATER LINE BELOW" or similar.

C. Tracer wire and test stations

1. Tracer wire shall be provided for all distribution reclaimed water lines and service laterals and shall be placed on top of pipe and attached with duct tape at 6' maximum intervals. At 500' intervals, tracer wire shall be extended into separate test stations consisting of risers and valve boxes (see City of Reno Reclaimed Water Treated Effluent Detail SR-3). Test lead wire shall be long enough to extend 4' above ground level and shall terminate in a test station box. Tracer wire shall be attached to service laterals with duct tape at 3' maximum intervals, shall be long enough to extend 4' above ground, and shall terminate in a meter box. Wire shall be #12 AWG, insulated, stranded copper, THHN 600V. Prior to acceptance of the reclaimed waterline(s) by the City of Reno, the contractor shall perform a continuity test after backfilling the trench to the satisfaction of the City of Reno Inspector and/or Engineer.

D. Thrust restraint

1. Mechanical joint fittings/pipe with wedge style mechanical joint restraint, Megalug as manufactured by EBAA Iron, Inc. or City of Reno approved equal.
2. Concrete thrust blocking per City of Reno Reclaimed Water Treated Effluent Detail SR-13.
3. RJ-DIP, TR Flex as manufactured by U.S. Pipe or City of Reno approved equal.
4. Ductile iron pipe push-on joint with restrained joint gasket, Field Lok Gasket for specified pipe size as manufactured by U.S. Pipe or City of Reno approved equal.
5. PVC pipe bell restraint harness as previously specified in 12-2D.2 of this Standard.
6. Engineer to submit calculations for thrust blocks used in vertical deflections applications.

E. Depth of cover

1. Design depth of cover = 4'
    a. Adjacent to existing water and gas, as required providing minimum separation requirements.
    b. Per NAC 445A.67145. Minimum depth of cover = 3'.
2. Design depth of cover which exceeds 5' shall require approval by the City of Reno.

3. RJ-DIP shall be used for all crossings under ditches, existing pipelines, reinforced concrete boxes, and any other structure that will impede access for maintenance purposes.
4. Steel casings shall be used for pipe installed using jack and boring methods, where approved by City of Reno and required to meet specific railroad and/or NDOT requirements, to provide structural support, or as required under other special conditions.
5. Casing shall be designed to be laid true to line and grade with no bends or changes in grade for the full casing length. Steel casing shall be 1/4" thick minimum wall thickness - or as approved by the City of Reno - (design calculations shall be submitted by Engineer) ASTM A283 Grade B, C, D, welded joints, interior joints smooth welded finish with polyethylene pipe spacers symmetrically located supporting pipe about its centerline inside casing at each joint to isolate carrier pipe from casing. Pipe casing to be sized per pipe spacer manufacturer's recommendations. Pipe spacer shall be Calpico model PX insulator or approved equal.
6. Isolation valves shall be installed on either side of crossing.
7. RJ-DIP shall be used for carrier pipe inside casing.

F. Pipe deflection/bending

1. PVC pipe per AWWA C605.
2. DIP per AWWA C600.
3. Per pipe manufacturer's recommendation, only if more stringent than AWWA C605 for PVC pipe or AWWA C600 for ductile iron pipe

G. Buoyancy

1. As determined by the Design Engineer and approved by the City of Reno. Buoyancy parameters and concerns shall be discussed by the Design Engineer with City of Reno Public Works engineering staff during the design phase of the project and shall be mitigated on a case-by-case basis.

H. Surge protection

1. As determined by the Design Engineer and approved by the City of Reno. Surge protection parameters and concerns shall be discussed by the Design Engineer with City of Reno Public Works engineering staff during the design phase of the project and shall be mitigated on a case-by-case basis. Proposed construction or improvements of pumping systems and/or tanks shall require submission of surge analysis with a supporting hydraulic model by the Design Engineer to the City of Reno.

I. Isolation valves

1. Gate valve shall be 3" to 12" per AWWA C500.
2. Gate valve shall be 14" to 15" per AWWA C515. Gate valves over 14 inches shall have adequate cover over bonnet. Bevel gear actuators shall be approved on a case-by-case basis for maintain adequate cover.

3. Butterfly valve shall be 14" to 30" per AWWA C504.
4. As required for operation and maintenance of the system:
    a. Tees shall require 2 valves minimum, location optimized for maintenance and operation of the system.
    b. Crosses shall require 3 valves minimum, location optimized for maintenance and operation of system.
5. As approved by the City of Reno:
    a. In residential/commercial developed areas, 500' maximum (as required in NAC 445A).
    b. Other areas, 1,200' maximum.

J. Combination air vacuum and air release valve assemblies

1. Installed at high points in the effluent mainline.
2. Installed where entrapment or collapse of pipeline due to vacuum may occur. Design Engineer shall submit an exclusive detail and calculations for combination air vacuum and air release valve assemblies larger than 1".
3. As determined by the Design Engineer and approved by the City of Reno.
4. Air release valve assembly materials and construction, including the valve, enclosure, and vent piping shall be per City of Reno Reclaimed Water Treated Effluent Details SR-12A and SR-12B for 1" valves.

K. Mainline blow off

1. For mainlines greater than 20" in diameter.
2. Located at low points in effluent mainline and approved by the City of Reno.
3. At least 6" pipe for blow-off structure.
4. Sized to provide minimum velocity of 2.5 fps in the main.

L. Purple coloration and warning

1. All covers for meter boxes, valve boxes, flush valves, pressure reducing vaults, air/vac release assemblies, and all other appurtenances requiring vaults or boxes shall be purple (Pantone Color #512), labeled "RECLAIMED WATER" or "EFFLUENT", and have secured or locking lids. Purple coloration shall be obtained from the manufacturer or be applied by powder coating or epoxy paint. All appurtenances shall have a purple tag attached with the wording "WARNING RECYCLED/RECLAIMED WATER DO NOT DRINK" and "AVISO AGUA IMPURA NO TOMAR" (T. Christy Enterprises, MAXI valve identification tag, ID-MAX-P2-RC006 or City of Reno approved equal). A debris cap with purple coloration shall be installed inside all round boxes.

2. All above ground piping shall be epoxy painted purple (Pantone Color #512) and have a purple tag attached with the wording "WARNING RECYCLED/RECLAIMED WATER DO NOT DRINK" and "AVISO AGUA IMPURA NO TOMAR" (T. Christy Enterprises, MAXI valve identification tag, ID-MAX-P2-RC006 or City of Reno approved equal).

M. Corrosion protection

1. As recommended by the pipe manufacturer for actual soil conditions, not less than the following:

    a. Polyethylene Pipe Encasement per AWWA C105, eight millimeter minimum thickness. All buried DIP, fittings, and valves shall be encased with low-density, polyethylene film (min. 8-mil thick). The polyethylene film shall be in tube form and colored purple. The film shall be clearly marked "RECLAIMED WATER" or "EFFLUENT" in BLACK letters at regular intervals.

    b. Brush-on mastic shall be applied to all bolts and exposed steel.

N. Sewer/water separation standards

1. NAC 445A.6715 - 445A.6718.
2. TMWA Engineering & Construction Standard Sections 8 and 8a.
3. Adopted regulation of the State Environmental Commission LCB File No. R049-18.

O. Direct connections to potable water system

1. Direct connections between potable water piping and reclaimed water piping shall not exist under any condition, with or without backflow protection.

P. Effluent service connections (public/private ownership and maintenance)

1. Transitions from publicly owned facilities (City of Reno) to privately owned facilities (Customer) shall be clearly delineated. Typically, the meter at the point of connection shall serve as the point of transition, with facilities upstream of the meter being owned and maintained by the City of Reno, and facilities downstream of the meter being owned and maintained by the Customer. In cases where mainlines exist within public right-of-way downstream of a meter (typically a "master" meter), the transition between City owned and maintained facilities and Customer owned and maintained facilities shall be delineated by and include an isolation valve and test station located as near possible to the boundary (property line) between public right-of-way and private property, if applicable.
2. All piping and appurtenances located on private property shall be owned and maintained by the Customer, unless within a dedicated easement and approved in writing by the City of Reno.
3. All reclaimed water mains less than 4" diameter shall be owned and maintained by the Customer and will be considered irrigation piping.

4. Publicly owned facilities (City of Reno) and privately owned facilities (Customer) shall be clearly delineated and labeled on the design drawings.

Q. Service laterals

1. Service laterals shall be sized to provide peak demand without excessive pressure loss through the meter and setter.
2. Minimum service size is 1.5".
3. Service laterals shall be installed perpendicular to the water main and the meter, unless otherwise approved by the City of Reno.
4. All services 3" and larger shall include a tee (or tapping saddle), gate valve, and valve box.
5. Service laterals shall maintain minimum separation between effluent and potable water per required separation standards (NDEP and TMWA).

R. Meters

1. Meter manufacturer shall be ABB or City of Reno approved equal.
2. Meter type shall be:
    a. Recordall Turbo Series Meter with integral strainer (1.5" to 4")
    b. Recordall Turbo Series Meter without integral strainer (6" and larger)
    c. Recordall Disc Meter (1.5" and 2")
    d. Magnetoflow Mag Meter
3. Meter shall be rated for reclaimed water use and shall have:
    a. Purple colored register and lid.
    b. Non-potable water symbol on register lid.
    c. The word "RECLAIMED" cast or engraved in the meter body and printed on the register dial face and lid.
4. For meters 6" and larger, provide upstream plate strainer.
5. Minimum meter size shall be 1.5".
6. Meters shall be supplied by the City of Reno, unless otherwise stated in the Effluent Agreement with the City.
7. Meter enclosure and setter with idler shall be constructed by the Customer, per the applicable City of Reno Reclaimed Water Treated Effluent detail.
8. The meter shall be installed on the property served immediately adjacent to the public right-of-way.

S. Flow control facilities (PRV)

1. Direct connections to the reclaimed water main line shall require a pressure reducing valve. Flow control facility requirements shall be as determined by the Design Engineer and approved by the City of Reno.
2. Services 3" and larger shall install a pressure reducing/pressure sustaining valve. The valve will reduce the pressure from the main distribution system to the required irrigation distribution system pressure. The sustaining feature will close the valve in the event that the pressure in the main distribution system drops below a set point. The valve shall be a Cla-Val Model 92-01 Combination Pressure Reducing and Pressure Sustaining Valve or City of Reno approved equal. The size of the valve shall be determined by the Design Engineer.
    a. The valve body shall be fusion bonded epoxy coated ductile iron, globe configuration.
    b. The valve shall have standard trim materials.
    c. The valve shall be Pressure Class 250, flanged (150 lb. ANSI).
    d. Downstream adjustment range shall be determined by the Design Engineer based on the irrigation distribution system pressure requirements (30 to 300 psi is standard setting).
    e. Upstream adjustment range shall be 20 to 200 psi (standard setting). Sustaining pressure shall be set per City of Reno requirements (site specific).
    f. Valve options shall include:

1. Brass opening and closing speed control valves.
2. Bronze shutoff cock.
3. Y-strainer.

    g. If the valve will be used as a shutoff valve, a solenoid control feature shall be added to the valve. Voltage, AC or DC power, and whether the valve shall be energized open (normally closed) or energized closed (normally open) shall be specified. Electrical service and conduit through vault wall shall be provided. Wall penetrations shall be grouted.
    h. If the valve will be used to control rate of flow, or if cavitation is possible downstream from the valve, specify orifice plate bore size per manufacturer's literature. Install orifice plate downstream from pressure reducing valve. Submit calculations for orifice plate.

3. A pressure reducing valve shall be installed for 1.5" and 2" services. The valve will reduce the pressure flow from the main distribution system to the required irrigation distribution system pressure. The valve shall be a Cla-Val Model 90-01 Pressure Reducing Valve or City of Reno approved equal. The size of the valve shall be determined by the Design Engineer.
    a. The valve body shall be fusion bonded epoxy coated ductile iron, globe configuration.

b. The valve shall have standard trim materials.

c. The valve shall be Pressure Class 400, threaded (ANSI B2.1).

d. Downstream adjustment range shall be determined by the Design Engineer based on the irrigation distribution system pressure requirements (30 to 300 psi is standard setting).

e. Valve options shall include:

1. Brass opening and closing speed control valves.
2. Bronze shutoff cock.
3. Y-strainer.

f. If the valve will be used as a shutoff valve, a solenoid control feature shall be added to the valve. Voltage, AC or DC power, and whether the valve shall be energized open (normally closed) or energized closed (normally open) shall be specified. Electrical service and conduit through vault wall shall be provided. Wall penetrations shall be grouted.

T. Pressure relief valves

1. All services require a pressure relief valve downstream of a pressure reducing valve. The valve will release excess pressure to protect the irrigation system. The size of the valve shall be approximately 1/3 of the pressure reducing valve size, to be determined by the Design Engineer. Relief pressure shall be set above irrigation line operating pressure and below irrigation line maximum pressure. These set points shall be specified in the design drawings.
2. Pressure relief valves 1.25” and larger shall be Cla-Val Model 50-01 Pressure Relief, Pressure Sustaining Valves or City of Reno approved equal. The size of the valve shall be determined by the Design Engineer.

a. The valve body shall be fusion bonded epoxy coated ductile iron, globe configuration.

b. The valve shall have standard trim materials.

c. The valve shall be Pressure Class 250.

d. Four inch and larger valves shall be flanged (150 lb. ANSI) and 1.25” to 3” valves may be flanged (150 lb. ANSI) or threaded (specified in design drawings).

e. Discharge pressure adjustment range shall be 20 to 200 psi (standard setting).

f. Valve options shall include:

1. Brass opening and closing speed control valves.
2. Bronze shutoff cock.
3. Y-strainer.

3. Pressure relief valves smaller than 1.25" shall be Cla-Val model 55F Pressure Relief Valves or City of Reno approved equal.
    a. The valve body shall be cast bronze.
    b. The valve shall have standard trim materials.
    c. The valve shall be Pressure Class 400.
    d. Discharge pressure adjustment range shall be 20 to 200 psi.

U. Pressure gauges
1. Provide pressure gauges with 1/4" NPT stem.
2. Gauges shall be liquid filled, 4.25", 270° dial, with built-in or separate snubber.
3. Provide polypropylene, aluminum, or stainless-steel case with stainless steel internals.
4. Provide dual gauge scale in psi and feet of water.
5. Gauge shall have an accuracy of 0.5% to 1% of full range.
6. Provide a brass isolation ball valve for each gauge assembly.
7. Provide gauge ranges as follows:
    a. 0 – 200 psi on the supply (high pressure) side of the pressure reducing valve.
    b. 0 – 150 psi on the discharge (low pressure) side of the pressure reducing valve.

V. Flush valve assembly
1. Flush valve assembly shall be provided on all dead-end pipe runs. Submit restraint length calculations.
2. Flush valve assembly shall be sized to provide 2.5 fps in the main line.

12-3 IRRIGATION SYSTEM STANDARDS FOR RECLAIMED WATER TREATED EFFLUENT

A. Design
1. The reclaimed water irrigation system shall be designed to standard potable water system requirements except as specified herein.
2. The reclaimed water irrigation system shall meet distribution system requirements included herein.

B. Tracer wire and test stations
1. Tracer wire shall be provided for all irrigation reclaimed water piping 3" in diameter and larger, both within public right-of-way and private property, and shall be placed on top of pipe and attached with duct tape at 6' maximum intervals. Tracer wire shall be long enough to extend 4' above ground and shall terminate in appropriate irrigation control/valve box at maximum 500' intervals. Wire shall be #12 AWG, insulated, stranded copper, THHN 600V. Prior to acceptance of the reclaimed waterline(s) by the

City of Reno, the contractor shall perform a continuity test after backfilling the trench to the satisfaction of the City of Reno Inspector and/or Engineer.

C. Sleeves for irrigation piping

1. All irrigation piping under hardscaped public right-of-way improvements (roads, curb and gutter, sidewalk, etc.), that does not meet the requirements of Section 12-2 (i.e. SCH-40 PVC pipe), shall be placed inside sleeves.
2. Sleeves shall be jointless (fused) high-density polyethylene pipe, colored purple or otherwise identified for reclaimed water per subsequent 12-3G.
3. Sleeves shall be sized by the Design Engineer to accommodate the irrigation piping, but in no case shall be less than 4" nominal diameter.
4. Sleeves shall extend a minimum of 3' beyond hardscaped public right-of-way improvements.
5. Sleeves shall be installed per City of Reno Reclaimed Water Treated Effluent Typical Trench Section Detail SR-4. Design depth of cover = 4'.
6. Tracer wire shall be installed on all sleeves per previous Section 12-B.

D. Filtration

1. In-line filtration/strainer shall be provided to ensure proper operation of irrigation system.

E. Manual drains

1. A gravel infiltration pit shall be provided at manual reclaimed water treated effluent drains. The pit shall be adequately sized to prevent reclaimed water treated effluent runoff.

F. High wind shutdown

1. An anemometer and automatic system shutdown shall be provided to prevent aerosol drift.

G. Purple coloration and warning

1. All covers for meter boxes, valve boxes, flush valves, pressure reducing vaults, and all other appurtenances requiring vaults or boxes shall be purple (Pantone Color #512), labeled "RECLAIMED WATER" or "EFFLUENT", and have secured or locking lids. Purple coloration shall be obtained from the manufacturer or be applied by powder coating or epoxy paint. All appurtenances shall have a purple tag attached with the wording "WARNING RECYCLED/RECLAIMED WATER DO NOT DRINK" and "AVISO AGUA IMPURA NO TOMAR" (T. Christy Enterprises, MAXI valve identification tag, ID-MAX-P2-RC006 or City of Reno approved equal). A debris cap with purple coloration shall be installed inside all round boxes.
2. All above ground piping shall be epoxy painted purple (Pantone Color #512) and have a purple tag attached with the wording "WARNING RECYCLED/RECLAIMED WATER DO NOT DRINK" and "AVISO AGUA IMPURA NO TOMAR" (T. Christy Enterprises, MAXI valve identification tag, ID-MAX-P2-RC006 or City of Reno approved equal).
3. All buried irrigation piping upstream of an electrical control valve shall be purple plastic pipe or be encased in purple polyethylene or bags labeled "CAUTION: BURIED RECLAIMED WATER LINE

BELOW" at intervals no greater than 5'. For polyethylene (PE) service pipe, purple stripes are acceptable.

4. All piping downstream of an electric control valve shall be purple plastic or have purple reclaimed warning tape placed on top of the pipe. This does not apply to flexible polyethylene tubing used in drip zones.

H. Minimize public exposure

1. The effluent irrigation system shall be designed and operated to minimize effluent exposure to the public.

   a. Irrigation time schedule:

2. Irrigation may be scheduled seven days per week.

3. Daily irrigation shall be scheduled to minimize public exposure. Typically, only drip irrigation will be allowed during daytime hours (4:00 A.M. to 8:00 P.M.), and spray irrigation will be allowed during nighttime hours (8:00 P.M. to 4:00 A.M.). Site specific irrigation hours will be established in the Effluent Agreement with the City of Reno.

   a. Areas of drip irrigation shall be maximized in lieu of spray irrigation.

   b. Spray irrigation heads shall be adjusted to prevent aerosol drift toward public areas.

   c. Irrigation duration shall be adjusted to minimize reclaimed water treated effluent runoff.

   d. Surface shall be graded to minimize runoff to paved travel ways.

I. Quick couplers

1. All quick coupler valves shall have purple, lockable covers (Rain Bird 44NP or City of Reno approved equal).

J. Irrigation controllers

1. All irrigation controller enclosures shall be labeled inside and outside warning that the system uses reclaimed water (T. Christy Enterprises, Controller Marking Decal, Part Number #ID-4100, or City of Reno approved equal).

K. Hose bibs

1. Hose bibs shall not be installed on reclaimed water systems.

PART 2 – QUALITY ASSURANCE PROGRAM AND CONSTRUCTION STANDARDS

SECTION 1 – QUALITY ASSURANCE PROGRAM

1-1 QUALITY ASSURANCE PROGRAM

A. It is the intent of this section to set forth the requirements and responsibilities of those parties involved in the inspection, testing, verification, and acceptance of bonded improvements or other new construction to provide consistent and satisfactory quality of such improvements.

B. All new construction shall have an EOR, when required by the City Engineer or their designated representative, retained by the owner and reporting to the Quality Assurance Inspector (QAI), who shall serve as the City's representative during the construction of the secured improvements. The contractor shall not retain the EOR, unless the contractor is also the owner. The EOR shall not be the contractor. The EOR shall be responsible for all inspection, testing, and verification of the constructed improvements for compliance with this section, the improvement plans of record, and with Reno Municipal Code. All new construction requiring an EOR shall have a testing firm responsible to the EOR and reporting to the EOR. The EOR is not responsible for means, methods, techniques, sequences, or procedures of construction, nor safety of the construction site.

C. The quality assurance program (QAP) elements contained herein shall apply to:

1. All public improvements in subdivisions, parcel maps, maps of dedication, records of survey, and easements related to subdivision of land.

2. Other major public improvements as required by the City Engineer.

D. All private subdivision related street, sanitary sewer, and storm drain improvements shall comply with all of the EOR requirements contained herein without the QAP, and without acceptance for maintenance by the City. The EOR shall verify to the City compliance with City standards and furnish acceptance by the private maintenance entity prior to issuance by the City of any temporary or permanent certificate of occupancy (except for model homes). The City does not require security for completion of private improvements, and cannot assure completion of same, nor can it assure the quality of such private improvements. The private maintenance entity may at its discretion enforce the one-year warranty (see also, Section X.)

1-2 RESPONSIBILITIES

A. Owner

1. Shall retain the services of an EOR.

2. Shall retain the services of a testing firm which shall be responsible to the EOR and report to the EOR.

3. Shall make every reasonable effort to retain as the EOR, the services of the firms or persons responsible for the preparation of the approved soils report and the improvement plans of record.

4. Shall retain the services of a contractor and notify said contractor of the requirements of this section.

5. Shall be responsible to the City for the adequacy of completed work covered under this section. Any defective material, equipment, or workmanship, or any unsatisfactory work which may be discovered before final acceptance, or within one year thereafter, shall be corrected immediately on the

requirement of the EOR or City Engineer, without extra charge, notwithstanding that it may have been overlooked in previous inspections. Failure to ensure adequate inspection and performance of the work shall not relieve the owner from any obligation to perform sound and reliable work.

6. Shall designate a representative with authority to act on behalf of the owner for all work performed.
7. The owner acknowledges the need for continuing involvement of the firms or persons responsible for the preparation of the approved project soils report and the improvement plans of record during construction. In the event the EOR is different from the above-mentioned firms or persons, the owner agrees to be financially responsible for services provided by the said firms or persons as requested by the EOR.

B. Engineer of Record (EOR)

1. Shall initiate a pre-construction meeting for construction of improvements at least one week in advance of initial construction. Representatives of the owner, contractor, City Engineer, EOR, and testing firm shall attend. No permit shall be issued prior to said pre-construction meeting.
2. Shall submit for review, prior to initiation of the pre-construction meeting, the qualifications of the testing firm and the field inspection and testing technician personnel for the project. Said qualifications shall meet the minimum specified in this section. The EOR shall provide documentation to confirm that adequate testing was performed to ensure compliance with the SSPWC.
3. Shall provide a written summary of the pre-construction conference to the owner, contractor, and City Engineer, and will also notify the participants of any significant changes in writing at least two working days in advance of implementing the changes. The pre-construction checklist will be submitted prior to any permit being issued.
4. Shall notify the QAI of the date and hour that work on any of the following items is expected to begin. Notification shall be given not less than 24 hours in advance or as otherwise provided in City standards; and, if thereafter conditions develop to delay the start of work, the EOR shall notify the QAI of the delay not less than two hours before the work is to begin:
    a. Grading, excavation, and fill operations within public right-of-way.
    b. Installation of sewer lines, drainage lines, or appurtenances.
    c. Backfilling of sewer lines, drainage lines, or appurtenances.
    d. Placing of reinforcing steel, forms, and falsework for concrete structures.
    e. Placing the concrete for curbs, gutters, sidewalks, alleys, valley gutters, headwalls, or structures.
    f. Placing of any type of base course or courses.
    g. Tacking bituminous or concrete surfaces.
    h. Placing asphalt concrete or Portland cement concrete pavement.
    i. Sealing asphalt concrete or Portland cement concrete pavement.
5. Shall perform inspections for encroachment and excavation permits.

6. Shall make inspection of workmanship and materials in accordance with this section. No work or materials will be accepted without such inspection. The EOR will make every reasonable effort to perform inspection and testing services in a manner which will accommodate the construction schedule.
7. Shall provide to the QAI, on a bi-weekly basis, copies of the daily inspection/testing reports for the previous two weeks. Not required for private improvements (see Section 1).
8. Shall immediately notify the QAI in writing of any proposed changes from the improvement drawings of record. Should the QAI determine that the proposed change is major in nature, such change shall require prior approval by the QAI. The City will not be liable for any delays caused by the review and approval of such changes.
9. Shall arrange as part of their contract with the owner to confer and coordinate with the firms or persons responsible for the preparation of the approved project soils report and the improvement plans of record throughout the construction of the project to evaluate compliance with the requirements of this section. In the event that the firms or persons responsible for the preparation of the approved project soils report or drawings of record are not available for consultation, the EOR shall notify the City Engineer of such prior to commencement of construction. In this event, the EOR and the City Engineer shall agree to an alternative arrangement for providing the necessary soils report and improvement plans of record interpretations prior to commencement of construction.
10. Shall, if during the course of construction, the EOR finds that defective materials or workmanship not meeting City requirements have been incorporated into the improvements and not satisfactorily corrected by the contractor within one week of verbal notification to the contractor, notify in writing the owner, contractor, and City Engineer. The written notification shall be supported by field reports and/or test results.
11. Shall, upon completion of the construction of improvements, provide the City with a letter of verification in the format provided by the City verifying the adequacy of the improvements. The letter must include the following: construction, inspection, and testing were performed in compliance with this section, improvement plans of record, and City standards. Attached to the letter must be the following: a compact disc containing the drawings of record in tif format, at a resolution of 300 dpi or greater, reproduced from the original drawings that have been wet stamped and sealed by a Nevada Licensed Civil Engineer per requirements in 2-9 of this manual. Drawings shall depict any changes from the approved drawings of record or a statement that no changes were made, and a complete packet of inspection and test reports. The final completion and acceptance of all such improvements, including recommendations to release and return any security, shall be subject to the approval of the City Engineer (or private maintenance entity per Section 1-1.D).
12. Shall sign and wet-stamp or cause to be signed and wet-stamped by a Nevada Licensed Civil Engineer, all reports and test data as required by Nevada Revised Statutes Chapter 625. All such documents shall be forwarded to the City, owner, and contractor. Unsatisfactory conditions addressed will be identified on the cover sheet of any report package. Permit numbers shall be clearly identified on any dailies, reports, or submittals to the QAI.

C. City Engineer, or their designated representative:

1. Shall assign a primary contact to the EOR who shall serve as the City's representative during construction of bonded improvements. This primary contact shall be known as the City QAI. The qualifications of the QAI, as a minimum, will meet the qualifications of a Public Works Construction Inspector. The QAI, with the City Engineer's approval, shall have the authority to issue a stop work order for non-compliance with the QAP.
2. Shall review the qualifications of the EOR to determine if they meet the minimum requirements of this section. If it is determined that the EOR does not meet said minimum requirements, the owner shall revise the improvement agreement (Exhibit C) and retain an EOR meeting the qualifications of this section as determined by the City Engineer.
3. Shall review the qualifications of the EOR's field inspection personnel to determine if the qualifications meet the minimum requirements of this section. If it is determined that the EOR's field inspection personnel do not meet said requirements, substitute field personnel will be required.
4. Shall attend the pre-construction meeting initiated by the EOR.
5. Shall check and evaluate that adequate inspection personnel are onsite during the construction of bonded improvements. Should the QAI determine that adequate personnel are not available onsite for inspection, the QAI shall immediately advise the EOR of the situation and so record the incident.
6. Shall keep a daily log of sites visited and document any discrepancies noted including pertinent conversations with the EOR.
7. Shall, on a bi-weekly basis, review the daily inspection/testing reports submitted by the EOR. Any unsatisfactory test results shall be called to the attention of the EOR who shall take immediate action to correct the deficiency.
8. Shall evaluate the performance of the EOR's field inspection personnel. The City Engineer shall have the authority to reject the selection of the testing firm, testing technicians or field inspection personnel for the project. The City Engineer shall also have the authority to reject the field inspection personnel or testing technician and direct substitute personnel in the event of unsatisfactory performance by said personnel in the opinion of the City Engineer

D. Contractor:

1. Shall be responsible for construction of improvements. This responsibility shall include the means, methods, techniques, sequence, and procedures of construction and safety of the construction site. All such construction shall conform to the requirements of both the most recently adopted version of the SSPWC and the requirements of this manual.
2. Shall attend the pre-construction meeting initiated by the EOR. The contractor shall present a proposed construction schedule including construction milestones and designate a representative who has the authority to resolve issues during construction.
3. Shall provide accessibility and exposure of all construction work subject to inspection until inspected by the EOR. Neither the City nor the EOR shall be liable for expenses entailed in the removal or replacement of any material required to allow inspection.

4. Shall notify the EOR two working days in advance of initiating construction of items outlined in Section 1-2.B.4.
5. Shall notify the EOR two working days in advance of initiating construction or resuming construction after any unscheduled interruptions.
6. Shall coordinate all sub-contractors for required inspections and testing.

1-3 INSPECTION REQUIREMENTS

A. General

1. For the purpose of implementing the requirements of this section, full-time inspection shall mean the EOR or their field inspector shall be present at all times to observe the operations of the contractor during the designated construction activity.

B. Grading, excavation, and fills

1. Full-time inspection of all materials, native or imported, to evaluate their compliance with City standards; that the subgrade is prepared according to City standards; that all subgrade materials encountered are as expected according to the approved soils report, or if not, are appropriately addressed by over-excavation and stabilization with suitable material or as otherwise recommended in the approved soils report or by redesign of the pavement section.

C. Street

1. Inspection by survey, hand level, or string line to determine that alignment and grade of sub-grade, base grade, and finish grade of the street conforms to the improvement plans of record.

D. Underground utilities

1. Inspection of pipe materials and bedding prior to the placing of any pipe to evaluate conformance with City standards. Collection of applicable manufacturer's certifications.
2. Inspection of installation of pipe laid to grade, to include mortar joints or gaskets prior to placing any material around or above pipe to evaluate conformance with City standards.
3. Full-time inspection of each lift of backfill to evaluate conformance with City standards. The EOR, in the presence of utility personnel, shall verify all valves are on prior to paving, and shall provide documentation of inspection to QAI a minimum of 48 hours prior to paving.
4. Inspection for pipe installation, not including backfill, by utility company shall be the responsibility of the appropriate utility.
5. Inspection of construction and/or installation of manholes, catch basins, and drop inlets to evaluate compliance with City standards.
6. Inspection of alignment and elevations to evaluate compliance with the improvement plans of record and specifications.

E. Aggregate base courses for streets, curbs, gutters, sidewalks, and alleys

1. Inspection of all material brought to the site to evaluate uniformity with tested and approved samples; inspection of placement and compaction of aggregate base to evaluate compliance with City standards and to confirm that grades conform to those specified in the improvement plans of record.

F. Reinforcing steel, forms, and falsework

1. Inspection of reinforcing steel, forms, and falsework prior to placement of concrete to evaluate compliance with the improvement plans of record, specifications, shop drawings and City standards.

G. Portland cement concrete

1. Full-time inspection of all exposed concrete pours including curb, gutter, sidewalks, driveway apron, alleys, valley gutters, structures, headwalls, slope paving, roadway pavement and manhole, and valve and monument collars to evaluate compliance with the improvement plans of record, specifications, details, and City standards.

H. Asphalt concrete

1. Full-time inspection to evaluate compliance with the improvement plans of record, details, specifications, and City standards.
2. Until a regional testing and certification program is developed and in place, a bituminous mixing plant inspection per ASTM 290-67 shall be required for each day or portion thereof of asphalt pavement placement. This inspection shall include, but is not limited to, the following:
    a. Collection of aggregate and asphaltic cement samples.
    b. Verification of lime addition to the mix.
    c. Verification of temperature of mix leaving plant.
    d. Verification of asphalt cement type and obtainment of refinery certification.
3. Should an unacceptable problem be observed, the EOR shall be informed immediately, and the EOR shall require corrective action.
4. Full-time inspection of the installation of all pavement markings for compliance to the manufacturer's specification for each product, contract drawings, MUTCD, and City standards.

I. Prime Coat, tack coat, seal coat and surface treatment

1. Sufficient inspection to evaluate compliance with City standards.

J. Testing and/or inspections required in addition to those listed in 1-3.D of this section: The following tests will be under the direction of the assigned EOR for the project. The City reserves the right to require additional testing and/or inspections at its discretion and the costs of which shall be the responsibility of the owner.

1. Videotaping Lines (video inspection of sanitary sewer and storm drain lines): The interior of all sanitary sewer and storm drain lines 48" or smaller in diameter, shall be inspected a color closed circuit television (CCTV) camera and document the inspection in digital MPEG format. There shall be a separate MPEG file for each run of pipe (manhole to manhole reach) and each file shall be able to be viewed with Microsoft Windows Media Player. The videotaping shall be performed after successfully passing a ball and mandrel test. The ball and mandrel test and videotaping shall not occur sooner than 30 days after the

placement and backfill of the associated pipe. All digital files shall be submitted on a USB Flash Drive for the approval of the QAI no later than 10 business days prior to paving. At the discretion of the QAI, an open cut penalty fee may be assessed if deficiencies are found and the 10-business-day submittal policy was not adhered to.

a. The EOR or their field inspector shall be present for all video tape inspections. If the EOR or their field inspector is not certified as a Pipe Assessment Certification Program (PACP) operator, a PACP certified operator shall also be present. The absence of voiceover by the EOR or field inspector shall be grounds for rejection. Proof of certification as a PACP operator must be submitted to the QAI prior to videotaping.

b. All pipes shall be clean and free of debris and no standing water present prior to videotaping.

c. All manholes, catch basin laterals, and sewer laterals shall be identified using the numbering system from the approved plan set.

d. Each segment videotaped shall begin with a voiceover by the EOR stating the date, project name (detailed enough to identify similarly named projects), starting point, ending point, direction of travel, pipe type, pipe size, and whether sanitary or storm line. The absence of voiceover shall be cause for rejection by the QAI.

e. The camera shall be stopped at all defects encountered and a still photo taken of the defect. The EOR shall not authorize paving activities until said defects have been satisfactorily corrected and meet the applicable City standards as identified via additional videotaping following correction of the defects.

f. The EOR shall submit the MPEG digital file, along with a written report of the findings or other notes, what deficiencies were encountered, how they were corrected, still photos, all plans used to produce the report, and a set of as-built drawings identifying all lines that were videotaped. Said report and drawings shall be submitted to the QAI prior to paving.

g. With the submittal of the MPEG, as-built drawings, and written report by the EOR, the piping is conditionally accepted based on item 1-3.J.1.h below and the contractor is released to proceed with the subsequent paving operations.

h. The EOR shall be responsible for any ensuing work required to remedy any problems that are subsequently identified by the City of Reno on the video tapes. All repairs shall be rerecorded a minimum of 30 days after the repairs have been made. The QAI shall determine if the repaired sections can be video taped prior to 30 days after the actual repair and backfill is complete.

2. Vacuum testing shall be required on all newly constructed sanitary sewer manholes per the requirements of ASTM C-1244 unless waived by the City Engineer in writing. These tests shall be performed in the presence of the assigned EOR or their representative. These tests shall be performed, as applicable, prior to any paving operations. The EOR shall not authorize paving unless the tests are satisfactorily passed. A report summarizing the results of the applicable test will be forwarded to the Engineering Manager.

3. Video inspection equipment shall be capable of meeting all of the following requirements:

a. The camera shall be capable of producing a true color inspection.

b. The tractor shall be capable of being adjusted to the centerline of any size pipe.

c. The camera shall have an articulated head.

d. The camera lens shall be adjustable as to be positioned looking along the axis of the pipe and should be within 10% of the vertical centerline of the pipe being televised.

e. The camera shall have an adequate illumination system, be capable of taking color still photos, and provide visibility to the inside diameter of the pipe.

4. Ball and Mandrel Test: A ball and mandrel operation shall be required on all newly constructed sewer mains per SSPWC. The tests shall be performed in the presence of the assigned EOR or their representative. The first test shall occur not sooner than 30 days after the backfill of the associated pipe. The second test shall be performed after paving, prior to the final walk through by the Quality Assurance Inspector. A report which includes and summarizes the results of this test will be forwarded to the QAI.

5. Sanitary sewer or storm drain facilities shall be recommended for acceptance to the City Council by the QAI based on the information contained in the reports of the previously mentioned tests and the verification of the EOR.

K. Landscaping and irrigation within the City right-of-way or within a public improvement easement, common area amenities:

1. Sufficient inspections to evaluate compliance with City standards, the improvement plans of record, and specifications. No public landscaping or irrigation shall be accepted for maintenance by the City without a memo from the Parks Department. Prior to acceptance of improvements within the project, the Engineering Division will notify the Parks Division and make arrangements for an onsite inspection of the landscaping to make sure that the landscaping is healthy and that the irrigation system is in a good state of repair and meets City of Reno code requirements. The Engineering Division will notify the developer of any necessary plant replacements or irrigation repairs that are necessary prior to acceptance. Following any replacements or repairs, the Engineering Division will arrange another onsite inspection with the Parks Division. When everything is acceptable and the developer has submitted drawings of record, then the Engineering Division will notify the Parks Division of the date when the City accepts the improvements and becomes responsible for maintenance.

L. All public improvements required to comply with the Downtown Redevelopment District Standards shall not be accepted for maintenance without a memo from the Downtown Redevelopment Agency.

M. Sufficient inspection of the construction traffic control in active streets to assure compliance with the City of Reno's issued encroachment permit traffic control plans. If the contractor is working in the City right-of-way in violation of such encroachment permit or without said permit, the EOR shall immediately notify the QAI.

N. Traffic signal loop detector locations shall be laid out in the field by the contractor per the design plans. After the loop locations are identified, EOR shall notify QAI, then City of Reno Traffic Signal Maintenance staff, to verify locations (see City of Reno Standard Detail R-406A and R-406B). Before new traffic signal installations are accepted by the City, the EOR shall provide the following:

1. A complete inspection of the signal installation by experienced personnel.
2. Signal phasing and timing patterns.
3. Proof of completion by the EOR prior to signal turn on.
4. A copy of the building permit for the electrical service with a sign off by the City's Building and Safety Division.
5. Copies of non-standard parts approvals, warranties, instruction manuals, etc.

The signal will be turned on only after City of Reno signal maintenance staff have made a final walk through and have verified that the signal installation is complete. When the construction of new improvements disturbs existing City of Reno facilities, said facilities shall be relocated by the developer to current standard detail locations.

O. The quantity, if any, of asphalt patches that have occurred prior to final acceptance of a street, will be determined by the City of Reno. The patch quantity will be assessed a 300% penalty consistent with the "5 year, No Cut" policy enforced by the City of Reno. Said penalty will be due and payable prior to final acceptance by the City of Reno.

1-4 TESTING REQUIREMENTS

A. Testing shall comply with the requirements set forth in the latest revision of City Standards.

1-5 PERSONNEL QUALIFICATIONS

A. Engineer of Record (EOR)

1. An EOR who is retained as a consultant by the owner is required to be legally authorized to practice civil engineering in the State of Nevada in accordance with NRS Chapter 625 and maintain a valid City of Reno business license.
2. A firm, co-partnership, corporation, or joint-stock association may engage in the practice of EOR for the City of Reno if the member or members of the firm, co-partnership, corporation, or joint-stock association immediately responsible for engineering work performed in the City of Reno are Nevada licensed professional civil or geological engineers in accordance with NRS Chapter 625.
3. Every office or place of business of any firm, co-partnership, corporation, or joint-stock association engaged in the practice of EOR for the City of Reno shall have a licensed civil engineer in residence and in direct responsible supervision of the work needed to satisfy the requirements of this section conducted in such office or place of business.
4. The EOR shall be familiar with City standards and all associated testing procedures.

B. Field inspector:

1. General

a. The field inspector's qualifications shall include sufficient education and experience to assure understanding of the quality control principles and the ability to implement the procedures related to their assigned duties.

b. The education and experience requirements specified below shall not be treated as absolute when other factors provide reasonable assurance that a person can competently perform a particular task. One factor may be "demonstrated capability" in a given job through previous performance.

c. The City of Reno does not require that individuals performing acceptance or field testing and sampling be certified in accordance with the Nevada Alliance for Quality Transportation Construction unless specified in writing by the City Engineer.

2. Education and Experience: To be considered qualified as a City of Reno approved field inspector, a candidate must meet the general requirements as mentioned above and satisfy at least one of the following requirements:

a. High school graduate plus at least three years of construction quality control experience in equivalent testing, or inspection activities.

b. Completion of college level work leading to an associate's degree in a related discipline plus at least two years of construction quality control experience in equivalent testing, or inspection activities.

c. Four-year college degree in a related discipline plus at least six months of construction quality control experience in equivalent testing, examination or inspection activities.

3. All personnel who are to perform as field inspector for the first time shall submit a resume to the QAI before commencing their duties. The QAI shall reject any candidate not meeting the minimum qualifications of this subsection.

4. The field inspector shall be familiar with City standards and this section, as well as all associated testing procedures.

C. Testing technician

1. To be considered qualified as a City of Reno approved testing technician, a candidate must meet the general requirements mentioned in 1-5.B.2.a. above and satisfy at least one of the following requirements:

a. One year of construction quality control experience in equivalent testing or inspection activities.

b. High school graduate plus at least six months of construction quality control experience in equivalent testing or inspection activities.

c. Completion of college level work leading to an associate's degree in a related construction quality control discipline plus at least three months of experience in equivalent testing or inspection activities.

d. Completion of at least two years of college level work towards a four-year degree in a related discipline plus at least three months of construction quality control experience in equivalent testing or inspection activities.

2. All new personnel shall submit a resume to the City of Reno QAI.
3. The testing technician shall be familiar with the testing procedures outlined in City standards.

D. Testing firm

1. General: The testing services of the testing firm shall be under the direction of a Nevada Licensed Civil or Geological Engineer who is a full-time employee of the firm and has at least five years of engineering experience in the inspection and testing of soil, concrete, and asphalt. The testing firm shall maintain a City of Reno business license.
2. Laboratory: The testing firm is responsible for laboratory testing of soil, concrete and asphalt and shall have suitable test equipment and laboratory facilities for storing, preparing, and testing samples. The firm shall have the capability of performing all laboratory testing associated with its intended functions according to governing procedures and shall have the facilities and equipment required for all laboratory testing performed. If at any one time equipment or expertise in the performance of a specialized test is not available in house, the services of a qualified subconsultant or their equipment may be utilized.
3. As evidence of its competence to perform the required tests or inspections, the agency shall have its laboratory procedures and equipment inspected at intervals of not more than three years by a qualified authority in accordance with a recognized plan.
4. Quality of Testing Systems: The firm shall make available information (as applicable) describing its procedural systems (procedures which directly affect the quality of services offered). In addition, the firm shall maintain documentation which provides evidence of compliance with the requirements of its procedural systems. The agency's procedural systems shall include the following:
    a. Equipment calibration programs.
    b. Standardization of methods of test, measurement, and determination.
    c. Data recording, processing, and reporting.
    d. A current quality assurance manual.

SECTION 2 – CONSTRUCTION MANAGEMENT AND ACCESS PLAN

2-1 MINIMUM REQUIREMENTS

1. Provisions for onsite and offsite construction material storage, including earth, rock, and topsoil stockpiling areas as needed.
2. Depiction of the construction site transportation plan, including truck haul routes, material delivery areas, worker entrance/exit routes and parking areas, and emergency access as needed.
3. Plan for traffic control measures for adjacent roadways and pedestrian paths impacted by the project and the construction site transportation plan.
4. Access maintenance plan, as needed, to ensure safe and unobstructed access (vehicular and pedestrian) is maintained for adjacent and/or nearby properties impacted by construction activities. Special emphasis shall be placed on residential traffic that must traverse the construction site on a daily basis as the only means of access to homes.
5. Construction Management and Access Plans should be presented and reviewed during project pre-construction meetings and revised thereafter as needed.
6. Construction Management and Access Plans may be provided entirely in an exhibit or drawing format with adequate notation or they can be a combination of exhibits and operational manual materials.
7. Once approved, the Construction Management and Access Plans are intended to be kept at the job site and updated as needed to reflect changes during construction.