Coconino County

Engineering Design and Construction Manual

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Revised August 2021
## 2021 Revisions

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<tr>
<td>All</td>
<td>Changed &quot;County Engineer or his/her designee&quot; to &quot;County Engineer&quot;</td>
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<td>All</td>
<td>Changed &quot;Engineer&quot; to &quot;Professional Engineer&quot;</td>
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<td>All</td>
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<td>1.6</td>
<td>Updated definition of County Engineer</td>
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<td>1.6</td>
<td>Added definition for Dry Utility(ies)</td>
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<td>Added definition for Professional Engineer</td>
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<td>1.8.1</td>
<td>Updated last paragraph to &quot;All work on property owned and controlled by Coconino County...&quot;</td>
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<td>2.2.3</td>
<td>Removed Item 1: Concept Approval Note</td>
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<td>2.3.7.1</td>
<td>New section &quot;Revisions to Final Submittal&quot;</td>
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<td>2.5</td>
<td>Updated Item 2 to match language of 2019 Subdivision Ordinance</td>
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<td>Updated the last bullet of Item 3</td>
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<td>2.10</td>
<td>Updated ARS reference in Note 13</td>
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<td>3.2</td>
<td>Updated first paragraph and Item 9 to better clarify when a grading permit is required</td>
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<td>3.3.1.2</td>
<td>Updated to include requirements on height of fills and berms and reduced the maximum fill slope without a geotechnical report</td>
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<td>Updated bullet to require re-vegetation for grading and updated bullet on requirement for a geotechnical report and removed reference to Seismic Zones 3 and 4</td>
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<td>Figure 3-1</td>
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<td>Added information regarding pavement cuts during pavement cut moratorium and updated section to require County oversight of sawcutting, backfill, subgrade preparation, and placement and compaction of ABC and AC</td>
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<td>Updated the development characteristics of when a Traffic Impact Analysis is required</td>
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List of Attachments

• GUIDANCE FLOWCHART FOR APPLICABILITY OF COCONINO COUNTY ENGINEERING DESIGN AND CONSTRUCTION MANUAL

• WAIVER REQUEST FORM

• RECORD DRAWINGS CHECKLIST
1.0 GENERAL CONDITIONS AND REQUIREMENTS

1.1 PURPOSE AND INTENT

The laws of the State of Arizona and its political subdivisions, as presently constituted, require permits from various regulatory agencies for most activities involving construction, engineering, surveying, and associated practices. At the County-level these activities will, more often than not, involve infrastructure design and construction. This Manual has been created to provide standards, specifications, and recommendations associated with good engineering practice and pertaining to hazard mitigation, public health, safety, and welfare in Coconino County.

The intent of these standards is to present clear and concise direction regarding technical requirements, policies, and processes needed to facilitate consistent uniform improvements through both the plan preparation and construction phases. However, the information presented is not intended to supersede sound engineering judgment. Accordingly, development of new technologies, creative and innovative use of materials, system design, or construction practices may be accepted by County plan review personnel upon finding that public health, safety and welfare is duly protected via a waiver process.

It is also recognized that the use of standard designs and materials, especially for public facilities and works, is often more desirable than not when viewed from the perspective of efficiency of maintenance, repair, replacement or about public safety.

It is anticipated that the primary users of these standards, specifications, and recommendations will be Engineers and Contractors licensed in the State of Arizona.

1.2 LEGAL AUTHORITY

1.2.1 State and Federal Codes

The Engineering Design and Construction Manual is not intended to interfere with, repeal or do away with law or right, or annul any other ordinance, rule or regulation, statute, or other provision of law except as provided in this Manual. Where any provision of this Manual imposes restrictions different from those imposed by any other provision of law, the provision that is more restrictive or imposes higher standards upon the development and use of land shall control.

1.2.2 County Code and Ordinances

It is the purpose of the Coconino County Code and Ordinances, to outline and establish the minimum acceptable standards for infrastructure improvements to define the responsibility of the Professional Engineer/developer in the design, construction and financing of public improvements, and to establish procedures for review and approval of engineering plans.

The Engineering Design and Construction Manual supplements requirements in the Zoning Ordinance, Comprehensive Plan, Subdivision Ordinance, Floodplain Management Overlay Zone, Stormwater Ordinance, Building Ordinance, Drainage
Criteria Manual and other regulations for land development within the County. Refer to the County website for the Comprehensive Plan.

The Engineering Design and Construction Manual shall govern all projects within the unincorporated County limits.

1.2.3 Applicability

This manual shall apply to the new construction of transportation, utility, and right-of-way facilities and improvements within the County.

This manual shall apply to modifications of street features or existing facilities which are within the scope of reconstruction, widening or narrowing, or to the extent they are expressly referred to in the Comprehensive Plan and associated Area Plans.

This manual shall apply to every new placement and every planned, non-emergency replacement of existing utility poles, underground facilities, and other utility system structures within the County right-of-way. Every effort shall be made to meet the standards during emergency replacements.

Refer to the Guidance Flowchart for Applicability of Coconino County General Engineering and Construction Standards for the applicability of the proposed project.

1.2.4 Severability

If any part of these standards as approved by the County Engineer shall be found invalid, all other parts shall remain in effect.

1.3 PROJECT CLASSIFICATIONS

1.3.1 Public Works

Public Works Projects or Capital Improvement Projects (CIP) are projects that are installed as part of a Capital Improvement Plan. CIP projects are typically County funded projects, often in public right-of-way, that are managed by County staff and designed in-house or by Professional Engineers. Ultimately, the construction of a CIP project is awarded by the County.

1.3.2 Community Development

Community Development projects are projects with construction improvements that are to be installed as part of a new private land development. Engineering and construction requirements are outlined in this Manual as well as the County codes and ordinances. Refer to the County website for specific information regarding the Community Development Processes. The website includes the applications, permits and a detailed flowchart outlining each step in the process.
1.4 COMPREHENSIVE PLANNING

1.4.1 Coconino County Comprehensive Plan

The County Comprehensive Plan was developed to provide the County with a vision to guide growth and development. At the same time, the Comprehensive Plan serves as a roadmap for the future by establishing goals and policies to direct growth responsibly, solve problems and improve the quality of life for County residents. The developer/Professional Engineer shall review the County Comprehensive Plan to assure their proposed construction improvements reflect and implement the goals and policies outlined in the Comprehensive Plan. Refer to the County website for the Comprehensive Plan.

1.4.2 Coconino County Parks and Recreation Organizational Master Plan

The Parks and Recreation Organizational Master Plan identifies current and future community parks, their capital improvement and other infrastructure needs, and sets the direction for undertaking parks projects that will enhance the County’s recreational opportunities afforded by a well-developed parks system. The current Parks and Recreation Organizational Master Plan is available on the County website.

1.4.3 Subdivision Ordinance

The most recent Coconino County Subdivision Ordinance can be found on the County’s website.

1.5 DEVIATION FROM STANDARDS

The County Engineer may approve a Waiver that would allow deviations from these standards under the criteria outlined in the Waiver Request Form. All known deviations must be approved prior to approval of the Engineering Plans for construction. The latest version of Waiver Request Form can be found on the Coconino County website. Refer to this manual’s attachments for the Waiver Request Form at the time of the publication.

1.6 DEFINITIONS

When referred to in these Standards or in contract documents, the following definitions shall apply:

**Board of Supervisors:** The Coconino County Board of Supervisors acting under the authority of the laws of the State of Arizona.

**Building Official:** An employee of Coconino County acting as the Building Official under the authority of the County Engineer or the Director of the Coconino County Community Development Department.

**Clear Zone:** The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder,
a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes and speeds and on the roadside geometry.

**Client Directed Work:** Work not defined in the contract to be paid under a Contract Allowance.

**County:** Coconino County, a political subdivision, organized and existing under and by virtue of the laws of the State of Arizona.

**County Clerk:** The authorized person who performs the duties of clerk for the Coconino County Board of Supervisors.

**County Engineer:** A Professional Engineer authorized by Coconino County to act as the “County Engineer” or other Professional Engineer as authorized by the County. Refer to ARS Title 11 – Counties for more information. References to County Engineer shall mean the County Engineer or his/her designee.

**Computer-aided drafting and design:** Software used by architects, engineers, drafters, artists, and others to create technical drawings or plans.

**Construction Plans or Engineered Plans:** A set of plans and specifications prepared, signed, and sealed by a Professional Engineer.

**Design:** Plans created to show proposed modifications to real property.

**Dry Utility(ies):** Utility infrastructure related to cable, electric, telephone, natural gas, television, and fiber optics.

**Hazard Mitigation:** Minimizing the possibility of harmful effects to the community and public safety.

**Improvement:** Any alteration to real property.

**Land Division:** Real property proposed to be divided into five or fewer parcels or fractional interests (see the Coconino County Subdivision Ordinance for a complete definition).

**Legal Description:** A description of real property prepared and sealed by a land surveyor licensed by the Arizona State Board of Technical Registration.

**Private Roadway:** A roadway that is located in either an easement, tract or the right-of-way that has not been accepted for ownership or maintenance by the County.

**Professional Engineer:** A holder of a valid license to practice engineering in the State of Arizona. References to Engineer shall mean Professional Engineer.

**Record Drawings:** Construction drawings, documents or plans sealed and signed by a professional registered in the State of Arizona (usually a Professional
Engineer or Registered Land Surveyor) which depict the locations of actual improvements. Record Drawings are also called and known as “As-Built” or “As-Constructed Plans”.

**Registered Land Surveyor:** A person who has a current surveying registration granted by the Arizona State Board of Technical Registration.

**Right-of-Way Plans:** Plans showing property lines, proposed right-of-way lines, acquisition and residual areas, and all improvements needed for the appraisal and acquisition functions.

**Road:** A general term denoting a way for vehicular travel, including the entire area within the right-of-way, easement or tract.

**Staff:** Employees of Coconino County.

**Subdivision:** Refer to the Coconino County Subdivision Ordinance for definition.

**Working Days:** The number of days necessary to successfully complete all construction work. Working days are generally any day except Saturday, Sunday and legal holidays. On accelerated projects, all calendar days may be specified as working days.

Additional definitions are included in the latest Maricopa Associations of Governments Uniform Standard Specifications and Details for Public Works Construction.

### 1.7 ABBREVIATIONS

Whenever the following abbreviations are used in these specifications, standard details or on the plans, they are to be construed the same as the respective expressions represented.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC</td>
<td>Arizona Administrative Code</td>
</tr>
<tr>
<td>AEC</td>
<td>Arizona Electric Code</td>
</tr>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
</tr>
<tr>
<td>AGC</td>
<td>Associated General Contractors of America, Inc.</td>
</tr>
<tr>
<td>ARS</td>
<td>Arizona Revised Statue</td>
</tr>
<tr>
<td>ASPH</td>
<td>Asphalt</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practices</td>
</tr>
<tr>
<td>CADD</td>
<td>Computer-aided drafting and design</td>
</tr>
<tr>
<td>CCR</td>
<td>Coconino County Records</td>
</tr>
<tr>
<td>CD</td>
<td>Community Development</td>
</tr>
<tr>
<td>CE</td>
<td>County Engineer</td>
</tr>
<tr>
<td>CLSM</td>
<td>Controlled Low Strength Material</td>
</tr>
<tr>
<td>CS</td>
<td>Curve to Spiral</td>
</tr>
<tr>
<td>ESAL</td>
<td>Equivalent Single Axle Load</td>
</tr>
</tbody>
</table>
### References

All references herein shall be to the editions or versions of documents in effect at the time a complete application for the required Permit is accepted by the County unless a Developer is otherwise vested by applicable law.

When a publication is specified, it refers to the most recent date of issue, including interim publications, unless a specific date or year of issue is provided.

#### 1.8.1 County References

All design and construction in Coconino County whether public or private shall be done in accordance with the principals, practices and standards in the current version of the following publications:

- The Coconino County Subdivision Ordinance
- The Coconino County Zoning Ordinance
- The Coconino County Drainage Criteria Manual

Other standards which will apply when appropriate shall include but not be limited to the current versions of the following:

- The Coconino County Comprehensive Plan
- The Maricopa Association of Governments – Uniform Standard Specifications and Details (MAG)
The County Engineer must review and approve all engineering plans, specifications, and documents for public works improvements and private improvements which require County authorization or permits.

All work on property owned and controlled by Coconino County will require an Encroachment Permit. Private development work within the County’s jurisdiction may be conveyed by the plat process. Inspections of the construction of public and private improvements by the County and written acceptance of the construction by the County Engineer is required for all County permitted work.

1.8.2 State References

All design and construction in Coconino County whether public or private shall be done in accordance with the principals, practices and standards in the current version of the following publications except as required by this manual or other County regulations or ordinances:

- Arizona Department of Transportation (ADOT), Standard Specifications for Road, Bridge, and Highway Construction
- Arizona Department of Transportation (ADOT), Roadway Design Standards and Guidelines, latest edition; Roadway Design Standards
- Arizona Department of Transportation (ADOT), Construction Manual, latest edition; Construction Manual
- The Arizona Department of Environmental Quality (ADEQ) Standards and Specifications
- Arizona Department of Water Resources (ADWR) Standards

The Arizona Department of Transportation (ADOT) requires that permits be issued by ADOT for any work performed in State rights-of-way.

Arizona Department of Environmental Quality (ADEQ) approval to construct both water and sewer systems must be obtained prior to approval of construction plans by the County Engineer and prior to issuance of County permits.

Arizona Pollutant Discharge Elimination System (AZPDES) Permit required prior to approval of construction plans.

Permits from controlling State Agencies will be required prior to the issuance of construction permits by Coconino County.
1.8.3 Federal References

The following specifications and guidelines shall be applicable when specifically cited in these Standards, when required as a Development condition, and/or when required by state or federal funding authority:

- American Society for Testing and Materials (ASTM), applicable standards and specifications as determined by the Professional Engineer

- The following American Association of State Highway and Transportation Officials (AASHTO) publications
  - Policy on Geometric Design of Highways and Streets, as adopted and supplemented by the State of Arizona
  - Standard Specifications for Highway Bridges
  - Guide for the Development of Bicycle Facilities
  - Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals
  - Roadside Design Guide
  - Guide for Planning, Design & Operation of Pedestrian Facilities
  - Guidelines for Geometric Design of Very Low Volume Local Roads

- Federal Highway Administration (FHWA)

- Manual on Uniform Traffic Control Devices (MUTCD)

- The American Water Works Association Standards (AWWA)

- The Occupational Safety and Health Administration (OSHA) Standards and Specifications

- The National Fire Protection Association (NFPA) Codes and Standards

- Federal Emergency Management Agency Guidelines and Standards

- The International Building Code Standards

The U.S. Army Corps of Engineers controls all work affecting “The Waters of the United States”. The Environmental Protection Agency controls pollution (noise, air, water, sewage). Permits from controlling Federal Agencies will be required prior to the issuance of construction permits by Coconino County.

All design construction shall attempt to meet and conform to current Americans with Disabilities Act (ADA) Guidelines, where practical.
2.0 CONSTRUCTION AND IMPROVEMENT PLANS

2.1 GENERAL INFORMATION

The purpose of this chapter is to present information, minimum specific guidelines, and provide minimum design criteria and guidance regarding the preparation of all types of improvement plans. This includes related work such as land surveying, use of GIS Data, preparation of Record Drawings, deliverable format and the general process for plan submittal review to the County.

While this chapter addresses the general requirements for all plan types, additional requirements are also listed in other chapters relating to the specific type of improvement proposed.

Engineering plans are required for construction of any new improvements within existing or proposed public rights-of-way, easements or tracts. Engineering plans are required for all subdivisions and most projects requiring review and permit by the County. Plan requirements may not be required for projects of a minor nature.

The majority of work involving construction and/or design will fall under the regulations and authority of the Arizona State Board of Technical Registration. Plans, drawings, specifications, estimates, legal descriptions and other work produced by non-registrants will not be accepted or reviewed by Coconino County Staff. All work must bear the seal and signature of the registrant and conform to the code and rules of the Board of Technical Registration.

2.2 CONSTRUCTION AND IMPROVEMENT PLAN REQUIREMENTS

2.2.1 Plan Requirements - General

All improvement plans must comply with the following requirements:

1. All design must be in accordance with the current Coconino County Engineering Design and Construction Manual, Subdivision Ordinance, Standard Specifications, Standard Details and General Notes.

2. All plans must follow the current Coconino County CADD Standards.

3. New street right-of-way or utility easements must be coordinated through the Public Works Department; except if they are in conjunction with a subdivision plat in which case they shall be coordinated through the Community Development Department as part of the subdivision plat process.

4. All water and sewer utility design must be per the latest ADEQ requirements and submitted to them for approval.

5. All improvements within proposed detention basins and/or roadway parkways shall be designed and constructed in accordance with current County policy and standards.
6. All jurisdictions (City, County, and State) in which a project falls shall be shown on plans. Projects that are adjacent to limits of municipalities, County or State shall delineate the location of the limits and identify the jurisdictions on all applicable sheets.

7. Plans shall differentiate between the existing and proposed improvements and show all existing germane facilities.

8. Utilities identified by a current Bluestake, certified Record Drawing Plans, utility company data and/or location testing shall be shown on the plans complete with line sizes, types (i.e., water, sewer, gas, electrical, telecommunication, etc.) and locations. A distinct line type shall be created for each type of utility that notes the size of the utility and type of line. All pothole information shall be shown on the plans.

9. The engineering plan sheets shall be 24”x36” in size on good quality white paper and in reproducible black ink.

10. Engineer scale and scale bar shall be required with horizontal scale of 1” = 40’ and vertical of 1” = 4’, or larger unless otherwise approved by the County.

11. A Professional Engineer licensed and in good standing with the State of Arizona shall prepare the Engineering Plans. The Engineering Plans must be signed and stamped by the responsible Professional Engineer, or clearly marked “PRELIMINARY NOT FOR CONSTRUCTION” per Arizona State Board of Technical Registration requirements prior to submittal.

12. The Engineering Plans’ title block shall be located in the lower right corner or along the right margin of the drawing and include the project name, permit number, Consultant/Developer’s name, and the name, address, seal, date and signature of the responsible Professional Engineer.

13. All final Engineering Plans submitted to the County shall be high resolution bond paper drawings and shall be clear, legible, contain a north arrow, and be drawn to scale. Electronic copies of the final approved Engineering Plans shall be provided to the County in PDF format. Where modifications to existing streets and utilities are to be constructed, existing features shall be “screened or ghost lined.” New construction and/or improvements shall be indicated with heavy bold lines using standard CADD symbols and layers. Final real property documents shall be submitted in hard copy or an electronic copy which is non-alterable.

14. The Engineering Plans must include right-of-way information including existing and proposed survey monuments. The street centerline, easements, and other pertinent data shall be referenced to existing monuments.

15. The County Engineer may require other plan elements in addition to those described above.
2.2.2 Plan Requirements - Subdivision

All Subdivision construction plans must comply with the following requirements:

1. All comments made at the Subdivision Technical Review and conditions imposed as part of the Preliminary Plat approval shall be incorporated into plans.

2. All design must be in accordance with the current Coconino County Subdivision Ordinance, Engineering Design and Construction Manual, Standard Specifications, Standard Details and General Notes.

3. The improvement plans must include a general master utility layout for the subdivision as one of the sheets in the total set of plans.

4. The developer is required to comply with the County Storm Water Regulations and the Environmental Protection Agency (EPA) Guidelines for storm water discharge.

5. Small scale subdivision sheet index map (north to top or to right side of sheet).

2.2.3 Cover Sheet Requirements

A cover sheet should be included for each category of construction plans submitted. The cover sheet should include the following when applicable.

1. Vicinity Map (including a north arrow).

3. Project title, Address, and any applicable Coconino Project information.


5. Professional Engineer’s seal and signature. Proper use of electronic signature for digital submittals is required.

6. Signature Block Requirements:
   - Public Improvements: Coconino County Engineer
   - Private Improvements: Community Development Engineering Supervisor

7. Block for Arizona Department of Environmental Quality approval (file number and date), if applicable.

8. Completed signature blocks for representatives from all potentially affected utility companies.


10. Index of the sheets.
11. List of all regulatory agencies which have been notified and/or have issued permits.

12. List the benchmark(s) used on the project, including any County benchmark.

13. A note: “Call the Arizona 811, Blue Stake Center 1-800-782-5348 (1-800-STAKE-IT), 48 hours before you dig for location of all underground utilities.”

14. Revision dates with descriptions of the revision.

2.2.4 General Notes, Quantity and Index Sheet Requirements

The General Note sheet shall contain the latest applicable County notes for the improvements proposed. Refer to Section 2.10 for General Notes.

On a quantities sheet, provide a detailed list of quantities broken down by sheet. If the project is to be phased, separate quantities must be provided for each phase. If the project includes both public and private improvements, separate quantities shall be provided accordingly.

An index sheet to a set of detailed plans in excess of two sheets should be presented. On a separate key index sheet, provide a graphical index referencing the sheets for all improvements included with the project (i.e., paving, storm drain, etc.).

2.2.5 Horizontal and Vertical Control Requirements

Horizontal Control Plans shall include the following:

1. The origination point of all horizontal position systems shall be based on physical survey points or monuments and identified on the plans.

2. Position systems shall be designed to proceed from south to north, west to east, left to right.

3. All plan sheets shall be stationed in 100-foot intervals at a minimum.

4. Bearing and distance on all horizontal control need to be clearly identified on each sheet. Bearing and distances need to be identified for each change in bearing.

5. Projects will require Temporary Benchmarks (TBM) established by a surveyor when it is necessary to maintain vertical control. Vertical control shall be per Section 2.6.2.2. For site plans at least three temporary benchmarks (TBM) shall be established and shown on the plans. For alignment plans (e.g., Roadways, Waterlines, Drainage Channels) a TBM shall be established near the beginning of the project, near the end of the project and at least every 600 linear feet along the project alignment and shown on the plans. All TBM’s shall be per latest approved County datum.
2.2.6 Plan and Profile Sheet Requirements

Plan and Profile sheet requirements are:

1. Standard single plan and profile will be required. The County will not accept double plan and profile unless approved by the County Engineer.

2. Plans must show sizes, types and locations of all existing and new utilities, including services, paving, curb, sidewalk, fire hydrants, valves, manholes and all miscellaneous items of construction, such as street sign posts, driveways, etc.

3. Clearly differentiate between new and old improvements (existing 6-inch pipe versus proposed 6-inch pipe) per the most recent Coconino County CADD Standards.

4. Plans should be stationed from left to right with north being towards the top or right side of the sheet, whenever possible. Storm Drain, channel and sewer plans should be stationed from downstream to upstream, whenever possible.

5. Plan view and profile view must align.

2.2.7 Detail Sheets Requirements

Detail sheets are supplemental sheets that depict special construction details required to clarify some aspect of the proposed improvements.

Coconino County or MAG Standard Details are not required on the detail sheets unless the detail is being modified. The modifications shall be clearly identified, and the detail shall be titled "Modified Coconino County or MAG Detail" and include the detail reference number.

2.3 CONSTRUCTION AND IMPROVEMENT PLAN SUBMITTAL

In order to obtain applicable permits (Civil Construction, Grading, etc.) for all projects, engineering plans shall be submitted through the County Community Development Department.

At the time of submittal of plans for private development projects, plan check fees, as per current adopted fee schedules, shall be paid.

2.3.1 Plan Review

Prior to issuance of any permit for construction, plans shall be reviewed and approved by the County Engineer. Such review is intended to assure general compliance with County Standards.

Upon completion of the review, the Professional Engineer will be notified by email or telephone when to pick up their submittal.
2.3.2 Plan Review Comments

The project’s plan review comments (including redlines) shall be addressed by correction or clarification response. If there is a discrepancy concerning a redline comment, contact the County plan review staff. The redline set of plans shall be returned with the next improvement plan submittal.

Include a separate tabulation of review comments addressing each comment and correction measure provided. The tabulated review comments shall depict the comment, comment originator, sheet number of the comment, and disposition to the comment. Upon completion, the table shall be forwarded to County staff for review prior to the comment resolution meeting. During the comment resolution meeting, final disposition will be determined. Subsequent submittals shall then reflect all necessary changes as outlined by the direction in the disposition table. The subsequent submittal shall include a copy of the comment disposing table and final disposition with a set of the revised documents.

Failure to identify all the changes may result in the return of the plans with an additional review required and may require additional review fees based on the approved fee schedule.

2.3.3 General Submittal Requirements

The Consultant/Developer must comply with the following County submittal requirements:

1. A Letter of Transmittal, in duplicate and signed by the Professional Engineer, shall accompany all improvement plan submittals. The letter of transmittal shall indicate the following:
   - Date of delivery of submittal
   - The review number (1st review, 2nd review, etc.)
   - The number and type of plans which are being submitted
   - The number and type of all required standard forms being submitted
   - Engineering permit number

2. The “red lined” checked prints and checklists from the previous review shall accompany all succeeding reviews (no exceptions). Likewise, a copy of the preliminary reports and/or studies shall accompany submittals of all subsequent reports and/or studies.

3. The submittal is to include a copy of the project’s Geotechnical/Soils Report for County review. Any areas of expansive soil may require special treatment during project construction. The Professional Engineer shall include any special requirements on the plans.

4. All Private Development plans submitted to the County shall be submitted at
the Community Development Department; do not hand-carry any plans to Department Directors or Plan Reviewers. Without a copy of the transmittal letter stamped “received,” plans are not in the review process. All review fees must be paid at the time of submittal.

5. All Private Development projects must include approved Preliminary Plat/Site Plan, Drainage Study, a copy of conditions or stipulations, Title Report, Schedule B items, Vesting Deed, and other required documents prior to improvement plan submittal.

2.3.4 Utility Company Approvals

Local Utility Companies shall sign the cover sheet of construction or improvement plans. By signing this sheet, the utility confirms that they have seen the plans, are aware of the scope of the project, and have identified existing and proposed utilities and their potential conflicts in relation to the project.

The County Engineer shall not approve construction plans until all potentially affected utilities have signed or the Professional Engineer has written correspondence from each utility confirming no conflicts or resolution of conflicts. Utilities which will commonly be contacted are cable TV, gas, electric power, telephone, sewer and water.

A full set of improvement plans with the “Utility Location and Conflict Notice” shall be submitted to each appropriate utility company in parallel with each submittal.

2.3.5 First Submittal Deliverables

The first review shall include 3 sets of the following (unless otherwise indicated):

- Construction Plans (Grading, Drainage, Paving, Water, Sewer, Streetlight, Traffic Signal/Interconnect, Signing and Striping, Landscape, Erosion and Sediment Control, etc.)
- Final Drainage Report (a complete report, not an addendum to the Preliminary Drainage Report).
- Traffic Impact Analysis or Statement
- Final Geotechnical/Soils Report – 1 copy
- Sewer and Water Report
- Approved Stormwater Pollution Prevention Plan (SWPPP) – Professional Engineer to use standard BMP detail sheet. Contractor or Developer will be responsible for obtaining NOI and Permit.
- Engineer’s Opinion of Probable Cost - 1 copy
- Project Specifications – 1 copy
• Water Provider “Will Serve” letter for private development or subdivisions

All items shall be sealed by the responsible Professional Engineer. Electronic submittals shall be made with 3 separate electronic storage devices, with all information in PDF format.

First reviews that are incomplete and do not contain all of the above itemized plans, reports, studies and required forms will not be accepted.

2.3.6 Second Submittal Deliverables

The second review and all subsequent reviews shall include 2 sets of the following (unless otherwise indicated):

• Construction Plans (Grading, Drainage, Paving, Water, Sewer, Streetlight, Traffic Signal/Interconnect, Signing and Striping, Landscape, Erosion and Sediment Control, etc.)

• Final Drainage Report (a complete report, not an addendum to the Preliminary Drainage Report).

• Traffic Impact Analysis or Statement

• Final Geotechnical/Soils Report – 1 copy

• Sewer and Water Report

• Approved Stormwater Pollution Prevention Plan (SWPPP) – Professional Engineer to use standard BMP detail sheet. Contractor or Developer will be responsible for obtaining NOI and Permit.

• Signed Utility Conflict Notices from all Utilities - 1 copy

• Engineer’s Opinion of Probable Cost - 1 copy

• Project Specifications – 1 copy

• Water Provider “Will Serve” letter for private development or subdivisions

• Previous redline set and checklists – 1 copy

2.3.7 Final Submittal

Upon approval of the civil plans, but prior to the issuance of a permit for construction, 1 set of plan originals shall be submitted to the County for signatures. One signed original set will be returned to the Professional Engineer for their records.

It may be possible to combine the various types of plans (i.e. grading plans, ROW plans, street plans, etc.) on some projects. However, the Professional Engineer shall obtain written approval from the County Engineer or Community Development
Engineering Supervisor prior to generating plans.

2.3.7.1 Revisions to Final Submittal

1. All original plan approvals, signatures, and seals are to remain on the revised plans.

2. All plans revised after the original approval shall be resubmitted for review and approval. The nature of the revisions must be called out on the cover sheet and on the sheet(s) which have been revised. The revision number itself shall consist of a numeral within a triangle next to each revision. Δ Changes on each plan sheet shall be specifically outlined with "clouding".

3. All revised sheets, including the cover sheet are to be re-sealed, signed and dated.

2.4 SUBDIVISION PROCESS

Refer to the Coconino County Subdivision Ordinance for all subdivision requirements including but not limited to Preliminary Plats and Final Plats.

2.5 DRAWINGS REQUIREMENTS

1. Record Drawings shall be produced for all construction on publicly owned or publicly controlled property including easements and rights-of-way. Record Drawings shall be sealed and signed by a Professional Engineer or land surveyor registered in Arizona. "Red lined" or Hand Annotated paper copy reproductions will not be accepted. Record Drawings shall be submitted in approved digital format.

2. All Record Drawings shall contain the following certificate sealed and signed by the Professional Engineer or Land Surveyor:

   “I certify that the construction of the public improvements and the “as-built” plan preparation were performed by me or under my direct control and supervision and are in substantial conformance with the approved construction plans and specifications. The construction details as shown on the “as-builts” are accurate and complete to the best of my knowledge and belief.”

3. The following records are required for County owned facilities or facilities that will be transferred to the County, including, but not limited to, test results, permits, certifications, registrations and reports such as:

   • Property legal descriptions, survey, registration and certification
   • Well abandonment registration and certification
   • Acknowledgement of completion to satisfaction of other jurisdiction or
agency requirements (water, sewer, cable, etc.)

- Refer to the Coconino County Record Drawings Checklist for additional requirements. Refer to this manual’s attachments for the Record Drawing Checklist at the time of the publication.

2.5.1 Record Drawings Submittals

All Record Drawings shall have a Letter of Transmittal attached in order to document who is submitting them. This is necessary in order to process the plans and for contact information when the review is complete. Plans will not be reviewed if transmittal documentation is missing.

Record Drawings submitted for review shall consist of two electronic copies in appropriate digital format as requested by the County, containing all the original signatures.

One set will be reviewed and returned if there are County comments. All comments must be addressed. Two revised plan sets will be required with each resubmittal along with the previous redlined review set until final County approval is obtained.

If the project is developed in phases, Record Drawings for each phase shall be submitted once the work is complete in that phase. Letters of Completion and Acceptance or Certificates of Occupancy will not be issued until all items out of tolerance as noted in the walk-through punch-list have been corrected and all final Record Drawings have been submitted and approved by the County.

2.5.2 Record Drawings Disclaimer

The County assumes no responsibility for the accuracy of Record Drawing information provided as a public record.

2.5.3 Record Drawings Certification

The County Engineer will accept applicable improvements following final inspection, approval and receipt of approved Record Drawings. It is the responsibility of the developer, Professional Engineer and contractor to coordinate timely submittals of the Record Drawings in order to affect a Final Letter of Completion.

Furthermore, a Final Letter of Completion or Certificate of Occupancy shall not be issued to the developer of the project until all affected roadways are restored to their previous condition or better and all applicable signing and pavement markings have been installed and inspected by the County staff. All survey monuments will need to be installed or replaced if destroyed before a Final Letter of Completion.

2.5.4 Letter of Completion

A Letter of Completion for improvements will be issued when all of the following conditions have been met.
Paving:

1. All concrete and asphalt work has been completed and approved.
2. Manhole rings, covers and water valve boxes have been brought to grade and approved.
3. Record Drawings have been submitted and approved.
4. Pavement striping is completed, and all street and regulatory signs are in place.
5. All monuments are in place and all destroyed monuments are re-established.

Drainage Facilities:

1. As facilities are completed and functional.

All Record Drawing measurements and data are to be taken and collected by the Professional Engineer of Record, their designee or land surveyor.

2.5.5 One Year Warranty

The Contractor shall guarantee the work against defective workmanship and materials for a period of one year from the date of its final acceptance under the contract. Ordinary wear and tear and unusual abuse or neglect is excepted.

Other forms of financial assurance may be provided as approved by the County Engineer.

2.6.1 General Information

All surveying and mapping activities associated with projects which will be reviewed and permitted by Coconino County shall comply with the rules and specifications of the Arizona State Board of Technical Registration. In general, this means that these activities must be performed by or under the responsible charge of an Arizona Registered Land Surveyor or registrant in a category appropriate to the activity.

The intent of this section is to ensure all projects that involve surveying activities will apply consistent methods and standards pertaining to ground surface measurements within the County.

2.6.1.1 SURVEY STANDARDS

All land survey work will be performed within the guidelines of the Arizona Boundary Survey Minimum Standards as well as all Arizona Revised Statutes and the Arizona Administrative codes pertaining to land surveying and boundary law and MAG Standard Specifications pertaining to all land and property monuments.
Refer to Federal Survey Standards for projects adjacent to Federal lands.

### 2.6.2 Survey Datums

#### 2.6.2.1 Horizontal Datum

The horizontal datum for use in the County is the North American Datum of 1983 (NAD 83) or the current datum as defined by the National Geodetic Survey (NGS).

#### 2.6.2.2 Vertical Datum

The vertical datum for use in the County is the North American Vertical Datum of 1988 (NAVD 88) or the current datum as defined by the National Geodetic Survey (NGS).

#### 2.6.2.3 Metadata

Metadata shall be included which defines the coordinate system used whether assumed or tied to the National Spatial Reference System (NSRS). When tied to the NSRS the epoch date shall be noted such as NAD 83(2011). When a projection system is used other than Arizona State Plane such as a Low Distortion Projection (LDP) provides necessary information to re-create that projection. The projection should be defined such that grid distances are equivalent to “ground” distances within the project area.

### 2.6.3 Monuments

#### 2.6.3.1 Existing Monuments

Prior to any construction activity the Contractor shall retain a Registered Land Surveyor (RLS) with current registration in the State of Arizona to reference the monumented private property corners, right-of-way markers, centerline monuments, geodetic monuments and Public Land Survey System (PLSS) monuments depicted on the Plans.

Any monuments to be re-monumented by the RLS as a part of the work will be identified as such in the Plans, Record of Survey and/or Final Plat and shall be paid for as a part of the work.

Any monuments that are disturbed or displaced by construction shall be reset by the RLS at Contractor’s cost and not charged to the County or the Owner.

#### 2.6.3.2 New Monuments

Type A frame and cover monuments shall be installed at section corners, quarter corners, and center of sections and at all centerline intersections, P.C.’s, P.T.’s of each curve for arterial and major collector streets. Type B monuments shall be used on all other streets and shall also include centers of cul-de-sacs.

The Surveyor will comply with the requirements of Arizona Boundary Survey Minimum Standards as it relates to filing a Record of Survey, Results of Survey, or
Corner Record with the County Recorder.

Refer to Figure 2-1 for survey monumentation.

### 2.7 GIS REQUIREMENTS

The Coconino County Geographic Information Systems (CCGIS) is using GIS technology for capturing, managing, analyzing, and displaying all forms of geographically referenced data and information. GIS data submitted to the County shall comply with the Arizona Spatial Data Accuracy and Geo-Referencing Standards available from the Arizona Professional Land Surveyors (APLS).

The goals of the CCGIS are:

1. Coordinate the GIS activities for County departments
2. Provide shared services for municipalities
3. Promote data standards for the GIS user community in Coconino County.

More information is available on the CCGIS website.

### 2.8 CADD STANDARDS

Refer to the current Coconino County CADD Standards.

### 2.9 STATE AND COUNTY REGULATIONS

#### 2.9.1 Environmental Analysis and Mitigation

Coconino County will require projects to comply with all requirements of the National Environmental Policy Act (NEPA), as well as, all other Federal, State, and local regulations. Coconino County shall require such compliance of all parties, both public and private.

For private development, the Developer is to obtain any required environmental permits or clearances.

#### 2.9.2 Arizona Department of Environmental Quality (ADEQ)

ADEQ regulates water quality and the quality of storm water discharges. All improvements whether Public Works or Community Development shall adhere to ADEQ regulations.

All utility design falling under the auspices of ADEQ shall be designed per the latest ADEQ requirements and submitted to them for approval prior to the issuance of the County permit.
2.9.3 Storm Water Quality

Projects disturbing 1 acre, or more are subject to the National Pollution Discharge Elimination System (NPDES) requirements for construction sites under the Environmental Protection Agency (EPA) general permit for Arizona. Owners, developers, engineers, and/or contractors are required to prepare all documents required by this regulation, including but not limited to Stormwater Pollution Prevention Plan (SWPPP), Notice of Intent (NOI) and Notice of Termination (NOT).

As prescribed by the Arizona Pollutant Discharge Elimination System (AZPDES) General Permit for Discharge from Construction Activities to the Waters of the U.S., any development project in Coconino County which will disturb 1.0 contiguous acres or greater, shall complete a Notice of Intent (NOI). See AZPDES for details.

Stormwater runoff from construction sites cannot include pollutants such as phosphorous and nitrogen, pesticides, petroleum derivatives, construction chemicals, solid wastes, and sediment that adversely affect water quality. Refer to the most recent Coconino County Stormwater Ordinance and the Coconino County Stormwater Management Program (SWMP) for additional information.

2.10 GENERAL NOTES

The latest version of Coconino County’s General Notes can be found on the Coconino County Public Works website. These notes may be periodically updated by the County. At the time of the publication of these Standards they were as follows:

1. Approval of these plans by the County Engineer is for a two-year period, subsequent to the date of approval. If construction work is not started within the two-year period or has been discontinued for any reason for longer than two years, the plans shall be resubmitted for review and re-approval in accordance with Arizona Technical Board of Registration.

2. Plan review by the County does not extend to material quantities shown on the plans.

3. An encroachment permit, issued by the Community Development Department, is required for all work in County rights-of-way or easements.

4. The County shall be notified forty-eight (48) hours prior to beginning different phases of construction so that County Inspector may be scheduled.

5. For construction purposes, the following precedence of standards will prevail: Current Coconino County Public Works Engineering Department Standards; current MAG Standards, International Building Code (IBC), project specific plans and specifications, ADOT Standards — or other specifications approved by the County Engineer and with generally accepted good construction practice. All work and materials which do not conform to the standards and specifications are subject to removal and replacement at the contractor’s expense.
6. Any work performed without the knowledge and approval of the County Engineer, is subject to removal and replacement at the contractor’s expense.

7. The County Engineer may suspend the work by written notice when, in their judgment, progress is unsatisfactory, work being done is unauthorized or defective, weather conditions are unsuitable, or there is danger to the public health or safety.

8. The County Engineer may order any or all materials used in the work to be tested according to MAG or ADOT Material Testing Requirements, American Association of State Highway and Transportation Officials (AASHTO) and the American Society for Testing and Materials (ASTM) Standards. The Contractor shall, at their expense, hire a qualified testing laboratory to perform Quality Control (QC) during all phases of construction, as stated in Coconino County Standards, or as directed in the Special Provisions.

9. Local Fire Department, County Engineering Division and other emergency responder’s approval is required for obstruction of access or water system shutdown – submission of traffic control plans is required.

10. The Contractor shall be responsible for maintenance of the streets and of partially completed portions of the work until final acceptance of the work. Any roads required to be closed for the construction activity shall be reopened within a reasonable time or upon order of County Engineer. The regulation and control of this traffic shall be as directed by the County Engineer.

11. Approval of a portion of the work in progress does not guarantee its final acceptance. Testing and evaluation may continue until written final acceptance of a complete workable unit. Any defects which appear in the work within one year from the date of acceptance and which are due to improper workmanship or inferior materials supplied shall be corrected by or at the expense of the owner/developer or the contractor.

12. Acceptance of completed public improvements will not be given until defective or unauthorized work is removed, and final clean-up is complete.

13. Location of underground utilities before work is begun is to be accomplished in accordance with ARS 40-360.22.

14. If work is done on private property in relation to a project constructed under these standards, the contractor will provide the County with written authorization from the property owner to do so.

15. The establishment and use of temporary construction yards shall require written authorization from the County Public Works Department.
16. County approval of these plans is for concept only. All liability resulting from errors or omissions is the responsibility of the permittee and/or his consultants and employees. Coconino County does not verify or guarantee the measurements, calculations, ownership, or conclusions indicated by the creator of these plans.

2.10.1 Paving Notes

1. Exact point of matching termination and overlay, if necessary, shall be determined in the field by the County Engineer.

2. No job will be considered complete until:
   a. All curbs, pavements, sidewalks, ditches, and manholes have been cleaned of all dirt and debris.
   b. Survey monuments are installed and stamped.
   c. All frames, covers, and valve boxes are adjusted to grade.

3. No paving construction shall be started until all utility lines under proposed paved area are completed and approved.

4. Asphalt shall not be placed before base course has been approved and base course will not be placed until subgrade has been approved by the County Engineer.

5. The location of all water valves, fire hydrants, and manholes must at all times during construction be referenced and made accessible to the County.

6. Utility facilities in conflict with this work will be relocated by the permittee or the utility owner. This activity shall be coordinated with the owner of the utility to prevent any unnecessary interruption of service to existing customers.

7. Existing street and traffic signs will be maintained during construction and relocated by the permittee as directed by the County Engineer.

2.10.2 Water and Sewer Plan Notes

1. Rough grading shall be completed within 0.1 feet of plan grade prior to installation of underground utilities.

2. No trench shall be filled with bedding material or backfilled until the excavation and pipe laying, respectively, have been approved by the County Engineer.

3. A water pressure test is required of all water lines and a hydrostatic or air test is required of all sewer lines. Tests are to be conducted after backfilling
is complete and compacted. All testing will conform to standards established by the responsible utility.

4. Water line disinfection is to be accomplished as outlined in Arizona Department of Environmental Quality (ADEQ) —Bulletin No. 8 or per requirements of the local utility.

5. In order to protect public water systems from possible contamination, a water main shall not:
   
a. Infringe upon an area which is within six feet of either side of a sewer main and shall not be below, at the same level as, or less than two feet above the top of the sewer main, unless extra protection is provided. Extra protection shall consist of constructing the sewer main with mechanical joint ductile iron pipe or with slip-joint ductile iron pipe. If joint restraint is provided it shall consist of encasing both the water and sewer mains in at least six inches of concrete.
   
b. Under any circumstances, infringe upon an area which is within two feet of either side of or two feet below the sewer main.

6. No water pipe shall pass through or come into contact with any part of a sewer manhole. The minimum horizontal separation between water mains and manholes shall be six feet, measured from the center of the manhole.

7. The minimum separation between force mains or pressure sewers and water mains shall be two feet vertically and six feet horizontally under all conditions. Where a sewer force main crosses above a water line, or less than six feet below it, the sewer main shall be encased in at least six inches of concrete for 10 feet on either side of the water main.

8. All distances are measured perpendicularly from the outside of the sewer main to the outside of the water main. These separation requirements do not apply to building plumbing or individual house service connections.

9. No water settling of trench fill material is allowed.

10. All water and sewer design and construction shall conform to the current Arizona Department of Environmental Quality (ADEQ) requirements. When ADEQ. requirements conflict with these standards, the more restrictive shall apply.

11. Tracer wires and tapes shall be installed prior to testing the water or sewer main.

12. Cathodic Protection shall be required as instructed by the County.
2.11 PLAN REVIEW CHECKLIST

Street Improvement Plans (Plan View)

- Engineer’s seal
- North arrow
- Scale
- Street alignment
  - Stationing
  - Monuments and center lines
  - Tangent bearings
  - Curve data
  - Curb (radii, elevations at beginning curb returns and end curb returns)
- Dimensions
  - Streets
  - Hammerheads
  - Cul-de-sacs
  - Temporary turnaround
  - Driveways
  - Typical cross sections
- Right-of-way and easement lines (existing and proposed)
- Lot lines
- Driveway locations
- Show, label, and dimension sight distance triangle easements
- Verify sight stopping distance
- Sidewalks
  - Connectivity (future stubs at minimum need concrete ramp to street)
  - Pedestrian ramps (check opposite ramp alignment)
- Turning Lanes
- Street Lights
- Traffic Signals and Signs
- Saw cut shown on plans (3’ minimum)
- Relevant Topography (contours and elevations)
- Utility Locations (existing and proposed)
- Drainage Structures (existing, proposed, conflicts, easements)
- Multi-modal and Transit Facilities
- Street Names
- Construction Notes

Street Improvement Plans (Profile View)

- Scale
- Existing ground lines
- Proposed grades and slopes
- Grade lines
- Vertical curve data
- Superelevation
- Extend profile minimum 200’ in each direction into existing/future streets
- Grade breaks and elevations
- Curb returns and elevations
• Utility locations, including culverts, pipes and drainage structures

2.12 FIGURES
1. RIGHT-OF-WAY CONTROL MONUMENTS SHALL BE FACTORY STAMBOED AND BEAR THE REGISTRATION NUMBER OF THE LAND SURVEYOR RESPONSIBLE FOR THE WORK.

2. TYPE A MONUMENT SHALL BE A MINIMUM 3" DIAMETER DOMED ALUMINUM OR BRASS CAP.

3. TYPE B MONUMENT SHALL BE A MINIMUM 1-1/2" DIAMETER FLAT ALUMINUM OR BRASS CAP.
3.0  GRADING AND SEDIMENT CONTROL

3.1  GENERAL INFORMATION

The purpose of this chapter is to protect the public's safety, property and overall welfare by regulating the grading on private property and within the County's right-of-way.

This chapter sets forth rules and regulations to control excavation, grading and earthwork construction, including fills and embankment. Also, this chapter establishes the administrative procedure for issuance of permits; and provides for the approval of plans, specifications and inspection of such construction.

3.2  COUNTY CODE, ORDINANCES AND STANDARDS

Excavation and grading are controlled and permitted by the regulations in this chapter.

A grading permit is not required for the following:

1. Single Family Residential where the excavation is:
   - Less than 50 cubic yards,
   - Less than 2 feet in depth and
   - Does not create a cut slope 5 feet or greater in height and steeper than 1-unit vertical in 1.5-units horizontal.

2. When approved by the County Engineer, grading in an isolated, self-contained area if there is no impact or danger to private or public property.

3. An excavation below finished grade for basements and footings of a building, retaining wall, or other structure authorized by a valid building permit. This shall not exempt any fill made with the material from such excavation or exempt any excavation having an unsupported height greater than 5 feet after the completion of such structure.

4. Cemetery graves.

5. Refuse disposal sites controlled by other regulations.

6. Excavations for wells, tunnels or utilities.

7. Mining, quarrying, excavating, processing or stockpiling of rock, sand, grave, aggregate or clay where established and provided for by law, provided such operations do not affect the lateral support or increase the stresses in or pressure upon any adjacent or contiguous property.

8. Exploratory excavations under the direction of soil engineers or geologists.
9. A fill that meets the following criteria:
   a. not intended to support structures, and
   b. does not exceed 50 cubic yards (38.3 cubic meters) on any one lot, and
   c. does not obstruct a drainage course, and
   d. is either:
      - less than 1 foot in depth and placed on natural terrain with a slope flatter than 1-unit vertical in 5-units horizontal (20% slope), or
      - less than 3 feet in depth

Exemption from the permit requirements of this chapter shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this chapter or any other laws or ordinances of this jurisdiction.

The controlling criteria for the construction of earthwork in Coconino County shall include the project specific geotechnical report, International Building Code, MAG Specifications and ADOT Specifications.

All excavation and grading shall adhere to the requirements in the Coconino County Grading Ordinance and Stormwater Quality and Runoff Control Ordinance also known as the Coconino County Stormwater Ordinance.

All drainage design shall adhere to the requirements in the Drainage Criteria Manual. In cases of conflict between the Drainage Criteria Manual and the following sections, the requirements of the Drainage Criteria Manual shall take precedence.

3.3 GRADING STANDARDS AND DESIGN CRITERIA

3.3.1 Earthwork

All earthwork shall conform to the requirements in the latest, adopted edition of the International Building Code and this chapter, unless otherwise recommended in the approved geotechnical report. If there is a discrepancy between the International Building Code or the requirements in this chapter, the more stringent of the two shall be enforced.

3.3.1.1 CUTS

The slope of cut surfaces shall be no steeper than is safe for the intended use, and shall be no steeper than 1 unit vertical in 2 units horizontal, unless the permittee furnishes a sealed geotechnical report stating that the site has been investigated and giving an opinion that a cut at a steeper slope will be stable and not create a hazard to the public or private property.
3.3.1.2 FILLS

All fills and berms shall be less than eight feet in height, as measured from the highest adjacent natural grade to the top of the fill, unless approved by the County Engineer. All fills within setback limits shall be no greater than four feet in height. All fill locations shall adhere by the following requirements pertaining to surface preparation, fill materials, fill slopes and compaction:

Surface Preparation:

- Fill slopes shall not be constructed on natural slopes steeper than 1-unit vertical in 4-units horizontal without geotechnical mitigation.
- The ground surface shall be prepared to receive fill by removing vegetation, non-complying fill, topsoil and other unsuitable material and scarifying to provide bond with the new fill.

Fill:

- Organic material shall not be permitted in fills, unless a sealed engineering report is provided and approved by the County Engineer.
- Rock or similar irreducible material with a maximum dimension greater than 12 inches shall not be in fills, unless otherwise accepted by the County Engineer. If placement of larger rock is accepted, the geotechnical Professional Engineer must inspect and approve the fill placement and fill stability.

Slopes and Benching:

- Fill slopes shall be no steeper than is safe for the intended use and shall be no steeper than 1-unit vertical in 3-units horizontal, unless otherwise approved in the geotechnical report.
- Benching shall be as required by the International Building Code and as determined by the geotechnical and design engineer.

Compaction:

- All fills shall be compacted per Table 3-1 as determined by ASTM D1557.

### TABLE 3-1 FILL COMPACTION

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Density*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Space</td>
<td>90%</td>
</tr>
<tr>
<td>Roadways, Driveways, Parking Lots</td>
<td>95%</td>
</tr>
<tr>
<td>Structures or Buildable Pads</td>
<td>Per Geotechnical Report</td>
</tr>
</tbody>
</table>

*Unless otherwise indicated in a sealed and approved geotechnical report
3.3.1.3 SETBACKS

Setback dimensions and cut/fill slope requirements shall be per the International Building Code.

Where a fill slope is to be located near the site boundary, special precautions shall be incorporated in the work as the County Engineer deems necessary to protect the adjoining property from damage as a result of such grading. These precautions may include but are not limited to:

- Additional setbacks
- Provision for retaining or slough walls
- Mechanical or chemical treatment of the fill slope surface to minimize erosion
- Provisions for the control of surface waters

The building official may approve alternate setbacks. The County Engineer may require an investigation and recommendation by a Professional Engineer or geologist to demonstrate that the intent of this section has been satisfied.

3.3.2 Drainage and Terracing

Unless otherwise indicated on the approved grading plan, drainage facilities and terracing shall conform to the provisions of this section for cut or fill slopes steeper than 1-unit vertical in 3-units horizontal.

3.3.2.1 TERRACES

Terraces within the County shall conform to the requirements set forth in the International Building Code, unless otherwise approved by the County Engineer.

3.3.2.2 SUB-SURFACE DRAINAGE

If deemed necessary by a Professional Engineer, sub-surface drainage shall be provided with cut and fill activities to provide stability of the slope.

3.3.2.3 DISPOSAL

All drainage facilities shall be designed to carry waters to the nearest practicable drainage way or other appropriate jurisdiction. Erosion of ground in the area of discharge shall be prevented by installation of non-erosive down drains or other devices.

Drainage gradient of 2 percent toward approved drainage facilities for a distance of 5 feet is required from buildings, unless waived by the building official. However, the gradient from the building may be 1 percent if all of the following conditions exist throughout the permit area:

- No proposed fills are greater than 4 feet in maximum depth.
• No proposed finish cut or fill slope faces have a vertical height in excess of 10 feet.

• No existing slope faces steeper than 1-unit vertical in 10-units horizontal shall have a vertical height in excess of 10 feet.

3.3.2.4 INTERCEPTOR DRAINS

Interceptor drains shall be installed along the top of all cut slopes where the tributary drainage area above slopes toward the cut and has a drainage path greater than 40 feet measured horizontally. The size, slope and stabilization of interceptor drains shall be determined by the Professional Engineer and have a minimum depth of 12 inches and a minimum width of 30 inches measured horizontally across the drain. The slope of drain shall be approved by the County Engineer.

3.3.3 Retaining Walls

Measure masonry and concrete retaining walls from the top of the footing to the wall’s top. Measure the horizontal distance between terraced retaining walls from the face of the wall to the face of the wall (Refer to Figure 3-1).

The County requires a permit and masonry and concrete retaining wall design from an Engineer for the following conditions:

• Retaining walls with heights over four (4) feet or

• Retaining walls with heights under four (4) feet with one of the following conditions:
  o a surcharge loading from structures or vehicles
  o A backslope exceeding ten horizontal units to one vertical unit (10H:1V) within a distance equal to the retaining wall height, or ten (10) feet, whichever is greater.
  o terraced walls with horizontal spacing less than two (2) times the height of the taller wall

Design of stacked rock and Mechanically Stabilized Earth (MSE) retaining walls for non-highway applications shall be per the current edition of the Design Manual for Segmental Retaining Walls.

The applicant must provide the engineer's approval for all retaining wall permits based on the engineer's final inspection before the County finalizes the permit.

Instead of an engineering design, the applicant may construct the retaining wall per ADOT Standard Detail 7.01. Retaining walls used in conjunction with or adjacent to stormwater conveyance or detention facilities, and subject to inundation or flow, shall be designed for such conditions.
3.3.4 Erosion Control

3.3.4.1 CONSTRUCTION PHASE EROSION CONTROL

Erosion control measures during construction shall be installed as soon as practicable and prior to the forecast that rain is imminent. Refer to Drainage Criteria Manual for SWPPP requirements.

3.3.4.2 PERMANENT EROSION CONTROL

The faces of cut and fill slopes shall be prepared and maintained to control against erosion. Slope stabilization is required for all grading work with cut and fill slopes two feet or higher. Where cut slopes are not subject to erosion due to the erosion-resistant character of the materials, such protection may be omitted. Slope Stabilization Options are:

- Re-vegetated banks may include combination of reseeding/seed mats, trees, shrubs, groundcover, rock and riprap. Plant type, size and coverage shall be sufficient to stabilize and begin restoring.

- Manufactured banks greater than eight feet high shall be formed to create a more natural appearance (a combination of rough-cut, undulating, and/or rounded toe and top of slope), and terraced where possible to improve plant establishment.

- Retaining walls shall be terraced or treated to blend into the natural landscape (e.g. tinted concrete, rock facing, slump block, railroad ties, and/or plantings).

- Un-planted banks are permitted for exposed bedrock cuts. Additional treatment of cut faces may be required to stabilize soil and reduce scarring effects, based on proven effective technologies and products.

Where necessary, check dams, cribbing, riprap or other devices or methods may be employed as approved by the County Engineer.

3.4 GRADING PERMITS

In the County, no grading shall be done without first having obtained a grading permit from the Community Development Department unless exempted per Section 3.2. A separate permit shall be obtained for each site and may cover both excavations and fills.

3.4.1 Grading Permit Requirements

In order to obtain a Grading Permit the following requirements shall be met:

- The application for a grading permit shall include submittal items as outlined in Chapter 2 of this Manual. Plans shall be drawn to scale and shall be per the County’s CADD Standards and be of sufficient clarity to indicate the
nature and extent of the work proposed and show in detail that they will conform to the provisions in this Manual and all relevant laws, ordinances, rules and regulations.

- Grading Plans shall be prepared by a Professional Engineer and at a minimum shall include the following:
  - Location of the work, the name and address of the owner, and the person by whom they were prepared.
  - Clearly defined original contours and proposed elevations or contours to be achieved by the grading construction.
  - Property limits and accurate contours and details of terrain / drainage of adjacent properties.
  - Clear delineation of the limits of cut and fill slopes including top and toe slopes relative to adjacent property lines and proposed improvements.
  - Clear delineation of potential rock disposal areas.
  - Proposed grades of streets, slopes, drainage ways, parking lots and driveways.
  - 100-Year Floodplain and Floodway Delineation where applicable.
  - All surface and sub-surface drainage devices, walls, cribbing, dams and other protective devices to be constructed with, or as a part of, the proposed work. A map showing the drainage area and the estimated runoff of the area served by any drains shall be referenced in the drainage report.
  - Location of any buildings or structures on the property where the work is to be performed and the location of any buildings or structures on land of adjacent owners that are within 15 feet of the property or that may be affected by the proposed grading operations.
  - Other details, as required, to clarify the plan.

- Coconino County shall require re-vegetation for any grading. The type and extent shall be shown on the grading plans and titled “Erosion Control”. Erosion control plans must conform to current NPDES requirements.

- A geotechnical report is required for all projects requiring a grading permit unless exempted per Section 3.2. The report shall include the following:
  - Data regarding the nature, distribution and strength of existing soils
  - Conclusions and recommendations for grading procedures
Design criteria for corrective measures, including buttress fills, when necessary

Opinion on adequacy for the intended use of sites to be developed by the proposed grading as affected by soils engineering factors, including the stability of slopes.

The geotechnical report or separate geology report shall include an adequate description of the geology of the site, conclusions and recommendations regarding the effect of geologic conditions on the proposed development, and opinion on the adequacy for the intended use of sites to be developed by the proposed grading, as affected by geologic factors.

The geotechnical or geology reports shall include the date, names, addresses and phone numbers of the firms or individuals who prepared the reports.

- Specifications shall contain information covering construction and material requirements.
- Recommendations included in the geotechnical report shall be incorporated in the grading plans or specifications.
- The County Engineer may require a geotechnical investigation in accordance with the International Building Code to address the potential for liquefaction if the following conditions are discovered:
  - Shallow ground water, 5 feet or less.
  - Unconsolidated sandy alluvium.
- An Owner or Operator who intends to disturb an area of land that is equal to or greater than one acre, or that is less than one acre but is part of a larger plan of development that disturbs one or more acres of soil in Coconino County outside of the County's designated Small Municipal Separate Storm Sewer System (SMS4) shall obtain permit coverage under the General Permit for Discharges from Construction Activities from ADEQ. A copy of the Notice of Intent (NOI) submitted to and approved by ADEQ and the SWPPP must be provided to the County prior to the start of any land disturbance on the construction site.

3.4.2 Grading Permit Issuance

The provisions of the International Building Code are applicable to grading permits. The County Engineer may require grading operations and project designs to be modified if delays occur from issues not considered at the time the permit was issued.
3.4.3 At-Risk Grading

A first review of the Grading and Drainage plan for the project is required to be completed prior to any consideration of an At-Risk Grading and Drainage plan being accepted for review (all major comments on the Grading and Drainage plan must be addressed prior to the At-Risk Grading and Drainage plan being accepted). An At-Risk Grading and Drainage Plan may be approved as a convenience to the developer. The County is not obligated to approve an At-Risk Rough Grading Plan. The permit may be revoked if timely progress is not made toward final Grading and Drainage plan approval.

At-Risk Grading and Drainage plans are approved to allow rough grading only. Trenching or fine grading is not allowed as part of the At-Risk Grading and Drainage plan approval.

The Professional Engineer shall work earnestly toward completing the full Grading and Drainage plan approval while the At-Risk Grading and Drainage plans are in use or the At-Risk Grading and Drainage permit may be revoked.

3.5 GRADING INSPECTION

Grading operations falling under the auspices of a grading permit shall be subject to inspection and testing. At the owner’s expense, professional inspection shall be provided as necessary by the civil Professional Engineer, geotechnical Professional Engineer or geologist. Testing results and reports shall be provided to the County prior to acceptance of the work.

3.5.1 Permittee

The permittee shall be responsible for the performed work in accordance with the approved plans and specifications and in conformance with the provisions of the code. The permittee shall engage consultants, as required, to provide professional inspections on a timely basis. The permittee shall act as a coordinator between the consultants, the contractor and the County Engineer. In the event of changed conditions, the permittee shall be responsible for informing the County Engineer of such change and shall provide revised plans for approval.

3.5.2 Civil Engineer

The civil engineer shall provide professional inspection within such engineer’s area of technical specialty. Inspection shall consist of observation and review as to the establishment of line, grade and surface drainage of the development area. If revised plans are required during the course of the work, they shall be prepared by the civil engineer and submitted to the County Engineer for approval.

3.5.3 Geotechnical Engineer

The geotechnical engineer shall provide professional inspection within such engineer’s area of technical specialty. Inspection shall include observation during grading and testing for required compaction. The geotechnical engineer shall
provide sufficient observation during the preparation of the natural ground and placement and compaction of the fill to verify that such work is being performed in accordance with the conditions of the approved plan and the appropriate requirements of this chapter. Revised recommendations relating to conditions differing from the approved geotechnical engineering and geology reports shall be submitted to the County Engineer for approval.

3.5.4 Geologist

The geologist shall provide professional inspection within such professional’s area of technical specialty. Inspection shall include professional observation of the bedrock excavation to determine if conditions encountered are in conformance with the approved report. Revised recommendations relating to conditions differing from the approved engineering geology report shall be submitted to the County Engineer for approval.

3.5.5 County Staff

The County Engineer shall inspect the project at the various stages of work requiring approval to determine that adequate control is being exercised by the professional consultants. The permittee shall provide the County representative copies of testing results and inspection reports.

3.5.6 Noncompliance

If the civil engineer, the geotechnical engineer or the geologist finds that the work is not being done in conformance with this chapter or the approved grading plans, the discrepancies shall be reported immediately in writing to the permittee and to the County Engineer.

If the civil engineer, the geotechnical engineer, or the geologist of record is changed during grading, the work shall be stopped until the replacement has agreed in writing to accept their responsibility within the area of technical competence for approval upon completion of the work. It shall be the duty of the permittee to notify the County Engineer in writing of such change before the recommencement of such grading.

3.6 COMPLETION OF WORK

Upon completion of the rough grading work and at the final completion of the work, the following reports, drawings and supplements are required, as applicable.

1. A Record Drawing per the requirements in Chapter 2 of this manual and the Record Drawings Checklist.

2. A report prepared by the geotechnical engineer retained to provide such services. The report shall include the locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved geotechnical engineering
investigation report. Geotechnical engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved geotechnical report and applicable provisions of this chapter.

3. If required as part of the grading permit, a report prepared by the geologist retained to provide such services. The report shall include a final description of the geology of the site and any new information disclosed during the grading and the effect of same on recommendations incorporated in the approved grading plan. Geologists shall submit a statement that, to the best of their knowledge, the work within their area of responsibility is in accordance with the approved geology report and applicable provisions of this chapter.

4. The grading contractor shall submit in a form prescribed by the County Engineer, a statement of conformance to the approved grading plans.

3.6.1 Notification of Completion

The permittee shall notify the County Engineer when the grading operation is ready for final inspection. Final approval shall not be given until all work, including installation of all drainage facilities and their protective devices, and all erosion-control measures have been completed, in accordance with the final approved grading plan, and the required reports have been submitted.

3.7 FIGURES
FIGURE 3-1   RETAINING WALL DESIGN
RETAINING WALL DESIGN

WALL HEIGHT: 4 FT

HORIZONTAL DISTANCE BETWEEN WALLS: 8 FT

BACKSLOPE: 10

COCONINO COUNTY ARIZONA
4.0 UTILITIES

4.1 GENERAL INFORMATION

This purpose of this chapter is to provide a consistent approach and minimum criteria for design, permitting and testing requirements for construction of utilities within dedicated County right-of-way. The information provided in this chapter is not intended to cover all situations that arise but shall provide general guidance. It is not a substitute for sound engineering and design principles.

Utilities are those companies, corporations, or entities that provide some type of utility service, whether it is electricity, telecommunications, water, sewer, or information services. Within the County, utilities are provided by, but not limited, to the following companies or utilities:

Electrical Service
- Arizona Public Service (statewide)
- Navajo Tribal Utility Authority

Natural Gas Service
- UniSource Energy Services
- Kinder Morgan
- Amerigas (Utah)-Coastal Gas (propane only)
- Black Mountain Gas Co. (propane only)
- Coast Gas, St. George, Utah
- Graves Propane Co.
- Southern Union Gas Co.

Water and Sewer
- Arizona Water Company
- City of Flagstaff
- Navajo Tribal Utility Authority
- Division of Economic Development Office, Navajo Nation
- American Water
- Doney Park Water
- Pinewood Sanitation
- Kachina Village Improvement District
- Utility Source

Telephone / Cable
- Cable One
- CenturyLink
- AT&T
- Suddenlink Communications
- Navajo Communications Company, Inc.
- South Central Utah Telephone Assn
- TDS Telecom
4.2 COUNTY CODE, ORDINANCES AND STANDARDS

Right-of-way encroachment permits shall be secured in advance of all work performed in Coconino County right-of-way.

Because the County is required to issue Encroachment Permits for utility construction in their right-of-way, there is an implication and expectation that construction permitted and accepted by the County meets commonly accepted standards for safety and utility.

Utility franchisees and permittees are required to install all improvements necessary to provide service to their customers. All improvements must comply with these standards as well as the standards of the utility companies and the permittee is responsible for the payment of all required permit fees. All work in County right-of-way shall be performed by a contractor appropriately licensed and bonded in the State of Arizona.

Other construction methods, which are determined from engineering studies and laboratory tests, may be substituted as satisfactory alternates with prior written approval of the County Engineer.

The applicant is responsible for obtaining approval from any other applicable agencies. If a regulatory conflict exists, Coconino County may choose to impose additional or more restrictive requirements than those provided by other regulatory agencies. Refer to Section 1.2 of this manual.

4.3 UTILITY PLACEMENT AND OWNERSHIP

4.3.1 Right-of-Way and Easements

Utility companies that are recognized as a public utility or have been granted franchise agreements by the County to serve the citizens are allowed to place facilities within the dedicated public rights-of-way and public easements subject to the review and approval of the County. All franchise agreements are on file in the office of the County Clerk and may be reviewed upon request. All other private facilities are prohibited from utilizing the public rights-of-way and public easements without a separate instrument of permission or right.

The design professional and the Non-County utility providers should be aware of, and become familiar with, the various regulations that pertain to land development within the County and its utility service areas. County ordinances provide for, and require that, all private land developments in the County be developed, operated and maintained in accordance with applicable regulations, standards and requirements.

The developer shall dedicate all public utility easements necessary to provide utility service to the proposed project, including any easements from other property owners. All Public Utility Easements (PUE) shall be granted by grantor to grantee on the recorded plat, survey or separate instrument in the office of the Coconino County Recorder.
Emergency encroachments, including excavation for public utility repairs necessary to protect the public safety, are allowed without a permit provided a permit is applied for the next working day, all traffic control and safety devices necessary are used, and final repairs are not performed until authorized by the County Engineer.

Existing improvements affected by work performed in the County right-of-way shall be returned to its original condition.

4.4 UTILITY DESIGN REQUIREMENTS

4.4.1 Location

With the exception of minor service extensions to individual parcels, all longitudinal utility facilities are preferred to be located in public utility easements. Where public utility easements do not exist, utilities shall be placed in a roadway right-of-way in the following order unless otherwise approved:

- Water on one side of the right-of-way
- Sewer on the opposite side of the right-of-way
- Gas, electric and communications outside the pavement.
- All utilities within right-of-way crossing washes shall have protection against flood scour.
- All utilities must be traceable either tracer wire, metal pipe or a method approved by the County Engineer.

Refer to Figure 4-1.

Unusual conditions or sites will be reviewed on a case-by-case basis as to the appropriate location of the facility. Utilize Record Drawings and physical verification to locate existing pavement and utility stubs and design to connect to the existing stubs where feasible.

4.4.2 Minimum Separation

Proposed utilities/facilities must maintain adequate separation between all other utilities. The separation shall be measured from the outer edge of the conduits or structures. Refer to Figure 4-2.

4.4.2.1 HORIZONTAL SEPARATION

The minimum horizontal separation between utilities within the County’s right-of-way shall be per Figure 4-2 and as described:

- Minimum separation between water and sewer lines shall be per ADEQ guidelines. Three (3) feet between power/communication line trench and water lines.
- Two (2) feet between power/communication line trench and sewer lines.
- One and a half (1.5) feet between gas line trench and water lines.
- Three (3) feet between gas line trench and sewer lines.
- For all other utilities, maintain two (2) feet separation.

The horizontal separation dimensions are minimums; therefore, additional clearances may be required depending on the number and size of utilities in a trench.

**4.4.2.2 VERTICAL SEPARATION**

The minimum vertical separation between utilities within the County’s right-of-way is:

- One and a half (1.5) feet between all crossing utility lines.
- Minimum vertical separation of water and sewer lines shall be per ADEQ guidelines.

Minimum cover shall be measured from the top of the pipe to the subgrade under existing or proposed pavement. On non-paved roads, the minimum cover shall be the distance between the top of the pipe and finished grade plus one foot.

The vertical separation dimensions are minimums; therefore, additional cover and/or clearances may be required depending on the number and size of utilities in a trench.

Refer to Figure 4-2.

**4.4.3 Trench Backfill and Compaction**

Backfilling of utilities within the County’s right-of-way or a PUE shall conform to MAG Specifications and as amended by Coconino County. Refer to Figure 4-3.

**4.4.4 Pavement Cuts**

Installation of utilities within County roads shall adhere to the following requirements:

- Sawcutting, backfill, subgrade preparation, and / or placement and compaction of ABC and AC shall be coordinated with the County Engineer prior to starting work to allow for observation by a representative of the County Engineer.
- All cuts in asphalt or concrete pavement shall have saw cut or neat and straight edges.
- The County has established a road cut moratorium on roadways under its jurisdiction. Newly paved roads shall not be cut for a period of 7 years. Newly
chip sealed roads may not be cut for a period of 3 years. If work is required to cross these road sections under moratorium, all roadway crossing work must be bored or pushed under pavement. Water boring is not permitted under a paved roadway. Chip sealed surfaces include chip, fog, slurry, scrub sealing and microsurfacing. Paved surfaces include overlays, reconstruction and new construction.

- If boring is not feasible, a request may be made to the County Engineer to waive the moratorium. Upon approval, a more extensive T-Top trench repair (see Figure 4-3) shall be required as well as an early cut fee in the amount of $300.00 plus $20.00 per linear footage of trenching to occur. A more extensive T-Top asphaltic concrete trench repair shall meet the following requirements:
  - Asphalt shall be replaced longitudinally, as measured parallel to the roadway alignment, and extend from ten feet downstream to ten feet upstream as measured longitudinally along the road to the outermost trench limits
  - Asphalt shall be replaced laterally from roadway centerline to edge of pavement if the pavement removal does not cross the road centerline. If the pavement removal crosses the centerline, full width of the road from edge of pavement to edge of pavement shall have the asphaltic concrete replaced.
  - Asphaltic concrete shall be 4” thick or match existing pavement, whichever is greater.
  - Small trench repairs that are less than one square foot in area, may be hot patched as approved by the County Engineer.

- Pavement cuts shall conform to MAG Section 336. Backfill consisting of ABC or CLSM shall be approved by permit authority.

- The asphalt material used for replacement of pavement cuts shall conform to Section 710 of the MAG Uniform Standard Specifications or as directed by Coconino County Public Works Department.

- The thickness of the pavement and aggregate base replaced shall be consistent with the thickness of the existing asphalt pavement and base but shall not be less than 2 ½” AC or 6” ABC. Minimum thickness requirements for asphalt pavement and aggregate base shall be measured compacted to 100% maximum density for the material.

- All concrete replacement shall be Class A (3000 psi). No site batch concrete is allowed. The thickness of Portland Cement concrete pavement replacement shall be consistent with the thickness of the existing section, but in no case less than six inches (6”). The concrete shall be Class A, in accordance with MAG specifications.

- The existing pavement shall be trimmed to a neat edge and the joint shall be sealed in accordance with Section 729 of the MAG Uniform Standard Specifications to insure a proper bond between the existing and new pavements

- All transverse or diagonal pavement cuts shall extend at least one foot (1’) beyond each side of the trench (“T”-Top). Excavated pavement material shall be
removed from the site and properly disposed of. Refer to Figure 4-3.

- Pavement patching for the street cuts shall be made within twenty-four (24) hours of completion of work. The use of steel plates set flush to pavement may be approved for use by County Engineer. Where the utility provider will be placing facilities in developer provided conduit, the developer will be required to provide construction plans showing the alignments, trenches, and bore holes required to install the utility conduit in County rights-of-way and easement. It is the responsibility of the project developer and utility provider to coordinate this requirement with each other.

- Depending on condition of existing pavement, additional removal and replacement of pavement wider than the trench may be required. When the trench of any lineal utility project is within four (4) feet or less from lip of gutter or edge of pavement, the pavement area between the trench and lip of curb or edge of pavement will also require full removal and replacement. In addition, should any raveling or damage occur to the existing pavement within the construction area, the damaged areas shall be saw cut, removed, and replaced. Damage to curb, gutter and sidewalk shall require full panel removal with saw cuts made at each joint. Removal and replacement of any and all existing infrastructure, damaged pavement, concrete, landscaping and irrigation, etc. shall be at the contractor’s or private utility’s expense

- Where trenching is through geogrid, membrane layers or chemical stabilizers, the material shall be replaced in kind or as approved by the County Engineer.

- Disturbance of any survey monument is not permitted.

Installation of utilities within County’s graveled or earth surfaced roads shall adhere to the following requirements:

- Surface replacement of gravel surfaced roads shall be consistent with the existing surface material in place and consist of select material or ABC as directed by the County Engineer.

- Fill placed on existing gravel surfaced roads or earth surfaced roads to obtain minimum allowable cover over the pipe of utility lines shall be placed to proper grade for the full width of the existing roadway and shall be compacted and graded to the satisfaction of the County Engineer.

4.4.5 Horizontal Bores

In lieu of pavement cuts, developers and contractors may use boring and jacking. Designs with pavement boring shall include a boring profile to insure proper separation is maintained from all existing utilities. Profiles of existing utilities shall be potholed prior to start of work and included on the boring profile. Utility potholes shall remain open and covered with a steel plate at the critical crossings in order to visually verify depth of bore and utility conflicts.
4.5 UTILITY PLAN REQUIREMENTS

Utility plans must comply with the requirements of Chapter 2 of this manual and the following:

- Comply with all applicable County CADD standards.
- All water and sewer utility design must be per latest ADEQ requirements and submitted to them for approval.
- Profiles will be required on projects involving installation of sewer or water in dedicated right-of-way. Power facilities must also be submitted in profile where the trade size of a single conduit exceeds six inches (6”) in diameter or where multiple conduits including the concrete encasements are sixty (60) square inches or greater in cross-sectional area. Profiles may be required by the County Engineer for other facilities or in cases of possible alignment or grade conflicts, cover problems or crossing conflicts.
- Traffic Control Plan in accordance with MUTCD

4.6 UTILITY PLAN SUBMITTAL, PLAN REVIEW AND PERMITTING

4.6.1 Utility Plan Submittal and Review

Submittals of the construction documents for the proposed utilities shall be made to the Community Development Engineering Division per the requirements identified in Chapter 2 of this manual.

4.6.2 Utility Conflict Review

In addition to County review, construction plans shall be sent to all applicable utility companies for a conflict review. The utility companies shall then sign the cover sheet of improvement plans or provide letter confirming that they have seen the plans, are aware of the scope of the project, have identified existing and proposed utilities conflicts in relation to the project and agreement to mitigate all conflicts with their facilities. The County Engineer shall not approve construction plans until all potentially affected utilities have signed the plans or provided this written correspondence.

It is understood and agreed that the Engineer and/or owner has considered all of the permanent and temporary utility appurtenances in their existing and relocated positions, as shown on the plans and specifications for the project. Therefore, the owner shall bear all risk and cost arising from problems associated with utility locations. County approval of plans and/or issuance of permits shall not affect this presumption.

4.6.3 Encroachment Permit

4.6.3.1 PERMIT APPLICATION
The Coconino County Encroachment Permit is to be filled out, signed by an appropriate and authorized representative of the utility provider, and included with the construction plan submittal. Copies of the application form are available on the Coconino County website or at the Community Development Department.

4.6.3.2 PERMIT ISSUANCE

Coconino County Encroachment Permit applications will only be accepted if all request information is supplied or provisions are otherwise made. The approved permits are either e-mailed to the applicant or are available at the Community Development Department. The applicant is responsible for obtaining approval from any other applicable agencies.

4.6.3.3 CONDITION ADHERENCE

The applicant shall adhere to all Encroachment Permit General Conditions stated on the Coconino County Encroachment Permit and General Notes on the civil plans. Final acceptance of the work within County right-of-way will be as described in Section 2.5.4.

4.6.3.4 PERMIT EXTENSIONS

As stated on the permit, Encroachment Permits shall be valid for one-year. A minimum of a pre and post inspection will be required. If after the one-year period the project is not complete, a renewal permit shall be obtained for the cost of the original permit. Prior to the permit’s expiration, the original permit may be renewed upon applicant’s request.

4.7 FIGURES
FIGURE 4-1  PREFERRED UTILITY LOCATIONS
1. Whenever possible, utilities shall be placed in public utility easement outside right-of-way. Minimum horizontal and vertical distance between water and sewer pipe shall be per ADEQ guidelines.

2. Alternate utility locations must meet requirements shown in Figure 4-2 and require approval by the County Engineer.

3. Where there are ditches, dry utilities shall be placed a minimum of 24" below flowline elevation.

4. Avoid running utilities directly under wheel path.

LEGEND:
- S Sewer Main
- W Water Main
- G Gas Line
- C Communication (Cable TV or Telephone)
- E Electric

COCONINO COUNTY ARIZONA
FIGURE 4-2  UNDERGROUND UTILITY TRENCHING
NOTES:
1. DIMENSIONS SHOWN ARE MINIMUMS - ADDITIONAL COVER AND/OR CLEARANCES MAY BE REQUIRED DEPENDING ON THE NUMBER AND SIZE OF UTILITIES IN A TRENCH.
2. MINIMUM COVER SHALL BE MEASURED FROM THE TOP OF THE PIPE TO THE SUBGRADE UNDER EXISTING OR PROPOSED PAVEMENT ON NON-PAVED ROADS THE MINIMUM COVER SHALL BE THE DISTANCE BETWEEN THE TOP OF THE PIPE AND FINISHED GRADE.
3. MINIMUM HORIZONTAL AND VERTICAL DISTANCE BETWEEN WATER AND SEWER PIPE SHALL BE PER ADEQ GUIDELINES.
4. WHEN WATER AND SEWER LINES CROSS REFER TO ADEQ GUIDELINES.
5. ALTHOUGH POWER AND COMMUNICATION CABLES MAY BE INSTALLED IN SANITARY SEWER TRENCH, A SEPARATE TRENCH MAY BE REQUIRED BY LOCAL CONTROLLING UTILITIES.
6. WATER AND ELECTRIC POWER SHALL NOT BE PLACED IN THE SAME TRENCH.
7. GAS AND SEWER LINES SHALL NOT BE PLACED IN THE SAME TRENCH.
8. TRACER WIRE AND WARNING TAPE SHALL BE INSTALLED.
9. POWER LINE TRENCH AND COMMUNICATIONS TRENCH SHALL NOT BE PLACED CLOSER THAN 3 FEET FROM WATER LINES AND 2 FEET FROM SEWER LINES. GAS LINE TRENCH SHALL NOT BE PLACED CLOSER THAN 3 FEET FROM SEWER LINES AND 1.5 FEET FROM WATER LINES. ALL CROSSING UTILITY LINES MUST MAINTAIN A VERTICAL SEPARATION OF AT LEAST 1.5 FEET. NOTE: THE MINIMUM VERTICAL SEPARATION REQUIRED FOR WATER AND SEWER IS PER ADEQ GUIDELINES.
10. CALL ARIZONA 811 AT LEAST TWO DAYS BEFORE YOU DIG.
11. GRANULAR BEDDING AND/OR BACKFILL WILL BE REQUIRED IN TRENCHES UNLESS APPROVED BY THE COUNTY ENGINEER.

LEGEND:
- **S** SEWER MAIN
- **G** GAS LINE
- **W** WATER MAIN
- **C** COMMUNICATION (CABLE TV OR TELEPHONE)
- **E** ELECTRIC

**FIGURE NO.**

**UNDERGROUND UTILITY TRENCHING**
FIGURE 4-3   T TOP PAVEMENT SECTION
**T-TOP PAVEMENT SECTION**

**MATCH EXISTING TYP.**

**PAVEMENT REPAIR:**

1. SAW CUT & REMOVE EXISTING AC FOR TRENCH EXCAVATION.

2. APPLY TACK COAT, RESTORE EXCAVATION MATCHING EXISTING AC PAVEMENT (TYPE COF 1/2" MIX), OVER 1 SACK SLURRY BACKFILL. SEE DETAIL BELOW.

**ROADWAY SECTION**

- SAW CUT IN STRAIGHT LINE SECTION +1'-0" FROM TRENCH
- TRENCH SECTION

**SAW CUT PLAN**

- APPLY TACK COAT & REPLACE AC WITH COF 1/2" ASPHALT MIX PER SPECIFICATIONS SEE PAVEMENT SECTION BELOW
- DISTANCE VARIES
- INSTALL BITUMINOUS TACK COAT ALONG ALL EXISTING AC SURFACES PER SPECIFICATIONS
- INSTALL NEW COF 1/2" AC MIX PER SPECIFICATIONS TO MATCH EXISTING AC
- MATCH EXISTING AC SECTION (PLACE BACK 4" ABC MIN IF THICKNESS NOT THERE)
- EXISTING AC (THICKNESS VARIES)
- EXISTING ABC (THICKNESS VARIES)
- NATIVE MATERIAL
- 1 SACK SLURRY BACKFILL (DEPTH VARIES)
- BEDDING & SHADING MATERIAL PER UTILITY COMPANY SPECIFICATIONS

APPLY CHIP SEAL SURFACE OR CHIP SEAL & FOG SEAL SURFACE IF EXISTING AC HAS TREATMENT

APPLY CHIP SEAL SURFACE OR CHIP SEAL & FOG SEAL SURFACE IF EXISTING AC HAS TREATMENT

MATCH EXISTING TYP.
5.0 TRANSPORTATION AND TRAFFIC ENGINEERING

5.1 GENERAL INFORMATION

This chapter provides standards and geometric requirements for the design and construction of transportation improvements within Coconino County. Transportation facilities may include roadways, traffic signals, street signing, pavement markings, pedestrian facilities, bicycle paths, and other facilities. The minimum requirements described herein are primarily based on safety considerations; therefore, under most circumstances, standards that provide a greater degree of safety may be used.

5.2 COUNTY CODE, ORDINANCES AND STANDARDS

New construction on property owned or controlled by Coconino County, and which will be owned by the County upon completion or work which is part of a privately maintained street within Coconino County, will require permits. The current versions of the following publications shall be utilized and/or accepted as standard criteria for engineering County maintained streets in Coconino County.

- Coconino County Engineering Design and Construction Manual
- Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction
- MAG Uniform Standard Details for Public Works Construction
- ADOT Standard Specifications for Road and Bridge Construction
- AASHTO, A Policy on Geometric Design of Highways and Streets
- Manual on Uniform Traffic Control Devices (MUTCD)

In addition, the current versions of the following publications are regulatory standards imposed by Coconino County:

- The Coconino County Subdivision Ordinance
- The Coconino County Zoning Ordinance

Other documents which will apply, when appropriate, shall include but not be limited to the current versions of the following:

- The Coconino County Comprehensive Plan
- The American Society for Testing Materials (ASTM) Standards and Specification
- The Occupational Safety and Health Administration (OSHA) Standards and Specifications
- Americans with Disabilities Act (ADA) Standards and Guidelines
- Federal Highway Administration Design Standards
- ITE (Institute of Transportation Engineers) Subdivision Street Standards
- ADOT Roadway Design Guide
- AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads
- AASHTO Roadside Design Guide
- Other American Association of State Highways and Transportation Officials (AASHTO) Standards and Specifications
• Other Arizona Department of Transportation (ADOT) Standard Drawings and Specifications
• Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) 5-Year and Long Range Transit Plans
• Flagstaff Urban Trail System (FUTS) Masterplan (or latest Regional Plan Map)
• Flagstaff Metropolitan Planning Organization Regional Transportation Plan

5.3 ROADWAY DESIGN

5.3.1 Street Classifications

Coconino County has seven (7) street classifications for all public roads to be maintained by the County. The location and street classification are determined as part of the planning or platting process. Refer to Figure 5-1 through Figure 5-8 for street typical sections.

The County encourages the development of privately maintained streets designed to a lesser standard than those identified in this chapter. However, the design must allow for emergency vehicle access as described in the Zoning Ordinance and provide street drainage outlined in Section 4.3.3 of the Drainage Design Criteria Manual.

5.3.1.1 PUBLIC STREET CLASSIFICATIONS

The County public street classifications consist of urban and rural sections. Urban sections require curb and gutter, while rural typically do not and provide roadside drainage ditches. The following types of development as defined in the Subdivision Ordinance are considered urban: Urban, Commercial and Industrial. The following types of development as defined in the Subdivision Ordinance are considered rural: Ranchette, Rural and Suburban.

The seven (7) public street classifications are:

• Local (Urban) - Figure 5-1
• Local (Rural) – Figure 5-2
• Minor Collector (Urban) - Figure 5-3
• Minor Collector (Rural) – Figure 5-4
• Major Collector (Urban) - Figure 5-5
• Major Collector (Rural) – Figure 5-6
• Arterial - Figure 5-7
• Lot Split – Figure 5-8

5.3.1.2 STREET RIGHT-OF-WAY REQUIREMENTS

The minimum right-of-way requirements are provided in Table 5-1 as well as in Figure 5-1 through Figure 5-8.
TABLE 5-1 PUBLIC STREET RIGHT-OF-WAY REQUIREMENTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Figure No.</th>
<th>Road Width*</th>
<th>R/W Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Street (Urban)</td>
<td>5-1</td>
<td>36’</td>
<td>76’</td>
</tr>
<tr>
<td>Local Street (Rural)</td>
<td>5-2</td>
<td>32’</td>
<td>80’</td>
</tr>
<tr>
<td>Minor Collector (Urban)</td>
<td>5-3</td>
<td>36’</td>
<td>90’</td>
</tr>
<tr>
<td>Minor Collector (Rural)</td>
<td>5-4</td>
<td>32’</td>
<td>100’</td>
</tr>
<tr>
<td>Major Collector (Urban)</td>
<td>5-5</td>
<td>49’</td>
<td>100’</td>
</tr>
<tr>
<td>Major Collector (Rural)</td>
<td>5-6</td>
<td>47’</td>
<td>100’</td>
</tr>
<tr>
<td>Arterial</td>
<td>5-7</td>
<td>73’</td>
<td>130’</td>
</tr>
<tr>
<td>Lot Split</td>
<td>5-8</td>
<td>24’</td>
<td>50’</td>
</tr>
</tbody>
</table>

*Includes curb and gutter, if applicable

5.3.2 Pavement Cross Slopes

Paved surfaces of undivided streets should have a normal crown that has a two-way cross slope with the cross-section high point on the street centerline. Unusual conditions may cause cross-slope requirements to vary, but normally the desirable cross-slope is 2%. The maximum acceptable cross-slope is 3% for roadways without superelevation, unless otherwise approved by the County Engineer. Roadway drainage shall be considered as detailed in Drainage Criteria Manual.

All typical cut and fill slopes are denoted in the typical street sections (Figure 5-1 through Figure 5-8). Refer to AASHTO’s Roadside Design Guide for non-typical cases.

Any deviation from the desirable cross slope is subject to approval by the County Engineer through a Waiver Request.

5.3.3 Design Speed

The design of roadway geometrics, such as horizontal and vertical curves, depends upon the design speed selected for the roadway. The choice of the design speed is primarily determined by the street classification. The design speed is the maximum speed for the safe operation of a vehicle that can be maintained over a specific section of a street when conditions are favorable so that the design features of the street govern.

Design speeds and minimum sight distances for the various classifications of streets may be found in Table 5-2. The use of design speeds other than those outlined in Table 5-2 must be approved by the County Engineer through a Waiver Request.
**TABLE 5-2  DESIGN SPEED REQUIREMENTS**

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Design Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>25</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>35</td>
</tr>
<tr>
<td>Major Collector</td>
<td>45</td>
</tr>
<tr>
<td>Arterial</td>
<td>40-55*</td>
</tr>
</tbody>
</table>

*Design speed needs to be approved by the County Engineer

Minimum sight distance shall be per AASHTO guidelines and as approved by the County Engineer.

### 5.3.4 Horizontal Alignment

The horizontal alignment of a roadway may be comprised of horizontal curves and tangent sections. Superelevation is introduced into the alignment to provide appropriate balance between centrifugal forces and side friction on the tires of the vehicle moving through the curved section. Refer to the AASHTO publications, *A Policy on Geometric Design of Highways and Streets* and *Guidelines for Geometric Design of Very Low-Volume Local Roads* for horizontal alignment design.

#### 5.3.4.1 HORIZONTAL CURVES

The nature of the surrounding development and topography, and the street classification will establish the factors that determine the radius of a horizontal curve. Values for design elements, including minimum curve radii, design speed, and superelevation, are found in the AASHTO’s *A Policy on Geometric Design of Highways and Streets* and *Guidelines for Geometric Design of Very Low-Volume Local Roads*. When designing the horizontal alignment of new or improved roadways, the following factors should be considered:

- The design of horizontal and vertical alignments should be well coordinated to avoid undesirable driver reactions. For more information on this topic, refer to the latest edition of the *AASHTO Policy*.
- Differences in design speed between successive horizontal curves should be avoided.
- For small deflection angles, horizontal curves should be sufficiently long to avoid the appearance of a kink. Curve arc lengths should be at least 500 feet for a central angle of 5 degrees, and the minimum length should be increased 100 feet for each 1-degree decrease in the central angle (*AASHTO Policy*).
- An angle point is acceptable for breaks in tangent alignments of less than 1°.
- Horizontal curves, meeting minimum radii as defined by the latest edition of the *AASHTO Policy*, should be avoided at points where driver expectation is low, such as at the ends of long horizontal and vertical tangent sections.
- Median openings along horizontal curves are generally discouraged.
- The use of broken-back curves (i.e., two horizontal curves in the same direction separated by short tangent sections) should be avoided.
5.3.4.2 SUPERELEVATION

Superelevation refers to cross slope introduced into the cross section of a roadway to compensate for the centrifugal forces created by horizontal curves. In the County, the maximum superelevation rates are:

- 0.06 ft/ft for rural roadways
- 0.04 ft/ft for urban roadways

Examples of design superelevation rates based on the design speed, the radius of curve, and the superelevation rate can be found in AASHTO Policy.

When superelevation is introduced to account for horizontal curvature and to provide a stable turning motion for vehicles traveling at or below the design speed, the rotation of the pavement section must be designed along a given axis. The location of this axis of rotation has impacts on the length required to transition from a normal crown section to a superelevated section. The location can also impact drainage patterns, driver perception of the transition area, and aesthetics. Within a given project, the axis of rotation should remain constant for all horizontal curves and for a given type of cross section. Regardless of the location of the axis of rotation, "flat" areas shall be avoided and the change in cross slope between the roadway and its intersecting driveways and cross streets shall be carefully reviewed.

Superelevation Transitions

Superelevation transitions refer to the lengths of highway that are used to bring a normal crown section up to the superelevation rate that is being designed. Transitions are also used to bring a superelevated section back to the normal crown section. There are two components that make up the total transition for a superelevated section:

1. Tangent Runout
   - Denotes the length of highway needed to bring a normal crown section to a section with an adverse crown removed (zero cross slope), or vice versa

2. Superelevation Runoff
   - Denotes the length of highway needed to bring a section with the adverse crown removed (zero cross slope) up to a fully superelevated section, or vice versa.

Guidelines for the minimum length of superelevation runoff and tangent runout for a variety of design speeds and superelevation rates are given in AASHTO Policy.

Compound and Reverse Curves

The use of compound circular curves should be avoided. In special cases, where topography or right-of-way constraints require the use of compound curves, the radius of the flatter curve should not exceed 1.5 times the radius of the sharper curve. Where topographic or right-of-way constraints require the use of reverse simple curves, a minimum tangent separation between the curves equal to at least 4/3 of the longer of the two superelevation runoff lengths shall be used or 100 feet if no superelevation provided.
5.3.5  **Vertical Alignment**

All sections of a street’s vertical alignment must meet passing and stopping sight distance requirements for design speed established for the street. Refer to the *AASHTO Policy* for vertical alignment design.

5.3.5.1  **LONGITUDINAL GRADES**

The County standards for maximum and minimum profile grades are as follows:

- 10% maximum grade for local streets. A 12.5% maximum grade will be allowed in hillside conditions with prior approval from the County Engineer.
- 8% maximum grade for minor collectors
- 6% maximum grade for major collectors and arterials
- 4% maximum grade break at side-street intersections
- 0.5% minimum flow line grade for all roadways
- Engineer shall consider grades and its effect on stopping sight distance at intersections

Any longitudinal street grade that may vary from the above requirements must be approved by the County Engineer through a Waiver Request. For further information, see the *AASHTO Policy*.

5.3.5.2  **VERTICAL CURVES**

All sections of a street’s vertical alignment must meet passing and stopping sight distance requirements for the design speed established for the street, while providing effective street drainage. Vertical curves generally should be made if possible to provide greater stopping sight distance and more pleasing aesthetics. However, a minimum length vertical curve may be required to reduce the amount of excavation in rolling or hilly terrain. Refer to the *AASHTO Policy* for vertical curve requirements and equations and Table 5-2 for design speeds.

Grade beaks are acceptable as an alternative for a vertical curve if they are less than 1% or as approved by the County Engineer.

*Crest Vertical Curve*

The formulas used to establish the length of a vertical curve for crest situations can be found in the *AASHTO Policy*.

Minimum lengths of crest vertical curves as determined by sight distance requirements generally are satisfactory from the standpoint of safety, comfort, and appearance. Additionally, the length of a crest vertical curve shall not be less than three times the project design speed. Most project designs should use a longer than minimum vertical curve length. Specific values for crest vertical curves, both tabular and graphical, can be found in the latest edition of the *AASHTO Policy*. 
Sag Vertical Curve

The formulas used to establish the length of a vertical curve for sag situations can be found in the AASHTO Policy.

The sight distance value for designing sag vertical curves is taken as the minimum safe stopping sight distance. The design will approximate the condition of headlight distance on the pavement at nighttime by using the stopping sight distance. The assumption for the design of sag vertical curves is that no continuous street lighting will exist, and that headlight distance will govern.

Additionally, the length of a sag vertical curve shall not be less than three times the roadway design speed. Most roadway designs should use a longer than minimum vertical curve length. Specific values for sag vertical curves, both tabular and graphical, can be found in the latest edition of the AASHTO Policy.

Special Considerations

Some of the important design considerations for both crest and sag vertical curves are:

- A smooth grade line with longer tangent grades and fewer vertical curves should be a design objective.
- Broken-back grade lines (two vertical curves in the same direction separated by short sections of tangent grade) should be avoided.
- For long upgrades, it is preferable to place the steepest grade at the bottom and reduce the grades at the top. Roller coaster and hidden dip profiles should be avoided.
- Special attention to drainage and flow patterns at the top of the crest and at the bottom of sag curves.

5.3.5.3 STOPPING SIGHT DISTANCE

The principal design control for both crest and sag vertical curves is the provision of adequate stopping sight distance along the entire length of the curve. All portions of the profile grade line shall meet sight distance requirements for the design speed of the roadway.

Refer to the latest edition of the AASHTO Policy for stopping sight distance information, specifically about the effects of grade on the stopping sight distance.

5.3.5.4 PASSING SIGHT DISTANCE

On two-lane roadways, provision of passing sight distance can be an important consideration. Generally, for crest vertical curves, the passing sight distance is substantially longer than the stopping sight distance, and the former is used as the design control. Appropriate no-passing zones and markings must be in place to enforce the no passing criterion. For multilane roadways, the stopping sight distance is again used as the design control for vertical alignment. Refer to the latest edition of the AASHTO Policy for a discussion of passing sight distances for various design
5.3.6 Combined Horizontal and Vertical Curves

The combined effect of vertical and horizontal alignments along a given section of roadway is an important factor to consider. Although there are no specific design values or specific criteria, the following considerations should be addressed:

- Crest vertical curves should not be coincident with or immediately precede sharp horizontal curves.
- Sharp horizontal curvature near the low point of a sag vertical curve should be avoided.
- Horizontal and vertical curvature should be as flat as possible at intersections where vehicles have to decelerate, stop or accelerate.

5.3.7 Pavement Design

5.3.7.1 STRUCTURAL SECTIONS

Pavement sections shall be determined by a Pavement Design Report prepared and sealed by a professional engineer registered in the State of Arizona and approved by the County Engineer. The evaluation should be based on good engineering judgment utilizing the best information available during the planning and design phases of the project together with consideration of the following project specific conditions:

- Pavement Design Life
- Traffic Considerations (ADTs, ESALs, etc.)
- Soil Conditions
- Weather
- Availability of Materials
- Maintainability
- Constructability
- Cost Comparisons (initial and life-cycle)

The minimum design parameters for County maintained streets can be found in Table 5-3.
### TABLE 5-3

**MINIMUM DESIGN PARAMETERS (AASHTO EMPIRICAL EQUATION FOR FLEXIBLE PAVEMENTS)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Local Street</th>
<th>Minor Collector</th>
<th>Major Collector</th>
<th>Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis Period</td>
<td>40 yrs.</td>
<td>40 yrs.</td>
<td>40 yrs.</td>
<td>40 yrs.</td>
</tr>
<tr>
<td>Serviceability</td>
<td>$P_o=4.5$, $P_t=3.0$</td>
<td>$P_o=4.5$, $P_t=3.0$</td>
<td>$P_o=4.5$, $P_t=3.0$</td>
<td>$P_o=4.5$, $P_t=3.0$</td>
</tr>
<tr>
<td>Level of Reliability</td>
<td>75%</td>
<td>85%</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>Compound Growth Rate</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Percent Truck Traffic</td>
<td>5%</td>
<td>6%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Directional Distribution</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Lane Distribution</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>Truck Equiv. Factor</td>
<td>0.50</td>
<td>0.70</td>
<td>0.70</td>
<td>1.40</td>
</tr>
<tr>
<td>Soil Resilient Modulus $M_r$</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

*Per Geotechnical Testing

Minimum structural section for any new road requested to be added to the County maintenance inventory shall be as follows:

- Local Street: 4” minimum AC over 8” A.B.C.
- Minor Collector: 5” minimum AC over 10” A.B.C.
- Major Collector: 5” minimum AC over 12” A.B.C.
- Arterial: 8” minimum AC over 16” A.B.C.

Mechanical or chemical stabilization techniques may be considered.

Volcanic cinder materials will not be accepted as any part of the pavement structural section including aggregate base course in Coconino County.

Alternate design parameters and structural sections may be considered for privately maintained roadways.

### 5.3.7.2 RUMBLE STRIPS

Rumble strips may be required on arterials and major collectors where deemed necessary by County officials. If required, coordinate with Coconino County Public Works on installation requirements.
5.3.8 Concrete Curbs and Gutters

5.3.8.1 VERTICAL CURB

Vertical curbs are required as denoted in Figure 5-1 through Figure 5-8. Vertical curbs with gutter are to be constructed in accordance with MAG Standard Detail 220-1, Type A. Vertical curb and gutter type shall match the adjacent pavement slope to the gutter cross slope direction. Variations may be approved by the County Engineer through a Waiver Request.

5.3.8.2 ROLL CURB

Roll curb may be constructed on Local streets in accordance with MAG Standard Detail 220-1, Type C. Variations may be approved by the County Engineer through a Waiver Request.

Transitions between roll curb to vertical curb shall be per MAG Standard Detail 221.

5.3.8.3 CURB RETURNS

All collector and arterial street intersections shall be constructed with concrete vertical curb returns and sidewalk ramps per MAG Standard Details and the Americans with Disabilities Act (ADA) Standards and Guidelines and Code of Federal Regulations (CFR) Section 35.151.

If adjacent curb and gutter is not vertical curb, the curb transitions shall occur outside of the curb returns. Curb return radii are measured to the back of curb and shall be in accordance with Table 5-4.

### TABLE 5-4 INTERSECTION CURB RETURN RADII

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Arterial</th>
<th>Minor or Major Collector</th>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>35’</td>
<td>35’</td>
<td>30’</td>
</tr>
<tr>
<td>Minor or Major Collector</td>
<td>35’</td>
<td>30’</td>
<td>30’</td>
</tr>
<tr>
<td>Local</td>
<td>30’</td>
<td>30’</td>
<td>25’</td>
</tr>
</tbody>
</table>

The design radii can be modified as necessary for special conditions, such as large volumes of truck traffic and/or skewed intersection angles. Consideration must be given to accommodate the design vehicle and the largest vehicle that may use the intersection/segment. Variations to curb radii proposed shall be reviewed and approved by the County Engineer through a Waiver Request.

5.3.9 Sidewalk Design

Installation of sidewalks shall promote and enhance pedestrian safety and the aesthetic quality of the roadway. Pedestrian walkways (sidewalks and paths) shall be
incorporated in a roadway cross-section. The minimum widths for sidewalks are:

- 5 feet for all local streets
- 6 feet for all collectors and arterials
- Space will be required between back of curb or edge pavement and sidewalks for snow removal purposes.

Sidewalks shall be constructed per MAG Standard Detail 230 and the Americans with Disabilities Act (ADA) Standards and Guidelines. Obstructions will not be allowed within sidewalks. If compliance with ADA is not possible, refer to Section 35.151 of the ADA Standards and Guidelines.

Refer to the Subdivision Ordinance for sidewalk requirements within subdivisions.

5.3.10 Intersections and Roundabouts

The goal of the design in providing intersection layouts is to allow for safe and efficient crossing, merging, and diverging of conflicting vehicle streams. These conflicts can be significantly reduced through the provision of adequate sight distances and efficient traffic control devices. Providing safe sight distances and effective control will depend on human factors related to the drivers, bicyclists, and pedestrians, the traffic volumes to be accommodated, and the geometric and topographical characteristics of the intersection itself. Refer to AASHTO’s guidelines for design of intersections.

Refer to the ADOT Roadway Design Guidelines for information about roundabout design.

5.3.10.1 LOCATION AND CONFIGURATION

Intersections shall be created or revised per the following guidelines:

- Intersections shall be located per Access Management Policy (Section 5.4)
- 90-degree intersections are preferable to skewed intersections
- Skews greater than three degrees on arterial and collector roads, and skews greater than five degrees on residential and local roads are to be avoided and require approval of the Coconino County Engineer.
- Intersections should be located along tangent sections of the roadway, unless otherwise approved by the County.
- Intersections with more than four entering approaches shall not be used unless approved by the County Engineer.
- Refer to AASHTO Policy for intersection clear view zone, sight triangle and sight lines requirements
- Refer to Subdivision Ordinance for additional information/requirements for intersections within subdivisions.

5.3.11 Cul-de-Sacs

A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system. The length of a cul-de-sac is measured between the centerline of an intersecting street and the radius point of
the cul-de-sac. Refer to Table 5-5 as well as Figure 5-9 and Figure 5-10 for cul-de-sac design criteria including minimum radii and maximum lengths.

Hammerhead cul-de-sacs may also be permitted within the County as long as approved by governing fire department. Refer to Figure 5-11 for hammerhead cul-de-sac design.

### Table 5-5: Cul-de-sac Design Requirements

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Min. Cul-De-Sac Radius (ft) (Clear Zone)</th>
<th>Max. Cul-De-Sac Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>50</td>
<td>600* 1200**</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Major Collector</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Arterial</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* If densities are greater than one dwelling unit per acre
** If densities are less than one dwelling unit per acre

5.3.12 Shoulders

Unpaved shoulder widths shall be a minimum of 2 feet wide. The shoulder slopes shall match the cross-slope of the adjoining travel lane, unless site specific conditions prevent it.

5.3.13 Clear Zone

Minimum clear zone width of 10 feet shall be required for roads with design speeds of 35 mph or below. Roads with design speeds of 35 mph or above shall require a clear zone sized per the criteria in AASHTO’s Roadside Design Guide.

5.3.14 Vehicle Barriers

Installation of roadside barriers shall be required per the criteria in AASHTO’s Roadside Design Guide. Roadside barriers shall be installed in accordance with current ADOT Specifications.

5.3.15 Ditches

Typical ditches as shown in the typical street sections are the minimums which will be accepted by the County under any conditions. However, they may not be adequate for drainage across some topography. Deeper ditches may require additional right-of-way considerations. The Design Engineer is responsible to insure adequate capacity of the drainage system. Refer to Drainage Criteria Manual for more information.

5.3.16 Handrails

Handrails shall be installed for protection of pedestrians when slopes are 2:1 or steeper, within 3 feet of a sidewalk or other walkway, and the embankment height of
the slope exceeds 3 feet, unless otherwise approved by the County Engineer.

Refer to Drainage Facilities in the Drainage Criteria Manual for handrail requirements for culverts.

5.3.17 Railroad Crossings

Railroad-roadway at-grade crossings shall be a right angle to the rails unless otherwise approved by the County Engineer. Pavement surfaces at railroad crossings shall be designed, constructed, and maintained to permit safe, smooth crossings for all roadway users. Warning signs and pavement markings should be installed in accordance with the MUTCD. Permits from railroad and state agencies must be issued prior to County approvals or acceptance.

5.4 ACCESS MANAGEMENT POLICY

Access management is defined as the regulation of vehicular access to public roadways from adjoining property. It is provided through legal, administrative, and technical strategies available to a political jurisdiction in order to maintain the health, safety, and welfare of the jurisdiction’s residents. It also regulates the level of access control on roadways and is needed to support the capacity of public highways and access to private land.

Different types of roadways are administered by different entities, such as the State, a municipality, or a county. The guidelines in this document are intended for access for properties and roadways under the jurisdiction of the County. Where access is managed by multiple jurisdictions, the guidelines or regulations are a shared responsibility of all involved entities.

5.4.1 Access Control

Access within the County shall be subject to the following guidelines:

Access to State Highways
- Access to state highways is regulated by the Arizona Department of Transportation (ADOT).
- Encroachment permits for access to State Highways must be obtained from ADOT.

Access to City Streets
- Access to incorporated city streets are regulated by the appropriate city.
- Encroachment permits for access to city streets must be obtained directly from the appropriate city.

Access to County Roads
- Access to roads and streets owned and maintained by Coconino County is regulated by the Coconino County Community Development Department.
- All new construction designed to connect to County roads must be authorized by a valid encroachment permit from the County.
• Existing accesses onto County roads, even if not in use, may not be altered or reconstructed without an encroachment permit issued by Coconino County.
• Encroachment permits shall be required for the following conditions:
  o Property division
  o Changes in use which cause existing traffic flow to be affected.
  o Relocations or realignments to existing driveways.
  o Changes in the type of traffic utilizing the access (usually an increase of larger heavier vehicles)
  o Modification of existing access
• The number of access points shall be kept to a minimum.
• No access points will be approved without an acceptable project site plan.

Access to County Roads within National Forest shall follow the above and the following:
• Access requires advanced application and approval by the Forest Service in cases where access would connect on federal land outside of the County right-of-way or if it is solely within County right-of-way on federal land. Driveways also require advance coordination and approval by the Forest Service.

5.4.2 Driveways

A driveway is any access constructed within right-of-way, connecting the roadway with adjacent property and which does not cause the blocking of any sidewalk, border area, street, or roadway. Driveways shall be designed and constructed in accordance with the current MAG and ADOT Standard Details.

5.4.2.1 RESIDENTIAL DRIVEWAYS

A residential driveway is one providing access to a single-family residence, a duplex, or an apartment building containing 5 or fewer dwelling units. Residential lots with frontage greater than or equal to 100 feet may have an additional driveway to allow for a circular driveway.

Residential properties that have frontage on a local street as well as on an arterial or collector street shall only access the local street.

Residential parcels fronting only on arterial or collector streets will be given access if reasonable alternate public access is not available as determined by the County Engineer. When such access is allowed, the driveway must be circular, or it must have a turn-around area to ensure that there is no need for vehicles to back onto the street.

5.4.2.2 COMMERCIAL AND INDUSTRIAL DRIVEWAYS

Driveways for commercial and industrial development shall be per the current MAG Standards and Details. Driveway widths shall be approved by the County Engineer.

Number of Driveways

The number of driveways is a function of the size and use of the property. Parcels will be limited to one two-way or two one-way driveways. For consideration of additional driveway(s), the minimum driveway spacing criteria as outlined in Table 5-8 must be
satisfied.

Where a property might access more than one road, the County may decide to limit access to the road with the lowest traffic volumes. Temporary access may occasionally be granted to undeveloped property for preliminary site access or construction.

Additional Driveways

Additional driveways may be permitted under the following conditions:
- If the daily volume using one driveway would exceed 250 vehicles (both directions).
- If traffic using one driveway would exceed the capacity of a stop-sign-controlled intersection during one peak street traffic hour or the peak site traffic hour.
- If a traffic analysis shows that the traffic conditions warrant two or more driveways.

Temporary Access

Temporary access will be granted to undeveloped property prior to development of a final plan if access is needed for construction or preliminary site access. Temporary accesses are subject to removal, relocation or redesign after final development plan approval.

Large Developments

For larger developments, a Traffic Impact Analysis (TIA) would be required to address the traffic impacts. Community Development Department may require the developer to consolidate access traffic to a single point, which may be signalized. Driveway signals must be located to provide satisfactory signal progression for through traffic on the road. Refer to Section 5.6.2.9.

Joint Access

Joint (or shared) access and/or cross access easements will be preferred for two adjacent developments where a proposed new access will not meet the spacing requirement set forth in Table 5-8. Joint access is encouraged and must be approved by the Community Development Department.

5.4.2.3 DRIVEWAY SPACING

A driveway may not block access to streets, roads, other properties, sidewalks or other driveways. The spacing between adjacent driveways must be adequate to allow vehicles to safely queue, accelerate, decelerate and cross lanes without excessive interference with through traffic or other driveways.

The minimum amount of spacing allowed by the County between adjacent driveways, depending upon the land use and street type, are listed in Table 5-8. The distances are measured from the driveway centerlines.
5.4.2.4 DRIVEWAY LOCATION RESTRICTIONS

Without approval of the County Engineer, a new driveway or a driveway with changed access will not be allowed under the following conditions:

- Within 25 feet of a guardrail ending
- Within 100 feet of a bridge or other drainage structure
- Within the minimum spacing as established in Table 5-8
- Within 150 feet of the right-of-way line of an intersecting arterial street
- Within 100 feet of an approved median opening location
- Within arc of curve which connects intersecting streets
- When adequate sight distance cannot be provided for vehicles on the driveway attempting to access the street, as those movements will be prohibited
- When the nearest edge of any driveway is closer than 2 feet from the nearest projection of a fire hydrant, utility pole, drop inlet and or appurtenances, traffic signal, or light standards
- For parking or loading areas that require backing maneuvers in right-of-way except for single family or duplex residential uses on local roads.
- Large graded or paved areas which function as the end of driveways and which allow drivers to enter or leave the traveled way at random locations will be discouraged

If a property has frontage on more than one street, access will be permitted only on those street frontages where standards contained in this manual and other County Regulations can be met.

If a property cannot be served by any access point meeting these standards, the County may designate one or more access point(s) based on traffic safety, operational needs, and conformance to as many of the requirements of these guidelines as possible. A Waiver Request may be submitted per requirements in Chapter 1.

5.4.2.5 TURNING MOVEMENTS

Where necessary for the safe and efficient movement of traffic, the County may require access points to be geometrically designed to provide for only limited turning movements. The restriction of movements should not affect the number and location of access points.

Generally, all new driveways on streets with vertical curbs shall be curb cut driveways unless turning movement requirements or high-volume use (e.g., right turns in and out allowed) dictate the use of curb radii.

5.4.2.6 DRIVEWAY SIGHT DISTANCE

Adequate sight distance must be provided for vehicles exiting and entering a driveway. Driveway locations should be evaluated to determine whether a sight obstruction exists, such as buildings, fences, signs, vegetation, parked vehicles, horizontal or vertical highway alignments, etc. Refer to AASHTO, A Policy on Geometric Design of Highways and Street, for detailed information regarding sight distance at intersections.
5.4.2.7 DRIVEWAY PROFILE AND ANGLES

Adequate design of driveway grades should reflect consideration for basic functions of the adjacent street and the site that the access driveway serves. Generally, in order to enable ingress and egress maneuvers, driveway profiles should provide for sufficient clearance between the vehicle and the driveway surface.

5.4.2.8 DECELERATION LANES

Deceleration lanes and additional right-of-way may be required on collectors and arterials as required by the County and TIA. Refer to Table 5-6 for guidance on right turn lanes and Table 5-7 for guidance on left turn lanes. In addition to the criteria presented in the figure and table below, other factors should be taken into consideration when performing a warrant study such as: shoulder width, percentage of trucks, sight distance, highway grade, horizontal and vertical curvature and crash history. The lane length must be determined on a case-by-case basis and must be approved by the County Engineer.

**TABLE 5-6 RIGHT TURN LANE WARRANT**

![Graph showing right turn lane warrant](image)

*Sources: City of Flagstaff Engineering Design Standards and Specifications For New Infrastructure; Idaho Transportation Department Traffic Manual; NCHRP Report 348 access Management guidelines for Activity Centers*
### TABLE 5-7  LEFT TURN LANE WARRANT

<table>
<thead>
<tr>
<th>Peak Hour Traffic Volume on the Highway in Advancing Direction</th>
<th>Minimum Peak Hour Left-turn Traffic Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of thru lanes per direction</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&lt; 45 MPH Posted Speed</td>
</tr>
<tr>
<td>&lt; 200</td>
<td>30</td>
</tr>
<tr>
<td>201 – 300</td>
<td>12</td>
</tr>
<tr>
<td>301 – 400</td>
<td>12</td>
</tr>
<tr>
<td>401 – 500</td>
<td>12</td>
</tr>
<tr>
<td>501 – 600</td>
<td>12</td>
</tr>
<tr>
<td>601 – 1000</td>
<td>12</td>
</tr>
<tr>
<td>1000+</td>
<td>12</td>
</tr>
</tbody>
</table>

*Source: ADOT Traffic Guidelines and Processes: Section 245 – Turn Lane Warrants

### 5.4.3  Access Management Policy Summary

The speed and functional classification of the roadway, as well as the abutting land use, are taken into consideration for access policy. **Table 5-8** presents some basic guidelines for spacing of access points from roadways to abutting properties depending upon the functional classification and design speed of the roadway.
TABLE 5-8  COUNTY ACCESS MANAGEMENT GUIDELINES

<table>
<thead>
<tr>
<th>Arterial</th>
<th>Speed</th>
<th>Road Spacing</th>
<th>Private Direct Access</th>
<th>Private Access Spacing</th>
<th>Private Access Geometrics</th>
<th>Private Access Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35-45 mph</td>
<td>660 ft</td>
<td>Allowed</td>
<td>250 ft min</td>
<td>Right turns allowed, turn lanes may be required.</td>
<td>One access per parcel Two for large developments when spacing standards can be met.</td>
</tr>
<tr>
<td></td>
<td>50-60 mph</td>
<td>1320 ft</td>
<td>Limited</td>
<td>450 ft min</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60+ mph</td>
<td>2640 ft</td>
<td>Limited</td>
<td>660 ft – 1,320 ft min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Collector</td>
<td>35-45 mph</td>
<td>660 ft</td>
<td>Allowed</td>
<td>330 ft min</td>
<td>Right turns allowed, turn lanes may be required.</td>
<td>One access per parcel Two for large developments when spacing standards can be met.</td>
</tr>
<tr>
<td></td>
<td>50-60 mph</td>
<td>1320 ft</td>
<td>Limited</td>
<td>450 ft min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Collector</td>
<td>35-45 mph</td>
<td>330 ft</td>
<td>Allowed</td>
<td>165 ft min</td>
<td>Right turns allowed, turn lanes may be required.</td>
<td>One access per parcel Two for large developments when spacing standards can be met.</td>
</tr>
<tr>
<td>Local</td>
<td>25-35 mph</td>
<td>250 ft</td>
<td>Allowed</td>
<td>50 ft min</td>
<td>Right turns allowed.</td>
<td>One per parcel*</td>
</tr>
</tbody>
</table>

*See Section 5.4.2.1

Any deviation from the County’s Access Management Policy is subject to approval by the County Engineer through a Waiver Request detailed in Chapter 1.

5.5 MULTI-USE PATH DESIGN

Coordination between the County, local communities, and private developments on multi-use path facilities shall be done through the County Community Development Department. Refer to AASHTO’s Guide for Development of Bicycle Facilities and Guide for the Planning, Design, and Operation of Pedestrian Facilities.

Where a multi-use path is intended to primarily serve pedestrian traffic and take the place of sidewalks, the path shall be concrete or other approved hard surface. The cross slope shall not exceed 2% and shall be designed to drain. The pathway shall meet the requirements of a sidewalk per Section 5.3.9 and ramps shall be provided at street intersections per Section 5.3.8.3.

5.6 TRAFFIC IMPACT ANALYSIS

The following scenarios shall require a Traffic Impact Analysis (TIA):

- Proposed new Development Project (as defined in the Coconino County Zoning Ordinance) with an average daily traffic (ADT) of 100 or more vehicles
- Proposed change in permitted use
• Expansion of an existing development with current access, either direct or indirect
• Modification of access to the Coconino County transportation network

Special attention to all proposed or modified developments should carefully examine the impacts resulting from the site’s traffic distribution onto the existing or programmed roadway network. Coconino County desires to operate a safe and efficient transportation network. The management of access to the network is vital to maintaining the overall safety and efficiency of the system. Access to the County transportation network is managed through the Encroachment permit process as detailed in Section 5.4.

The purpose of the TIA is to:

• Determine the transportation impacts of the project on the existing and future public transportation networks.
• Highlight any special or unusual transportation conditions which may exist or be anticipated and describe how they will be handled.
• Provide sufficient information for an assessment of the fair costs to address the impacts of the development.
• Coordinate circulation aspects of the project with those of other projects, existing developments, and the County’s Comprehensive and specific plans.
• Ensure uniform requirements and treatment for all developers

The procedures outlined in this section present the minimum information required when conducting a TIA. The preparer of the TIA shall contact the Community Development Department to discuss the scope of the analysis, methodology, level of detail required for the project, and the study limits prior to beginning the analysis.

5.6.1 Requirements

The County Engineer shall set or waive requirements for a TIA.

The determination of the level of analysis shall be based on the average daily traffic generated by the development or as required by the County Engineer.

The specific analysis requirements and level of detail are determined by the following categories:

5.6.1.1 TRAFFIC IMPACT STATEMENT

Refer to Table 5-9 for the development characteristics requiring a Traffic Impact Statement (TIS). A TIS will be based on existing conditions and/or anticipated traffic issues within ¼ mile radius of the site or as required by the County Engineer.

5.6.1.2 CATEGORY I TRAFFIC IMPACT ANALYSIS

Refer to Table 5-9 for the development characteristics requiring a Category I Traffic Impact Analysis. A Category I TIA may also be required for any of the following reasons:
The existence of any current traffic problems or concerns in the local area such as an offset intersection, a high number of traffic accidents, etc.
• The sensitivity of the adjacent neighborhoods or other areas where the County Engineer may perceive an adverse impact based on public or other input
• The proximity of proposed site driveways to existing driveways or intersections
• Other specific problems or safety related concerns that may be aggravated by the proposed development.

5.6.1.3 CATEGORY II TRAFFIC IMPACT ANALYSIS

Refer to Table 5-9 for the development characteristics requiring a Category II Traffic Impact Analysis. The analysis will cover the circulation system within the influence area of the development and may include analysis at different future stages of the project as required by the County Engineer. A Category II TIA may also be required for any of the reasons stated in Section 5.6.1.2 and at the discretion of the County Engineer.

The County Engineer shall make the final decision on requiring a Traffic Impact Analysis and determining whether the analysis falls within Category I or II. A developer shall first estimate the number of vehicle trips generated by the development to determine the applicable TIA category. The developer shall obtain concurrence from the County Engineer on the number of trips generated by the development.

5.6.2 Analysis and Methodology

Prior to beginning any analysis, the developer or his authorized representative shall contact the County Engineer and discuss the elements, approach, methodology, existing and programmed roadway network improvements, previous studies, and scope of the study.

5.6.2.1 STUDY AREA

The minimum study area shall be determined by development’s size and overall trip generation in accordance with the criteria in Table 5-9. The limits of the study area may be adjusted by the County Engineer.

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

Applicant should reference Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) 5-Year and Long Range Transit Plans, Flagstaff Urban Trail System (FUTS) Masterplan (or latest Regional Plan Map), Flagstaff Metropolitan Planning Organization Regional Transportation Plan and expected modal levels of service for the area and place type as they appear in the latest regional plan. Existing multimodal facilities and any other pedestrian facilities, including crosswalks, shall be discussed/illustrated in this section.
5.6.2.2 STUDY HORIZON YEARS

The study horizon years shall be determined by project type and size in accordance with the criteria in Table 5-9. The study horizon may be adjusted by the County Engineer.

TABLE 5-9 TIA STUDY REQUIREMENTS

<table>
<thead>
<tr>
<th>Development Characteristics²</th>
<th>Study Horizons</th>
<th>Minimum Study Area Limits¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Small Development: 100 – 299 ADT</td>
<td>County Engineer shall set or waive requirements for TIA for very small projects on a case-by-case basis</td>
<td></td>
</tr>
<tr>
<td><strong>I</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Small Development: 300 – 749 ADT | 1. Opening year and Build Out | 1. Site access driveways and adjacent streets within ¼ mile  
2. Adjacent signalized intersections and/or major street intersections |
| **II (a)**                   |                |                            |
| Moderate Development: 750 – 1,500 ADT | 1. Opening year and Build Out | 1. Site access driveways and adjacent streets within ½ mile  
2. All State highways, signalized intersections, and/or unsignalized street intersections within ½ mile of the site boundary. |
| **II (b)**                   |                |                            |
| Large Development: >1,500 ADT | 1. Opening year  
2. 5 years after opening  
3. 10 years after opening | 1. Site access driveways and adjacent streets within 1 mile  
2. All State highways, signalized intersections, and/or unsignalized street intersections within 1 mile of the site boundary. |

¹Study limits may be modified at the discretion of the County Engineer.  
²The number of trips shall include all trips made to/from the site, including but not limited to pass-by and diverted link trips.

5.6.2.3 ANALYSIS PERIOD

The weekday peak period shall be analyzed.

5.6.2.4 SEASONAL ADJUSTMENTS

Traffic volumes for the analysis hours shall be adjusted for the peak season if determined appropriate by the County Engineer. Use of seasonal adjustment factors should be approved by the County. The intent is not to assess maximum peak hourly volumes, such as the day after Christmas for a retail development, but to address peak seasonal volumes. For example, if traffic counts were collected in a retirement community in January, and the peak traffic period occurs during the summer months,
the counts should be adjusted to summer months.

Under the condition whereby the majority of the development’s trips are anticipated to travel to external locations (e.g., Flagstaff, Phoenix, etc.) along State highways, the author should obtain seasonal adjustment factors from ADOT and determine the applicability of such factors to any collected daily traffic counts.

### 5.6.2.5 DATA COLLECTION REQUIREMENTS

All data shall be collected in accordance with the latest edition of the Institute of Transportation Engineers *Manual of Transportation Engineering Studies* or as directed by the County.

1. Turning Movement Counts
   - Turning movements shall be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods and the peak hour of the generator. Turning movement counts may be required during other periods as directed by the County.
   - Existing turning movement counts may be used for the analysis provided the date of the collected information is no more than one year from the date of the initial report submittal, and with the written concurrence of the County Engineer.

2. Traffic Volumes
   - The current and projected daily traffic volumes shall be presented in the report. Available daily count data may be obtained from previous transportation and traffic studies and extrapolated a maximum of two years with the concurrence of the County Engineer.
   - Traffic volume estimates from other approved developments within the study area which are expected to occur during the study horizon years should be obtained directly from those respective developments and included within the study report.
   - Where daily count data are not available, or such counts are over two-years old, mechanical counts shall be required.

3. Traffic Crashes
   - Crash data shall be obtained from the County Sheriff’s Office, Flagstaff Police Department, ADOT or other source as approved by the County
   - Data shall be obtained for the most current three-year period available.
   - Any collected records must be presented in the report.

4. Roadway Geometrics
   - Geometric information shall be obtained including right-of-way widths, road surface width, number of lanes, turning lanes, vertical grade, location of driveways, vertical and horizontal geometry, sight distance, and any multi-modal facilities.

5. Traffic Control Devices
   - The location and type of traffic controls shall be identified, including pavement markings, signs, and signals.
• All traffic signals within the study area shall be identified along with their phasing, timing, and coordination programs.

6. Other
• The author shall obtain and include any current or planned County transportation improvement projects expected to occur during the study horizon years within the study area.

5.6.2.6 TRIP GENERATION

Trip generation and the selection of trip generation rates shall be per the latest edition of the Institute of Transportation Engineers’ Trip Generation Manual. For studies that may require an extended period of time to complete and if during this time a revision to the ITE Manual is made, the author shall obtain written approval from the County Engineer to continue to use data as provided within the previous edition.

Other source’s rates may be used with the prior approval of the County Engineer in cases where Trip Generation Manual does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have shown to significantly differ from the Trip Generation Manual rates.

5.6.2.7 TRIP DISTRIBUTION AND ASSIGNMENT

Projected trips shall be distributed and added to the projected non-site traffic (e.g., background, adjacent development, etc.) within the study.

The specific assumptions, methodology and data sources used in deriving trip distribution and assignment shall be documented in the report.

Trip distribution shall only be applied to existing County roadways and/or highways. Trip distribution may be applied to County programmed roadway improvements with prior approval of the County Engineer. Connections shall be completed to the ultimate point of trip destination. Trips shall not be assigned to unimproved roadways that are not constructed or maintained by the County, outside the improvement envelope of the TIA or TIS, or roadways that will be improved and/or constructed after the horizon year of the site. Trip distribution may be permitted on roadways expected to be improved by other surrounding developments provided such is evaluated as a secondary trip distribution pattern.

5.6.2.8 CAPACITY ANALYSIS

Level of Service (LOS) shall be computed for all signalized and major unsignalized intersections within the study area. The LOS at site driveways shall also be computed.

For signalized intersections, operational analyses shall be performed for time horizons up to five years. The planning method will be acceptable for time horizons beyond five years. Queuing lengths for dedicated turns at signalized intersections shall be determined.

LOS and roadway capacity shall be presented in a Level of Service Warrant Study
determined in accordance with the latest edition of the *TRB Highway Capacity Manual*.

### 5.6.2.9 TRAFFIC SIGNAL NEEDS

A traffic signal needs study shall be conducted per the ADOT Traffic Manual section on the *Traffic Signal Needs Study* for all new proposed signals for the base year. If the warrants are not met for the base year, they should be evaluated for each year in the five-year horizon.

The study shall identify the steps to be taken to mitigate any adverse effects of the traffic generated by the development on the street network within the study area. This shall include, but not be limited to:

- Improvements to existing signalized and unsignalized intersections.
- Future signalization of unsignalized intersections.
- Maintenance of street capacity at site driveways.

Existing signals adjacent to the development’s access to the County transportation network shall be evaluated for continued signal warrants, phasing, timing, and coordination for each year in the five-year horizon.

Refer to Section 5.7.1.

### 5.6.2.10 SPEED CONSIDERATIONS

Vehicle speed is used to estimate safe stopping and cross corner sight distances. In general, the 85th percentile speeds for highways and roadways are commonly higher than the posted speed limit. Therefore, a speed of 10 mph over the posted speed limit or the 85th percentile speed, as directed by the County, should be used to estimate safe stopping and cross corner sight distances for highways and/or roadways with posted speeds of 25 mph or greater.

### 5.6.2.11 IMPROVEMENT ANALYSIS

The roadways and intersections within the study area shall be analyzed both with and without the proposed development to identify any projected impacts regarding level of service and safety.

Where the roadways, intersections, intersection approaches, or lane groups will operate in the horizon year(s) at level of service C or better without the development, the traffic impact of the development on the roadway in the horizon year shall be mitigated to a minimum level of service C. Mitigation to level of service D may be acceptable in urban areas of over 50,000 population at the discretion of the County Engineer and with the concurrence of all affected municipalities.

Where the roadways, intersections, intersection approaches, or lane groups will operate below level of service C and greater than level of service of F in the horizon year(s) without the development, the traffic impact of the development shall be mitigated to provide the same level of service at the horizon year(s).
If the roadways, intersections, intersection approaches, or lane groups operate at a level of service of F without the development – mitigation is required to maintain the same degree of level of service F (i.e. same duration of delay and queue length) which would occur without the development.

Additional site improvements may be required to address site and public safety, as determined by the County Engineer, prior to approval of the TIA/TIS.

5.6.2.12 CERTIFICATION

The TIA or TIS shall be prepared under the supervision of a registered Professional Engineer authorized to practice in the State of Arizona.

Any Preliminary TIA or TIS, for the purposes of review by Coconino County, shall be stamped, labeled or sealed in accordance with the rules and requirements of the Arizona State Board of Technical Registration. All Final Reports and associated documents must be sealed and signed in accordance with said rules.

5.6.3 TIS Report Format

A TIS shall include a discussion of the existing and proposed conditions, trip generation and any other analysis or evaluation deemed necessary by the County Engineer. The TIS shall be sealed by a licensed professional engineer.

5.6.4 TIA Report Format

Full documentation of the analysis is required in the TIA. The report format should be scaled to the required category of the analysis. Table 5-10 shows the minimum content requirements for inclusion in the report for each level of TIA analysis category.

The Coconino County Community Development’s tracking number shall be included on the study’s cover sheet. If a number is not available, then the author should state such on the cover (Coconino County Tracking No. N/A).
## TABLE 5-10  MINIMUM TIA REPORT CONTENT REQUIREMENTS

<table>
<thead>
<tr>
<th>TIA CATEGORY</th>
<th>I</th>
<th>II-a</th>
<th>II-b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Executive Summary</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Project Description</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Site Plan</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Phasing and Timing</td>
<td></td>
<td></td>
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<td><strong>Study Area Conditions</strong></td>
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<tr>
<td>Existing and Anticipated Land Use</td>
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<td>X</td>
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<tr>
<td>Existing and Future Roadway System</td>
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<tr>
<td><strong>Analysis of Existing Operations</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Roadway Conditions and Traffic</td>
<td></td>
<td></td>
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<tr>
<td>Other Modes</td>
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<td>Traffic Volumes</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Level of Service</td>
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<td>Traffic Signal Needs</td>
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<td><strong>Conclusion</strong></td>
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<tr>
<td><strong>Recommendations</strong></td>
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<td>X</td>
</tr>
<tr>
<td><strong>Appendices</strong></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

### 5.6.4.1 INTRODUCTION

The report’s Introduction section shall contain at a minimum the following subsections:

1. *Purpose of Report*
2. *Study Objectives*

The report’s Executive Summary section shall contain at a minimum the following subsections:

1. *Site Location and Study Area*
The Site Location and Study Area should be shown on a street map and should show:

- The boundary of the proposed development with north arrow
- The study area (showing all existing roadways and intersections to be examined under the study)
- Any necessary roadway network elements mentioned within the study’s report body and surrounding land use.

The site layout should not be shown within this section of the report. It shall be shown in Project Description (Section 5.6.4.2).

**ii. General Description of the Project**

The general description of the project should include a narrative of the land uses proposed for the overall development and the land uses examined within this report.

**iii. Estimated Trip Generation for the Entire Development**

The estimated resulting trip generation for the entire site at phased buildout conditions should be stated clearly and agree with the land uses.

**iv. Assumptions used within the Study**

The author should clearly outline all assumptions employed within the report.

**v. Principal Findings**

The report should provide a brief outlined summary of the study’s principal finding(s) including resulting Levels of Service and Roadway Capacity.

**vi. Conclusions**

The report should provide a brief outlined summary of the study’s general conclusions.

**vii. Recommendations**

This section should contain sufficient information with regard to the recommendations made for the internal/external roadway network (e.g., turn lane and associated storage, safety concerns and associated mitigation measures, etc.).

**5.6.4.2 PROJECT DESCRIPTION**

The report’s Project Description section shall contain at a minimum the following subsections:
i. **Site Plan**

Clearly show the complete layout of the site including commercial areas, schools, internal and contiguous roadway network, phasing limits (if applicable), street names, scale or dimensions showing the distances between main study elements (e.g., distances to and/or between intersection, etc.) and any other information that would be relative when reviewing the study’s content, conclusions and recommendations.

Along with the Site Plan, this section should include a general narrative of the site location as well as detailed information regarding the planned land uses within the site.

ii. **Phasing and Timing**

This section should contain sufficient information regarding the development’s phasing and/or the anticipated timing. For large developments, the phasing should be clearly stated as such developments may develop only isolated portions one at a time. Development phasing should be based on reasonable building construction and occupation rates.

5.6.4.3 **STUDY AREA CONDITIONS**

The report’s Study Area Conditions section shall contain at a minimum the following subsections:

i. **Land Use**

This section should include a narrative and/or map discussing the existing land use surrounding the project site and any planned developments within the influence area. Information regarding anticipated future developments should include the planned opening year and any horizon years that are known or planned to occur.

ii. **Site Accessibility**

This section should provide a narrative and an associated map detailing access into the site. The Site Layout Map, if sufficient detail is shown, may be used in place of this.

This section should also contain narrative detailing the area of significant traffic impact with regards to the existing and future roadway network.

5.6.4.4 **ANALYSIS OF EXISTING OPERATIONS**

This section of the report should contain detailed information regarding the results of the analysis of the existing conditions within the study limits. The report’s Analysis of Existing Operations section shall contain at a minimum the following subsections:

i. **Roadway Conditions and Traffic Controls**
This section should include detailed information regarding the characteristics of the existing roadways, main access facilities to be used by the development and other transportation facilities located within or immediately contiguous to the study area. Characteristics of the roadways should include general roadway alignment information, including but not limited to horizontal and vertical curves, existing right-of-way widths, bridges, major culvert system, etc.

This section shall also include a narrative regarding the existing traffic control devices within or immediately adjacent to the study area limits including but not limited to stop-controlled intersections, traffic signals, posted and/or the 85th percentile speed, etc.

ii. Other Modes

If pedestrian and/or bicycle facilities are within the study area limits, this section shall include a narrative regarding them.

If transit services are within the study area limits, this section shall include a narrative regarding them.

iii. Traffic Volumes

Existing daily, morning and afternoon peak period should be documented in accordance with ITE’s Manual of Traffic Engineering Studies. Morning and afternoon peak period documentation alone in general are not sufficient for developments including non-residential development or for developments located adjacent to regional commercial or industrial zones given that the peak period may not coincide with the peak hour of the adjacent street.

iv. Level of Service

The existing level of service and roadway capacity shall be determined and presented within the study report. Levels of service and roadway capacity estimates shall be presented for the morning and afternoon peak period and that of the peak hour of the generator of the proposed development as determined by the author.

v. Safety

Traffic, pedestrian, and bicycle safety elements are of paramount concern given that such facilities may not be present within the study area or that the existing facilities are substandard. Field observations should be conducted to determine what, if any, safety elements are present within the study area and be documented within the report.

5.6.4.5 PROJECTED TRAFFIC

This section of the report shall contain detailed information regarding the projected
traffic resulting from the proposed development and that resulting from non-site traffic. The report’s Projected Traffic section shall contain at a minimum the following subsections:

i. **Site Traffic Forecasting**

   This section shall provide a detailed accounting of the base trip generation developed by the site. If the development is expected to be phased, then an accounting of each phase’s trip generation should be included.

   The trip generation rate(s) shall be taken from the ITE’s most recent edition of the *Trip Generation Manual* or other trip generation sources if approved by the County.

ii. **Non-Site Traffic Forecasting**

   Planned or partially constructed developments within the study area which do not contribute to existing traffic volumes shall be accounted for within the study and be documented. All necessary information shall be obtained from the adjacent development owner(s) directly.

iii. **Total Traffic Forecasting**

   This section should summarize the total traffic forecasted after development is completed.

---

### 5.6.4.6 TRAFFIC AND IMPROVEMENT ANALYSIS

This section of the report shall contain detailed information regarding the recommended traffic and roadway improvements required to mitigate future projected traffic congestion or safety issues to maintain the before condition Level of Service or the minimum standard of Level of Service C as determined by the County Engineer. The report’s Traffic and Improvement Analysis section shall contain at a minimum the following subsections:

i. **Site Access**

   This section shall provide a detailed accounting of the base trip generation developed by the site or when the development is expected to be phased then an accounting of each phase’s trip generation should be included.

ii. **Level of Service Analysis**

   This section shall provide a detailed analysis of the current level of service prior to the programmed improvements as well as phased and buildout conditions.

iii. **Roadway Improvements**

   This section shall provide a detailed accounting of the improvements
programmed by Coconino County or others to accommodate off-site traffic as well as additional programmed improvements to accommodate on-site traffic.

iv. Driveway Operation Analysis

This section shall provide information on the impact to driveway(s) and access to/from the proposed development.

v. Alternate Modes

This section shall provide information on the impact to other modes of transportation from the proposed site.

vi. Traffic Control Needs

This section shall provide a detailed accounting of the traffic control required.

vii. Traffic Sign Needs

This section shall provide a detailed accounting of the traffic signs required.

5.6.4.7 STUDY CONCLUSIONS

This section of the report should contain detailed information regarding the conclusions of the study.

5.6.4.8 STUDY RECOMMENDATIONS

This section of the report should contain detailed information regarding the recommendations of the study.

5.6.4.9 APPENDICES

Appendices shall be located in the back of the report. The following are some Appendices that shall be included, if applicable.

i. Existing Traffic Counts and Turning Movement Counts

ii. Capacity Analyses Worksheets (separate based on the following)

   Existing Conditions
   Background Conditions (for each Horizon Year)
   Background plus Adjacent Traffic (for each Horizon Year)
   Total Traffic (for each Horizon Year)

iii. Traffic Signal Needs/Warrants

iv. Accident Data and Summaries

v. Coconino County Meeting Minutes and Review Comments

5.6.4.10 EXHIBITS AND MAPS
Exhibits and Maps shall be located in the back of the report. The following are some Exhibits and Maps that shall be included, if applicable.

i. Vicinity Map  
ii. A Street Map  
iii. Site Layout Map  
iv. Existing Peak Hour Turning Volumes  
v. Estimated Site Traffic Generation  
vi. Directional Distribution of Site Traffic  
vii. Site Traffic Assignment  
viii. Projected Background Traffic  
ix. Adjacent Traffic  
x. Total Traffic  
xi. Future Traffic Assignment  
xii. Level of Service  
xiii. Recommended Improvements

5.6.4.11 TIA/TIS APPROVAL

The TIA/TIS shall be submitted to the Coconino County Community Development and Public Works Departments for approval. The County Engineer shall approve, comment on and return for update, or disapprove the TIA/TIS. A TIA/TIS is required based on Table 5-9 for zoning changes and conditional use permits. The TIA/TIS must be approved prior to going to the Planning and Zoning Commission.

An approved TIA/TIS shall be required prior to issuance of grading, building, and encroachment permits when a TIA/TIS is required by the project.

5.7 TRAFFIC ENGINEERING

5.7.1 Traffic Signals

Coconino County does not maintain any traffic signals. Any proposed development requiring signalization shall be coordinated with the County Engineer and be the maintenance responsibility of the developer, HOA or property owners. Refer to Section 5.6.2.9 for Traffic Signal Study requirements.

5.7.2 Street Lighting System

Coconino County generally does not maintain any street lights. Any proposed development requiring street lighting should be coordinated with the County Engineer and be the maintenance responsibility of the developer, HOA or property owners.

Lighting requirements within the County shall confirm to the Coconino County Lighting Ordinance (2001-19).

5.7.3 Traffic Control

Projects and public functions in a County right-of-way will require a written traffic control plan reviewed and accepted by the Community Development Department,
utilities, emergency services and other interested parties.

Traffic control plans shall conform to the following principles:

- The safety of the public and construction personnel takes precedence over all other considerations.
- Provision for access by emergency response vehicles must be in place at all times.
- Access to adjoining properties must be available at all times.
- Schools, hospitals, and other public service organizations must be made aware of the project and level and duration of impact prior to starting construction. Notification shall be the responsibility of the permittee.
- Traffic control shall utilize and conform to the Manual on Uniform Traffic Control Devices (MUTCD), published by the U.S. Department of Transportation, Federal Highway Administration and the project specifications (if any).

5.8 FIGURES
FIGURE 5-1  LOCAL STREET (URBAN) TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER CURB, GUTTER AND SIDEWALK.

FIGURE NO. 5-1
LOCAL STREET (URBAN) TYPICAL STREET SECTION
FIGURE 5-2  LOCAL STREET (RURAL) TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER SIDEWALK.

FIGURE NO. 5-2

LOCAL STREET (RURAL)
TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR TURN LANES, ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER CURB, GUTTER AND SIDEWALK.

FIGURE NO. 5-3

MINOR COLLECTOR (URBAN)
TYPICAL STREET SECTION
NOTES:
1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR TURN LANES, ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.
2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.
3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.
4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER SIDEWALK.

*4' FOR SPEEDS UP TO 35 MPH
5' FOR SPEEDS 40 MPH AND ABOVE

5" AC (2 LIFTS)
MAG SECT. 321

10" ABC
MAG SECT. 310

MINIMUM PAVEMENT
STRUCTURAL SECTION

FIGURE NO.
5-4

MINOR COLLECTOR (RURAL)
TYPICAL STREET SECTION

COCONINO COUNTY ARIZONA
FIGURE 5-5 MAJOR COLLECTOR (URBAN) TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR TURN LANES, ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER CURB, GUTTER AND SIDEWALK.
FIGURE 5-6  MAJOR COLLECTOR (RURAL) TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR TURN LANES, ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER SIDEWALK.

FIGURE NO.
5-6

MAJOR COLLECTOR (RURAL)
TYPICAL STREET SECTION
NOTES:

1. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED FOR TURN LANES, ON STREET PARKING, DRAINAGE, UTILITIES, SLOPES, TRAFFIC SIGNALS, IRRIGATION FACILITIES OR TRAILS.

2. DETACHED SIDEWALK PREFERRED UNLESS OTHERWISE APPROVED BY COUNTY ENGINEER.

3. PAVEMENT DESIGN TO BE BASED ON GEOTECHNICAL INVESTIGATION AS APPROVED BY THE COUNTY ENGINEER. HOWEVER, STRUCTURAL SECTIONS SHALL BE NO LESS THAN THE MINIMUMS SHOWN.

4. A MINIMUM OF 4" OF AB SHALL BE PLACED UNDER CURB, GUTTER AND SIDEWALK.

FIGURE NO.

5-7

ARterial
TYPICAL STREET SECTION

COCONINO COUNTY ARIZONA
LOT SPLIT
TYPICAL STREET SECTION

R/W

25'

C

25'

MAY BE WAIVED

6' 2' 10' 10' 2' 6'

3:1 (TYP)

4:1 (TYP)

4:1 (TYP)

3:1 (TYP)
FIGURE 5-9  TYPICAL CUL-DE-SAC (URBAN)
TYPICAL CUL-DE-SAC (URBAN)
FIGURE 5-10  TYPICAL CUL-DE-SAC (RURAL)
TYPICAL CUL-DE-SAC (RURAL)
FIGURE 5-11  HAMMERHEAD CUL-DE-SAC
THE DIMENSIONS ARE THE MINIMUM REQUIREMENTS. FINAL DIMENSIONS ARE DEPENDENT ON AN APPROVED TRAFFIC STUDY AND FIRE DEPARTMENT APPROVAL REQUIREMENTS.

1) ALL DIMENSIONS ARE TO THE FACE OF CURB

2) RADIUS FOR FIRE LANE PER AASHTO DETAIL SU-40

HAMMERHEAD CUL-DE-SAC
6.0 LANDSCAPING AND IRRIGATION

6.1 GENERAL INFORMATION

The purpose of this section is to establish landscaping standards and guidelines in order to maintain and enhance the environmental qualities of the County; to mitigate the impacts of adjacent uses; and to enhance the quality and appearance of new or existing development in the County. By requiring adequate and environmentally compatible landscaping, the visual quality of the environment will be enhanced, and other environmental qualities will be improved by promoting conservation of water used for landscaping, addressing wildfire safety concerns, providing erosion and storm water runoff control, providing control of Noxious Weeds and invasive plants, requiring native and/or drought tolerant plants, and encouraging the preservation of existing trees and vegetation.

6.2 COUNTY CODE, ORDINANCES AND STANDARDS

Refer to Zoning Ordinance for additional Coconino County landscaping policies and definitions.

Refer to the Coconino County Seeding Standards for materials and methods required by the County.

In the event of conflict between the regulations set forth in this section and any other regulations applicable to the same area, the more stringent requirement shall govern.

6.3 LANDSCAPE AND IRRIGATION PLAN REQUIREMENTS

An approved landscape plan is required prior to any site clearing for any use other than a single-family residential lot. A landscape plan designed in accordance with this section shall be provided for all new development and redevelopment, except for single family residential. The landscape plan shall be prepared by a landscape architect, a professional landscape designer, or a plant nursery.

Landscape plans shall include the following:

1. A site plan drawn to scale providing sufficient detail to evaluate the features of landscaping and irrigation required by this Section. The site plan shall show the location of property lines, proposed contours, drainage structures, subsurface utilities, existing and proposed development including all buildings, parking, pedestrian, and circulation areas. If phased development is proposed, the phasing plan shall be identified. The plan shall show the location of all proposed landscaped areas, and the dimensions and total area (in square feet) for each interior parking lot landscaped area.

2. The location, design and materials of all landscape areas including planting strips along all streets, earth berms, retaining walls, fences, water features, detention areas, trash enclosures, lighting, and paved areas. Where fencing
is used for required screening, a scaled elevation drawing of the fence must be included.

3. The location, size, and type of all proposed plant and non-plant materials, including any existing vegetation to be retained and existing trees over 6” caliper proposed to be removed.

4. A chart comparing the landscaping requirements to the proposed materials and area covered, including, but not limited to, the following information:
   a. Total parking lot and circulation areas, including interior drives and driveways (in square feet);
   b. Total number of parking stalls required and total provided;
   c. Total parking lot landscaped area required and total provided (in square feet);
   d. Total buffer and screen landscaped area required and total provided (in square feet);
   e. Total site landscaped area required and total provided (in square feet);
   f. Total quantity and size of plant material required and the total provided;
   g. Size, type, and quantity of non-plant material to be provided;
   h. Any other information as the Community Development Director may determine is necessary to ensure compliance with the Standards.

5. All landscape plans must provide an irrigation plan. Irrigation systems shall be designed to maximize efficient water use and minimize the waste of water. An automatic irrigation system designed to provide efficient irrigation coverage is required.
   a. The irrigation system should be designed to correlate to the organization of plants into zones with similar watering requirements.
   b. The use of treated effluent, a collection system to capture stormwater runoff, and other alternatives for irrigation purposes are encouraged.
   c. A waiver from the automatic irrigation system requirement may be approved by the Director of Community Development. If an alternative means of watering is proposed a specific plan must be provided.

6.4 LANDSCAPE AND IRRIGATION DESIGN

Landscape design within the County right-of-way should take the following into consideration:

1. Plants should be grouped in strategic areas and not spread thinly around the
site.

2. Trees must be planted to allow for maximum growth in height and shape without the need for pruning in excess of that required to maintain the health of the plant.

3. New vegetation shall be selected, planted, and maintained so that at maturity it will not interfere with utility lines, snow storage areas, vehicular parking, pedestrian circulation, traffic sight visibility at driveways and Street intersections, and will not cause damage and upheaval of sidewalks and pavement.

4. All landscape designs shall take into consideration the need for Defensible Space.

5. All landscaped areas shall incorporate a ground cover to tie the landscaping together and to discourage weed growth.

6. A mix of deciduous and evergreen plant materials is desired. Invasive species should not be considered.

7. A clear sight triangle shall be maintained at all street intersections and driveway entrances. Such clear sight triangle shall be determined by measuring 25’ along each right-of-way/easement line at street intersections, and along the right-of-way/easement line and the driveway for driveway entrances. Landscape materials in this area shall have a clear trunk height of six (6) feet from grade level; mature shrubs, groundcover, or other materials shall not exceed three (3) feet in height from grade level.

8. Trees shall be located away from underground utilities to avoid conflict with mature tree roots. A root barrier or other method is an acceptable means to avoid conflict.

If the Community Development Director determines that the proposed Landscaping does not comply with this Standard, the plan will not be approved.

6.4.1 Site Landscaping

Refer to Coconino County Zoning Ordinance for requirements pertaining to site landscaping. These include buffer and screen landscaping, parking lot landscaping and building site requirements.

6.4.2 Preservation of Existing Vegetation

The preservation of healthy existing trees and shrubs shall be provided wherever possible. These trees and shrubs must be shown on the landscape plan and labeled as “existing to be protected in place.” They must also be listed on the plant list with their current size shown.

All landscape plans must identify methods for protecting existing vegetation that will remain. Construction materials and debris may not be stockpiled within 1 ½
times the drip line perimeter outside the drip line of all trees and shrubs being retained. This protection area must be clearly marked with temporary fencing or similar material.
Attachments

The following attachments are the most current at the time of publication. For the latest versions of the Guidance Flowchart, Waiver Request Form and Record Drawings Checklist, please visit the County’s website.
Guidance Flowchart for

Applicability of Coconino County Engineering Design and Construction Manual

Residential Construction (fewer than 6 homes)?

Commercial or Industrial Development?

Residential Subdivision (6 or more homes)?

Engineered Plans not required

Do the proposed improvements avoid modifications to existing drainage courses?

Yes

Is the grading (cut or fill) 50 CY or less?

Yes

Do the grading cuts meet the following:
- Less than two (2) feet in depth?
- Five (5) feet or less with slopes flatter than 1-1/2:1?

No

Do the grading fills meet the following:
- Less than 1 foot deep on natural terrain with a flatter slope than 5:1?
- Less than 3 feet in depth and not intended to support structures?

No

Is all of the property outside of the 100-year floodplain?

Yes

Are all retaining walls less than four (4) feet high and not have surcharge loading from structures or vehicles?

No

Is existing adjoining street adequately improved?

Yes

Are existing sewer, water, and storm drain facilities adequate?

Yes

Engineered Plans Required in accordance with Coconino County Engineering Design and Construction Manual

No
Waiver Request Form
The intent of this form is to provide guidance for deviations from the approved Engineering Design and Construction Manual. Specifically, this outline details the three waiver types (Administrative, Technical and Design) and the respective fees for each type of request, accompanying timelines, the decision appeal process, acceptable justification for a waiver, as well as specific examples of types of waivers. The fees shown below cover the County staff time to administrate the application. All fees are non-refundable regardless of whether the County approves the waiver request. All engineering analysis is required to be sealed by a Professional Engineer in good standing in the State of Arizona.

The following is required to be submitted with Waiver Request Form:

- Fees associated with the application.
  - Administrative Waiver ($100)
  - Technical Waiver ($250)
  - Design Waiver ($450)

- Completed and signed Waiver Request Form.
  County staff will determine if the Waiver Request Form is Technically Complete. If so, a notice of Technical Completion and a receipt for the filing fee will be sent to the applicant within fifteen (15) days of submittal of the form. Also, if the form is deemed to not be Technically Complete, the applicant will receive notice within fifteen (15) days of submittal of the form.

  2 copies of the following:

- Narrative describing the project as well as the proposed deviation submitted with the Waiver Request Form. The narrative shall include the following:
  a. Section of Coconino County Engineering Design and Construction Manual and/or the Technical Specification or Standard Detail which relates to the proposed deviation.
  b. Justification for the proposed deviation - A detailed explanation stating the extraordinary factors that does not allow for the strict adherence to the County standard(s) or code justifying approval according to the Approval Criteria (See Page 4).
  c. Any additional documentation and background information that is required to support the request.

- Engineering Analysis including supporting documentation, (i.e., traffic studies, structural analysis, hydraulic and hydrologic assessment, water and sewer reports, typical sections, alternative designs, etc.) for technical or design waivers.

Forms without the required information will not be accepted. If you have questions regarding submittal requirements you may call the Community Development Engineering Team at (602) 679-8850.
Classification
(please check the appropriate box)

☐ **Administrative Waiver**

Minor deviations a) do not involve safety or offsite impacts, b) involve minimal review, c) do not involve broad public interest, d) are similar to other approved modifications, and e) occur routinely.

Examples of Administrative Waiver include:

- Minor access spacing changes when no alternative is feasible
- A minor increase in the maximum number of lots served by driveways
- Reduced cross sectional requirements, in order to match existing roadway and curbs

A filing fee in the amount of: $100.00

☐ **Technical Waiver**

Moderate deviations a) require limited engineering analysis and County review, b) have minimal expected safety impacts, c) have minimal potential offsite impacts, and d) generate minimal public interest.

Examples of a Technical Waiver include:

- Use of attached sidewalk in lieu of detached sidewalks based on site conditions
- Use of roll curb and gutter in lieu of vertical curb and gutter
- Removal of on-street parking
- Modification to medians, access locations or lane channelization when no offsite impacts result

A filing fee in the amount of: $250.00

☐ **Design Waiver**

Major deviation are unique cases that have the potential for significant impacts to the public or County and require extensive analysis and documentation.

Examples of a Design Waiver include:

- Alternative roadway pavement design
- Reduced left turn or right turn pocket storage
- Cross circulation or roadway spacing changes when the obligation may be passed on to other properties
- Design changes concerning traffic or pedestrian safety
- Access changes with potential material impacts to other parties
- Pre-development versus post-development detention or retention requirements

A filing fee in the amount of: $450.00
The initial ruling will be made by the Community Development Engineering Supervisor. The initial ruling will include a verification that the applicant has appropriately classified the waiver type (i.e. Administrative, Technical, or Design). Appeals can be made to County Engineer by including a copy of the waiver request and all supporting documents and calculations, along with a letter describing in detail the reasons for the appeal.

Failure to comply with the approved or conditionally approved waiver will be cause for

1. Denial or revocation of engineering plan approvals and permits.
2. Withholding or release of financial assurances.
3. Removal and reconstruction.
4. Delay of final inspection.
5. Delay or denial of final approval.
6. Denial of occupancy certificates (temporary and permanent).
7. Notice to surety or other financial institution and/or legal action for forfeiture of financial assurances.
9. Any other applicable penalties as provided by law.
Approval Criteria
(for County use)

In reviewing a Waiver request, the County shall consider the applicable factors that include, but are not limited to, the following:

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All circumstances of the situation will be considered.
Record Drawings Checklist
RECORD DRAWINGS
CHECKLIST for Civil Improvements
for
Coconino County
August 2021

Project Name: ________________________________

Project No.: ________________________________

Date: ________________________________

All items listed below shall be provided on Record Drawings unless identified with N/A.

General (applies to entire plan set)

_____ Record Drawings plan set shall contain all improvement plan sheets from the approved design/construction plan set (cover sheet to last sheet including details). The Record Drawings shall contain all horizontal and vertical design information, sizes, thicknesses, and material types of improvements shown on the design/construction plan set (even if unchanged during construction). Include supplemental sheets for exhibits, ESIs, etc. issued during construction, as appropriate.

_____ All plan sheets shall be certified and sealed by a Professional Engineer or Registered Land Surveyor with knowledge of practice in the field of practice for the elements they are certifying. Refer to Arizona Revised Statute 32-152.

_____ If the entity preparing the record drawings is different from the Design Engineer / Firm, provide contact info on cover sheet.

_____ Place “Record Drawing” lettering and date in lower right-hand corner of all sheets.

_____ Improvements deleted in the field shall be crossed out with an “x” and labeled “not built”.

_____ Major Improvements changed from the approved design plans shall be reflected and clearly called out by “clouding”.

_____ Plan sheets that represent improvements that were not changed from the approved design plans shall have “Per Plan” indicated clearly for the elements that were actually constructed without variance from the original design plans.

_____ All elevations shall be based on the same benchmark as the project plans.

Sanitary Sewer Plans

_____ Sanitary Sewer improvements built exactly per design plan shall have the elevations/stations/locations identified as constructed “per plan”. As built improvements which vary from the original design information on the plans shall be marked “AB”. 
Stations and offsets for all services and lateral stub-outs (station and invert elevation)

Manhole stations, cleanout stations, pipe invert elevations (in and out) and manhole rim elevations shall be determined by field surveying.

Pipe lengths and diameters indicated on both plan and profile.

Recalculate longitudinal pipe slopes for all pipe segments.

Stations and length of pipe encasements/extra protection.

Utilities discovered during construction including type, size, station, offset & elevation.

Lift Station, force mains, sewage valves, air valves, etc. locations and details.

**Water Plans**

Water system improvements built exactly per design plan shall have the elevations/stations/locations identified as constructed “per plan”. As built improvements which vary from the original design information on the plans shall be marked “AB”.

Stations and offsets of all water services including landscape and fire lines.

Stations and offsets of all fire hydrants.

Stations and offsets of all valve boxes, blow-offs, reducers, and air release valves.

Stations and offsets of all bends, tees, and dimensions and type of joint restraints.

Profile view of all pipeline vertical alignments, including stations of all fittings, depth to finish grade, and pipe separation dimensions.

Stations and length of pipe encasements/extra protection.

Utilities discovered during construction including type, size, station, offset & elevation.

Booster station details, tank details, control valve details, system logic and/or SCADA details

Verification that water services are live to the property line (i.e., the corp stop at the waterline main is open)

**Grading and Drainage Plans**

Grading and Drainage improvements built exactly per design plan shall have the elevations/stations/locations identified as constructed “per plan”. As built improvements which vary from the original design information on the plans shall be marked “AB”.

Stations, offsets, inverts for storm sewer pipes at inlets, outlets and manholes shall be determined by field surveying.

Recalculate longitudinal pipe slopes for all pipe segments.

Flow line slopes and elevations.

Stations and offsets, Culvert lengths, headwalls, slopes and pipe size and material.

Channel lengths, stations, locations, slopes, cross sections and materials.

Constructed and design Storage volumes for detention/retention facilities.
Building pad elevations, swales, berms, slopes and footing and top of retaining walls.

Details and Inverts of outlet structure(s), headwalls and weir elevation(s).

Location and depth of underdrain system and cleanouts and pond liners, as applicable.

Cut and Fill, import and export volumes.

Areas of non-engineered fill placement

**Street/Trail Plans**

Street/Trail projects built exactly per design plan shall have the elevations/stations/locations identified as constructed “per plan”. As built improvements which vary from the original design information on the plans shall be marked “AB”.

Stations and offsets of all survey monuments.

Location and area/limits of geogrid, chemical stabilization, interlayers or other pavement enhancements.

Location and approximate area of unsuitable material removal and replacement.

Sleeve/conduit/casing types, sizes, locations and stations.

Centerline, edge of pavement (or top of curb), Vertical and horizontal curve data.

Stations, offsets, and elevations of all curb angle points and curb return radii.

Stations, offsets, bottom elevation and wing dimension of all catch basins.

**Streetlights and Traffic Signal Plans**

Locations of all street illumination lights.

Locations of all traffic signal poles, cabinets, J-boxes and related conduits.

Abandonment of existing conduits and facilities.

**Miscellaneous**

Unforeseen underground structures exposed during construction such as vaults, pipes or culverts.

Dry utilities and/or their conduits with depth and location based on surveyed positions or swing ties (2 minimum) to permanent structures or other acceptable method of measurement.

Verification that gas services are live to the property line (i.e., the corp stop at the gas main is open)