



Welcome to the Town of Marana!

Below you will find the checklists compiled by Marana Water for use by design engineers involved with the preparation of water improvement plans for the Town. Use of the following checklists will expedite and simplify the review process. If you have any questions please contact Marana Water using the contact information below. We look forward to working with you!

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Sewer Improvement Plan Checklist

APPLICABLE REFERENCES FOR PUBLIC SEWER DESIGN AND CONSTRUCTION:

- <http://www.maranaaz.gov/water-plan-requirements>
- <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=57385>
- www.pima.gov/wastewaterreclamation

1. Arizona Administrative Code, Title 18, Chapters 5 and 9
2. Pima County Code of Ordinances, Title 13 - Public Services, Division II – Sewers
3. Pima County Preliminary Sewer layout Requirements, March 1984 (Revised April, 1988)
4. Pima County Engineering Design Standards (latest current edition)
5. Pima County Standard Specifications and Details for Construction (latest current edition)
6. Pima County Public Sewer Formatting Standards as modified in the checklist below
7. Town of Marana *General Notes and Standard Details* sheet found at the Marana Water webpage:
<https://static1.squarespace.com/static/54cc191ce4b0f886f4762582/t/5b843a84575d1f8154ce0a87/1535392394543/Sewer+Detail+and+General+Notes%2C+June+2018.pdf>
8. No hatching or pattern such as pavement, sidewalk, buildings, etc. is allowed.
9. No contour line (proposed or existing) is allowed.

Note: All items on this checklist must be addressed. Items not addressed will result in a review comment. This checklist does not have to be submitted with the plans for review.

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| I. | All Sheets |
| 1. | The designer shall use good engineering judgment by following engineering standards of practice, and rely on appropriate engineering methods, calculations, and guidance. (Ref. 1, R-18-9-E301(4.01)(C)(7)) |
| 2. | Plans shall be of construction quality drawings that provide overall details of the site and engineered works comprising the project including: (Ref. 1, R-18-9-E301(4.01)(C)(4)) |
| 3. | All construction plans shall be drawn on 24" x 36" sheets with clear and readable print, with a quality to produce legible electronic and microfiche copy. (Ref. 6, Sect. 1-1,1) |
| 4. | Title blocks shall contain the project title, lot numbers to be served and for single parcels, provide address or the Assessor's Tax ID. Include sheet numbers. (Ref. 6, Sect. 1-1,2) |
| 5. | Engineering Firm's name, address, and phone number. (Ref 6, Sect. 1-1,3) |
| 6. | The plan number S-20XX-XXX and ENG20XX-XXX (Ref. 6, Sect. 1-1,4) |
| 7. | Plans shall be sealed by an Arizona Licensed Professional Engineer in accordance with Arizona Board of Technical Registration Rules. (Ref. 6, Sect. 1-1,5) |
| 8. | Include a Revision Block. (Ref. 6, Sect. 1-1,6) |
| 9. | Manhole numbers shall start from the most downstream manhole and increase upstream; (Ref. 6, Sect. 1-1,7) |
| 10. | Add Arizona 811 Logo. (Ref. 6, Sect. 1-1,8) |
| 11. | North arrow shall be provided on all maps and plan views, preferably on the upper right corner of the plan view. (Ref. 6, Sect. 1-1,9), including numeric and bar scale |
| II. | Cover Sheet |
| 1. | Project Title to include the words "Public Sewer Improvement Plan," followed by the project name, the specific lots to be served, address or parcel ID if not a recorded subdivision, and the subdivision name (recording information or blank line if not recorded). If the sewer plan is only for offsite sewers include the word "offsite" in the project title. (Ref 6, Sect. 1-2,1) |



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| 2. | A location map at a scale of 3"=1 mile with proposed development highlighted, adjacent platted subdivisions called out, major street intersections and section(s), township(s) and range(s) noted;(Ref. 6, Sect. 1-2,2) |
| 3. | Overall Map (Key Map): |
| | a. Should be scaled appropriately to clearly depict the entire project including on-site and adjacent rights-of-way, easements, final street names, and lot numbers; |
| | b. At a minimum, show the location of the sewer lines and manholes with numbers; |
| | c. Sheet number call outs shall be shown; |
| | d. Shall be consistent with the most recently approved Tentative Plat, Final Plat, Development Plan, or Preliminary Sewer layout; |
| | e. For off-site public sewer easements provide adjacent property tax ID; |
| | f. Define the status of the downstream public sewer as being proposed or existing; and |
| | g. If downstream public sewer is "proposed", add a note addressing status of downstream sewer in relation to construction and release of proposed sewer. (Ref. 6, Sect. 1-2,3) |
| 4. | Identify and describe the basis and record of bearing (horizontal control). (Ref. 6, Sect. 1-2,4) |
| 5. | Identify and describe the benchmark elevation (vertical control). Elevations shall be NAVD 88 datum. For future phases of existing master planned communities having significant planning and design efforts established in NGVD 29 or other datum, the established datum may be allowed on a case-by-case basis. In these cases, a conversion equation from the established datum to NAVD 88 datum shall also be provided, preferably on every sheet. (Ref. 6, Sect. 1-2,4) |
| 6. | Lots requiring backwater valves shall be shown on Overall Map or on a list. (Ref. 6, Sect. 1-2,5) |
| 7. | Reference projects by the lower right corner of the page including but not limited to Preliminary Sewer Layout, Tentative Plat, and Final Plat. (Ref. 6, Sect. 1-2,7) |
| 8. | Include a "Sheet Index" containing sheet numbers and corresponding sheet subtitles used in the plans. (Ref. 6, Sect. 1-2,8A) |
| 9. | As-built certification statement as shown: (Ref. 6, Sect. 1-2,9) AS-BUILT CERTIFICATION: I HEREBY CERTIFY THAT THE "AS-BUILT" ANNOTATIONS PROVIDED ON THIS DRAWING WERE BASED ON AS-BUILT SURVEY CONDUCTED UNDER MY SUPERVISION AND ACCURATELY DEPICTS EXISTING FIELD CONDITIONS TO THE BEST OF MY KNOWLEDGE AND BELIEF. <hr/> REGISTERED LAND SURVEYOR OR CIVIL ENGINEER DATE <hr/> REGISTRATION NUMBER EXPIRES |
| 10. | Include the owner/developer's name, address, phone number, and e-mail address. (Ref. 6, Sect. 1-2,10) |
| 11. | Locate the Sewer Plan number S-20##-### in the lower right-hand corner of the sheet |
| 12. | Include a table of quantities for all pipe sizes, materials, and new manholes (services not included). |
| III. | Legend and General Note Sheet |
| 1. | The legend is a list containing symbols and corresponding features used on the plans, and shall include: |
| | a. All symbols used on the plans for this project |
| | b. Use only symbols that are in the Legend section |



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| | c. Do not include symbols that are not applicable to the project. (Ref. 6, Sect. 1-3,1 and Exhibit #3) |
| 2. | General Sewer Notes for subdivisions and development projects can be found on Pima County Regional Wastewater Reclamation Department's website. (Ref. 6, Sect. 1-3,2) |
| IV. | Plan and Profile Sheets |
| | Plan views shall contain the following: |
| 1. | Existing sewer pipe size, material, and plan number. (Ref. 6, Sect. 1-4,1A) |
| 2. | Adjacent right-of-ways. (Ref. 6, Sect. 1-4,1B) |
| 3. | New and existing sewer directional flow arrows. (Ref. 6, Sect. 1-4,1C) |
| 4. | Within a right-of-way, the sewer alignment shall be described using bearings, coordinates, and/or calculated stationing in combination with calculated right angle dimensional ties to the street construction line. (Ref. 6, Sect. 1-4,1D) |
| 5. | Dimensions from section lines, survey control lines, property lines and/or easement boundaries to all new sewers to the nearest tenth of a foot. (Ref. 6, Sect. 1-4,1E) |
| 6. | Stationing shall begin at a known permanent point such as street monument or property pin. (Ref. 5, Subsection 3.2.3A.ii) |
| 7. | Station equations when manholes are shown in different stationing alignments. (Ref. 6, Sect. 1-4,1G) |
| 8. | Dimension new manholes constructed over existing sewer lines to downstream and upstream manholes. (Ref. 6, Sect. 1-4,1H) |
| 9. | Show and label all new and existing service laterals (HCS/BCS). Locate all laterals by stationing or dimensioning to the nearest property corner to the nearest foot. Location information may be shown on the plan view or provided in a data table on the sewer plan sheet. (Ref. 6, Sect. 1-4,1I) |
| 10. | New manhole numbers. (Ref. 6, Sect. 1-4,1J) |
| 11. | Existing manhole IMS numbers. (Ref. 6, Sect. 1-4,1K) |
| 12. | Show all existing and proposed structures over, under, or near public sewers. (Ref. 6, Sect. 1-4,1L) |
| 13. | All existing utilities. (Ref. 6, Sect. 1-4,1M) |
| 14. | All new utilities, including water, and drainage improvements. (Ref. 6, Sect. 1-4,1N) |
| 15. | Dimension horizontal separation between sewer and water to the nearest tenth of a foot. (Ref. 6, Sect. 1-4,1O) |
| 16. | Coordinates and/or bearings and distances will be utilized to define the horizontal position of the proposed main line sewer in all instances except when the main is located within a public right-of-way. (Ref. 6, Sect. 1-4,1P) |
| 17. | Existing contours for unpaved areas must be labeled adequately. (Ref. 6, Sect. 1-4,1Q) |
| 18. | Drainage flow arrows. (Ref. 6, Sect. 1-4,1R) |
| 19. | Call-out the typical street/roadway cross section detail on every plan sheet. (Ref. 6, Sect. 1-4,1S) |
| 20. | Show all areas of pavement replacement according to the Standard Details of the applicable agency or jurisdiction. (Ref. 6, Sect. 1-4,1T) |
| 21. | Indicate horizontal and vertical scales. Include contour interval if applicable. (Ref. 6, Sect. 1-4,1U) |
| 22. | Show existing onsite and adjacent sewers labeled with Pima County plan number and size. Include a minimum of two adjacent existing manholes labeled with the full 6-digit Pima County manhole number. (Ref. 4, Subsection 4.2) |
| 23. | Ensure manholes are appropriately placed. (Ref. 4, Subsections 5.2.1 and 5.2.4) |
| 24. | Verify manhole spacing conforms to maximum spacing shown in Table 5.2. (Ref. 4, Subsection 5.2.2) |
| 25. | Separation of manholes from pavement items (e.g., curbs and gutters, survey monuments, and speed bumps). (Ref. 4, Subsection 5.2.3) |
| 26. | Manholes located in the vicinity of drainage features require Special Approval. (Ref. 4, Subsection 5.2.4) |
| 27. | Deflection angles at manholes to conform to RWRD requirements included in Table 5.3 (< 90° for 8-inch to 10-inch pipe, and < 60° for pipes larger than 12-inches). (Ref. 4, Subsection 5.2.6) |



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| 28. | Manhole diameters shall conform to RWRD requirements shown in Table 5.4. (Ref. 4, Subsection 5.2.7) |
| 29. | Show all new and existing easements, include record information. (Ref. 4, Section 7) |
| 30. | Sewer mains shall not be designed through drainage basins or within grading side slopes. |
| | Profile views shall contain the following: |
| 1. | New sewer pipe diameters. (Ref. 6, Sect. 1-4,2A) |
| 2. | New sewer pipe material. (Ref. 6, Sect. 1-4,2B) |
| 3. | New sewer true pipe length, measured from the inside walls of adjacent manholes to the nearest hundredth of a foot. (Ref. 6, Sect. 1-4,2C) |
| 4. | New sewer true pipe slope, measured from the inside walls of adjacent manholes to the nearest hundredth of a percent. (Ref. 6, Sect. 1-4,2D) |
| 5. | New manhole numbers. (Ref. 6, Sect. 1-4,2E) |
| 6. | Label on top of the pipe, each sewer reach with pipe diameter, material and length measured between center of MHs (to nearest hundredth of a foot). Also, below the pipe and in parenthesis, show the pipe length measured from the inside face of the opposing four foot (4') diameter manholes and calculated slope using this pipe length. For example: Length Distance= 350.00 ft (Pipe Length = 346.00 ft, 8" PVC @ S = 1.00%). (Ref. 4, Subsection 5.1.3B) and (Ref. 6, Sects. 1-4,2C and 1-4,2D) |
| 7. | Existing manhole IMS numbers. (Ref. 6, Sect. 1-4,2F) |
| 8. | New manhole rim elevations to the nearest hundredth of a foot, show the elevation on top of the manholes. (Ref. 6, Sect. 1-4,2G) |
| 9. | New and existing manhole inverts to the nearest hundredth of a foot, show elevation at the base of the manholes. (Ref. 6, Sect. 1-4,2H) |
| 10. | Identify the invert direction if there is more than one invert per manhole. (Ref. 6, Sect. 1-4,2I) |
| 11. | Show station and elevation of existing and proposed structures over, under, or near public sewers. (Ref. 6, Sect. 1-4,2J) |
| 12. | All existing utilities and include sizes. (Ref. 6, Sect. 1-4,2K) |
| 13. | All new water and drainage improvements. Dimension vertical separation between sewer and water (outside diameters) to the nearest tenth of a foot. (Ref. 6, Sect. 1-4,2L) |
| 14. | Finished and existing profile grade along sewer alignment. (Ref. 6, Sect. 1-4,2M) |
| 15. | Show and station each appurtenance relevant to the sewer system. (Ref. 6, Sect. 1-4,2N) |
| 16. | Drainage Q100, velocity, total scour and water surface elevation (text and graphically) within unpaved areas. (Ref. 4, Appendix A) and (Ref. 6, Sect. 1-4,2O) |
| 17. | Show location and method of connection to existing public sewer. Identify the point of connection to existing downstream manhole number, invert elevation, plan number, northing and easting coordinates, and block out alignment. Invert elevations of existing manholes shall be from current survey information, referenced to the project basis of elevation. (Ref. 6, Sect. 1-4,4) |
| 18. | Sewer plans must include HCS/BCS and Manhole Tables and the distance from the downstream public manhole for each private sewer lateral along the length of the public sewer. (Ref. 6, Sect. 1-4,5 and Exhibit #5) |
| 19. | Where adjacent drainage ways or washes are in possible conflict with, or could have a future negative impact upon the proposed sewer line, special details such as enlarged profiles, plotting the flow line invert elevation of the adjacent wash on the sewer design profile or related cross sections may be required on the construction plans by the reviewing agency. Attention must be given to local run-off conditions where flood damage to the line may occur, or where run-off may be diverted onto contiguous private property. (Ref. 6, Sect. 1-4,6) |
| 20. | Provide flood prone/erosion hazard setback limits in unpaved areas requiring all weather access. (Ref. 6, Sect. 1-4,7) |
| 21. | If sewer plans include both public and private sewers, label sewers as public or private. (Ref. 6, Sect. 1-4,8) |



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| 22. | Ensure that the lots and numbering are consistent with the cover sheet. (Ref. 6, Sect. 1-4,9) |
| 23. | Show match lines and stationing as needed for information that continues onto another sheet. (Ref. 6, Sect. 1-4,10) |
| 24. | Provide as-built manhole and HCS tables on plan & profile sheets, separate sewer detail sheet, or cover page. Tables shall be left blank and completed during preparation of the as-built plans. (Ref. 6, Sect. 1-4,11 and Exhibit #5) |
| 25. | Label existing sewer lines and force mains with the Department's plan tracking number (S-20##-###), pipe diameter, pipe material, and direction of flow. (Ref. 4, Subsection 4.2) |
| 26. | Design sewer lines to avoid a slope that creates a sewage velocity greater than 10 feet per second. Special provisions shall be considered to protect sanitary sewer system. (Ref. 4, Subsection 5.1.3) |
| 27. | Verify all slopes are accurate to 0.01% and conform to the minimum design slopes. (Ref. 4, Subsection 5.1.3C and Table 5.1) |
| 28. | Verify manhole drops conform to Table 5.5. (Ref. 4, Subsection 5.2.9) |
| 29. | Verify that all terminal 8-inch sewer reaches have a minimum slope of 1.00%. (Ref. 4, Subsection 5.1.3C and Table 5.1) |
| 30. | Verify a minimum cover of 4 feet (3 feet for DIP). (Ref. 4, Subsection 5.1.7) |
| 31. | Match top of pipe (crown) elevations on pipe size changes (minimum required manhole invert drops shall be met). (Ref. 4, Subsection 5.2.9) |
| 32. | Provide coupling for unlike pipe materials. (Ref. 5, S.D. RWRD-103) |
| 33. | Dimension sewer separation at the crossing of utilities and at drainage structure that may affect construction. (Ref. 4, Subsections 5.1.9 and 5.1.10) |
| 34. | Show invert/top elevations for both, water AND sewer at ALL water/sewer crossings and dimension the pipes separation. (Ref. 5, S.D. RWRD-108) |
| 35. | For sewer lines crossing under water lines, verify all water/sewer crossings have vertical clearance of no less than 2.00 feet. If not, use alternate material as accepted by PDEQ and Town of Marana. DIP no longer accepted. (Ref. 5, S.D. RWRD-108) |
| 36. | For sewer lines crossing over water lines, verify sewer is DIP and a minimum 2.00 feet vertical clearance is provided. (Ref. 5, S.D. RWRD-108) |
| V. | Manholes |
| 1. | Whenever possible, manholes should be located within the paved area of a Right-of-Way or within a Public Sewer easement. (Ref. 4, Subsection 5.2.1) |
| 2. | Verify watertight manhole frames and covers are provided. (Ref. 4, Subsection 5.2.13) |
| 3. | The placement of manholes in sidewalks, crosswalks, bike trails, wash crossings, back or side yards, behind walls, curb or gutters shall be avoided. (Ref. 4, Subsection 5.2.1) |
| 4. | Verify future connections into manholes, provide a block-out (Public stub-outs are not allowed). (Ref. 4, Subsection 5.2.10) and (Ref. 5, S.D. RWRD-203) |
| 5. | Concrete collars shall be provided where manholes are located in unpaved areas. (Ref. 4, Subsection 5.2.12) and (Ref. 5, S.D. RWRD 212) |
| 6. | PVC, Polymer, or other corrosion-proof manholes shall be required for new manholes in the following conditions: |
| | a. Manholes with pipe diameters of 12-inches and greater |
| | b. Manholes within 200 feet of a manhole with pipe diameters 12-inches and greater |
| | c. Force main discharge manhole |
| | d. Manhole receiving flow from a sewer line with slope greater than 10.00%. (Ref. 4, Subsection 5.2.16) |
| 7. | Split flow dry manhole is strictly forbidden. |



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| VI. | Service Laterals (HCS/BCS) |
| 1. | Ensure no HCS/BCS connections into a manhole unless the manhole is in a cul-de-sac or adjacent to another terminal MH with no possibility of future extension. (Ref. 4, Subsection 5.3.2) and (Ref. 5, S.D. RWRD-402) |
| 2. | 6-inch or larger HCS/BCS must connect to public sewer at an existing or new manhole unless Special Approval is obtained from the Director or his/her delegate, on a case by case basis. (Ref. 4, Subsection 5.3.2) |
| 3. | A manhole shall be required where a service lateral must connect to a 15-inch or greater diameter public sewer line unless Special Approval is obtained. (Ref. 4, Subsection 5.3.4) |
| 4. | Clearly identify by symbol the private backwater valves required for any service laterals. (Ref. 4, Subsection 5.3.6) and (Ref. 6, Exhibit #3) |
| VII. | Potential Conflicts |
| 1. | Verify that all parallel sewer and water lines are horizontally separated by at least 6 feet or the sewer main shall be constructed of DIP. (Ref. 5, S.D. RWRD-108) |
| 2. | Verify 6 feet minimum clearance is provided between water lines and center of manholes. (Ref. 4, Subsection 5.1.8) and (Ref. 5, S.D. RWRD-108) |
| VIII. | Dedicated Sewer Easements and Accessibility |
| | Note: "Easements" are replaced with the term "Lease" on state land and "Use Agreement" on tribal land. |
| 1. | Verify that all sewers are within a public Right-of-Way or Public Sewer Easement. (Ref. 2, Subsection 13.20.030 A.1) and (Ref. 4, Subsection 5.1.1) |
| 2. | Show and call out stabilized surface to each public sewer manhole. (Ref. 5, S.D. RWRD-111) |
| 3. | Verify conformance to the minimum width of each public sewer easement. (Ref. 4, Subsection 7.1) |
| 4. | Verify the inner and outer return radii for all turns are at least 35 feet and 55 feet respectively (including turnarounds for one-way access). (Ref. 4, Subsection 7.1) and (Ref. 5, S.D. RWRD-109) |
| 5. | Label public sewer easements granted by final plat as "XX' PUBLIC SEWER EASEMENT BY FINAL PLAT, RECORDED IN SEQ. # _____". (Ref. 4, Subsection 7.2) |
| 6. | Label existing easements NOT granted by final plat: "EXISTING XX' PUBLIC SEWER EASEMENT DKT XX, PG XXX" or "SEQUENCE #". (Ref. 4, Subsection 7.2) |
| 7. | Label new easements NOT granted by final plat: "PROPOSED XX' PUBLIC SEWER EASEMENT BY SEPARATE INSTRUMENT. "SEQUENCE #", the easement shall be recorded and the Sequence # included before approval of the Sewer Improvement Plan. (Ref. 4, Subsection 7.2) |
| 8. | For easements dedicated by separate instrument: Include with the submittal the legal description of the public sewer easement, an 8½" x 11" drawing, sealed/signed/dated by an RLS for review and processing. Drawing shall be a clear and accurate depiction of the easement description and shall show all bearings, distances, and curve data. (Ref. 4, Subsection 7.2) |
| IX. | Point of Connection |
| 1. | Show location & method of connection to existing public sewer: <ul style="list-style-type: none"> a. If connecting to an existing (same size) block-out, add note: "Remove block-out and connect." (Do not refer to a Standard Detail); b. If connecting to an existing manhole, without block-out; and (Ref. 5, S.D. RWRD-300 or 301) c. If connecting to an existing sewer with a new manhole. (Ref. 5, S.D. RWRD-303) |
| 2. | Add the following note to the outlet of first proposed manhole, upstream of existing sewer. "Install temporary plug and secure with a chain or cable to a manhole step. Plug to include contractor's company name. The plug to be removed after PDEQ/ADEQ's Discharge Authorization and post paving inspection as directed by the Field Engineering inspector." Locate the plug downstream of ALL proposed service laterals. (Ref. 2, Subsection 13.20.035 C) |



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| 3. | Add the following note to point of connection: "Contractor shall field verify existing invert elevation(s) prior to start of public sewer construction". (Ref. 2, Subsection 13.20.040) |
| X. | Sewer Pipe |
| 1. | Public Sewer Wash Crossing, Access & Miscellaneous |
| 2. | Show and label all areas requiring fill: "Fill and compact to 95% of maximum dry density". (Ref. 5, Subsection 3.1.3) |
| 3. | Include with submittal a with scour depth calculations for all wash crossings. Show scour depth and lateral migration on plans. (Ref. 4, Subsections 5.1.11, 5.2.11, and Appendix A) |
| 4. | Verify all-weather vehicular access to all manholes is provided with a stabilized surface slopes equal or less than 9%. (Ref. 4, Subsection 7.5) and (Ref. 5, S.D. RWRD-110 and RWRD-111) |
| XI. | Applicable Additional Requirements Not Included Above |
| 1. | Verify distances, elevations, and other overlapping information shown on multiple sheets are consistent with each other. |
| 2. | Include the Marana Water "General Notes and Standard Details" Sheet found online at http://www.maranaaz.gov/water-plan-requirements |
| 3. | Confirm no conflicts between storm drain pipe and HCS's when storm drain is parallel to sewer. |
| 4. | Confirm the plans identify the HCS's requiring ductile iron pipe (DIP). |
| 5. | Sewer Report shall include the following as a minimum: title sheet signed, sealed, and date by AZ registered Professional Engineer, Table of Content, Main Content, Appendix/Exhibits including sewer map, calculations referenced to sewer map. The report shall use san serif font, minimum font size 12 and minimum line spacing 1.5. |
| XII. | For Marana Water use only |
| 1. | Assign the S-20XX-XXX sewer plan number. |
| 2. | Assign the MW-20XX-XXX sewer manhole numbers. |