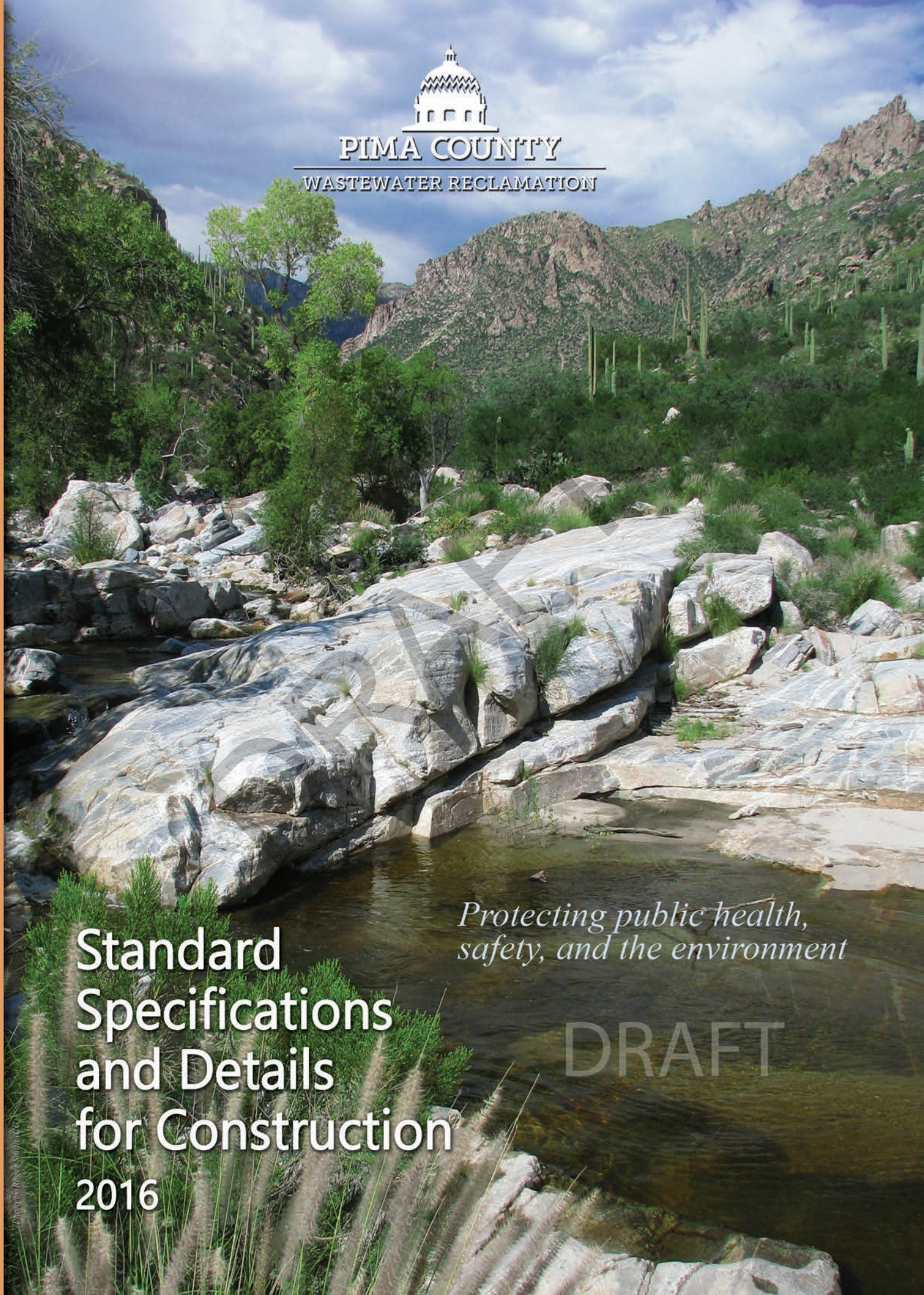
PIMA COUNTY
WASTEWATER RECLAMATION
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Protecting public health,
safety, and the environment
Standard
Specifications
and Details
for Construction
2016
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00 GENERAL CONTENTS

Acronyms and Abbreviations

Wherever the following abbreviations are used in this document, they are construed to be the same as the respective expressions represented;

Term	Description
AAC	Arizona Administrative Code
AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACH	Air Changes Per Hour
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
ACPA	American Concrete Pipe Association
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWF	Average Dry Weather Flow
ANSI	American National Standards Institute
APP	Aquifer Protection Permit
ARS	Arizona Revised Statutes
ARV	Air Relief Valve
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
BCS	Building Connection Sewer
BMPs	Best Management Practices
CA	Construction Authorization per R18-9-E301 – 4.01 General Permit
CCFRPM	Centrifugally Cast Fiberglass Reinforced Polymer Mortar
CCTV	Closed Circuit Television
cfs	Cubic Feet Per Second
CIP	Capital Improvement Program
CIPP	Cured in Place Pipe
CLSM	Controlled Low Strength Material

CMP	Corrugated Metal Pipe
Code	Pima County, Arizona, Code of Ordinances, specifically Title 13 – Public Services, Division II – Sewers
COT	City of Tucson
DA	Discharge Authorization per R18-9-E301 – 4.01 General Permit
dB	Decibels
Design Standards	The Pima County Regional Wastewater Reclamation Department's Planning and Engineering Design Standards ~~2012~~2016
dia	Diameter
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
DR	Dimension Ratio
DSD	Development Services Department
ECC	Engineer's Certificate of Completion
EPA	Environmental Protection Agency
EPDM	Ethylene Propylene Diene Monomer (rubber)
FCR	Final Compaction Report
FE	Field Engineering
Fed Spec	Federal Specifications
FEMA	Federal Emergency Management Agency
FMP	Flow Management Plan
ft	Feet
GFCI	Ground-Fault Circuit Interrupter
GIS	Geographical Information System
gpad	Gallons Per Acre per Day
gpd	Gallons Per Day
gpm	Gallons Per Minute
HAZMAT	Hazardous Material
HCS	House Connection Sewer
HDPE	High Density Polyethylene
HMI	Human Machine Interface
HOA	Home Owners Association

Hz	Hertz
IBC	International Building Code
IMS	Infrastructure Management System (Hansen Asset Management Program)
in	Inch or Inches
IPC	International Plumbing Code
I&I	Infiltration and Inflow
LF	Linear Foot
max	Maximum
mgd	Million Gallons Per Day
MH	Manhole
min	Minimum
mil	1/1,000 of an Inch
mV	Millivolt
N/A	Not Applicable
NASSCO	National Association of Sewer Service Companies
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPSHA	Net Positive Suction Head Available
NPSHR	Net Positive Suction Head Required
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
PAG	Pima Association of Governments
PAG Standard Specifications	The 2003 Edition of the City of Tucson and Pima County Standard Specifications and Details for Public Improvements or latest revision
PCDSD	Pima County Development Services Department
PCRWRD	Pima County Regional Wastewater Reclamation Department
PDEQ	Pima County Department of Environmental Quality

PDWF	Peak Dry Weather Flow
P.E.	Professional Engineer
PE~~/FBE~~	Polyethylene (PE) ~~Fusion Bonded Epoxy (FBE)~~
PF	Peaking Factor
PMOC	Point and Method of Connection
PPI	Plastics Pipe Institute
psi	Pounds Per Square Inch
PUE	Public Utilities Easement
PVC	Polyvinyl Chloride
PVCPA	The PVC Pipe Association
PWWF	Peak Wet Weather Flow
RAP	Recycled Asphalt Product
RCP	Reinforced Concrete Pipe
rpm	Revolutions Per Minute
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDR	Standard Dimension Ratio
S.D.	Standard Detail
S.S.D.	Special Standard Detail
S.S.	Stainless Steel
sf	Square Foot
SPCS	State Plane Coordinate System
SSO	Sanitary Sewer Overflow
Standard Specifications and Details	The Pima County Regional Wastewater Reclamation Department's Standard Specifications and Details ~~2012~~2016
SWPPP	Storm Water Pollution Prevention Plan
TDH	Total Dynamic Head
UC	Utility Coordination
UBC	Uniform Building Code
v	Velocity
VCP	Vitrified Clay Pipe

WSS	Welded Steel Sewer

PIMA COUNTY
WASTEWATER RECLAMATION

SECTION 1
GENERAL PROVISIONS FOR PUBLIC SEWER CONSTRUCTION

Standard Specifications and Details for Construction

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Section 1

General Provisions for Public Sewer Construction

1.1 Introduction

It is the policy of the Department that all Public Sewers be constructed in accordance with accepted construction standards. The purpose of the *Standard Specifications and Details* is to establish the minimum acceptable standards by which certain new Public Sewers, or modifications to existing Public Sewers, are to be constructed in Pima County. Public Sewers and related appurtenances shall be constructed in full accordance with the *Standard Specifications and Details* unless otherwise Approved in the Sewer Plans or in writing by the Sanitary Engineering Manager.

1.2 Definitions and Terms

Whenever the following terms are used in this document, the intent and meaning shall be interpreted as described in this subsection. Where there is a conflict between these definitions and those in the AAC and ARS, the AAC and ARS definitions shall apply for persons seeking a Discharge Authorization under a Type 4.01 General Permit.

100-Year Flood – A flood event that statistically has a 1 out of 100 (or one percent) chance of being equaled or exceeded on a specific watercourse in any given year.

Accept or Acceptance – Written notice from the Director or his/her authorized representative agreeing to the concept presented in the plans, studies or reports, and required as part of a review process.

Affidavit of Cost – Documentation of final construction costs.

Agency – The jurisdictional body for whom the construction is being done, either by Permit or Contract.

Aggregate – Inert material such as sand, gravel, broken stone, crushed stone, or a combination thereof.

Applicant – The owner or a representative of the owner of the property or unit requesting connection to the Public Sewer.

Approve or Approval – Written authorization from the Department for a submittal when it has been determined that it meets a County standard.

As-Built Plans or As-Builts – An annotated copy of the Sewer Plans providing the exact final location and layout of Public Sewer facilities, their positional verification and records that include deviations to the design.

Augmentation – The construction of sanitary sewer facilities adjacent to or in replacement of existing Public Sewer facilities for the purpose of increasing flow capacity.

Backfill – The material used to fill a trench from the top of shading to subgrade or finished grade.

Bedding – The material placed at the bottom of a trench and used to support the pipe prior to the placement of Shading and Backfill.

Bill of Sale – A written instrument showing the voluntary transfer of a right, interest, or title to personal property, either by way of security or absolutely, from one person to another without the actual physical possession of the property leaving the owner or being delivered to the other party.

Building Connection Sewer (BCS) – The private sanitary sewer line between the commercial or industrial building and its connection to the Collection Sewer.

Calendar Day – Any day shown on the calendar, beginning at midnight, extending for a 24 hour period, and ending at midnight.

Cathodic Protection – A method for protecting metallic materials from damage caused by corrosive soils.

Code – Pima County, Arizona, Code of Ordinances; more specifically, Title 13 – Public Services, Division II – Sewers that includes ordinances governing wastewater management.

Collector or Collection Sewer – A sanitary sewer line that receives Wastewater from two or more Service Laterals.

Construction Acceptance – The Acceptance, by the Department, for the transfer of newly constructed or modified sanitary sewer assets to the Department.

Construction Permit – Written authorization from the Department to allow construction, modification or connection to Public Sewer facilities in accordance with the Sewer Plans. Also see Observation Permit.

Contractor – The individual, partnership, firm, corporation, or any acceptable combination thereof that is responsible for the construction of the Project in accordance with the Sewer Plans and Construction Permit.

Cover – The vertical distance from the top of a buried pipe to finished grade.

Crown – In a transverse cross section of pipe, the highest point of elevation on the interior surface.

d/D – Ratio of flow depth (d) to pipe diameter (D).

Day – Unless otherwise designated, day shall be understood to mean a Calendar Day.

Deficiency – Departure from, or noncompliance with, specified criteria.

Department – The Pima County Regional Wastewater Reclamation Department.

Design Drawings – The Sewer Plans prior to their Acceptance by the Department. Also see Sewer Plans.

Design Engineer – The Professional Engineer sealing the Design Drawings for a Project or design staff performing duties under his/her direct supervision.

Developer – One or more individuals or incorporated entities that desires to convert land from its present use to another.

Development – Any man-made improvement (change) to real property including but not limited to: buildings or structures, fencing, paving, grading, filling, excavation, trenching dredging mining, drilling, or storage of equipment or materials.

Director – The Director of the Department or his/her designated representative.

Engineering Directive – The process used by the Department to clarify and improve the design and construction standards and details for Public Sewer facilities.

Excavation – Any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal.

Field Engineer – The Sanitary Engineering Manager's authorized representative assigned to make detailed inspections for the construction or modification of Public Sewer facilities.

Flow Through –That part of a Public Sewer intended for receiving existing or future Wastewater originating from outside a development or municipality and not from inside a development or municipality.

Force Main – A pressurized sanitary sewer discharge line extending from a Pump Station having a horizontal length greater than 10-feet.

Full Flow – A ratio of 1.0 d/D, where d is the hydraulic grade line of Wastewater flow in the pipe and D is the inside diameter of the pipe.

Geotechnical Engineer – An Arizona-Registered Professional Engineer (Civil) responsible for Project soils characterization and construction backfill compaction quality control testing and certifications.

Grey Water – Residential wastewater collected separately that originates from clothes washers, bathtubs, showers and sinks. Grey water excludes wastewater from kitchen sinks, dishwashers and toilets.

Haunch – That portion of a pipe barrel extending from the bottom to the springline.

Holiday – (1) A legal holiday pursuant to A.R.S. 1-301, as amended. (2) Microscopic holes in liners and coatings detected by a Holiday Test.

Holiday Test – Electrical testing used to determine the presence and number of discontinuities in a coating film performed on a nonconductive coating applied to an electrically conductive surface in accordance with ASTM D5162 standards.

House Connection Sewer (HCS) – The private sanitary sewer line between the residence or building connection and its connection to the Collection Sewer.

Inspector – See Field Engineer.

Interceptor Sewer – A sanitary sewer line that receives Wastewater from a number of collector and trunk sewers.

Invert – In a transverse cross section of pipe, the lowest point of elevation on the interior surface.

Jetting – A soil compaction technique that forces pressurized water into the bedding or backfill material in order to saturate it and force the air out. Also referred to as flooding.

Lift Station – A sanitary sewer facility that pumps Wastewater to a higher elevation without the need for a Force Main. Also see Pump Station.

Observation Permit – Written authorization from the Department to allow access into Public Sewer manholes. Also see Construction Permit.

Over-sizing – The increase in capacity of sanitary sewer facilities to provide capacity for future flow from within or beyond the proposed design boundaries of a Project.

PAG Standard Specifications – The *2003 Edition of the City of Tucson and Pima County Standard Specifications for Public Improvements* or latest revision.

Permit – See Construction Permit and Observation Permit.

Pressure Sewer – See Force Main.

Project – The specific, coordinated design, construction or similar undertaking identified by a single Project number.

Public Sewer – The sanitary sewer assets of Pima County, specifically for the conveyance of Wastewater.

Pump Station – A sanitary sewer facility that pumps Wastewater to a higher elevation and requires the use of a Force Main. Also see Lift Station.

Reach – A single gravity sewer line connecting into a manhole at both ends.

Record Drawings – See As-Built Plans.

Residual Capacity – The difference between the predicted PDWF from the development constructing the sanitary sewer line and the theoretical flow in the sanitary sewer line at 0.75 d/D (where d is the depth of flow and D is the inside diameter of the pipe) based on the Manning Equation using an "n" value of 0.013 at any given point in the Sanitary Sewer.

Right-of-Way – A general term, denoting a strip of land, property or interest therein, acquired for or devoted to transportation and other public works purposes.

Sanitary Sewage – See Wastewater.

Scour – A computed value for the potential depth that material, from the bed and banks of a Wash, will be removed due to the flow of water during a 100-year flood event.

Service Lateral – The private sanitary sewer line between a residential, commercial, or industrial building and its connection to the Collection Sewer. Also see House Connection Sewer and Building Connection Sewer.

Sewer Basin – All portions of the sanitary sewer collection system tributary to an interceptor sewer or pump station. Generally, the sewers within a Sewer Basin are hydraulically linked.

Sewer Plans – The Project's official construction documents, or reproductions thereof, Accepted by the Department, that show the location, character, dimensions and details for the extension, augmentation or modification of Public Sewers. Also see Design Drawings.

Shading – The material that extends from the top of the Bedding to one foot (typically) above the top of pipe.

Siphon – A sanitary sewer conveyance facility used to convey Wastewater underneath an obstruction, such as a Wash or drainage culvert, without pumping.

Special Approval – Written authorization from the Department to proceed with the design of a specific concept for Public Sewers that is typically not Accepted by the Department.

Special Provisions – Additions and revisions to the Standard Specifications and Details, specifically Section 3, covering conditions and requirements peculiar to on individual Project.

Springline – In a transverse cross section of pipe, the line of maximum horizontal dimension.

Storm Drain – A conduit or system of conduits that convey stormwater runoff, street drainage, and other wash waters or drainage but excludes Wastewater.

Stub-Out – An upstream length of pipe installed at a sanitary sewer manhole that is intended for future connection.

Trench – A narrow excavation for the installation of sanitary sewer facilities or other utilities.

Trunk Sewer – A sanitary sewer line that receives Wastewater from many Collector Sewers.

Variance – A waiver, issued in writing by the Department, granting a one-time deviation from a specific design or construction standard for unique circumstances where full compliance is not realistically feasible.

Wash – A dry creek bed or gulch that temporarily fills with water after a heavy rain; an arroyo or an alluvial watercourse.

Wastewater – The wastes from toilets, baths, sinks, lavatories, laundries, drains, and other plumbing fixtures in residences, mobile homes, institutions, public and business buildings, industrial wastewaters and other places of human habitation, employment, or recreation.

Work – All labor, materials, equipment, and other incidentals necessary or convenient to the successful completion of Public Sewer construction and the carrying out of all the duties and obligations required by the Sewer Plans.

Working Day – Any Day, other than Saturday, Sunday or a Holiday, on which legal business can be conducted by Pima County.

1.2.1 Interpretation of Terms

When not inconsistent with the context, words used in the present tense include the future, words in the singular number include the plural, and words in the plural number include the singular.

1.2.2 Titles and Headings

The titles or headings of sections and subsections are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

1.2.3 Capitalization of Defined Terms

Defined terms within this document that are intended to be capitalized. The Director reserves the right to interpret words or phrases listed in Subsection 1.2 - Definitions and Terms, where the context warrants.

1.3 Revisions to the *Standard Specifications and Details*

The Sanitary Engineering Manager will be responsible for monitoring revisions to the *Standard Specifications and Details* to ensure that the standards:

- Are consistent with current and accepted engineering practices;
- Do not impose extraordinary burdens for typical development and improvement projects; and
- Do not conflict with Code, AAC or the public's interest.

When a specific standard requires immediate attention for clarification or improvement, the Sanitary Engineering Manager will make a request to the Standards Committee for review and Approval of an Engineering Directive. An Engineering Directive is a separate document that describes new standards, or modifications, until such revisions can be incorporated in the *Standard Specifications and Details*. Any errors to the current standards should be brought to the attention of the Sanitary Engineering Manager, in writing.

The Department will keep users of the *Standard Specifications and Details* informed of future updates through its website. Hard copy (printed) revisions will not be distributed. It is the holder's responsibility to keep the document current by periodically checking the Department's website for updates.

1.4 General Provisions

1.4.1 Permits and Fees

A Construction Permit shall be obtained from the Department at least 72 hours prior to accessing the Public Sewer or commencing work for any Project that proposes:

- New Public Sewers;
- Modifications to existing Public Sewers;
- New service connections to Public Sewers; or
- Modifications to existing maintenance access to Public Sewer manholes.

Pursuant to Code, specifically 13.20.045, all applicable permit and connection fees shall be paid prior to issuance of the Construction Permit. A Construction Permit cannot be issued until:

- All applicable Department inspection fees are paid;
- ~~t~~The Sewer Plans are Accepted by the Department;~~.~~ And
- Copies of the Sewer Plans are provided to the Permitting group.

1.4.2 License Requirements for Contractors

The Contractor responsible for the construction of, modification or connection to Public Sewers, shall be an Arizona Registered Contractor with an A, A-12, AE or K-80 type license, as applicable per the Arizona Registrar of Contractors. The Contractor shall be responsible for performing all required actions that will allow completion of Public Sewer construction.

1.4.3 Pre-Construction Meeting

The Contractor shall schedule a pre-construction meeting with the Field Engineer after the Construction Permit is obtained and the FMP Approved (see Subsection 2.3). The construction of Public Sewers shall not commence until a written notice to proceed is issued by Field Engineering. Any Public Sewer construction done prior to the notice to proceed shall be removed at the sole expense of the Contractor.

The purpose of the preconstruction meeting is for the Contractor and the Field Engineer to review any special inspections requirements and items peculiar to Public Sewer construction. It is also intended to get personnel together to become familiar with the Project and each other. Prior to this meeting the Contractor, Field Engineer and all other key personnel should study the Sewer Plans and become familiar with the Project site to be well informed as to the requirements and existing conditions.

At a minimum, the Contractor shall furnish the following documentation to the Field Engineer at the pre-construction meeting:

- Survey cut sheets per Subsection 3.2.3(A)(i);
- Certification documents and batch numbers for DIP interior linings per Subsection 3.2.2(D);
- Certification documents for all materials testing (e.g. sieve analysis) per Subsection 3.1.2; and
- Shop drawings for manufactured assemblies, if applicable.

1.4.4 Inspection of Work

All Work done to or within an existing Public Sewer manhole, in order to install a new connection, shall be inspected and Approved by the Field Engineer prior to approval of private sewer construction by the Agency having jurisdiction over the building and plumbing codes.

If a new Public Sewer manhole is constructed on the existing Public Sewer line in order to install a private connection, the new manhole shall be inspected and Approved by the Field Engineer prior to approval of private sewer construction by the Agency having jurisdiction over the building and plumbing codes.

1.4.5 Field Changes

The Contractor shall notify the Field Engineer of any field change prior to proceeding with construction. The Field Engineer will determine whether the field change is de minimus or reportable. For a de minimus field change, sewer construction may continue and the field change shall be annotated on the As-Built Plans per Subsection 1.4.5. For a reportable field change, construction shall not proceed on the affected areas or upstream of the affected areas until the Sewer Plans are revised and Accepted by the Department.

1.4.6 Storage of Construction Materials near a Public Sewer Manhole

Construction materials shall not be stored within 10 feet of any existing Public Sewer manhole. The contractor must contact the Department's Conveyance Division at least 48 hours in advance to request permission to temporarily block or restrict access to an existing Public Sewer manhole. The Contractor shall indicate the nature of the planned activity and length of time that access will be blocked or restricted.

1.4.7 As-Built Plans

Pursuant to AAC R18-5-508 and Code, specifically 13.20.030(E), the As-Built Plans for the construction of new Public Sewers or for the repair, replacement or rehabilitation of existing Public Sewers, shall be submitted to ADEQ and the Department for review and Approval, prior to Construction Acceptance (see

Subsection 1.4.8). Emergency repairs are exempt from the prior Approval requirement but not from the requirement to submit As-built Plans.

The Contractor shall be responsible for retaining an Arizona Registered Land Surveyor to provide the exact final location and layout of Public Sewers, and preparing the sewer As-Built Plans in accordance with the following requirements:

- As-Built Plans shall be certified by an Arizona Registered Land Surveyor or an Arizona Registered P.E. (Civil). The following certification shall appear on each sheet of the As-Built Plans: a seal per AAC R4-30-304, the label "AS-BUILT" and the contact information of the certifier's employer. The cover sheet shall also include the following certification statement: "I HEREBY CERTIFY THAT THE AS-BUILT ANNOTATIONS PROVIDED ON THESE~~THIS~~ DRAWINGS WERE BASED ON AN AS-BUILT SURVEY CONDUCTED UNDER MY SUPERVISION AND ACCURATELY DEPICTS EXISTING FIELD CONDITIONS TO THE BEST OF MY KNOWLEDGE AND BELIEF".
- The party responsible for annotating the As-Built Plans shall obtain from the Design Engineer, either a full-size copy or an electronic copy of the original and complete Sewer Plans, with all seals, acceptance signatures and design revisions. The quality of the hard copy shall be equivalent to the original Sewer Plans. The quality of the electronic copy shall have a minimum resolution of 200 x 200 dpi.
- The As-Built Plan submittal shall include a complete and full-size set of the Sewer Plans. If a complete set of plans includes sheets that are not related to Public Sewer construction, the Field Engineer may allow these sheets to be excluded from the As-Built Plans.
- The As-Built Plan submittal shall be of a quality that ensures clear reproduction through electronic scanning and microfilming. The quality of these copies shall conform in appearance, scale, resolution and accuracy to the original Sewer Plans. All design information and annotations shown on the As-Built Plans shall be clear and legible.
- For deviated design values, As-Built annotations shall add a strikethrough of the design value with the measured value shown next to it. For non-deviated design values, As-Built annotations shall add the letters "AB" next to the design value to indicate that it was verified with the As-Built survey and is accurate.
- As-Built annotations shall verify or update the horizontal control data for each new manhole, at the center of its base (e.g. station and offset). This may also be accomplished by providing a separate tabular report with the manhole number, and the 'X' and 'Y' coordinates based on SPCS (NAD83).
- As-Built annotations shall verify or update all pipe invert elevations and the rim elevations for new or modified manholes. Elevation data shall be consistent with the vertical datum used in the Sewer Plans.
- As-Built annotations shall verify the nominal diameter, slope, length and pipe material for each reach of new sewer line. The As-Built slopes for each reach

shall be calculated based on the horizontal reach length between the interior walls of each manhole and the invert of the sewer line at these locations.

- As-Built annotations shall verify or update the layout of new service laterals (HCS/BCS) in plan view. In addition, the As-Built Plans shall provide a separate tabular report with the lot number, 'X' and 'Y' coordinates of the private cleanout riser based on SPCS (NAD83), the distance from the HCS/BCS at the sewer line connection to the nearest downstream manhole, and the station of the HCS/BCS sewer line connection.
- Pursuant to Arizona Blue Stake law (ARS 40-360.21 to 40-360.32) the Department is responsible for locating service laterals (HCS/BCS) installed after December 31, 2005. Where service laterals are damaged due to inaccurate As-Built annotations, the registrant and the firm certifying the As-Built Plans may be held accountable for the cost of repair.
- The use of non-transparent blocks, masking, or the pasting of information onto the Sewer Plans that would cover any language, design data or line work shown on the original Sewer Plans is not allowed. If additional room is required for annotations, an additional sheet shall be added to the As-Built Plans.
- The As-Built Plans shall include any construction variances or design revisions that occurred during the progress of construction.
- For new force mains, annotations shall additionally verify or update the horizontal alignment of the force main and the location of any bends.

~~Three full-size c~~Copies of the As-Built Plans shall be submitted to the Field Engineer, within 30-days of the completion of all sewer construction. Contact the Department's Construction Permit Section for specific submittal requirements. The submittal will be reviewed for conformance. Incomplete or non-conforming submittals will be returned for revisions. The As-Built Plans must be Approved by the Department prior to completion and processing of the ECC.

1.4.8 Construction Acceptance

Upon written notice from the Contractor of completion of the Work, the Field Engineer will conduct a final inspection. If all construction is complete and in accordance with the Sewer Plans and the *Standard Specifications and Details*, the Field Engineer will process the Engineer's Certificate of Completion (ECC) per AAC R18-9-E301(E).

If, however, the final inspection discloses any Work, in whole or in part, as being unsatisfactory or not complete, the Field Engineer will notify the Contractor and he shall immediately correct such deficiencies. Upon completion and correction of the Work, another final inspection will be required to verify the Work has been satisfactorily completed.

The Contractor shall provide the following documentation to the Field Engineer before the ECC is processed by the Department:

- As-Built Plans conforming to the requirements of Subsection 1.4.7;
- Materials testing documentation per Subsection 3.1.2 and 3.3.2;
- Pipe installation testing documentation per Subsection 3.2.3(D);
- Manhole installation testing documentation per 3.3.3(C);
- Backfill density testing documentation per Subsection 3.1.3(F); and
- If applicable, a Memorandum of Understanding per for Type III buried cleanouts per 3.2.3(C).

The Applicant shall provide the following documentation to the Permitting group of the Department before the Discharge Authorization (DA) request is processed:

- A Notarized Bill of Sale;
- An Affidavit of Cost for Public Sewers; and
- A check made payable to "ADEQ" for review fees.

The Department will issue a letter of acceptance and release of assurances to the Applicant upon receipt of the DA from ADEQ, as required to obtain a certificate of occupancy.

1.5 Work in Public Sewer Easements

The Department has the right to install anywhere within a Public Sewer easement temporary or permanent underground or above ground facilities that may be required to monitor, operate, maintain, repair or replace Public Sewers, or under emergency conditions, pump or otherwise convey wastewater.

The Department assumes no liability for damage to or removal of any vegetation, above ground or below ground facilities, surface treatments, materials, equipment or structures placed within a Public Sewer easement or within 20 feet above its surface by anyone other than the Department.

The property owner shall be liable for injury to personnel and/or damage to maintenance vehicles or construction equipment that result from contact with any prohibited encroachments anywhere within the full width of the Public Sewer easement or within 20 feet above its surface, or from any actions necessary to remove such encroachments from the easement. Liability for injury or damage includes personnel and equipment of the Department.

The Department will endeavor to provide advance notice to the property owner of the need to utilize/access Public Sewer easements and/or Public Sewers. However, the Department has no obligation to provide such advance notice and shall not provide notice under emergency conditions.

Temporary storage of vehicles, equipment, or materials by the property owner is not allowed within the Public Sewer easement without the prior written permission of the Department.

PIMA COUNTY
WASTEWATER RECLAMATION

SECTION 2
WASTEWATER FLOW MANAGEMENT

Standard Specifications and Details for Construction

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Section 2

Wastewater Flow Management

2.1 Introduction

When a modification or connection is proposed to a live Public Sewer line, the Contractor shall:

- Develop a written Flow Management Plan (FMP) and submit to the Field Engineering section for Approval prior to construction;
- Furnish, operate and maintain all equipment necessary to provide continuous sewer service to customers tributary;
- Manage wastewater flows in a planned and proactive manner to prevent any sanitary sewer overflow (SSO); and
- Conform to all applicable environmental and regulatory requirements.

These are the primary goals that shall be reflected in an FMP and closely adhered to by the Contractor.

2.2 Planning for Wastewater Flow Management

2.2.1 Conditions that Require an FMP

An FMP shall be required for any proposed construction that encroaches into the impact zone of existing Public Sewers (see Figure 2-1). Proposed construction includes, but is not limited to, any type of connection to, or modification of, a Public Sewer line or manhole, as well as any proposed excavation with the potential to undermine, or cause the collapse of, any such asset.

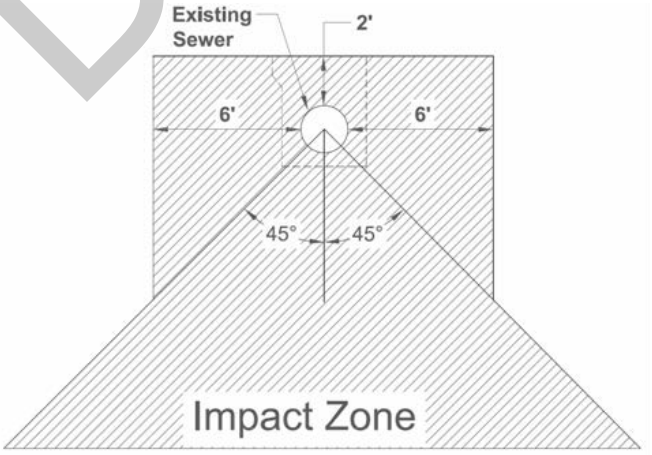

Figure 2-1: Impact Zone for Existing Sewer Lines

2.2.2 Preparing the Flow Management Plan

For Projects that require wastewater flow management measures, an FMP shall be prepared by the Design Engineer during the design stage of a Project. The FMP is a "living" document and may be updated by the Contractor for site-specific conditions during construction. The FMP may be shown either as part of the Sewer Plans or as a separate and stand-alone document.

2.2.3 Flow Management Data

At a minimum, the FMP shall include the following data:

- A note that the Contractor shall adhere to the Department's flow management standards, more specifically Section 2 of the *Standard Specifications and Details*;
- Wastewater flow rates, either:
  - Metered with the time and date at each existing manhole; or
  - Estimated, showing the method of calculation (e.g. ½ flow, full flow, etc.) and the results;
- The nearest upstream and downstream manholes including the following information:
  - Manhole diameters and materials;
  - Pipe diameters, materials and inverts; and
- A description of the available flow management options and constraints.

2.2.4 Formats of the Flow Management Plan

The criteria for determining the format of the FMP as well as the content shall depend on the diameter of existing Public Sewer lines to be impacted.

A. Small Lines

For proposed construction impacting existing Public Sewers having pipe sizes equal to or less than 12 inches in diameter (i.e. small lines), the Sewer Plans may also serve as the FMP if flow management data per Subsection 2.2.3 is incorporated into the Sewer Plans. A separate and stand-alone FMP may be provided; however, it is not required.

B. Large Lines

For proposed construction impacting existing Public Sewers having pipe sizes greater than 12 inches in diameter (i.e. large lines), a separate and stand-alone FMP shall be prepared. Under this format, the FMP shall be sealed by an Arizona Registered P.E. and include the following information:

- Flow management data, per Subsection 2.2.3;
- A plan view of the proposed flow management bypass layout;
- Pump calculations for total dynamic head, flow rates and head losses;
- Sizing of bypass pumping units and setup;

- Temporary wet wells, if necessary;
- Discharge piping materials, lengths and diameters;
- A list of necessary standby equipment and any equipment checks required before placing into bypass service;
- A list of required equipment submittals (e.g. pump specifications, etc.);
- If a gravity bypass system is proposed, sheets showing a plan and profile of the system, along with supporting hydraulic calculations; and
- Any additional information necessary for the Contractor to quickly implement the recommended bypass activities.

If low-flow conditions exist, the FMP format for existing small lines per Subsection 2.2.4(A) may be permitted with Approval by the Field Engineering manager.

2.3 FMP Approval Process for Construction

The Contractor shall ultimately be responsible for providing an Approved FMP that is appropriate to Project-specific conditions. The Contractor has the option to either resubmit the FMP originally developed by the Design Engineer or develop a new FMP. If the Contractor elects to use the original FMP, the Contractor shall field-verify all field conditions and flow rates before it is submitted for Approval to the Field Engineering section.

The pre-construction meeting shall not be scheduled until the FMP is Approved by the Field Engineering section. It is recommended that the Contractor submit the FMP at least 4 weeks prior to the anticipated pre-construction meeting date. The Field Engineering section will complete the FMP review within 10 business days, in order to accommodate a second review if needed.

The Contractor shall submit one original and two copies of the FMP to:

Field Engineering Manager
PCRWRD Field Engineering Section
1313 S. Mission Rd.
Tucson, AZ 85713-1398

With prior Approval from the Field Engineering manager, the FMP may be submitted electronically as a ~~color~~ portable document format~~file~~ (PDF). A cover letter shall also be included with any submittal and signed by the Contractor.

The Contractor shall, at his expense, obtain all permits necessary for the installation and operation of flow management measures. The Contractor shall also notify the assigned Field Engineer at least 72 hours in advance of commencing either Public Sewer construction or flow management measures. Where indicated in the Sewer Plans, the Contractor may also be required to provide at least 72 hours advance notice to the designated community relations representative of the Department.

Any questions or concerns regarding the development of the FMP should be directed to the Field Engineering manager. The Field Engineering manager

reserves the right to allow or modify the requirements specified on a case-by-case basis.

In cases where there are no wastewater flows in an existing sewer, the Contractor may request, in writing, a waiver of the FMP requirements. In most cases, the Field Engineering manager will verify the absence of flows before granting this waiver.

2.4 Determining Wastewater Flow Rates for Existing Sewers

The Department recognizes specific methods for determining the actual wastewater flow rates in existing sewers for flow management. The Field Engineering manager may allow the modification of a selected method for determining the actual wastewater flow rates or may consider alternatives for unique field conditions. Such conditions may include existing sewer lines with reaches having significant slope variations or unique channel configurations within existing manholes.

2.4.1 Flow Metering Method

The most accurate method for determining wastewater flow rates is flow metering. This method may require the cleaning and flushing of existing sewers prior to the installation of metering equipment. Metering equipment will typically remain installed in the existing manhole for a period of 1 to 2 weeks prior to removal. Flow metering data shall expire 18 months from the date it was obtained. After 18 months, the data must be re-verified prior to commencing flow management measures. The flow results obtained by the flow metering method shall be represented as peak dry weather flow and used as the basis for flow management planning.

The effectiveness of this method is limited to ideal field conditions, as described in the following:

- Manholes and pipes should be silt-free;
- Flow depths should range between 2.5 inches and 0.60 [d/D], at all times;
- Flow velocities should range between 2 fps and 6 fps, at all times;
- Force main discharge should not be immediately upstream;
- Nearest adjacent manhole should be at least 60 pipe diameters away;
- Flow channel should be straight and without lateral connections; and
- Flow channel should conform in shape to the bottom half of the pipe.

If a recorded precipitation event occurs during the metering period, which results in increased flows from inflow and infiltration (I/I), the Field Engineering manager may allow the increase in flow rates to be ignored. This decision shall only be made after consultation with the Flow ~~Metering~~ Monitoring group.

The Flow ~~Metering~~ Monitoring group of the Department may provide flow metering services after a *Temporary Flow Metering Request* form is submitted. For a copy of the current form, contact the Department's Flow ~~Metering~~ Monitoring group or check the Department's website. This submittal should occur at least 9 weeks prior

to the date that flow data is needed (4 weeks for scheduling, 3 weeks for data collection and 2 weeks for data analysis). Flow metering requests will be reviewed and scheduled on a first-come, first-served basis.

When the proposed sewer construction involves an existing small Public Sewer line (pipe sizes of 12 inches in diameter or less), the flow metering request shall include the following:

- Temporary Flow Metering Request Form (for a blank copy of this form, contact the Field Engineering section or check the engineering forms page on the Department's website);
- A plan depicting the current sewer basin area and all contributing sewer lines to the point of proposed bypass (MapGuide map is acceptable);
- Construction schedule (additional pump capacity may be required for rainy months); and
- A review of the potential for flow surges caused by industrial dischargers (e.g. pool draining, laundromat operations, etc.)

When proposed sewer construction involves an existing large Public Sewer line (pipe sizes greater than 12 inches in diameter), the flow metering request shall include the following:

- The design requirements for an existing small line (described in Subsection 2.2.2);
- Review and condition assessment of the impacted manholes;
- A list of all seasonal flow contributors identified within the sewer basin (i.e. schools, RV parks, etc.); and
- A preliminary version of the flow management design being developed.

The Flow Monitoring ~~Metering~~ group will review these requests and notify the applicant, as soon as possible, if the flow metering request cannot be met. When existing field conditions are not ideal for reasonable flow metering or the task cannot be performed by the Department for other reasons, the Flow Monitoring ~~Metering~~ group will recommend other methods for estimating current wastewater flow rates.

If the Flow Monitoring ~~Metering~~ group cannot provide services within a reasonable amount of time or within the frame that was requested, the following methods for estimating wastewater flows may be used for flow management planning, when authorized by the Field Engineering manager:

- At their own expense, the property owner or the Developer may hire an Approved third-party flow metering service; or
- The Assumed Depth Method per Subsection 2.4.2.

2.4.2 Assumed Depth Method

Where metering does not yield reliable results or cannot be performed, flows may be estimated based on an assumed depth calculation method. This method is

subject to approval after the Field Engineering section has verified such depth conditions during the flow management review process. For low depths of flow (less than 2.5 inches), the existing pipe shall be assumed to be flowing half-full. For high depths of flow (0.60D < d < 1.0D), the existing pipe shall be assumed to be flowing full. The Manning's formula shall be used to estimate wastewater flows. The flow results obtained by the Assumed Depth Method shall be represented as peak dry weather flow and used as the basis for flow management planning.

2.4.3 ADEQ Design Method

Where accurate flow data is not needed, existing wastewater flow rates may be estimated in accordance with the method required for sewer design by ADEQ for calculating peak dry weather flows. These method is more specifically described in AAC R18-9-E301(D) – Type 4 General Permits and R18-9-Table 1 - Unit Design Flows. This method may be more practical for flow management planning purposes in the early stages of a project and may be superseded later by a more precise method, such as flow metering, if elected by the Contractor.

2.5 Design Flows for Flow Management Measures

The Contractor shall be responsible for providing wastewater flow management measures that are capable of conveying the existing wastewater flows in all conditions, including wet weather. All peak dry weather flows shall be multiplied by a factor of 1.5 to obtain the design flow for flow management measures, such as pumping or gravity bypass systems. A factor of 1.5 shall be used to accommodate most variations in flow and wet weather conditions, unless otherwise specified by the Field Engineering Manager.

Example 2.1 – Calculate Bypass Pumping Flow Rate:

The Flow Monitoring ~~Metering~~ group provides the PDWF for an incoming sewer line at manhole number MH-5462 as 1.17 mgd. Determine the required design flow to properly specify the pumps to be used in bypass pumping measures.

Solution:

$$Q_{FM\ Design} = PDWF \times 1.5$$

Where: $Q_{FM\ Design}$ *= Pumping Design Flow*

$$Q_{FM\ Design} = 1.17\ mgd \times 1.5 = 1.755\ mgd$$

$$Q_{FM\ Design} = \frac{1.755\ mgd}{1{,}440\ min/day} = \frac{1.755\ x\ 10^6\ gal/day}{1{,}440\ min/day} = 1{,}218.75\ gpm$$

Round up to the nearest 5 gpm; therefore: $\boldsymbol{Q_{FM\ Design}}$**= 1,220 gpm**

2.6 Standard Measures for Wastewater Flow Management

The following are standard measures intended for typical small Public Sewer line construction and may not be applicable in all cases, as actual site conditions may vary. For large Public Sewer line construction, the Field Engineering manager should be contacted early in the flow management planning stage to identify project-specific requirements.

The bypass method, either pumping or gravity, will consider project-specific conditions and the Contractor's level of expertise. Bypass pumping is more appropriate for short durations of construction or restricted areas; whereas gravity bypass measures is more appropriate for long durations of construction, for large sewer lines, or for open, undeveloped areas. The Contractor shall be responsible for determining the most appropriate method for Approval by the Field Engineering section.

2.6.1 Phasing

For some projects, it is more cost-effective to phase flow management measures simultaneously with regulatory approvals. The Contractor shall be responsible for proposing any such phasing in the FMP. The FMP shall clearly identify the phasing of flow management measures, the wastewater flows associated with each phase, the details for flow management measures, and any special construction.

2.6.2 Pumping Systems

Flow management pumping measures may require a pump truck or a stationary bypass pumping system. The type of pumping measure will depend on the flow rate in the existing sewer line, the duration of Public Sewer construction and site-specific conditions. With Approval of the Field Engineering section, the Contractor can determine the best type of pumping measure to be used on a project-specific basis.

A. Pump Trucks

The use of a pump truck for flow management measures is most suitable for low flow rates and short durations of construction.

B. Stationary Bypass Pumping Systems

The use of stationary bypass pumping systems for flow management measures are more suitable for high flow rates, long durations of construction and inaccessible site conditions for a pump truck.

Fuel storage shall be provided for stationary pumping measures, sufficient for 24 hours of operation. Stationary pumping units shall be quiet during operation. If necessary, the Contractor shall provide noise suppressing systems, such as sound boards, barriers or mufflers. The Contractor shall also adhere to any noise abatement requirements of the local jurisdictional agency.

For standby stationary pumping measures, pumping equipment shall be tested with clean water and located in a nearby staging area.

When stationary bypass pumping measures are used, the Contractor shall be responsible for providing spare pumps in case maintenance or repair is necessary. The required number of spare pumps shall be determined by multiplying the total number of pumps required for the design flow by a factor of 0.50 and rounding up to the nearest integer.

Example 2.2 – Calculate the Required Number of Spare Pumps:

The Contractor specifies 3 pumps, each at 410 gpm, for a ~~PDWF~~ pumping flow rate of 1,220 gpm, ~~–~~(see Subsection 2.5)~~obtained from flow metering results~~. Determine total number of pumps required for stationary bypass pumping measures.

Solution:

$$Spare\ Pumps\ = \#\ Design\ Pumps\ \times 0.5$$

$$Spare\ Pumps\ = 3\ Design\ Pumps\ \times 0.5\ = 1.5$$

$$Round\ 1.5\ up\ to\ the\ nearest\ integer = 2\ Spare\ Pumps$$

$$Total\ Required\ \#\ Pumps\ = 3\ Design\ Pumps\ + 2\ Spare\ Pumps = \mathbf{5\ pumps}$$

Suction piping shall be steel-reinforced pipe or other ~~Approved~~ material ~~as~~ Approved by the Field Engineering manager. Separate suction pipes shall be used for each pump; manifolds shall not be permitted. Spacing between suction pipes shall be sufficient to prevent interference and swirling. Each suction pipe shall be installed without provisions for debris control (e.g. screens). If debris is a problem, the Contractor shall consult with the Field Engineering manager for appropriate countermeasures.

Two pumping discharge lines ~~shall~~ may be required for redundancy. Discharge lines shall be butt-fused HDPE (SDR 11), with a minimum nominal inside diameter of 3 inches. Structural calculations may be required for some installations as determined by the Field Engineering manager. Where air relief valves are required, a redundant valve shall be installed. Vertical bends shall be installed at the discharge manhole as needed to direct flows into the outgoing sewer line without splashing and excessive scour affects. Where applicable, the Contractor shall install measures for protecting the discharge lines from vandalism.

Where discharge lines will cross paved roads, the Contractor shall provide measures as needed for protecting the lines from vehicular damage, and for the safe and efficient flow of traffic. Approved measures for road crossings include the use of pre-fabricated pipe ramps or cutting pavement and burying the line with an approved minimum cover. Such crossings shall be capable of handling H-20 truck loadings and shall not be susceptible to damage by vehicles with low height clearances (e.g. fire trucks).

The Contractor shall maintain daily inspection logs per Subsection 2.6.7 for recording pump/motor operational data and the condition of discharge lines at maximum time intervals of ½ hour throughout the duration of pumping.

2.6.3 Manholes for Pumping or Gravity Bypass

New manholes for pumping or gravity bypass measures shall be sized to provide for the expeditious installation and removal of plugs with the use of isolation gates per S.D. RWRD-228 or as Approved by the Field Engineering manager. Isolation gates shall be oriented in such a way not to interfere with any such flow management measures.

Where the surcharging of wastewater is required above the bench of an existing manhole that will be used for pumping, the interior walls of the manhole shall be sealed with an Approved coating product prior to pumping. This coating shall be applied to the manhole walls, from the bench to at least 1 foot above the required surcharging elevation. In no case shall the surcharging of wastewater rise above the required surcharging elevation. If the Department determines that an existing manhole requires rehabilitation or reconstruction, it shall be considered incidental to the Project and the responsibility of the Contractor.

A level-monitoring system that is capable of notifying the Contractor by pager or cell phone during high-water levels shall be installed at the suction and the discharge manholes. The level-monitoring system shall be tested prior to actual startup of bypass flow measures.

Once field conditions have been verified, the Contractor shall submit a written procedure and schematic for any planned cuts into the tops of pipes and for the safe removal of, and preservation of, coupons. Pipe coupons shall be cut at an angle to prevent it from falling into the existing pipe. In the case that a coupon is damaged, is destroyed, or is otherwise unable to be replaced intact onto the cut pipe, the Contractor shall have a plan in place to fabricate a coupon of similar material, or material Approved by the Department, that can be attached to the cut pipe in a manner acceptable to the Department.

At the conclusion of pumping or gravity bypass measures, pipe coupons shall be reinstalled using a high-strength, moisture-insensitive, structural epoxy paste adhesive. All temporary piping shall be removed and flow channels filled with concrete or grout to form a smooth surface. For temporary manholes, the coupon area of the pipe and bench shall be capped with concrete the manhole abandoned per Subsection 3.3.3(E). The precise location of abandoned temporary manholes shall be annotated on the As-Built Plans and abandonment monuments installed per S.D. RWRD-503.

The Contractor shall maintain daily inspection logs for recording depth of water in pumping or diversion manholes at maximum time intervals of ½ hour per Subsection 2.6.7.

2.6.4 Plugs

The installation of plugs shall only occur during low-flow conditions. Sewer plugs for flow management measures shall be approved pneumatic pipe plugs with permanent tags to identify the Contractor. Plugs shall be installed in the sewer line and secured to an affixed object with a chain or steel cable. As a secondary safety measure for sewer lines that extend to daylight, a second plug shall also be installed in the opposite end of the same sewer line. The installation of plugs shall conform to the manufacturer and OSHA requirements.

Prior to installing a pneumatic plug, the Contractor shall inspect the host pipe for imperfections that could cause damage to the plug or the pipe during inflation. The results of this inspection may require an alternate installation location for the plug. The Contractor shall ensure that the pneumatic plug is properly positioned in the pipe and closely monitor the air pressure gage during inflation. The Contractor shall also verify that air lines are not compromised by tension, friction or other conditions that could cause damage or failure. The Contractor shall install plugs and isolation gates only during low-flow conditions. The Contractor shall maintain daily inspection logs per Subsection 2.6.7 for recording the air pressure of pneumatic pipe plugs at maximum time intervals of ½ hour.

Where an isolation gate is located immediately downstream of an installed plug, it may be used for supporting the plug in place.

After the plug is removed, the Contractor shall remove all debris within the manhole flow channels and bench.

2.6.5 Gravity Bypass Measures

Temporary gravity bypass measures shall be designed for flows per Subsection 2.5. These measures shall use pipes that are equivalent in size and slope to the existing system, unless otherwise approved by the Field Engineering manager. The FMP submittal (See Subsection 2.2.4(B)) for gravity bypass measures shall also include a hydraulic analysis proving that the proposed gravity bypass system will be adequate for conveying the design flows. Materials for gravity bypass pipes shall be adequate for Public Sewer applications and Approved by the Field Engineering manager. The use of corrugated metal pipe or other storm drain piping materials is not permitted.

Prior to excavation, the Contractor shall be responsible for accurately locating all existing utilities. For gravity bypass measures utilizing pipe sizes that are greater than 12 inches in diameter, the Contractor should locate these utilities by method of potholing.

2.6.6 Odor Control

The Contractor shall provide measures for minimizing odors and preventing their migration to populated areas. Approved odor control measures may include lids, shroud covers or chemical agents. In cases where odors are excessive, the Department may require that an Approved odor control unit be installed onsite.

2.6.7 Daily Inspection Logs

The Contractor shall ensure that all bypass measures are working correctly and not leaking with regular frequent inspections. The Contractor shall have on-site and qualified personnel monitoring flow management measures at all times during bypass operations (24 hours per day, 7 days per week). High level alarm notifications to pagers or cell phones shall not eliminate this requirement.

The Contractor shall also maintain daily inspection logs, for specific flow management measures. For typical inspection log forms, contact the Field Engineering section. The Contractor shall keep all flow management inspection logs at the site and shall have them available for review by the Department at all times. At the conclusion of the project, a copy of all inspection logs shall be provided to Field Engineering section prior to Construction Acceptance.

2.6.8 Direct Connections to Existing Sewer Lines

When a new service lateral (HCS/ BCS) will be connected directly to an existing Public Sewer line, the best management practice for flow management will depend on the depth of flow in the pipe during the time of the connection. The connection may occur during at low flow periods or when the depth of flow is less than half the pipe. However, when the depth of flow is equal to or greater than half the pipe diameter, standby pumping measures or other considerations will be required.

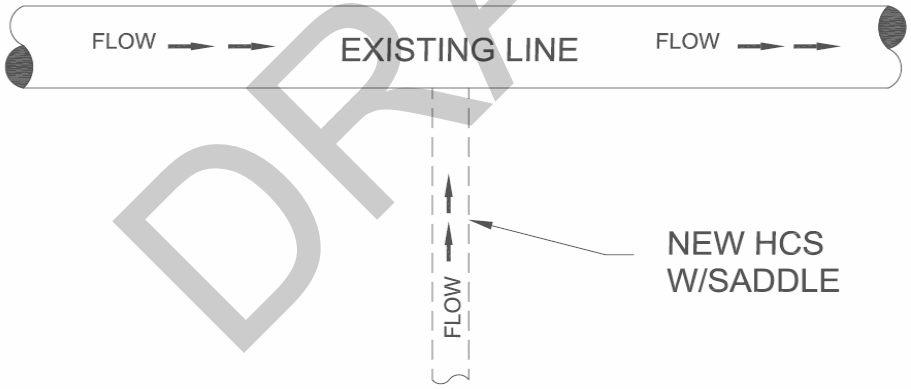

Figure 2-2: Direct Connection to Existing Sewer Lines

2.6.9 New Manholes on Existing Sewer Lines

When a new manhole will be constructed on an existing Public Sewer line, the best management practice for flow management will depend on the depth of flow in the pipe during the time of the connection.

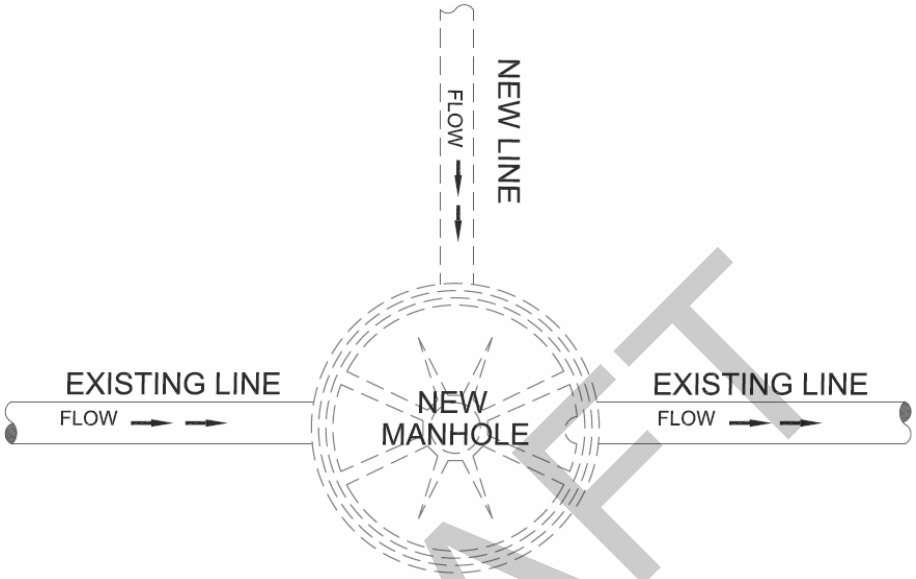

Figure 2-3: New Manhole on an Existing Sewer Line

A. Low and Moderate Depths of Flow

When the depth of flow in an existing pipe is moderate (2.5 inches to 0.60 [d/D]), two best management practices will be available, depending on the material of the existing pipe. When the existing pipe is a flexible material, such as PVC or DIP, the construction of a poured base per RWRD 303 may be permitted without standby pumping measures and with the existing pipe fully intact. However, when the existing pipe is a rigid material, such as VCP or ACP, the upstream pipe(s) shall be plugged at the nearest upstream manhole(s) and monitored with standby pumping measures.

The Field Engineering manager may waive the need for standby pumping measures if the depth of flow is low (less than 2.5 inches) and the Contractor has demonstrated substantial experience with the construction of manholes in accordance with S.D. RWRD-303.

B. High Depths of Flow

When the depth of flow in an existing pipe is high (greater than 0.60 [d/D]), the best management practices will be limited to standby pumping at the nearest upstream manhole(s).

2.6.10 New Sewer Line Connections to Existing Terminal Manholes

When a new sewer line will be connected to an existing terminal manhole, the downstream sewer line shall be plugged to prevent construction debris from being flushed downstream and also to protect the work area from an unanticipated backwater surcharge. After all work within the manhole is completed and all debris removed, the plug shall be moved to the new line.

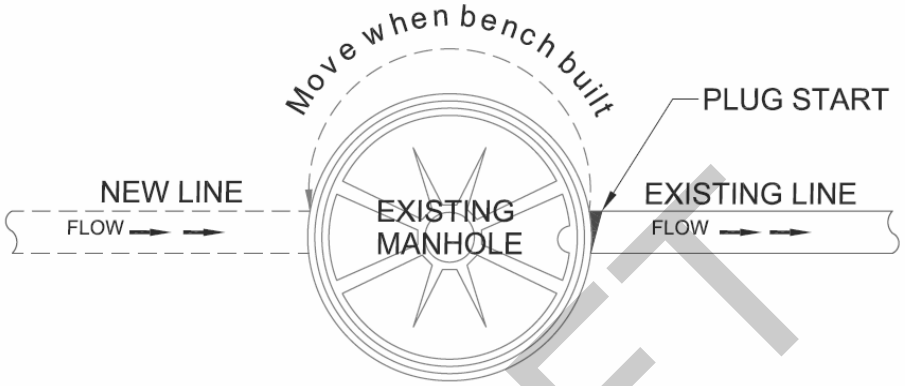

Figure 2-4: New Sewer Line Connection to Existing Manhole

2.6.11 New Lateral Sewer Line Connections to Existing Manhole

When a new lateral sewer line will be connected to an existing manhole, as shown in Figure 2-5, the flow in the existing manhole governs the flow management options. Connections to an existing manhole are made either by using a block-out or by coring the manhole barrel above the base.

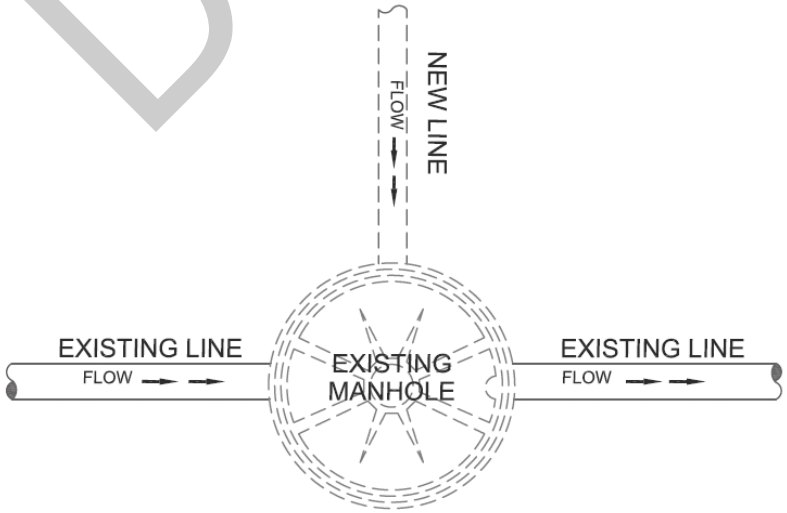

Figure 2-5: New Lateral Sewer Line Connection to Existing Manhole

A. Low Depths of Flow

When the depth of flow in the existing sewer line is low (less than 2.5 inches), a flow-through plug may be installed inside the upstream line and the upstream manhole(s) shall be monitored.

B. Moderate and Low Depths of Flow

When the depth of flow in the existing sewer line is moderate (2.5 inches to 60% depth of flow), a flow-through plug may be installed during the connection and during construction. A second available option is to install a plug inside the upstream existing sewer line with pumping at the upstream manhole(s). The pumping measures may be reduced to monitoring with a standby pumping setup for low depths of flow (less than 2.5 inches).

C. High Depths of Flow

When the depth of flow in the existing sewer line is high (greater than 60% depth of flow), flow management options are limited to pump bypass measures at the upstream manhole(s).

2.6.12 Sewer Line Repairs and Pipe Section Replacements

With the exception of a dry sewer line, any sewer line repair or the replacement of an existing pipe section (e.g. DIP replacements) shall require a plug to be installed in the upstream sewer line at the upstream manhole for pumping measures. A plug shall also be installed in the downstream pipe at the downstream manhole to protect the existing sewer system from receiving construction debris.

2.6.13 Manhole Adjustments

The Contractor shall install a flow channel cover per S.D. RWRD-306 on the bench of a manhole that will have its rim adjusted or any other type of construction having the potential for debris or equipment to fall into the manhole. The Contractor shall comply with any request by the Field Engineering section to install a flow channel cover.

2.7 Formatting Requirements for Flow Management Plans

2.7.1 Simple Format FMP

For relatively simple construction activities involving an existing small line, the FMP may be presented in a simple letter-format consisting of a cover letter with attached documents. The cover letter should meet the following requirements:

A. Use the letterhead of the Contractor responsible for wastewater flow management (add contact information if not included in letterhead);

B. Identify the project name, plan number (e.g. G#, etc.), project owner, location and brief description of sewer-related construction;

C. Identify the Department's unique manhole identification number for manholes impacted by, or located immediately upstream and downstream of, sewer-related construction;

D. Include a detailed description of the proposed measures for wastewater flow management and phasing, if applicable;

E. Identify the estimated flows in the existing sewer line, the method of how these flows were estimated, and the dates and times of metering or observation;

F. Identify the calculated design flows that the proposed measures were based on;

G. Specify the type of disinfectant and required volume for incidental releases;

H. Provide a schedule for sewer-related construction activities (e.g. dates and times for start, completion, normal working hours and variations for sewer-related construction);

I. Include the following standard note to the Contractor: "Machine excavation shall not be conducted within 2 feet of the top of sewer. Excavation within 2 feet of the top of sewer shall be conducted by hand digging only. Any manhole frame and cover adjustments shall be conducted only after a flow channel cover per Detail No. RWRD 306 has been properly installed to protect existing Public Sewers from receiving construction debris.";

J. Include the name, signature, title and contact information of the person responsible for implementing the FMP; and

K. Include a contractor's certification statement such as: "*We have read, understand and will adhere to Section 2 of the Pima County RWRD Standard Specifications and Details for Construction ~~2012~~ 2016 for the preparation of Flow Management Plans*".

For a boiler-plate example of this cover letter, contact the Field Engineering section. Where applicable, the simple-letter format FMP should also meet the following requirements:

L. Include a map per Subsection 2.7.4;

M. Include spare pump calculations per Subsection 2.6.2;

N. Include photos of existing manholes that are impacted by flow management activities. Photos shall be taken looking down into the manhole, clearly showing the flow channels and with the north pointing to the top. For each photo, provide the date, time and the Department's unique manhole identification number;

O. Provide flow metering documents and calculations showing how existing flows and design flows were obtained;

P. Include a customer notification plan in accordance with Subsection 2.8;

Q. Include cut sheets for flow management equipment;

R. Include a list of emergency contact numbers for Contractor's staff responsible for maintaining wastewater flow management (i.e. project owner, superintendent, etc.); and

S. Include a list of emergency contact numbers for Department staff (for verification and to be returned to Contractor).

2.7.2 Detailed Format FMP

For larger sewer construction activities that will involve existing large lines, the FMP shall be presented in a plan format and shall meet the following requirements:

A. Submit plans on sheets, 24" x 36" in size;

B. Provide a simple-format FMP cover letter per Subsection 2.7.1;

C. If phasing is proposed, provide a complete and detailed description of the flow management procedures and their order of phasing;

D. Specify the required procedures for sealing and testing the proposed pumping or gravity bypass system to prevent leakage;

E. If either pumping or gravity bypass measures are proposed, use a minimum scale of 1" = 40' (plan) and 1" = 4' (profile) on all sheets;

F. If pumping bypass measures are proposed, include detailed information for bypass piping (e.g. stationing, offsets, elevations, size, material, suction and discharge points, air relief valves, discharge manifold, etc.);

G. If gravity bypass measures are proposed, include all existing utilities in the vicinity of excavation on all plan sheets;

H. Include a Map of Flow Management Measures per Subsection 2.7.4;

I. Provide a separate detail for temporary pumping and diversion manholes; detail should emphasize the piping cutout location and dimensions, isolation gates and spacing between suction lines;

The specifications for a FMP shall meet the following requirements:

J. Provide in an 8.5" x 11" bound format;

K. Include all required attachments for a simple format FMP, with the exception of the map requirements per Subsection 2.7.4;

L. If isolation gates will be used, include structural calculations sealed by an Arizona Registered P.E.;

M. If pumping measures will be used, include calculations for the minimum required sump depth in the manhole and sealed by an Arizona Registered P.E.;

N. Include pump performance curves with system curve and duty points shown;

O. Show that NPSHA substantially exceeds the NPSHR to avoid cavitation;

P. If gravity bypass measures will be used, include a hydraulic analysis for these measures and sealed by an Arizona Registered P.E.;

Q. If pumping or gravity bypass measures will be used, include a capacity analysis, sealed by an Arizona Registered P.E., of the existing sewer lines that will receive additional flows and include the maximum flow depths that will occur in existing sewer lines, manhole flow channels and service laterals (HCS/BCS);

R. If odor control measures will be used, include a detailed description of this requirement and specifications;

S. Include a list of equipment and identify the primary and backup equipment that will be kept onsite;

T. Include an equipment maintenance and inspection plan with sample inspection logs for the required daily inspections of installed flow management facilities;

U. Provide provisions to ensure pneumatic pipe plugs will be closely monitored;

V. Include a description of the security measures for personnel and equipment during flow management measures and outside standard work hours, as applicable;

W. Include a description of the proposed measures for keeping local residents and businesses informed of service interruptions and the status of construction. For certain projects, the Contractor may be required to coordinate with the Departments public relations group, for customer notifications;

X. Include a Sanitary Sewer Overflow Spill Prevention Plan per Subsection 2.7.5.

2.7.3 Wastewater Flow Data

The FMP shall provide the following information in either a table or at each manhole:

A. For metered flows, show the peak dry weather flows, dates of metering, and note any wet weather conditions, if applicable;

B. For instantaneous flow observations, show the estimated peak dry weather flow with the assumed pipe depth (e.g. half-flow or full-flow) and note any wet weather conditions, if applicable; and

C. Show the available flow capacity of the downstream sewer lines that will convey bypass flows during sewer construction.

2.7.4 Map of Flow Management Measures

The FMP shall include a map that clearly depicts of the area of sewer-related construction, along with the proposed layout for flow management measures. This map shall clearly and legibly show the following information:

A. Existing Public Sewers in the vicinity of flow management activities;

B. The type of plugs required and the locations they are to be installed; and

C. Street address and location of service laterals (HCS/BCS) that will be affected by construction.

In some cases, a copy of the Pima County MapGuide with clear and legible hand-written annotations may be acceptable.

2.7.5 Sanitary Sewer Overflow Spill Prevention Plan

The Contractor shall be responsible for insuring there will be no unauthorized discharges or spills of raw sewage during construction. For construction that will impact large sewer lines, the Contractor shall also prepare a Spill Prevention Plan in the event of a flow management failure and a sanitary sewer overflow (SSO). The SSO Spill Prevention Plan shall be included with the submittal of the FMP for review and approval by the Department.

The Contractor shall install containment measures for incidental spills at pumps, valves and manifolds. These measures may be accomplished by constructing earthen berms along the perimeter of the equipment's staging area and lining that area with a single sheet of polyethylene plastic sheeting or other approved material. Berms shall be a minimum height of 6-inches and the sheeting material shall have a minimum thickness of 35 mils. The use of a portable spill containment setup may also be permitted when Approved by the Field Engineering manager.

The Contractor shall store 12.5% sodium hypochlorite solution (NaOCl) near each pumping setup for the disinfection and cleanup of incidental spills. For sewer lines 12 inches in diameter or less, the minimum required volume of NaOCl shall be 6 gallons. For sewer lines greater than 12 inches in diameter, the minimum volume shall be 50 gallons. Storage containers for this solution shall be sealed securely at all times to prevent off-gassing. Unsealed containers shall be replaced immediately with fresh solution. These measures are not intended for an SSO.

In the event of an SSO, the Contractor shall immediately notify the Field Engineer and Department's Conveyance Division. For weekends, Holidays or between 5:00 pm and 8:00 am, the Contractor shall immediately call the Pima County Sheriff's Communication Center and request a Department representative to be dispatched to the site.

The Contractor shall take immediate action to prevent or contain an SSO. The Contractor shall be responsible for all costs to repair the system, for all expenses to mitigate the release and to disinfect the release areas, and for any regulatory penalties levied on the Department.

The Contractor shall repair all damage to the satisfaction of the Director or his/her delegate. In cases where the Contractor is not in compliance with mitigation efforts, any assistance provided by the Department will be billed to the Contractor. The Contractor shall compensate the Department for the cost of any fines levied as the result of an SSO.

2.8 Customer Notifications for Service Interruptions

The FMP shall also include a customer notification plan that shall address, at a minimum, all of the following requirements:

- Identify all customers that may experience service interruptions or any other disturbances during construction and describe why these cannot be avoided;
- Describe how customer notifications for service interruptions or disturbances will be carried out by the Contractor;
- Describe the mitigation methods proposed by the Contractor for service interruptions or disturbances; and
- Include specific time frames for service interruptions or disturbances.

The customer notification plan shall be reviewed and approved by the Department's public relations group, prior to construction.

The Contractor shall be responsible for locating all service laterals (HCS/BCS) that will be affected by construction and shall identify any services with the potential for high flow rates or other non-typical flow characteristics. The Contractor should contact the Department's Maps and Records section to obtain all available records regarding the location of existing service laterals. If location records are not available, the Contractor shall locate existing service laterals through such methods as CCTV, dye testing or locating private cleanouts.

The Contractor shall make every possible effort to notify, in person, all sewer customers that will be affected by proposed construction and shall promptly respond to any questions or concerns. The Contractor shall make arrangements for at least 1 neighborhood meeting a minimum of 10 Calendar Days prior to construction to address sewer-related issues. The Contractor's superintendent and at least 1 staff member from the Field Engineering section shall attend these meetings. The neighborhood meetings shall be a dialogue between the Contractor, the Department and the public to cover the following items, at a minimum:

- Describe the parameters of the Project and how proposed construction will affect service to sewer customers;
- Identify any special requirements or specific needs from the public;
- Exchange contact information for any questions or concerns; and
- Provide an opportunity for questions and answers.

At least 72 hours in advance, the Contractor shall also distribute door hanger pamphlets to all sewer customers to be affected by proposed construction. Each pamphlet shall be typed in both English and Spanish and shall describe the scope of the work, methods of construction and the dates and times that any interruptions in service may occur.

The Contractor shall also re-confirm with all customers at least 24 hours prior to the scheduled interruption in their service. The 24 hour notification shall require the Contractor to attempt to contact each customer verbally (i.e. by phone call or

in-person) and also distribute an "Official Notification" that has been approved by the Department's public relations group. The Contractor shall maintain a customer notifications log to track the notification attempts for each customer. This log shall include the customer names, dates and times of each attempt, and the type of notification (e.g. verbal or door hanger pamphlet). A copy of the customer notification log shall be submitted to the Field Engineering section prior to the interruption in service.

For customers with interrupted sewer service, the Contractor shall provide portable sanitary facilities during the entire period of interruption. The required number of portable sanitary facilities shall not be less than one portable facility per two residences and one portable facility per each business. The Contractor shall be responsible for cleaning and maintaining these facilities. The Contractor shall accommodate any special requirements or specific needs for these customers (e.g. ADA compliance). If the period of any service interruption exceeds 24 hours, the Contractor shall provide temporary bypass pumping systems for these services.